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PENNSYLVANIA (Wharton) Philadelphia	- 1
NORTHWESTERN (Kellogg) Evanston, Ill.	3 3
CHICAGO Chicago	8 8
MICHIGAN Ann Arbor	2 2
NARVARD Boston	4 6
GOLUMBIA New York	6
BIKE (Fuqua) Durham, N.C.	11 1
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S. STANDUTH (Tuck) Hanover, N.H.	10
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11. Vindenson) Los Angeles	12
12. UCLA (Anderson) New York	14
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15. MIT (Sloan) Cantor (Haas) Berkeley	18
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18. TEXAS Austin	
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GMAT Class Study Book AWA, Quantitative and Verbal

ninth edition

2018

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The Test

AA	IR	break	Quant.	break	Verbal
Score: 1-6 30 min. 1 Essay	Score: 1-8 30 min. 12 Questions	8 min.	37 Questions 75 min.	8 min.	41 Questions 75 min.

Analysis of an argument:

"It has become almost impossible to eat a balanced, healthy diet. Television news programs are constantly providing new, sometimes contradictory information about what is healthy and what is not. The average consumer cannot make informed decisions from this kind of scanty information and is generally overwhelmed upon entering increasingly larger supermarkets with more and more brands to choose from."

Discuss how logically convincing you find this argument. In explaining your point of view, be sure to analyze the line of reasoning and the use of evidence in the argument. Also discuss what if anything, would make this argument more sound and persuasive, or would help you better evaluate its conclusion.

Brainstorming (5 min. max)

Conclusion:

Premise:

Premise:

Assumption:

Assumption:

Assumption:

The argument presented is not convincing. The author concludes (conclusion) based on (evidence). There are several questionable assumptions, resulting in a logical gap between the premises and conclusion.

A major assumption made in this argument is that (first assumption). This assumption may very well be wrong, as (why it may be wrong).

The validity of the conclusion also depends on (second assumption), a key concept omitted in the argument. For if (opposite of second assumption) were true, it is likely that (opposite of conclusion).

Finally, even if the two assumptions discussed above were true, the argument would be unconvincing because, without providing any evidence, it requires that (third assumption).

In order to make the argument more persuasive, the author would have to demonstrate that the assumptions discussed above are, in fact, true. Thus, evidence supporting (first assumption), (second assumption) and (third assumption) would tighten the link between the premises and conclusion, making the reasoning more sound. Without any discussion of these ideas, however, it is impossible to evaluate the conclusion.

Integrated Reasoning

Starting 5 June 2012, the biggest change to the test in more than a decade will take place. The Analysis of an Issue essay from the AWA will be replaced with the new section Integrated Reasoning (IR).

Integrated Reasoning questions are intended to resemble the types of problems students will encounter in business school and in business. These questions focus on test takers' ability to solve complex problems using data from multiple sources in a variety of formats.

You will be asked to analyze different types of data in the form of graphs, tables and spreadsheets.

You will be given 30 minutes to answer 12 questions in the form of four new question types:

- Multi-Source Reasoning
- Table Analysis
- Graphics Interpretation
- Two-Part Analysis

IR will in no way influence your GMAT score. You will receive a separate score of 1-8 from this section.

For more information and sample questions please visit: http://www.gmac.com/gmat/next-generation-gmat-information-center.aspx Multi-Source Reasoning: Click on the page to reveal different data and discern which data you need to answer the question.



Table Analysis: Sort the table to organize the data so you can determine whether certain conditions are met. Each question will have statements with opposing answers (e.g., yes/no, true/false, inferable/not inferable); select one answer for each statement.

Commodity	Production, world share (%)	Production, world rank	Exports, world share (%)	Exports, world rank
Beef	16	2	22	1
Chickens	15	3	38	1
Coffee	40	1	32	1
Com	8	4	10	2
Catton	5	5	10	4
Orange juice	56	1	82	1
Pork	4	4	12	- 4
Soybeans	27	2	40	Z
Sugar	21	1	- 44	1

Graphics Interpretation: Interpret the graph or graphical image and select the option from a drop-down list to make the answer statements accurate.



Two-Part Analysis: Select one answer from each column to solve a problem with a two-part solution. Possible answers will be presented in a table with a column for each part.

	Students per faculty member in Spring 2004	Number of faculty in Fall 1999
5,500 A	0	0
5,500	0	0
1	0	ø
$\left(\frac{100 + S}{200 + F}\right)$	0	0
$\left(\frac{100 - 5}{100 + 7}\right)$	0	0
$\left(\frac{100 + F}{100 - S}\right)$	0	0

Multi-Source Reasoning

Email #1 Email #2 Email #3

Email from **project manager** to financial officer August 3, 9:43 a.m.

Did all three bids arrive on time last night? We need to minimize delays on construction, so if the contractors have submitted their estimates and our research team has compiled reports on the contractors' histories, we should make a decision on which firm to hire by the end of the day.

Email from **financial officer** in response to the project manager's August 3, 9:43 am email

August 3, 10:12 am.

Appaloosa Construction sent us a bid of \$1.35 million. Its bid is the highest of the three, but its track record is spotless; none of the past 10 major projects it has worked on has gone over budget by more than 4%. Breton Construction did manage to underbid them— its representative claims that it can do the project for \$1.25 million. However, in the past two years, Breton oversaw two different projects that went over budget by a full 25%. If our project were to exceed Breton's estimate by a comparable percentage, we would run out of funds before completion. Finally, Campolina Construction presented a \$1.1 million plan, and its track record is as good as Appaloosa's. Unfortunately, although Appaloosa and Breton cm, both start tomorrow, Campolina would be unable to begin work until August 25, so we cannot accept Campolina's low bid.



Email from **project manager** in response to the financial officer's August 3, 10:12 a.m. email

August 3, 10:38 a.m.

Even though Breton's work could potentially cost less than either of the other two, that savings does not justify the risk of being unable to complete the project. But as far as Campolina is concerned, you're not considering the actual cost of a delay. It's true that we are losing money at a constant rate each day we don't start building. But even after factoring in the losses of waiting until August 25, the estimated cost of working with

Campolina still ends up \$50,000 below Appaloosa's bid.

1. Consider each of the following statements. Does the information in the three emails support the inferences as stated? Choose Yes if the statement can be accurately inferred; otherwise choose No.

YES	NO	
		The total budget for the project is between \$1.4 million and \$1.5
		minion.
		The project manager and the financial officer agree in their evaluation of Appaloosa's bid.
		In making their decision, the project manager and the financial officer considered how much time the contractors would spend on construction.
		The project manager and the financial officer disagree about the best choice of contractors for completing the project.
		The project manager is willing to wait a few days before deciding on Campolina's bid.

- 2. The amount of money lost each day that construction is delayed is closest to
 - a) \$2,500
 - b) \$10,000
 - c) \$20,000
 - d) \$55,000
 - e) \$65,000

Table Analysis

Household Size: Occupied Housing Units by State, 2010 Census Sort by

1-person households

•	1-person	2-person	3-person	4-person	5-person	6-person	7 or more-	Total
	households	households	households	households	households	households	person	households
							households	
Vermont	72,233	96,889	39,695	31,210	11,107	3,480	1,828	256,442
New	133,057	188,923	85,046	70,835	27,365	9,286	4,461	518,973
Hampshire								
Maine	159,533	213,695	84,340	64,010	23,840	7,854	3,947	557,219
Connecticut	373,648	443,095	226,658	197,116	84,916	29,348	16,306	1,371,087
Massachusetts	732,263	813,166	417,216	353,676	150,842	51,409	28,503	2,547,075

The above data is drawn from 2010 census data for New England (excluding Rhode Island, whose data is not available). The table provides the total number of households in each state and the distribution of households of various sizes within each state.

Sort by

2-person households

	1-person households	2-person households	3-person households	4-person households	5-person households	6-person households	7 or more- person households	Total households
Vermont	72,233	96,889	39,695	31,210	11,107	3,480	1,828	256,442
New	133,057	188,923	85,046	70,835	27,365	9,286	4,461	518,973
Hampshire								
Maine	159,533	213,695	84,340	64,010	23,840	7,854	3,947	557,219
Connecticut	373,648	443,095	226,658	197,116	84,916	29,348	16,306	1,371,087
Massachusetts	732,263	813,166	417,216	353,676	150,842	51,409	28,503	2,547,075

Sort by

3-person households

	1-nerson	2-nerson	3-nerson	4-nerson	5-nerson	6-nerson	7 or more-	Total
		2-per301	5-person		5-person		7 OF HIOTC-	10121
	households	households	households	households	households	households	person	households
							households	
Vermont	72,233	96,889	39,695	31,210	11,107	3,480	1,828	256,442
Maine	159,533	213,695	84,340	64,010	23,840	7,854	3,947	557,219
New	133,057	188,923	85,046	70,835	27,365	9,286	4,461	518,973
Hampshire								
Connecticut	373,648	443,095	226,658	197,116	84,916	29,348	16,306	1,371,087
Massachusetts	732,263	813,166	417,216	353,676	150,842	51,409	28,503	2,547,075

Sort by

4-person households

	1-person	2-person	3-person	4-person	5-person	6-person	7 or more-	Total
	households	households	households	households	households	households	person	households
							households	
Vermont	72,233	96,889	39,695	31,210	11,107	3,480	1,828	256,442
Maine	159,533	213,695	84,340	64,010	23,840	7,854	3,947	557,219
New	133,057	188,923	85,046	70,835	27,365	9,286	4,461	518,973
Hampshire								
Connecticut	373,648	443,095	226,658	197,116	84,916	29,348	16,306	1,371,087
Massachusetts	732,263	813,166	417,216	353,676	150,842	51,409	28,503	2,547,075

Sort by

5-person households

	1-person	2-person	3-person	4-person	5-person	6-person	7 or more-	Total
	households	households	households	households	households	households	person	households
							households	
Vermont	72,233	96,889	39,695	31,210	11,107	3,480	1,828	256,442
Maine	159,533	213,695	84,340	64,010	23,840	7,854	3,947	557,219
New	133,057	188,923	85,046	70,835	27,365	9,286	4,461	518,973
Hampshire								
Connecticut	373,648	443,095	226,658	197,116	84,916	29,348	16,306	1,371,087
Massachusetts	732,263	813,166	417,216	353,676	150,842	51,409	28,503	2,547,075

Sort by 6-person households

•	1-person	2-person	3-person	4-person	5-person	6-person	7 or more-	Total
	households	households	households	households	households	households	person	households
							households	
Vermont	72,233	96,889	39,695	31,210	11,107	3,480	1,828	256,442
Maine	159,533	213,695	84,340	64,010	23,840	7,854	3,947	557,219
New	133,057	188,923	85,046	70,835	27,365	9,286	4,461	518,973
Hampshire								
Connecticut	373,648	443,095	226,658	197,116	84,916	29,348	16,306	1,371,087
Massachusetts	732,263	813,166	417,216	353,676	150,842	51,409	28,503	2,547,075

Sort by

7-person households

•	1-person	2-person	3-person	4-person	5-person	6-person	7 or more-	Total
	households	households	households	households	households	households	person	households
							households	
Vermont	72,233	96,889	39,695	31,210	11,107	3,480	1,828	256,442
Maine	159,533	213,695	84,340	64,010	23,840	7,854	3,947	557,219
New	133,057	188,923	85,046	70,835	27,365	9,286	4,461	518,973
Hampshire								
Connecticut	373,648	443,095	226,658	197,116	84,916	29,348	16,306	1,371,087
Massachusetts	732,263	813,166	417,216	353,676	150,842	51,409	28,503	2,547,075

Sort by

Total households

	1-person households	2-person households	3-person households	4-person households	5-person households	6-person households	7 or more- person	Total households
							households	
Vermont	72,233	96,889	39,695	31,210	11,107	3,480	1,828	256,442
New	133,057	188,923	85,046	70,835	27,365	9,286	4,461	518,973
Hampshire								
Maine	159,533	213,695	84,340	64,010	23,840	7,854	3,947	557,219
Connecticut	373,648	443,095	226,658	197,116	84,916	29,348	16,306	1,371,087
Massachusetts	732,263	813,166	417,216	353,676	150,842	51,409	28,503	2,547,075

1. Based on the information in the table above, the population of Vermont is approximately

- a) 194,000
- b) 256,000
- c) 440,000
- d) 510,000
- e) 600,000
- 2. Consider the following statements about these states. For each statement, evaluate whether that statement is True or False, according to the information in the table

Т	F	
		New Hampshire has the largest percent difference between the number of 2- person households and the number of three-person households.
		The median household size of all households in the five states combined is two people.
		Of the seven categories of household size, Maine has the median number of households in exactly three.
		In each of the seven categories of household size, Massachusetts has more households than the next highest two states combined.

Graphics Interpretation

Public Elementary and High Schools, by State: 2008-2009



The graph above is a scatter plot with 49 points. The 49 points represent the number of elementary and high schools in 48 U.S. states and the District of Columbia (the number of schools in California and Texas is too large to appear on a graph of this scale). The dotted line represents a regression line. For each blank, select the answer choice that correctly completes the statement according to the information in the graph.

- 1. The slope of the regression line is _____
 - a) greater than one
 - b) approximately one
 - c) less than one
- Approximately _____ percent of the states (including the District of Columbia represented in the graph have fewer than 500 elementary schools)
 - a) 10
 - b) 25 c) 50
 - c) 50
 - d) 75
 - e) 90

Two-Part Analysis

1. Two water storage tanks, Tank A and Tank B, can each hold more than 20,000 liters of water. Currently, Tank A contains 5,000 liters of water, while tank B contains 8,000 liters. Each tank is being filled at a constant rate, such that in 15 hours, the two tanks will contain the same amount of water, though neither will be full.

In the table below, identify rates of filling for each tank that are consistent with the information. Make only one selection in each column.

Tank A	Tank B	Fill Rate	
		30 liters/hr	
		90 liters/hr	
		150 liters/hr	
		220 liters/hr	
		290 liters/hr	

GMAT Quant. and the CAT

Trap Answers and the Voodoo Method...

The Desperate Test Taker

1. When Susan and Melinda work together they can do a certain job in 1 hour. When Susan works alone she can do the same job in 3 hours. How long would it take Melinda working alone to do the job?

a) 1 b) 1.5 c) 2 d) 3 e) 4

The I Am So Great at Math Test Taker

2. How much interest will \$2000 earn at an annual rate of 8% in one year if the interest is compounded every 6 months?

a) \$160 b) \$163.20 c) \$249.73 d) \$332.80 e) \$2163.20

3. In Motor City 90% of the population own a car, 15% own a motorcycle, and everybody owns one the other or both. What is the percentage of motorcycle owners who own cars?

a) 5% b) 15% c) 33.33% d) 50% e) 90%

- 4. It costs 10 cents a kilometer to fly and 12 cents a kilometer to drive. If you travel 200 kilometers, flying x kilometers of the distance and driving the rest, then the cost of the trip in dollars is?
 - a) 20 b) 24 c) 24 2x d) 24 0.02x e) 2400 2x
- 5. A certain business printer can print 40 characters per second, which is 4 times as fast as an average printer. If an average printer can print 5 times as fast as an electric typewriter, how many characters per minute can an electric typewriter print?

a) 2 b) 32 c) 50 d) 120 e) 600

6. There are three types of tickets available for a concert: orchestra, which cost \$12 each; balcony which cost \$9 each; and box, which cost \$25 each. There were P orchestra tickets, B balcony tickets and R box tickets sold. for the concert. Which of the following expressions gives the percentage of ticket proceeds due to the sale of orchestra tickets?

a)
$$100 \times \frac{P}{P+B+R}$$

b) $100 \times \frac{12P}{12P+9B+25R}$
c) $\frac{12P}{12P+9B+25R}$
d) $100 \times \frac{9B+25R}{12P+9B+25R}$
e) $100 \times \frac{12P+9B+25R}{12P}$

7. A computer salesman sells an average of 15 computer systems a month at \$4,200 per system. He earns a basic salary of \$22,000 per year plus a commission of 7.5% on monthly sales made over a level of \$25,000 per month. What is his expected annual income?

a) \$78,700 b) \$75,200 c) \$66,700 d) \$56,200 e) \$34,200

Trap Answers Review



- 1. What is the perimeter of the square?
 - a) 5
 - b) 8
 - c) 20
 - d) 32
 - e) 40



- In the figure above, the shaded triangle has equal sides of length 1.
 If AC = BC = 3, what is the area of the unshaded portion of triangle ABC as a fraction of the total area of the triangle?
 - a) 8/9
 - b) 7/8
 - c) 2√3
 - d) 3/8
 - e) 1/9
- 3. A total of \$30000 invested in two investments yields 4.5% and 6% simple interest. If the total interest at the end of the year was \$1470, how much was invested at the higher rate?
 - a) \$8000
 - b) \$14000
 - c) \$17500
 - d) \$22000
 - e) \$25650

- 4. A 4000 liter tank, half-full of water is being filled from a pipe with a flow rate of 1 kiloliter every 2 minutes. At the same time, the tank is losing water from two drains at a rate of 1 kiloliter every 4 minutes and every 6 minutes. How many minutes does it take to fill the tank completely?
 - a) 8
 - b) 12
 - c) 18
 - d) 24
 - e) 48
- Oak trees line both sides of a street for a length of 3/8 of a kilometer. If there is 16 meters of space between the trees, and each tree is 1 meter wide, how many trees are there along the street?
 - a) 22
 - b) 23
 - c) 24
 - d) 44
 - e) 46
- 6. A lighthouse emits a light which can be seen for 60 miles in all directions. If the intensity of the light is strengthened so that its visibility is increased by 40 miles in all directions, by approximately how many square miles is its region of visibility increased?
 - a) 6400
 - b) 10000
 - c) 10300
 - d) 20000
 - e) 31400

- From 1985 to 1995, the population of Jamestown increased by 50%, and from 1995 to 2005, the population increased by 200% to 13,284. The population in 2005 was how much greater than the population in 1985?
 - a) 2,952
 - b) 4,428
 - c) 7,971
 - d) 8,856
 - e) 10,332
- If the length of one leg of a right triangle is 6, and if the perimeter is 18, what is the area of the triangle?
 - a) 12.5
 - b) 13.5
 - c) 21
 - d) 25
 - e) 27
- 9. A new skyscraper has 172 floors. Tom is in an elevator on the 169th floor going down at a rate of 16 floors per minute and James is in an elevator on the 13th floor going up at a rate of 10 floors per minute. If Tom and James make no stops along the way, what floor will they meet on?
 - a) 43
 - b) 60
 - c) 73
 - d) 96
 - e) 110

- 10. Company X has 720 employees. After a certain employee meeting it was discovered that only 40% of the employees are men and that 50% of them earn more than \$100,000 per year. If 35% of all the employees earn more than \$100,000 per year, what fraction of the female employees earn less than \$100,000 per year?
 - a) 1/4
 - b) 1/3
 - c) 11/20
 - d) 9/20
 - e) 3/4

GMAT Verbal and the CAT

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Reading Comprehension

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Warm up...

In a large part as a consequence of the feminist movement, historians have focused a great deal of attention in recent years on determining more accurately the status of women in various periods. Although much has been accomplished for the modern period, premodern cultures have proved more difficult: sources are restricted in number, fragmentary, difficult to interpret and often contradictory. Thus it is not particularly surprising that some early scholarship concerning such cultures has gone unchallenged. An example is Johann Bachofen's 1861 treatise on Amazons, women-ruled societies of questionable existence contemporary with ancient Greece.

Starting from the premise that mythology and legend preserve at least a nucleus of historical fact, Bachofen argued that women were dominant in many ancient societies. His work was based on comprehensive survey of references in the ancient sources to Amazonian and other societies with matrilineal customs-societies in which descent and property rights are traced through the female line. Some support for his theory can be found in evidence such as that drawn from Herodotus, the Greek "historian" of the fifth century B.C., who speaks of Amazonian society, the Sauromatae, where the women hunted and fought in wars. A woman in this society was not allowed to marry until she had killed a person in battle.

Nonetheless, this assumption that the first recorders of ancient myth have preserved fact is problematic. If one begins by examining why ancients refer to Amazons, it becomes clear that ancient Greek descriptions of such societies were meant not so much to represent observed historical fact-real Amazonian societies-but rather to offer "moral lessons" on the supposed outcome of woman's rule in their own society. The Amazons were often characterized, for example, as the equivalents of giants and centaurs, enemies to be slain by Greek heroes. There customs were presented not as those of a respectable society, but as the very antitheses of ordinary Greek practices.

Thus, I would argue, the purpose of accounts of the Amazons for their male Greek recorders was didactic to teach both male and female Greeks that all-female groups, formed by withdrawal from traditional society, are destructive and dangerous. Myths about the Amazons were used as arguments for the male-dominated status quo, in which groups composed exclusively of either sex were not permitted to segregate themselves, permanently from society. Bachofen was thus misled in his reliance on myths for information about the status of women. The sources that will probably tell contemporary historians most about women in the ancient world are such social documents as gravestones, wills, and marriage contracts. Studies of such documents have already begun to show how mistaken we are when we try to derive our picture of the ancient world exclusively from literary sources, especially myths.

1. The primary purpose of the passage is to?

- a) compare competing new approaches to understand the role of women in ancient societies
- b) investigate the ramifications of Bachofen's theory about the dominance of women in ancient societies
- c) explain the burgeoning interest among historians in determining the actual status of women in various societies
- d) analyze the nature of Amazonian society and uncover similarities between it and the Greek world
- e) criticize the value of ancient myths in determining the status of women in ancient societies

- 2. All of the following are stated by the author as problems connected with the sources for knowledge of premodern cultures EXCEPT?
 - a) partial completeness
 - b) restricted accessibility
 - c) difficulty of interpretation
 - d) limited quantity
 - e) tendency toward contradiction
- 3. Which of the following can be inferred from the passage about myths recorded by the ancient Greeks?
 - I. They sometimes included portrayals of women holding positions of power.
 - II. They sometimes contained elaborate explanations of inheritance customs.
 - III. They comprise almost all of the material available to historians about ancient Greece.
 - a) I only
 - b) III only
 - c) I and III only
 - d) II and III only
 - e) I, II and III
- 4. Which of the following is presented in the passage as evidence supporting the author's view of the ancient Greeks' descriptions of the Amazons?
 - a) The requirement that Sauromatae women kill in battle before marrying
 - b) The failure of historians to verify that women were ever governors of ancient societies
 - c) The classing of Amazons with giants and centaurs
 - d) The well-established unreliability of Herodotus as a source of information about ancient societies
 - e) The recent discovery of ancient societies with matrilineal customs
- 5. It can be inferred from the passage that the probable reactions of many males in ancient Greece to the idea of a society ruled by women could best be characterised as
 - a) confused and dismayed
 - b) wary and hostile
 - c) cynical and disinterested
 - d) curious but fearful
 - e) excited but anxious
- 6. The author suggests that the main reason for the persisting influence of Bachofen's work is that
 - a) feminists have shown little interest in ancient societies
 - b) Bachofen's knowledge of Amazonian culture is un paralleled
 - c) Reliable information about the ancient world is difficult to acquire
 - d) Ancient societies show the best evidence of women in the positions of power
 - e) Historians have been primarily interested in the modern period
- 7. The author's attitude toward Bachofen's treatise is best described as one of
 - a) qualified approval
 - b) profound ambivalence
 - c) studied neutrality
 - d) pointed disagreement
 - e) unmitigated hostility

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How to Read – less passive more active

Read – Paraphrase – Predict (RPP)

1. Among academic historians, a rift of sorts has arisen between social historians, who pinpoint their studies on the suffering of victims of prejudice, and traditional historians, who prefer to emphasize wars, diplomacy, and the great personalities involved.

Pa	raphrase:	
Pro	edict:	-
2.	Tchaikovsky received financial support for nearly fourteen years from hi Nadezhda von Neck, the widow of a wealthy German railroad magnate. rumoured that Tchaikovsky resisted meeting her because he was too pa self-doubt to convey his love for her.	s patron, It has been ralyzed with
Ра	raphrase:	
Pro	edict:	- - -
3.	The clearest advantage that the new Ferro-Electric Random-Access Mer chip has over its predecessor, the dynamic RAM chip, is FeRAM's ability reproduce information with greater security and much greater speed. If a decade, though, before FeRAM is inexpensive enough for mass produce	nory (FeRAM) to retain and t will be at least ction.
Pa	raphrase:	-
Pro	edict:	

Scope Drill

The world's longest fence is the 3,307 miles of unbroken wire mesh that comprise the "Dog Fence," which runs from the eastern coast of Australia, near Brisbane, to the center of the continent's southern coast, ending at a remote village called Yacka

.....

The fence is in place to protect the wool industry and what has become the world's second largest sheep population.....

.....

The fence protects the sheep from dingoes, Australian wild dogs, cousins to coyotes and jackals.....

That the fence is necessary to the industry is demonstrated by the fact when damage occurs, such as when 1992 rains caused flooding that destroyed parts of the fence in many areas, the punishment inflicted by the dingoes becomes exponentially worse.

The "Dog Fence," though has stirred controversy and protests from conservationists, most of which are based around the notion that animal migration, which the fence severely restricts for many species, is an essential component of the

ecology.....

.....

The kangaroo population inside the fence, consisting of red and grey kangaroos and wallabies, has exploded, as the large marsupials, natural prey for dingoes, have had no enemies to keep their population in check. The kangaroos now also threaten the sheep population, competing with it for water and grass.....

.....

.....

As a result the Australian government has had to cull 3,000 kangaroos per year from the environment. Obviously, another solution to this problem should be found.

Flow of Ideas: _____

Main idea of the Passage: ______

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1. The passage is primarily concerned with?

- a) The problem of overpopulation of large marsupials afflicting certain areas of eastern Australia.
- b) The conflict between environmentalists and ranchers over sheep-grazing areas.
- c) The challenges the "Dog Fence" places on animal migration.
- d) The role of economics in determining human manipulation of an ecological system.
- e) The positive and negative effects of the "Dog Fence."

2. According to the passage, the erection of the "Dog Fence" has contributed to all the following developments EXCEPT?

- a) A population boom among wallabies.
- b) The success of the Australian wool industry.
- c) Areas where the high concentration of sheep and kangaroos has caused overgrazing.
- d) Several million dollars worth of damage to the Australian wool industry.
- e) Protests from environmentalists concerning Australia's treatment of its wildlife.
- 3. The author of the passage probably mentions the 1992 flood damage in order to?
 - a) Highlight the unreliability of the "Dog Fence".
 - b) Convince the reader of the necessity of the wool trade to Australia's economy.
 - c) Give an example of how the "Dog Fence" manages to protect the flocks of sheep.
 - d) Demonstrate the potential damage to the wool industry prevented by the "Dog Fence".
 - e) Underline the savage nature of the dingos.
- 4. According to the passage, the Australian government has had to keep the kangaroo population in check because?
 - a) Overgrazing has damaged the soil in south eastern Australia.
 - b) They have caused damage to the "Dog Fence".
 - c) The rate at which the species is reproducing has accelerated.
 - d) There are now more kangaroos than sheep.
 - e) These large marsupials use important resources necessary to the wool industry.

5. The passage provides support for which of the following statements?

- a) The "Dog Fence" has led to a steady deterioration of Australia's environment.
- b) Before the "Dog Fence" was built the dingos preyed on kangaroos.
- c) Floods prevented Australia's wool industry from turning a profit in 1992.
- d) Uncontrolled overgrazing could endanger Australia's wildlife.
- e) The "Dog Fence" was originally built by ranchers to prevent the flocks of sheep from leaving a certain area.

6. Which of the following solutions to the problem, if feasible, would the author of the passage most likely support?

- a) The gradual removal of the kangaroo population to another region of Australia where there are fresh grazing areas.
- b) The construction of another fence separating the sheep from the large marsupials.
- c) A dismantling of the fence in order to allow the dingos to prey on the kangaroos.
- d) The use of pesticides to eradicate the dingo population.
- e) A cessation of the Australian wool industry.

What to Read

1/3 Passage = 80% Scope

- Many people think you should just skim the passage or read the first lines of every paragraph, and not to read the passage. This is wrong; if you misunderstand the main idea of the passage, you will certainly get many of the questions wrong. Give the passage one good read, taking no more than 3 minutes to read all of the text. Skim past the details and focus attention on key ideas that will establish 'The Flow of Ideas'.
- 1/3 Passage = 80% Scope Use RPP to spark interest in the text Look for the connection between each sentence.
 Have an argument with the author.
 You should have a good idea of the Scope from the first paragraph.
- As you read take brief notes: (spend no more than 30 seconds taking notes)
 - 1. Identify the Topic
 - 2. The Main Idea or Primary Purpose of Passage
 - 3. Organization of passage The Flow of Ideas
 - 4. If applicable the Tone or Attitude of the Author

What the Purpose of a Paragraph?

- to discuss only one idea
- find it and move on
- remember one paragraph flows into the next

Using key words can help establish the flow of ideas.

Continue the Idea Words Similarly Moreover Additionally In the same way Likewise		Conclusion Words Thus Therefore Hence So In summary In conclusion
Contradiction or Contrast W	/ords	
Nevertheless Nonetheless However But Although Though Even though	Notwithstandin Yet Despite In spite of On the one han While Unlike	g don the other hand

THE BUSINESS PASSAGE

It comes as no surprise that there is little consensus among economists who study the prospects for the new European Central Bank (ECB). Some are overwhelmingly enthusiastic about the ECB's potential to eliminate exchange-rate currency fluctuations among its sixteen member economies, while others are convinced that cultural differences and inevitable squabbles over monetary policy doom the central bank to failure.

The pessimists have a valid point. The ECB's primary goal, as specified by the Maastricht Treaty, is to bring about price stability within its area of sovereignty. This stability, however, is predicated on reducing the current incongruity of prices throughout the region. Currently, though, there are too many cultural and financial variables that prevent prices from coming into alignment anytime soon.

For a start, the prices of many products sold in Europe already vary from country to country by large margins. The average cost of a pair of blue jeans is 34 percent higher in Germany than it is in Italy. Some reasons for this can be remedied through legislation. If Germany were to repeal its law prohibiting supermarkets from stocking aspirin on their shelves, for example, aspirin prices might come in line with the rest of the European Union. But most price differentials derive from seemingly immutable standards of living. Personal incomes in Spain and Portugal are well below the European average, as they have been for decades. Thus, prices stay lower to accommodate weaker buying power. And since Scandinavian countries show no sign of adopting the high demand for coffee products that exists in France and Italy, coffee prices will remain much higher in southern Europe than in the north.

Until now, Europe's different currencies have done well to divert consumer's attention from these price differentials. But now that Europe has adopted its one currency, the euro, Europeans are more likely to seek out the best price regardless of geography. This could mean depressed localized economies of scale. Many countries will not recover from this situation in the short term.

Fortunately, for the ECB's architects, there are two extraordinary financial models to study and replicate: the German Bundesbank and America's Federal Reserve Board. Each country within the European Union, regardless of its population or the size of its gross domestic product (GDP), will be represented equally in the ECB's governing council, which will dictate the policies that the various national central banks (NCBs) will implement. As long as the lines of communication remain open and country representatives keep an open mind toward what may become a radical overhaul within European commerce, the euro and the ECB have a fighting chance to survive.

This text has five rather long paragraphs. Use your summarizing skills to write a brief summary of each. (Two sentences maximum, use left side of page if necessary)

Paragraph 1: Paragraph 2: Paragraph 3: Paragraph 4: Paragraph 5 Overall Main Idea: mba.help

Main idea questions

These questions ask you to identify the central theme of the passage. They are usually worded in one of the following ways:

The primary purpose of the author is to... The main purpose of the author is to... The author is mainly concerned with...

Example:

The primary purpose of the passage is to

- a) compare the ECB to other financial governing bodies
- b) assert that the European countries that have not yet embraced the euro are destined to do so before too long
- c) provide support for the theory that Europe's transition to a central bank will have many obstacles
- d) enumerate several examples of the constantly changing global financial climate
- e) prove that the ECB will never bring about the price stability on which its survival so clearly depends

Sometimes the main idea question is more vague:

In the passage, the author is primarily concerned with which of the following?

- a) comparing two different approaches to resolving a conflict
- b) expressing dismay over a poorly reasoned conclusion
- c) presenting information and offering different ways to interpret it
- d) describing a problem that will not be solved easily
- e) defending an established policy

Detail questions

Detail questions test your ability to locate supporting details in the text. Most detail questions ask directly about a specific detail.

To answer a detail question, locate the relevant detail in the passage and carefully read the sentences concerning the detail and one or two surrounding sentences to determine the context. Then, select the answer choice that correctly restates the detail.

The Decoys:

- Refer to the wrong part of the passage. GMAT likes to refer to something that you've already read even though it doesn't pertain to the current question.
- Make good common sense but are not mentioned. These are known as "heartstring" answer choices because they appeal to your heart but not to the passage.
- Refute the passage directly. GMAT knows that it's very easy to misread text. You can miss just one word (such as "Magellan did **not** sail around the world" instead of "Magellan did sail around the world") and come away with the opposite meaning.
- Stray away from the passage

Line reference

Some questions are nice enough to give you a hint where to look:

The author mentions the researchers' experiment in lines 26-33 for which of the following reasons?

It might be a good idea to read line 25 and 34, as those tricky devils at GMAT might be hiding the golden nugget of information just above or just below the line indicators.

Lead words

Of course, questions don't always include references, but that isn't necessarily bad. Suppose a question looked like this:

The author most probably mentions the Bundesbank in order to

- a) suggest an alternate composition of the ECB's governing council
- b) compare its fiscal policies to those of the Federal Reserve Bank
- c) provide an example of a financial institution to which the ECB will never measure up
- d) indicate that there are other established fiscal entities for the ECB to emulate
- e) urge the German government to ease its restrictions on supermarkets

The lead word in the question is *Bundesbank*, so skim the passage until you find the term. (Don't read just skim. This one's easier because Bundesbank is a proper noun with a big fat capital letter – they're easier to find.) Once you find Bundesbank (in the first sentence of the last paragraph), start reading.

Lead Word Drill

Circle the lead words in each of the following questions.

- 1. Which of the following is an assumption underlying the author's conclusion regarding Beethoven's collection of rare Belgian tapestries?
- 2. According to the passage, which of the following is an accurate statement concerning Indian rope tricks?
- 3. The passage suggests that software bundling is the biggest threat to which of the following networking strategies?
- 4. It can be inferred from the passage that which of the following social programs was defunct by 1964?
- 5. According to the passage, a patient suffering from angina can collapse into complete cardiac arrest after each of the following happens EXCEPT

In addition to the detail questions that ask about one specific detail, there are two forms of detail questions that test your ability to locate several details in the text. These are EXCEPT questions and the Roman numeral questions.

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Except or Not questions

ask you to identify a detail that is not in the passage.

According to the passage, price stability within the European Union is affected on all of the following EXCEPT

- a) regional tastes
- b) currency exchange-rates
- c) consumer bargain-hunting
- d) legislation
- e) consumer wealth

Roman numeral detail questions

test the same ability as EXCEPT questions, but in a different format.

The elimination technique is the best approach to Roman numeral questions. The basics of the techniques are as follows:

- Decide which statement in the question to read first. Your goal is to read as few statements as possible. If by eliminating one of the statements you can narrow the choices to one, read that statement.
- Read the statement. If the statement is true, eliminate all answer choices that do not contain that statement. If the statement is false, eliminate all choices that do contain the statement.
- Now decide which statement to read next. In the majority of cases, you will need to read only two statements.

The passage provides information that would answer which of the following questions?

- I Is price arbitrage possible within the Eurozone?
- II Do Germans enjoy a higher standard of living than do other citizens of the Eurozone?
- III Are certain pharmaceutical products banned in supermarkets of any given Eurozone country?
- a) I only.
- b) III only.
- c) I, II, and III.
- d) II only.
- e) I and III only.

Inference questions

Inference questions test your ability to recognize information that is not explicitly stated in the passage, but that is strongly implied. Inference questions can refer to specific details or more general ideas and are usually worded in one of the following ways:

It can be inferred... The passage suggests... The author probably considers... The author implies that...

To answer inference questions, look for answer choices that present information that can be deduced directly from the passage. Do not make assumptions. The majority of wrong answer choices in inference questions try to draw you into making unwarranted assumptions. Do not assume anything. Do not use your outside knowledge. Use only the information in the passage.

The passage most clearly implies which of the following?

- a) Countries whose economies are depressed by the price wars following the arrival of the euro will eventually rebound and prosper
- b) The average German or Italian has more disposable income than does the average Portuguese or Spaniard
- c) Were it not for the Maastricht Treaty, the ECB would never have come about
- d) The arrival of the Euro has not solved the problem of price disparity in Europe
- e) The governing council may have to alter its plan of equal representation to account for the contributions of each country to Europe's overall gross domestic product.

Logic Questions

Logic questions test your ability to analyze the organization of the author's argument. These questions focus on the organization of the passage as a whole, the organization of a paragraph, or the role played by a particular detail in the structure of the argument.

As with main idea questions, the key to answering logic questions is to select the answer choice which fully and precisely describes the structure of the passage or paragraph, or the role of the detail in question.

Which of the following best describes the organization of the passage?

- a) Two historical backgrounds are compared and contrasted.
- b) A problem is identified, discussed and resolved.
- c) A theory is discussed, and evidence is introduced to condemn it.
- d) A paradox is described, and one side is shown to be more dominant than the other.
- e) A debate is introduced, and supporting evidence for both sides is presented.

Which of the following best describes the relation of the last paragraph to the passage as a whole?

- a) It advances an argument to be debated further.
- b) It outlines a process to be re-examined.
- c) It adds some positive points to an otherwise negative outlook.
- d) It reinforces a theory that is not easily disproved.
- e) It poses a question that as yet has no answer.

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Application questions

Application questions ask you to relate the information in the passage to a larger context or one that is different from that of the passage. These questions primarily appear in one of the following forms:

The passage most likely appeared in a... The passage is most relevant to which field of study...

To answer application questions, think about the main idea of the passage, the scope of supporting evidence, and the author's style. Select the answer choice that puts the passage into the most suitable context.

The passage on the ECB most likely appeared in ...

- a) the financial press
- b) university lecture notes
- c) transcripts of a television documentary
- d) The ECB's promotional literature
- e) an article written by a British Europhobe

Tone questions

Author's tone questions are like Phil Collins' music: totally middle of the road. Eliminate the extremes. Just as Phil would never incorporate "gangsta" rap music in his lyrics or screaming heavy metal guitar solos, you should NEVER opt for extreme attitudes, whether they be extremely positive or extremely negative.

MOST LIKELY ANSWER CHOICES:

- Neutral neutral
- Neutral positive
- Neutral negative

The author's attitude toward the success of the ECB can be best described as

- a. indifference
- b. hostility
- c. scepticism
- d. amusement
- e. admiration

THE SHORT PASSAGE

Australian researchers have discovered electroreceptors (sensory organs designed to respond to electrical fields) clustered at the tip of the spiny anteater's snout. The researchers made this **discovery** by exposing small areas of the snout to extremely weak electrical fields and recording the transmission of resulting nervous activity to the brain. While it is true that **tactile receptors**, another kind of sensory organ on the anteater's snout, can also respond to electrical stimuli, such receptors do so **only** in response to electrical field strengths about 1000 times greater than those known to excite electroreceptors.

Having discovered the electroreceptors, researchers are now investigating how anteaters utilize such a sophisticated sensory system. In one **behavioural experiment**, researchers successfully trained an anteater to distinguish between two troughs of water, one with a weak electrical field and the other with none. Such evidence is consistent with researchers' **hypothesis** that anteaters use electroreceptors to detect electrical signals emanating from termite mounds, where the favourite food of anteaters live. **Still**, researchers have observed anteaters breaking into a nest of ants at an **oblique angle** and quickly locating nesting chambers. This ability to **quickly** locate unseen prey **suggests**, according to the researchers, that the anteaters were using their electroreceptors to locate the nesting chambers.

- 1. Which of the following can be *inferred* about the experiment described in the first paragraph?
 - a) Researchers had difficulty verifying the existence of electroreceptors in the anteater because electroreceptors respond to such a narrow range of electrical field strengths.
 - b) Researchers found that the level of nervous activity in the anteater's brain increased dramatically as the strength of the electrical stimulus was increased.
 - c) Researchers found that some areas of the anteater's snout were not sensitive to a weak electrical stimulus.
 - d) Researchers found that the anteater's tactile receptors were more easily excited by a strong electrical stimulus than were the electroreceptors.
 - e) Researchers tested small areas of the anteater's snout in order to ensure that only electroreceptors were responding to the stimulus.
- 2. The author of the passage most probably discusses the function of tactile receptors in order to
 - a) eliminate an alternative explanation of anteaters' response to electrical stimuli
 - b) highlight a type of sensory organ that has a function identical to that of electroreceptors
 - c) point out a serious complication in the research on electroreceptors in anteaters
 - d) suggest that tactile receptors assist electroreceptors in the detection of electrical signals
 - e) introduce a factor that was not addressed in the research on electroreceptors in anteaters

- 3. Which of the following can be inferred about anteaters from the behavioural experiment mentioned in the second paragraph?
 - a) They are unable to distinguish between stimuli detected by their electroreceptors and stimuli detected by their tactile receptors.
 - b) They are unable to distinguish between the electrical signals emanating from termite mounds and those emanating from ant nests.
 - c) They can be trained to recognize consistently the presence of a particular stimulus.
 - d) They react more readily to strong than to weak stimuli
 - e) They are more efficient at detecting stimuli in a controlled environment than in a natural environment
- 4. The passage suggests that the researchers mentioned in the second paragraph who observed anteaters break into a nest of ants would most likely agree with which of the following statements?
 - a) The event they observed provides conclusive evidence that anteaters use their electroreceptors to locate unseen prey.
 - b) The event they observed was atypical and may not reflect the usual hunting practises of anteaters.
 - c) It is likely that the anteaters located the ants' nesting chambers without the assistance of electroreceptors.
 - d) Anteaters possess a very simple sensory system for use in locating prey.
 - e) The speed with which the anteaters located their prey is greater than what might be expected on the basis of chance alone.
- 5. Which of the following if true, would most strengthen the hypothesis mentioned in the middle of the second paragraph?
 - a) Researchers are able to train anteaters to break into an underground chamber that is emitting a strong electrical signal.
 - b) Researchers are able to detect a weak electrical signal emanating from the nesting chamber of an ant colony.
 - c) Anteaters are observed taking increasingly longer amounts of time to locate the nesting chambers of ants.
 - d) Anteaters are observed using various angles to break into nests of ants.
 - e) Anteaters are observed using the same angle used with nests of ants to break into nests of other types of prey.

Researchers: Electroreceptors at tip of anteater's snout

- Discovery: exposed small parts of snout to weak electric fields and recorded brain activity
- Tactile receptors on snout only respond to stronger fields

Investigation: How anteaters use electroreceptors

- Experiment: Trained to distinguish water troughs by electric fields
- Hypothesis: use receptors to detect signals given off by prey
- No signals detected yet from prey, through anteaters locate it very quickly

Sometimes you will need to read a lot to establish the scope

Two divergent definitions have dominated sociologists' discussions of the nature of ethnicity. The first emphasizes the primordial and unchanging character of ethnicity. In this view, people have an essential need for belonging that is satisfied by membership in groups based on shared ancestry and culture. A different conception of ethnicity de-emphasizes the cultural component and defines ethnic groups as interest groups. In this view, ethnicity serves as a way of mobilizing a certain population behind issues relating to its economic position. While both of these definitions are useful, neither fully captures the dynamic and changing aspects of ethnicity in the United States. Rather, ethnicity is more satisfactorily conceived of as a process in which preexisting communal bonds and common cultural attributes are adapted for instrumental purposes according to changing real-life situations.

One example of this process is the rise of participation by Native American people in the broader United States political system since the Civil Rights movement of the 1960's. Besides leading Native Americans to participate more actively in politics (the number of Native American legislative officeholders more than doubled), this movement also evoked increased interest in tribal history and traditional culture. Cultural and instrumental components of ethnicity are not mutually exclusive, but rather reinforce one another.

The Civil Rights movement also brought changes in the uses to which ethnicity was put by Mexican American people. In the 1960's, Mexican Americans formed community-based political groups that emphasized ancestral heritage as a way of mobilizing constituents. Such emerging issues as immigration and voting rights gave Mexican American advocacy groups the means by which to promote ethnic solidarity. Like European ethnic groups in the nineteenth-century United States, latetwentieth-century Mexican American leaders combined ethnic with contemporary civic symbols. In 1968 Henry Cisneros, then mayor of San Antonio, Texas, cited Mexican leader Benito Juarez as a model for Mexican Americans in their fight for contemporary civil rights. And every year, Mexican Americans celebrate Cinco de Mayo as fervently as many Irish American people embrace St. Patrick's Day (both are major holidays in the countries of origin), with both holidays having been reinvented in the context of the United States and linked to ideals, symbols, and heroes of the United States.

1. Which of the following best states the main idea of the passage?

- a) In their definitions of the nature of ethnicity, sociologists have underestimated the power of the primordial human need to belong.
- b) Ethnicity is best defined as a dynamic process that combines cultural components with shared political and economic interests.
- c) In the United States in the twentieth century, ethnic groups have begun to organize in order to further their political and economic interests.
- d) Ethnicity in the United States has been significantly changed by the Civil Rights movement.
- e) The two definitions of ethnicity that have dominated sociologists' discussions are incompatible and should be replaced by an entirely new approach.

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- 2. Which of the following statements about the first two definitions of ethnicity discussed in the first paragraph is supported by the passage?
- a) One is supported primarily by sociologists, and the other is favored by members of ethnic groups.
- b) One emphasizes the political aspects of ethnicity, and the other focuses on the economic aspects.
- c) One is the result of analysis of United States populations, and the other is the result of analysis of European populations.
- d) One focuses more on the ancestral components of ethnicity than does the other.
- e) One focuses more on immigrant groups than does the other.

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3. The author of the passage refers to Native American people in the second paragraph in order to provide an example of?

- a) The ability of membership in groups based on shared ancestry and culture to satisfy an essential human need.
- b) How ethnic feelings have both motivated and been strengthened by political activity.
- c) How the Civil Rights movement can help promote solidarity among United States ethnic groups.
- d) How participation in the political system has helped to improve a group's economic situation.
- e) The benefits gained from renewed study of ethnic history and culture.
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4. The passage supports which of the following statements about the Mexican American community?

- a) In the 1960's the Mexican American community began to incorporate the customs of another ethnic group in the United States into the observation of its own ethnic holidays.
- b) In the 1960's Mexican American community groups promoted ethnic solidarity primarily in order to effect economic change.
- c) In the 1960's leader of the Mexican American community concentrated their efforts on promoting a renaissance of ethnic history and culture.
- d) In the 1960's members of the Mexican American community were becoming increasingly concerned about the issue of voting rights.
- e) In the 1960's the Mexican American community had greater success in mobilizing constituents than did other ethnic groups in the United States.

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5. Which of the following types of ethnic cultural expression is discussed in the passage?

- a) The retelling of traditional narratives.
- b) The wearing of traditional clothing.
- c) The playing of traditional music.
- d) The celebration of traditional holidays.
- e) The preparation of traditional cuisine.

One example of this process is the rise of participation by Native American people in the broader United States political system since the Civil Rights movement of the 1960's. Besides leading Native Americans to participate more actively in politics (the number of Native American legislative officeholders more than doubled), this movement also evoked increased interest in tribal history and traditional culture. Cultural and instrumental components of ethnicity are not mutually exclusive, but rather reinforce one another.

The Civil Rights movement also brought changes in the uses to which ethnicity was put by Mexican American people. In the 1960's, Mexican Americans formed community-based political groups that emphasized ancestral heritage as a way of mobilizing constituents. Such emerging issues as immigration and voting rights gave Mexican American advocacy groups the means by which to promote ethnic solidarity. Like European ethnic groups in the nineteenth-century United States, latetwentieth-century Mexican American leaders combined ethnic with contemporary civic symbols. In 1968 Henry Cisneros, then mayor of San Antonio, Texas, cited Mexican leader Benito Juarez as a model for Mexican Americans in their fight for contemporary civil rights. And every year, Mexican Americans celebrate Cinco de Mayo as fervently as many Irish American people embrace St. Patrick's Day (both are major holidays in the countries of origin), with both holidays having been reinvented in the context of the United States and linked to ideals, symbols, and heroes of the United States.

- 6. Information in the passage supports which of the following statements about many European ethnic groups in the nineteenth century United States?
- a) They emphasized economic interests as a way of mobilizing constituents behind certain issues.
- b) They conceived of their own ethnicity as being primordial in nature.
- c) They created cultural traditions that fused United States symbols with those of their countries of origin.
- d) They de-emphasized the cultural components of their communities in favour of political interests.
- e) They organized formal community groups designed to promote a renaissance of ethnic history and culture.

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7. The passage suggests that in 1968 Henry Cisneros most likely believed that

- a) many Mexican American would respond positively to the example of Benito Juarez.
- b) many Mexican American were insufficiently educated in Mexican history
- c) the fight for civil rights in the United States had many strong parallels in both Mexican and Irish history.
- the quickest way of organizing community-based groups was to emulate the tactics of Benito Juarez
- e) Mexican Americans should emulate the strategies of Native American political leaders.

Sometimes You will need to read very little to establish the Scope

Remember you can always go back to the text what to read section

No very satisfactory account of the mechanism that caused the formation of the ocean basins has yet been given. The traditional view supposes that the upper mantle of the earth behaves as a liquid when it is subjected to small forces for long periods and that differences in temperature under oceans and continents are sufficient to produce convection in the mantle of the earth with rising convection currents under the mid-ocean ridges and sinking currents under the continents. Theoretically, this convection would carry the continental plates along as though they were on a conveyor belt and would provide the forces needed to produce the split that occurs along the ridge. This view may be correct: it has the advantage that the currents are driven by temperature differences that themselves depend on the position of the continents. Such a back-coupling, in which the position of the moving plate has an impact on the forces that move it, could produce complicated and varying motions.

On the other hand, the theory is implausible because convection does not normally occur along lines, and it certainly does not occur along lines broken by frequent offsets or changes in direction, as the ridge is. Also it is difficult to see how the theory applies to the plate between the Mid-Atlantic Ridge and the ridge in the Indian Ocean. This plate is growing on both sides, and since there is no intermediate trench, the two ridges must be moving apart. It would be odd if the rising convection currents kept exact pace with them. An alternative theory is that the sinking part of the plate, which is denser than the hotter surrounding mantle, pulls the rest of the plate after it. Again it is difficult to see how this applies to the ridge in the South Atlantic, where neither the African nor the American plate has a sinking part.

Another possibility is that the sinking plate cools the neighboring mantle and produces convection currents that move the plates. This last theory is attractive because it gives some hope of explaining the enclosed seas, such as the Sea of Japan. These seas have a typical oceanic floor, except that the floor is overlaid by several kilometers of sediment. Their floors have probably been sinking for long periods. It seems possible that a sinking current of cooled mantle material on the upper side of the plate might be the cause of such deep basins. The enclosed seas are an important feature of the earth's surface, and seriously require explanation because, in addition to the enclosed seas that are developing at present behind island arcs, there are a number of older ones of possibly similar origin, such as the Gulf of Mexico, the Black Sea, and perhaps the North Sea.

- According to the traditional view of the origin of the ocean basins, which of the following is sufficient to move the continental plates?
 a) Increases in sedimentation on ocean
- a) Increases in sedimentation on ocean floors
- b) Spreading of ocean trenches
- c) Movement of mid-ocean ridges
- d) Sinking of ocean basins
- e) Differences in temperature under oceans and continents

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- 2. It can be inferred from the passage that, of the following, the deepest sediments would be found in the
- a) Indian Ocean
- b) Black Sea
- c) Mid-Atlantic
- d) South Atlantic
- e) Pacific

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- 3. The author refers to a "conveyor belt" in the first paragraph in order to
- a) illustrate the effects of convection in the mantle
- b) show how temperature differences depend on the positions of the continents
- c) demonstrate the linear nature of the Mid-Atlantic Ridge
- d) describe the complicated motions made possible by back-coupling
- e) account for the rising currents under certain mid-ocean ridges

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4. The author regards the traditional view of the origin of the oceans with

- a) slight apprehension
- b) absolute indifference
- c) indignant anger
- d) complete disbelief
- e) guarded skepticism

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5. According to the passage, which of the following are separated by a plate that is growing on both sides?

- a) The Pacific Ocean and the Sea of Japan
- b) The South Atlantic Ridge and the North Sea Ridge
- c) The Gulf of Mexico and the South Atlantic Ridge
- d) The Mid-Atlantic Ridge and the Indian Ocean Ridge
- e) The Black Sea and the Sea of Japan

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6. Which of the following, if it could be demonstrated, would most support the traditional view of ocean formation?

- a) Convection usually occurs along lines.
- b) The upper mantle behaves as a dense solid.
- c) Sedimentation occurs at a constant rate.
- d) Sinking plates cool the mantle.
- e) Island arcs surround enclosed seas.

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7. According to the passage, the floor of the Black Sea can best be compared to a

- a) rapidly moving conveyor belt
- b) slowly settling foundation
- c) rapidly expanding balloon
- d) violently erupting volcano
- e) slowly eroding mountain

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Critical Reasoning

The ethics codes of universities should be decided by an external committee rather than by the faculty and students of the universities themselves. The involvement of both students and faculty leaves many decisions subject to changing positions in political thought.

The conclusion drawn above relies most on which of the following assumptions?

- a) External committees chosen to judge ethics codes would be made up of ethics experts.
- b) External committees chosen to judge ethics codes would be relatively less susceptible to the changing fashions in political thought.
- c) The involvement of students and faculty in ethics codes has given those codes a decidedly liberal bent.
- d) The faculty and students of most universities are unable to avoid the pressure to accord with changing fashions in political thought.
- e) Most universities that are trying to form ethics codes are aware of the need to avoid making concessions to the changing fashions of political thought.

Anatomy of an Argument

The Assumption

- In order for the conclusion to be true the assumption must be true.
- The assumption is an unstated fact.
- It is what is not said that needs to be said in order for the argument to make sense.

Break down the arguments

Airplanes can't land when there is snow on the ground. It is snowing so we won't be able to land.

Conclusion: _____

Premises: ______

Assumption: _____

- 1. Most airline passengers don't pay attention when flight attendants give safety instructions before take-off. Unless airlines find a more effective means of communicating to their passengers, most passengers will not know what to do in case of an on-board emergency.
- 2. A scientist planted two groups of plants under identical conditions of light, temperature, humidity, and moisture. Every day he would play sound effects of thunderstorms to one of the groups and sounds of city traffic to the other. The group to which he played thunderstorms all died within a few weeks, but the other group thrived during the experiment. He therefore concluded that the sound of city traffic is more effective for helping plants grow than is the sound of thunderstorms.
- 3. In an effort to reduce the daily commuter traffic entering a certain city, the city government plans to raise the tolls on all major roads that have access to the city. The government plans to use part of the revenues generated by the tolls to modernize commuter rail systems. However, critics object that under this plan drivers will unfairly pay for a service that is beneficial only to those who ride trains.
- 4. A city's public transportation board has decided to cut costs by reducing the frequency of its bus service from an average of eight minutes to an average of ten minutes between buses. The board announced that it can do so without seriously reducing the quality of service.
- 5. A popular Internet service provider changed its billing system, charging customers per each connection to the system rather than per total hours connected. According to company representatives, under the new system, customers will spend more time connected to the Internet while being billed the same or smaller amounts.

The Questions:

Assumption – Conclusion – Strengthening – Weakening – Inference – Boldface Complete the Passage – Explain – Parallel Argument - Except

Identify the assumption.

- To attack these questions let your mind be flooded with what if or what about questions. This will help you identify a hole in the argument. It is this hole that must be filled with the assumption. It is especially useful on assumption questions to try to predict the answer before going to the answer choices.
- Remember the correct answer should lead you to the conclusion. It should stay 100% inside the scope.
- Wendy, a student, is an avid backgammon player. All students play either chess or checkers, but some checkers players do not play chess because they do not understand chess strategy. Backgammon players never play checkers, because they do not find checkers challenging. Therefore, Wendy must understand chess strategy.

Which of the following must be true for the conclusion drawn above to be logically correct?

- a) All chess players understand chess strategy.
- b) Backgammon is more challenging than checkers.
- c) All students who understand chess strategy play chess.
- d) Chess is more challenging than backgammon.
- e) All students who find backgammon challenging play checkers.

Select the best conclusion.

- This type of question is a good reason to read the questions first. Sometimes there is really no argument to break down. You will be given some facts and your job is simply to choose an answer that most logically follows the premises in the argument.
- > Remember to stay 100% inside the scope; any answer that would require an assumption is wrong.
- Avoid "Jumping to conclusions."
- 2. To lay cable to remote areas would be prohibitively expensive since the number of customers served by such cable lines would be too small for the cable company to make a profit. Microwave cable service is a good alternative for use in remote areas because the signal is sent through the air and cables are unnecessary. However, microwave cable service should not become standard practice in non-remote areas, because the long-term effects of microwaves are not known.

Which of the following is the best conclusion to the statements above?

- a) Microwave technology should be regulated by the government indefinitely.
- b) Residents of remote areas must take precautions to mitigate the potential danger of microwaves.
- c) Most residents of non-remote areas will not want to change their existing service to microwave service.
- d) Microwave cable service is safe enough for use in remote areas.
- e) Microwaves are potentially more dangerous in urban areas than in suburban areas.

Strengthen an argument.

- In such questions it is understood that a flaw in the argument will remain. It is not our job to fill the hole as in an assumption question.
- > The best answer will give simply more justification to accept the conclusion.
- Sometimes looking for opposite answer choices can be very useful.
- 3. The purpose of the proposed law requiring a doctor's prescription for obtaining hypodermic needles is to lower the incidence of drug-related deaths, both accidental and intentional, involving hypodermic needles. But even knitting needles can be lethal if they fall into the wrong hands; yet everyone would agree that imposing legal restrictions on obtaining knitting needles would be preposterous. Hence the proposed law involving hypodermic needles makes no sense and should not be enacted.

Which of the following, if true, would provide most support for the argument above?

- a) Knitting needles have been known to cause injury and death.
- b) The benefits of hypodermic needles outweigh those of knitting needles.
- c) The proposed law would not deter the sort of activity known to result in drugrelated deaths.
- d) The proposed law could not be effectively enforced.
- e) Knitting needles are not readily available to anybody who wants to obtain them.

Weaken an argument.

- Perhaps the most common of all questions in critical reasoning. In order to ace these you must clearly identify the conclusion and determine the weak link in the argument.
- > Like strengthen questions look for opposite answers.
- As always try to predict the answer before you look at the answer choices.
- 4. In the sport of maxiball, in which the objective is to score more goals than the opposing team, each team member faces off against one member of the other team. The coach for the Panthers predicts victory over the Cougars in an upcoming match between these two maxiball teams. The chief reason for the coach's prediction is that the Cougars' best defensive player will not be defending against Fonsica, who is the Panthers' highest scoring player.

Which of the following, if true, would cast most doubt on the accuracy of the prediction made by the Panthers' coach above?

- a) The Panthers have defeated fewer opponents than the Cougars this year.
- b) Fonsica is the Panther's best defensive player.
- c) The Panthers' best defensive player will not be defending against the Cougars' highest scoring player.
- d) Fonsica is not the Panthers' best defensive player.
- e) The Cougars' highest scoring player will not be defending against Fonsica.

Identify the inference.

- Inference questions ask you to infer something from the passage other than an assumption or the conclusion.
- > An inference is the next logical step without leaving the scope.
- > It is the idea that the author is trying to get across.
- > The best answer paraphrases words and ideas from the text.
- > An inference is always true whereas a conclusion is not necessarily true.
- 5. Informed people generally assimilate information from several divergent sources before coming to an opinion. However, most popular news organizations view foreign affairs solely through the eyes of our State Department. In reporting the political crisis in foreign country *B*, news organizations must endeavor to find alternative sources of information.

Which of the following inferences can be drawn from the argument above?

- a) To the degree that a news source gives an account of another country that mirrors that of our State Department, that reporting is suspect.
- b) To protect their integrity, the news media should avoid the influence of State Department releases in their coverage of foreign affairs.
- c) Reporting that is not influenced by the State Department is usually more accurate than are other accounts.
- d) The alternative sources of information mentioned in the passage might not share the same views as the State Department.
- e) A report has not been influenced by the State Department if it accurately depicts the events in a foreign country.

Complete the passage.

- Identify if either a conclusion or a premise is missing.
- > If a conclusion is missing handle it as a conclusion type question.
- > If a premise is missing handle it as an assumption question.
- > As always stay 100% inside the scope.
- 6. Labor laws cannot in and of themselves eliminate the discrepancy between the earnings of union and non-union workers. High-paying occupations are not evenly distributed along union and non-union lines; unionized positions tend to yield higher wages. Therefore, even when labor legislation is rigorously applied, _______ is the result.

Which one of the following is most appropriate for inclusion in the blank above?

- a) a smaller discrepancy between the salaries of union and non-union workers
- b) a wider distribution of unionized workers among lower paying jobs
- c) an increase in competition for high paying jobs among different non-union groups
- d) a comparatively lower earning average for non-union workers
- e) a greater financial gain for non-union workers with large salaries

Explain the contradiction.

- > You will be given two simultaneous situations that are in paradox.
- > In order to get these correct you need to look at both sides.
- 7. Before the advent of writing, each of the isolated clans of the Comaquogue tribe contained master story tellers whose function was to orally transmit the tradition of each clan from one generation to the next. When writing was developed within certain clans of the tribe, the master storytellers of these clans disappeared within a few generations. This stands to reason, considering that the availability of written records obviated the need for masterful oral communicators to keep the tradition of literate clans alive. What has puzzled anthropologists, however, is the total lack of masterful storytellers in modern illiterate Comaquogue clans.

Which of the following, if true, best helps to explain the puzzling situation mentioned above?

- a) Modern illiterate Comaquogue clan members display personality characteristics that resemble their ancestors more closely than they resemble the characteristics of modern literate Comaquogue clan members.
- b) Modern illiterate Comaquogue clans participate in more ritual gatherings than most modern literate Comaquogue clans do, but they participate in fewer ritual gatherings than did their common ancestors.
- c) Modern illiterate Comaquogue clans are recently descended from long time literate clans that failed to pass on the skills of reading and writing due to a devastating 75year war.
- d) The celebrations of modern illiterate Comaquogue clans involve a great deal of singing and dancing, and children are taught clan songs and dances from a very young age.
- e) The traditions of modern illiterate Comaquogue clans are an amalgamation of the cumulative experiences of previous generations plus innovations to the heritage added by the current generation of clan members.

Except questions.

- > These questions can be quite tricky; you must remember to take what is not being asked.
- In such questions it is best to make a prediction that would answer the question than to eliminate all answers that somehow follow the logic of your prediction.
- > The answer choice that does not follow your prediction is the best answer.
- 8. Newspaper publishers earn their profits primarily from advertising revenue, and potential advertisers are more likely to advertise in newspapers with a wide circulation—a large number of subscribers and other readers—than with other newspapers. But the circulation of the newspaper that is currently the most profitable one in this city has steadily declined during the last two years, while the circulation of one of its competitors has steadily increased.

Any of the following, if true, would help explain the apparent discrepancy between the two statements above EXCEPT:

- Advertisers generally switch from the most widely circulated newspaper to another one only when the other one becomes the most widely circulated newspaper instead.
- b) Advertising rates charged by the most profitable newspaper in the city are significantly higher than those charged by its competitors.
- c) The most profitable newspaper in the city receives revenue from its subscribers as well from advertisers.
- d) The circulation of the most profitable newspaper in the city is still greater than of any of its competitors.
- e) The number of newspapers competing viably with the most profitable newspaper in the city has increased during the last two years.

Bold questions

- Identify the conclusion. Ask yourself what the conclusion is, what the author trying to prove, or what the author's main point is.
- Look for the evidence that the author uses to support or argue against a position.
- Search for an *argument indicator* to determine the relationship between evidence and conclusion.

Conclusion Indicators	Premise Indicators	Counter-evidence Indicators
•so	•because	 actually
•thus	•since	•despite
•therefore	•for	 admittedly
•as a result	•as	•except
 consequently 	●if	•even though
 accordingly 	•assume	 nonetheless
•hence	•suppose	 nevertheless
•imply	•evidence	 ●although
•conclude that	•on the basis of	•however
•follows that	•the reason is that	•In spite of
•means that	 may be derived from 	•do
•infer that	•in that	•may

9. Modern navigation systems, which are found in most of today's commercial aircraft, are made with low-power circuitry, which is more susceptible to interference than the vacuum-tube circuitry found in older planes. <u>During landing, navigation systems</u> <u>receive radio signals from the airport to guide the plane to the runway</u>. Recently, one plane with low-power circuitry veered off course during landing, its dials dimming, when a passenger turned on a laptop computer. <u>Clearly, modern aircraft navigation systems are being put at risk by the electronic devices that passengers carry on board, such as cassette players and laptop computers.</u>

The two portions in boldface play which of the following roles?

- a) The first is a principle that the argument relies on and the second is a conclusion that can be drawn from the first.
- b) The first is a fact that argument relies on and the second is a conclusion that must be drawn from this argument.
- c) The first acknowledges a consideration that supports the main position; the second is the conclusion.
- d) The first is evidence that supports the conclusion, the second is that conclusion.
- e) The first is a principle that is necessary for this argument; the second is a conclusion that could be drawn from this argument.

Identify a parallel argument.

- > In this type of question you will need to identify similarities between argument types.
- A clear understanding of the different argument types is important to get these right.

Causal

- A causal argument is an argument that concludes that X is responsible for Y, based on the evidence of a temporal relationship between X and Y – that X accompanies Y, or that X precedes Y.
- > In other words, it could be just a coincidence.
- For example as I stepped out of the house lightning struck the tree across the street does not mean my stepping out of the house caused the lightning to strike.

Past Present Future

> Maybe something has changed or could change.

When we hired Marizonian immigrants 10 years ago, the project was a failure. They had trouble speaking English and had difficulties adjusting to American life, both of which made them unreliable workers. For all these reasons, we should not have Marizonian immigrants in our factory.

Analogy

A connection is made between the premises by analogy.

The purpose of the proposed law requiring a doctor's prescription for obtaining hypodermic needles is to lower the incidence of drug-related deaths, both accidental and intentional, involving hypodermic needles. But even knitting needles can be lethal if they fall into the wrong hands; yet everyone would agree that imposing legal restrictions on obtaining knitting needles would be preposterous. Hence the proposed law involving hypodermic needles makes no sense and should not be enacted.

Would the proposed solution solve the problem?

The number of crimes committed by adolescents in Los Angeles is highest during those hours when they should be in school. If we want to stop teenage crime, we should take action to ensure that teenagers do not skip school.

Scope Shift

The plastics commonly used in household garbage bags take, on average, 100 years to decompose in landfills. From an environmental standpoint, the plastic bag industry should be forced to switch to newly developed plastics, which begin to decompose after only 20 years.

Alternative Solution

Membership in the Theta Delta Phi fraternity is easily obtained by those who have previously had strong social connections with existing fraternity members before college. However, one must have attended high school with one or more of the members in order to forge such strong social connections. People who lack these social connections because they have not attended high school with one or more current fraternity members will therefore find it difficult to join the fraternity.

Numbers and Statistics

•**Choi**: All other factors being equal, children whose parents earned doctorates are more likely to earn doctorates than children whose parents did not earn doctorates.

•Hart: But consider this: over 70% of all doctorate holders do not have a parent that also holds a doctorate

Only given difference

After eating a bowl of strawberries and whipped cream Tom suffered an allergic reaction. Tom's Doctor says that Tom is definitely not allergic to whipped cream. Therefore Tom must be Allergic to strawberries.

Parallel Argument

10. Beautiful beaches attract people, no doubt about it. Just look at this city's beautiful beaches, which are among the most overcrowded beaches in the state.

Which of the following exhibits a pattern of reasoning most similar to the one exhibited in the argument above?

- a) Moose and bear usually appear at the same drinking hole at the same time of day. Therefore, moose and bear must grow thirsty at about the same time.
- b) Children who are scolded severely tend to misbehave more often than other children. Hence if a child is not scolded severely that child is less likely to misbehave.
- c) This computer program helps increase the work efficiency of its users. As a result, these users have more free time for other activities.
- d) During warm weather my dog suffers from fleas more so than during cooler weather. Therefore, fleas must thrive in a warm environment.
- e) Pesticides are known to cause anemia in some people. However, most anemic people live in regions where pesticides are not commonly used.

Extra Fun 🕲

11. Consumer advocate: It is generally true, at least in this state, that lawyers who advertise a specific service charge less for that service than lawyers who do not advertise. It is also true that each time restrictions on the advertising of legal services have been eliminated, the number of lawyers advertising their services has increased and legal costs to consumers have declined in consequence. However, eliminating the state requirement that legal advertisements must specify fees for specific services would almost certainly increase rather than further reduce consumers' legal costs. Lawyers would no longer have an incentive to lower their fees when they begin advertising and if no longer required to specify fee arrangements, many lawyers who now advertise would increase their fees.

In the consumer advocate's argument, the two portions in *boldface* play which of the following roles?

- a) The first is a generalization that the consumer advocate accepts as true; the second is presented as a consequence that follows from the truth of that generalization.
- b) The first is a pattern of cause and effect that the consumer advocate argues will be repeated in the case at issue; the second acknowledges a circumstance in which the pattern would not hold.
- c) The first is a pattern of cause and effect that the consumer advocate predicts will not hold in the case at issue; the second offers a consideration in support of that prediction
- d) The first is evidence that the consumer advocate offers in support of a certain prediction; the second is that prediction.
- e) The first acknowledges a consideration that weighs against the main position that the consumer advocate defends; the second is that position.
- 12. Reading skills among high school students in Gotham have been steadily declining, which can only be the result of overcrowding in the schools.

Which of the following, if true, most seriously weakens the argument expressed above?

- a) The high school system in Gotham succeeds in giving students a good education at considerably less cost than do most systems.
- b) Several cities have found that overcrowding in the schools is not always associated with lower reading scores.
- c) Gotham schools have a greater teacher-to-student ratio than most other school systems.
- d) Students' reading skills have not declined in other cities where the high schools are just as crowded as those of Gotham.
- e) Schools are not overcrowded in many cities where high school reading scores have declined more than they have in Gotham.

13. The plastics commonly used in household garbage bags take, on average, 100 years to decompose in landfills. From an environmental standpoint, the plastic bag industry should be forced to switch to newly developed plastics, which begin to decompose after only 20 years.

Which of the following pieces of information would be most helpful in evaluating the argument above?

- a) The rate of growth or decline in sales of plastic garbage bags.
- b) The number of plastic garbage bags sold last year that eventually wound up in landfills.
- c) The feasibility of enforcing legislation that regulates the plastics used in garbage bags.
- d) The length of time it takes the newly developed plastic to fully decompose in landfills.
- e) A comparison of the production cost of one bag made with the old plastics and of one bag made with the new plastics.
- 14. According to some sports historians, professional tennis players develop unique playing styles that result from a combination of the peculiarities of each player's physical attributes and the influence of coaches during their early adaptation to the game. But when the increase in strength and endurance of modern players is discounted, it becomes readily apparent that the playing styles of the current crop of professional tennis players are no different from the styles of players from previous generations. Clearly, there is a universally efficient tennis style to which all professional tennis players conform.

Which of the following most effectively undermines the conclusion drawn above?

- a) The differences in physical attributes among tennis players are even more pronounced than the sports historians believe.
- b) Few current professional tennis players are familiar with the professional tennis players of fifty years ago.
- c) The increased strength of current tennis players contributes more to the development of individual playing styles than does increased endurance
- d) All the early coaches of today's professional tennis players were professional tennis players themselves earlier in their lives.
- e) Weight training and greater attention to diet are the primary factors in the increased strength and stamina of the current generation of professional tennis players.
- 15. Membership in the Theta Delta Phi fraternity is easily obtained by those who have previously had strong social connections with existing fraternity members before college. However, one must have attended high school with one or more of the members in order to forge such strong social connections. People who lack these social connections because they have not attended high school with one or more current fraternity members will therefore find it difficult to join the fraternity.

This argument displays flawed reasoning because it neglects to consider the possibility that

- a) Many of those who went to high school with Theta Delta Psi fraternity members did not themselves become members of the fraternity.
- b) It is more important in the long run to socialize with non-fraternity members than to develop strong social connections with fraternity members.
- c) It is more difficult to forge social connections with fraternity members than with non-fraternity members.
- d) One may easily obtain membership in the fraternity through means other than having strong social connections with existing fraternity members.
- e) Some current members of the fraternity did not go to high school with other members.

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16. The paintings of French painter Trianne Dejere sold best in the period following the production of Le Triomphe, now Dejere's most famous piece. In the 12 month period preceding the unveiling of this piece, Dejere sold 57% of the works she produced in this period, a far greater percentage than in previous years. In the 12 month period following a glowing review of Le Triomphe in a popular magazine, however, Dejere sold 85% of the paintings she produced. Interestingly, Dejere's revenues from painting sales was roughly the same in both periods, since she sold the same number of paintings in the 12 months before presenting Le Triomphe as she did in the 12 months following the favourable review.

Which of the following statements can be properly concluded from the passage if the information above is true?

- a) Due to the positive review, Dejere was able to charge substantially more for the works produced after Le Triomphe than the works produced before it.
- b) Dejere was more concerned with positive reviews than with increasing the prices of her paintings.
- c) The positive review of Le Triomphe brought Dejere's work to the attention of more art collectors than were previously aware of her work.
- d) Dejere painted fewer works in the 12 month period following the review of Le Triomphe than she had in the 12 month period preceding the unveiling.
- e) Dejere paid more attention to marketing her paintings after Le Triomphe received such a positive reception.
- 17. •Choi: All other factors being equal, children whose parents earned doctorates are more likely to earn doctorates than children whose parents did not earn doctorates.
 •Hart: But consider this: over 70% of all doctorate holders do not have a parent that also holds a doctorate

Which of the following is the most accurate evaluation of Hart's reply?

- a) It establishes that Choi's claim is an exaggeration.
- b) If true, it effectively demonstrates that Choi's claim cannot be accurate.
- c) It is not inconsistent with Choi's claim.
- d) It provides alternative reasons for accepting Choi's claim.
- e) It mistakes what is necessary for an event to with what is sufficient to determine that the event will occur.

18. A social worker surveyed 200 women who recently had given birth to their first child. Half of these women had chosen to give birth in a hospital or obstetric clinic; the other half had chosen to give birth at home under the care of certified midwives. Of the 100 births that occurred at home, only 5 had presented any substantial complications, whereas 17 of the hospital births had required extra attention because of complications during delivery. The social worker concluded from this survey that the home is a safer environment in which to give birth that is a hospital or clinic.

Which of the following, if true, most seriously calls the social worker's conclusion above into question?

- a) All of the women in the study who were diagnosed as having a high possibility of delivery complications elected to give birth in a hospital.
- b) Many obstetricians discourage their patients from giving birth in their own homes.
- c) Women who give birth in their own homes tend to experience less stress during labor and delivery than do those who deliver in hospitals.
- d) Women who give birth in hospitals and clinics often have shorter periods of labor than do those who give birth at home.
- e) Pregnant doctors prefer giving birth in a hospital.

Problem Solving

First a few words about difficulty level...

Easy – The I guess I won't be going to Harvard level.

1. If x - 5 = 15 then what is the value of 2x?

a) 10
b) 20
c) 40
d) 100
e) 200

Medium 450 – 500

- 2. If x and y are prime numbers, and the average (arithmetic mean) of x and y is 14, then x could be which of the following?
 - a) 2
 - b) 3
 - c) 7
 - d) 11
 - e) 13

Difficult 650+

- 3. Series T is a sequence of numbers where each term after the first term is x greater than the term that precedes it. If the sum of the first and last term of series T is 14, then what is the sum of the first three terms of series T and the last three terms of series T?
 - a) -7
 - b) 7
 - c) 14
 - d) 42
 - e) 84

How to attack the Problems

LOGIC APPROXIMATION ERROR IDENTIFICATION INSERTING BACK SOLVING SCHOOL METHODS

4. In the figure below triangle ABC is drawn tangent to the circle. If triangle ABC is an isosceles right triangle with an area of 4, what is the area of the shaded region of the circle within the area of the triangle?



a)	π
b)	2π
c)	2π √ 2
d)	4π
e)	8π

- 5. If the area of a square is 80, then what is the area of the largest circle that could fit within the area of the square?
 - a) 10π
 - b) 20π
 - c) 25π
 - d) 40π
 - e) 80π
- 6. The hexagon ABCDEF is regular. Each side of the hexagon is 2 feet. What is the area of rectangle BCEF?



- a) 4 square feet
- b) 4v3 square feet
- c) 8 square feet
- d) 4 + 4√3 square feet
- e) 12 square feet

7. Regular hexagon ABCDEF is inscribed in a circle with area 16π . What is the area of hexagon ABCDEF?



- a) 4 b) 6√3
- c) 12√2
- d) 24√3
- e) 48√2

Approximation

- 8. A computer salesman sells an average of 15 computer systems a month at \$4,200 per system. He earns a basic salary of \$22,000 per year plus a commission of 7.5% on monthly sales made over a level of \$25,000 per month. What is his expected annual income?
 - a) \$78,700
 - b) \$75,200
 - c) \$66,700
 - d) \$56,200
 - e) \$34,200
- 9. From 1985 to 1995, the population of Jamestown increased by 50%, and from 1995 to 2005, the population increased by 200% to 13,284. The population in 2005 was how much greater than the population in 1985?
 - a) 2,952
 - b) 4,428
 - c) 7,971
 - d) 8,856
 - e) 10,332

Inserting

The general case

- When they give you a variable, but they don't ask for its value then inserting could be the way to go.
- When you see variables in the answer choices insert first.
- 10. It costs 10 cents a kilometer to fly and 12 cents a kilometer to drive. If you travel 200 kilometers, flying x kilometers of the distance and driving the rest, then the cost of the trip in dollars is?
 - a) 20
 - b) 24
 - c) 24 2x
 - d) 24-0.02x
 - e) 2,400 2x
- 11. When ticket sales began, Pat was the nth customer in line for a ticket, and customers purchased their tickets at the rate of x customers per minute. Of the following, which best approximates the time, in minutes, that Pat had to wait in line from the moment ticket sales began?
 - a) (n 1) x
 - b) n + x 1c) $\frac{n-1}{x}$ d) $\frac{x}{n-1}$
 - d) $\frac{n-1}{n}$
 - e) *x*−1
- 12. The R students in a class agree to contribute equally to buy their teacher a birthday present that costs y dollars. If x of the students later fail to contribute their share, which of the following represents the additional number of dollars that each of the remaining students must contribute in order to pay for the present?

a)
$$\frac{y}{R}$$

b) $\frac{y}{R-x}$
c) $\frac{xy}{R-x}$
d) $\frac{xy}{R(R-x)}$
e) $\frac{y}{R(R-x)}$

- 13. If M and N are positive integers that have remainders of 1 and 3 respectively, when divided by 6. Which of the following could not be a possible value of M+N?
 - a) 86
 - b) 52
 - c) 34
 - d) 28
 - e) 10
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- 14. Mike and Nancy weigh a combined T pounds. Mike weighs 10 pounds more than Nancy. Their son Edward weighs T/4 pounds more than Nancy. In terms of T what is Edward's weight in pounds?
 - a) (T/4) 20
 - b) (3T/2) 5
 - c) 5T/4
 - d) 4T 10
 - e) (3T/4) 5
- 15. The length of two sides of a right triangle are d/3 and d/4, where d > 0. If one of these sides is the hypotenuse, what is the length of the third side of the triangle?



16. If the shaded area is one half the area of the triangle ABC and the angle ABC is a right angle, then the length of the line segment AD is?



$$\frac{w}{2} \qquad \frac{w+x}{2} \qquad \sum_{(c)} \sqrt{2x^2+z^2} \qquad \sum_{(c)} \sqrt{w^2-3y^2} \qquad \sum_{(c)} \sqrt{y^2+z^2}$$

Inserting

How to deal with algebra...

17. If
$$x \neq 3$$
, then

$$\frac{3x(x-3)-x+3}{x-3} = ?$$
a) $x + 1$
b) $x - 3$
c) $3x + 1$
d) $3x - 1$
e) $3x + 3$

2x + 4

18. Which of the following is equivalent to $\overline{2x^2 + 8x + 8}$ for all values of x for which both expressions are defined?

	1
a)	$\frac{2x^2 + 6}{1}$
b)	$\overline{9x+2}$ 2
c)	$\overline{x+6}$ 1
d)	$\overline{x+4}$ 1
e)	$\overline{x+2}$

$$\frac{n-4\sqrt{n+4}}{\sqrt{n}} = ?$$

19. If n > 4, which of the following is equivalent to $\sqrt{n-2}$

a)
$$\sqrt{n}$$

b) $2\sqrt{n}$
c) $\sqrt{n+2}$
d) $\sqrt{n-2}$
e) $n+\sqrt{n}$

$$\frac{y^3 + 5y^2 - 15y - 7}{y + 7} = ?$$

20. If $y \neq -7$, then a) y^2-5y+1 b) y^2-2y-1 c) $y^2+5y-15$ d) $2y^2-3y-1$ e) $2y^2-5y+1$

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Inserting

How to deal with Ratios

- When you are asked for a ratio, fraction or percentage inserting could be the way to go.
- Think about the Least Common Multiple (LCM)
- 21. If one tic equals 3 tacs and 2 tacs equals 5 tocs, what is the ratio of one tic to one toc?
 - a) 15:2
 - b) 2:15
 - c) 6:5
 - d) 5:6
 - e) 1:15

22. If a = 2b, $\frac{1}{2}b = c$, and 4c = 3d, then what is the ratio of d to a?

- a) 1:3
- b) 3:1
- c) 3:4
- d) 1:1
- e) 4:3

How to deal with Fractions

- When you are asked for a ratio, fraction or percentage inserting could be the way to go.
- Think about the Least Common Multiple (LCM)
- 23. If a vender sells 2/5 of his goods in the morning and 1/3 of the remaining goods in the afternoon, what fraction of his goods did he sell in the morning and afternoon combined?
 - a) 3/8
 - b) 2/5
 - c) 3/5
 - d) 2/3
 - e) 11/15
- 24. If ½ of the number of white mice in a certain laboratory is 1/8 of the total number of mice, and 1/3 of the number of gray mice is 1/9 the total number of mice, then what is the ratio of white mice to gray mice in the laboratory?
 - a) 16:27
 - b) 2:3
 - c) 3:4
 - d) 4:3
 - e) 3:2
Inserting

How to deal with Percents

- When you are asked for a ratio, fraction or percentage inserting could be the way to go.
- Think 10 or 100
- 25. Last year a certain store made a 10 percent profit on all sales. This year sales are 20 percent higher than last year, but the store's profits are only 5 percent of sales. This year's profits are what percent of last year's profits?
 - a) 60%
 - b) 80%
 - c) 100%
 - d) 120%
 - e) 140%
- 26. In the first half of the 20th century, the population of a particular country increased by 200 percent. In the second half of the century the population increased by 300 percent. What was the percent increase for the 20th century as a whole?
 - a) 500%
 - b) 600%
 - c) 800%
 - d) 1100%
 - e) 1200%

 d^2w

- 27. If the time it takes a company to build a dam is determined by the formula *n*, where d is the depth of the dam in meters, w is the width in meters, and n is the number of employees involved, and the plans for a certain dam are changed so that the depth increases by 20 percent, the width decreases by 30 percent, and the number of employees increases by 40 percent, what will be the percent change in the time required to build the dam?
 - a) 40%
 - b) -28%
 - c) +15%
 - d) + 30%
 - e) +78%
- 28. In a class of 350 students 60% are men, of whom 30% swim. If 40% of all the students swim, what % of the women does not swim?
 - a) 18%
 - b) 22%
 - c) 30%
 - d) 45%
 - e) 55%

Error Identification and the Unit Method

29. If Mike travels at a constant speed of x miles in y hours, how long will it take him to travel z miles?



30. David can sail m miles in 13 hours. At that constant rate, how many hours will it take to sail n miles?



31. If snow falls at a rate of x centimeters per minute, how many hours would it take for y centimeters to fall?



32. If n identical pipes can fill an x-gallon pool in t hours, then at the same rate how long will it take one such pipe to fill a y-gallon pool?

ty	<u>nty</u>	n	_ <u>y</u>	xy
$_{a)}$ xn	_{b)} x	$_{c)}xyt$	_{d)} xnt	_{e)} nt

33. If a publishing company prints books at a constant rate of b books in m minutes, how long will it take to print 10000 books with p amount of presses in hours? (no answer choices what goes on top of the fraction bar and what goes on the bottom)

Algebra revisited with Back Solving.

34. Evaluate the following:

9	506
	97
a)	95
b)	96

- c) 97
- d) 98
- e) 99

$$\frac{3x(x-3)-x+3}{x-3} = ?$$

- 35. If $x \neq 3$, then
 - a) x+1
 - b) x-3
 - c) 3x + 1
 - d) 3x 1
 - e) 3x + 3

$$\frac{n-4\sqrt{n+4}}{\sqrt{n}} = ?$$

- 36. If n > 4, which of the following is equivalent to $\sqrt{n-2}$
 - √*n* a) $2_{
 m V}$ b) $\sqrt{n+1}$ c) d) _{е)} *n*+

37. If
$$y \neq -7$$
, then

$$\frac{y^3 + 5y^2 - 15y - 7}{y + 7} = ?$$

- a) y²-5y+1
- b) y²-2y-1
- c) y²+5y-15
- d) 2y²-3y-1
- e) $2y^2-5y+1$

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Back Solving

When they give you a variable, and ask for its value then back solving could be the way to go...

- 38. Four friends live together in an apartment and split the monthly rent equally. When one of the friends moves out, the remaining three split the rent equally and each pays \$50 per month more than before. How much is the total monthly rent for the apartment?
 - a) \$240
 - b) \$360
 - c) \$480
 - d) \$600
 - e) \$800
- 39. A salesman is paid \$5.00 per hour for every hour he works in the office and \$8.00 for every hour he spends on the road. If he worked twice as many hours in the office as worked on the road, and he earned \$360 during a certain week, then how many hours did the salesman work in the office during the week?
 - a) 20
 - b) 40
 - c) 50
 - d) 60
 - e) 70
- 40. A car dealer had a sale in order to sell off excess stock. Before the sale, the dealer had three times as many cars as he had trucks. During the sale, he sold 100 cars and 25 trucks. If after the sale the dealer has twice as many cars as trucks, then how many cars did the dealer have prior to the sale?a) 60
 - b) 90
 - c) 120
 - d) 150
 - e) 180
- 41. In the right triangle DEF below, what is the value of x?



- 42. Philip has twice as many salamanders as Matt. If Philip gives Matt 10 of his salamanders, he will have half as many as Matt. How many salamanders do Philip and Matt have together?
 - a) 10
 - b) 20
 - c) 30
 - d) 40
 - e) 60

- 43. An angle of x degrees has the property that its complement is equal to 1/6 of its supplement where x is?
 - a) 30 degrees
 - b) 45 degrees
 - c) 60 degrees
 - d) 63 degrees
 - e) 72 degrees
- 44. A wire is cut into three equal parts. The resulting segments are then cut into 4, 6 and 8 equal parts respectively. If each of the resulting segments has an integer length, what is the minimum length of the wire?
 - a) 24
 - b) 36
 - c) 48
 - d) 54
 - e) 72
- 45. A store has a parking lot that contains 70 parking spaces. Each row in the parking lot contains the same number of parking spaces. The store has bought additional property in order to build an addition to the store. When the addition is built, 2 parking spaces will be lost from each row; however 4 more rows will be added to the parking lot. After the addition is built the parking lot will still have 70 parking spaces, and each row will contain the same number of parking spaces as every other row. How many rows were in the parking lot before the addition was built?
 - a) 5
 - b) 6
 - c) 7
 - d) 10
 - e) 14
- 46. It takes an hour more by train to cover a distance of 360 miles when the usual speed of the train is decreased by 4 mph. What is the usual speed of the train?
 - a) 60
 - b) 55
 - c) 50
 - d) 45
 - e) 40
- 47. A certain used-book dealer sells paperback books at 3 times dealer's cost and hardback books at 4 times dealer's cost. Last week the dealer sold a total of 120 books, each of which had cost the dealer \$1. If the gross profit (sales revenue minus dealer's cost) on the sale of all of these books was \$300, how many of the books sold were paperbacks?
 - a) 40
 - b) 60
 - c) 75
 - d) 90
 - e) 100

- 48. A merchant paid \$300 for a shipment of x identical calculators. The merchant used 2 of the calculators as demonstrators and sold each of the others for \$5 more than the average (arithmetic mean) cost of the x calculators. If the total revenue from the sale of the calculators was \$120 more than the cost of the shipment, how many calculators were in the shipment?
 - a) 24
 - b) 25
 - c) 26
 - d) 28
 - e) 30
- 49. A car traveled 462 miles per tank full of gasoline on the highway and 336 miles per tank full of gasoline in the city. If the car traveled 6 fewer miles per gallon in the city than on the highway, how many miles per gallon did the car travel in the city?
 - a) 14
 - b) 16
 - c) 21
 - d) 22
 - e) 27
- 50. A total of \$ 30,000 invested in two investments yields 4.5% and 6% simple interest. If the total interest at the end of the year was \$ 1,470, how much was invested at the higher rate?
 - a) \$8,000
 - b) \$14,000
 - c) \$17,500
 - d) \$22,000
 - e) \$25,650

Speed Drills

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30 Minutes (20 Questions)

- 1. The 180 students in a group are to be seated in rows so that there is an equal number of students in each row. Each of the following could be the number of rows EXCEPT
 - a) 4
 - b) 20
 - c) 30
 - d) 40
 - e) 90
- 2. A parking garage rents parking spaces for \$10 per week or \$30 per month. How much does a person save in a year by renting by the month rather than by the week?
 - a) \$140
 - b) \$160
 - c) \$220
 - d) \$240
 - e) \$260
- 3. In a certain diving competition, 5 judges score each dive on a scale from 1 to 10. The point value of the dive is obtained by dropping the highest score and the lowest score and multiplying the sum of the remaining scores by the degree of difficulty. If a dive with a degree of difficulty of 3.2 received scores of 7.5, 8.0, 9.0, 6.0, and 8.5, what was the point value of the dive?
 - a) 68.8
 - b) 73.6
 - c) 75.2
 - d) 76.8
 - e) 81.6
- 4. If Jack walked 5 miles in 1 hour and 15 minutes, what was his rate of walking in miles per hour?
 - a) 4
 - b) 4.5
 - c) 6
 - d) 6.25
 - e) 15
- 5. At a certain diner, a hamburger and coleslaw cost \$3.59, and a hamburger and french fries cost \$4.40. If french fries cost twice as much as coleslaw, how much do french fries cost?
 - a) \$0.30
 - b) \$0.45
 - c) \$0.60
 - d) \$0.81
 - e) \$1.62
- 6. Of a certain high school graduating class, 75 percent of the students continued their formal education, and 80 percent of those who continued their formal education went to four-year colleges. If 300 students in the class went to four-year colleges, how many students were in the graduating class?
 - a) 500
 - b) 375
 - c) 240
 - d) 225
 - e) 180

7. If 6 gallons of gasoline are added to a tank that is already filled to $\frac{4}{9}$ of its capacity, the tank is then

filled to 10 of its capacity. How many gallons does the tank hold?

- a) 20
- b) 24
- c) 36
- d) 40
- e) 60
- 8. A certain culture of bacteria quadruples every hour. If a container with these bacteria was half full at 10:00 a.m., at what time was it one-eighth full?
 - a) 9:00 a.m.
 - b) 7:00 a.m.
 - c) 6:00 a.m.
 - d) 4:00 a.m.
 - e) 2:00 a.m.
- 9. Al, Lew, and Karen pooled their funds to buy a gift for a friend. Al contributed \$2 less than 1/3 of the cost of the gift and Lew contributed \$2 more than ¼ of the cost. If Karen contributed the remaining \$15, what was the cost of the gift?
 - a) \$24
 - b) \$33
 - c) \$36
 - d) \$43
 - e) \$45

10. What is the total number of integers between 100 and 200 that are divisible by 3?

- a) 33
- b) 32
- c) 31
- d) 30
- e) 29

11. Which of the following inequalities is equivalent to 10 - 2x > 18?

- a) x > -14
- b) x > -4
- c) x > 4
- d) x < 4
- e) x < -4
- 12. In 1979 approximately 1/3 of the 37.3 million airline passengers traveling to or from the United States used Kennedy Airport. If the number of such passengers that used Miami Airport was 1/2 the number that used Kennedy Airport and 4 times the number that used Logan Airport, approximately how many millions of these passengers used Logan Airport that year?
 - a) 18.6
 - b) 9.3
 - c) 6.2
 - d) 3.1
 - e) 1.6

- 13. A certain basketball team that has played 2/3 of its games has a record of 17 wins and 3 losses. What is the greatest number of the remaining games that the team can lose and still win at least 3/4 of all of its games?
 - a) 7
 - b) 6
 - c) 5
 - d) 4
 - e) 3
- 14. Dan and Karen, who live 10 miles apart meet at a cafe that is directly north of Dan's house and directly east of Karen's house. If the cafe is 2 miles closer to Dan's house than to Karen's house, how many miles is the cafe from Karen's house?
 - a) 6
 - b) 7
 - c) 8
 - d) 9
 - e) 10

$n = \frac{2 \cdot 3 \cdot 5 \cdot 7 \cdot 11 \cdot 13}{77k}$

- 15. If n is an integer and
 - a) 22
 - b) 26
 - c) 35
 - d) 54
 - e) 60
- 16. There were 36.000 hardback copies of a certain novel sold before the paperback version was issued. From the time the first paperback copy was sold until the last copy of the novel was sold 9 times as many paperback copies as hardback copies were sold. If a total of 441.000 copies of the novel were sold in all, how many paperback copies were sold?

then which of the following could be the value of k?

- a) 45.000
- b) 360.000
- c) 364.500
- d) 392.000
- e) 396.900

$w = \frac{p}{\sqrt{p}}$

17. In the formula $\sqrt[t]{v}$, integers p and t are positive constants. If w =2 when v = 1 and if w = 1/2 when v = 64, then t =

- a) 1
- b) 2
- c) 3
- d) 4
- e) 16

- 18. Last year Mrs. Long received \$160 in dividends on her shares of Company X stock, all of which she had held for the entire year. If she had had 12 more shares of the stock last year, she would have received \$15 more in total annual dividends. How many shares of the stock did she have last year?
 - a) 128
 - b) 140
 - c) 172
 - d) 175
 - e) 200

Month	Average Price	
April	\$1.26	
May	\$1.20	
June	\$1.08	

- 19. The table above shows the average (arithmetic mean) price per dozen of the large grade A eggs sold in a certain store during three successive months. If 2/3 as many dozen were sold in April as in May, and twice as many were sold in June as in April, what was the average price per dozen of the eggs sold over the three-month period?
 - a) \$1.08
 - b) \$1.10
 - c) \$1.14
 - d) \$1.16
 - e) \$1.18
- 20. If $y \neq 3$ and 3x/y is a prime integer greater than 2, which of the following must be true?
 - I x = y
 - II y = 1
 - III x and y are prime integers.
 - a) None
 - b) I only
 - c) II only
 - d) III only
 - e) I and III

Benchmark Problems

Number Properties

- a) odds and evens
- b) integers
- c) LCM Lease common multiple
- d) HCF Highest common factor
- e) factors // divisors multiples and primes
- f) divisibility rules
- g) remainders
- h) factorials

Exponents & Roots

Progressions AP and GP (Arithmetic and Geometric Progressions)

Mean, Median, Mode and Standard Deviations

Ratios, Percentages and Fractions

Algebra

- a) basic
- b) linear equations
- c) factoring
- d) simultaneous equations
- e) quadratic equation
- f) inequalities

Permutation & Combination

Probability

Geometry

- a) lines and angles
- b) quadrilateral
- c) triangles
- d) circles
- e) areas and volumes

Coordinate Geometry

Functions

- Word problems
- a) averages
- b) Coins
- c) Mixtures
- d) Speed, Time, Distances and Races
- e) Work
- f) Set Theory
- g) Age

Mixture Problems

 $C_I \times (V_I) + C_A \times (V_A) = C_D \times (V_T)$

- C_I Concentration initial
- VI Volume initial
- C_A Concentration added
- V_A Volume added
- C_D Concentration desired
- V_T Volume total
- 1. If a farmer has 3 pounds of fertilizer that is 5% pesticide, how many pounds of fertilizer with 20% pesticide must he add to create a new fertilizer with 15% pesticide?
- 2. A florist wishes to make bouquets of mixed spring flowers. Each bouquet is to be made up of tulips at \$30 a bunch and daisies at \$21 a bunch. How many bunches of each should she use to make 15 bunches which she can sell for \$24 a bunch?
- 3. A service station checks Andy's radiator and finds it contains only 30% antifreeze. If the radiator holds 10 quarts and is full, how much must be drained off and replaced with pure antifreeze in order to bring it up to required 50% antifreeze?
- 4. A drink contains 40% gin and 60% vodka. If the volume of the drink is (n) how much vodka must be added in terms of (n) to be left with a 25% concentration of gin?

Benchmark Problems – Know at least these Age and Coin

- Thomas purchases a selection of wrenches for his shop. His bill is \$78. He buys the same number of \$1.50 and \$2.50 wrenches, and half that many of \$4 wrenches. The number of \$3 wrenches is one more than the number of \$4 wrenches. How many of each did he purchase?
- 2. 8 years ago, Jimmy was three times as old as Anne. In 4 years, Jimmy will be 3/2 of Anne's age. How old will Anne be in 2 years?
 - a) 8
 - b) 12
 - c) 14
 - d) 20
 - e) 22

3. John is 6 years younger than Tina. Beth is 3 times as old as Steve. Tina is twice as old as Mike. Steve is 2 years older than Mike. If the sum of everyone's age in 2 years is 102, how old is John?

- a) 10
- b) 12
- c) 14
- d) 20
- e) 36

Algebra

4. Find the solution set for the following inequality -2|3-2x| < 14?

5. Find the solution set for the following inequality $|3x - 2| \le |2x - 5|$?

6. Is
$$|x-z| + |x| = |z|$$
?
(1) $zy < xy < 0$
(2) $y > 0$
 $s - \frac{1}{s} < \frac{1}{t} - t$
(1) $s > 1$
(2) $t > 0$
8. If $a \neq -b$, is $\frac{a-b}{a+b} < 1$
(1) $b^2 > a^2$
(2) $a - b > 1$
9. Is $\frac{x}{12} > \frac{y}{40}$?
(1) $10x < 3y - 6$

(1) 10x < 3y - 6(2) 12x - 7 > 4y

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Averages

- 10. The average weight of a class of 44 students is 36 kg. If the weight of the teacher is included, then the average weight of the class increases by 1 kg. What is the weight of the teacher?
- 11. In Tom's favorite game he has a certain average for the first 25 rounds. After scoring 140 points in the 26th his average improves by 3 points. What is his new average after the 26th round?
- 12. The average of 11 games is 50. The average of the first 6 is 49 and the last 6 is 52. What is the result of the 6th game?
- 13. Committee X and Committee Y, which have no common members, will combine to form Committee Z. Does Committee X have more members than Committee Y?
 (1) The average (arithmetic mean) age of the members of Committee X is 25.7 years and the average age of the members of Committee Y is 29.3 years.
 (2) The average (arithmetic mean) age of the members of Committee Z will be 26.6 years.

Combinations and Permutations

- 14. A famer has 10 sheep 4 black and 6 white. He would like to take 3 of the sheep to get shaved. How many different groups of 3 sheep can he select that would have at least one black one?
- 15. There are 10 books on a book shelf, 5 Math, 3 History and 2 Art. If 2 books are selected at random how many different pairs of 2 different kinds of books can be selected?
- 16. Four different science books, six different art books and two different novels are to be arranged on a shelf. How many different arrangements are possible if (a) all the books of one type must stand together, and (b) only the science books must stand together?
- 17. How many 3 digit numbers exist that have only one 7?
- 18. A manager needs to hire 3 people to work in her marketing department, and one of which is to be the team leader. If there are 10 potential candidates, how many distinct ways can she fill these three positions?
- 19. If Roger lives at point A and works at point B, how many different ways can he travel to work if he must always take the shortest path?



20. How many ways can Mike and John sit down at the table so that they don't sit directly across from each other?



Coordinate Geometry

21. What is the value of k?

(1) In the xy-coordinate system, (a,b) and (a+3, b+k) are two points that lie on the line defined by the equation x = 3y - 7

- (2) k² = 1
- 22. What is the least possible distance between a point on the circle $x^2 + y^2 = 1$ and a point on the line y = 3/4(x) 3?
 - a) 1.4
 - b) √2
 - c) 1.7
 - d) √3
 - e) 2.4
- 23. In the xy plane line m has the equation 4x + y = k. Line n passes through the origin and is perpendicular to line m. If point p has the coordinates (r, r+1) and is on both line n and m what is the value of r?
 - a) -4/3
 - b) 1/4
 - c) -4
 - , d) 3/4
 - e) 4/3
- 24. In xy-plane, $y=ax^2+bx+c$, does the graph intersect with x-axis?
 - (1) a > 0
 - (2) c < 0
- 25. If line k in the xy plane has equation y = mx + b, where m and b are constants, what is the slope of k?
 (1) k is parallel to the line with equation y = (1-m)x + b + 1
 (2) k intersects the line with equation y = 2x + 3 at the point (2,7)
- 26. In the xy-plane, the line with equation ax + by + c = 0, where $abc \neq 0$, has slope 2/3. What is the value of b?
 - (1) a = 4
 - (2) c = -6

Exponents and Roots

27. Simplify the following fractions:

$$\begin{array}{c} 2 \\ a) \overline{4 + \sqrt{14}} \\ \frac{2^{21}}{4^4 (4^5 - 4^3)} \\ a) \overline{4^4 (4^5 - 4^3)} \\ a) \overline{4^4 (4^5 - 4^3)} \\ a) \overline{4^2 (4^5 - 4^3$$

28. Simplify the following roots:

a)
$$\sqrt{486}$$

b) $\sqrt{64 + 2^6}$
c) $\sqrt[5]{100} \times \sqrt[6]{100}$
29. Solve for n for the following equations:
a) $9^7 + 9^7 + 9^7 = 27^{n+1}$
b) $16^{n-9} + 4^{2n-18} = 256^{n-4}$

$$\binom{1}{7}^{n} \times \left(\frac{1}{9}\right)^{17} = \frac{1}{3^{3} \times 21^{31}}$$

d) $\sqrt{(10n - 25)^{3}} = n^{3}$

e)
$$2^n - 2^{n-2} = 3 \times 2^{13}$$

Functions

- 30. For all integers b, b = b² -2. What is the value of $^{(5)}$?
- 31. For numbers j and r, r @ j = $r \times (r j)$. What is the value of x if x @ 10 = -25?
- 32. For all integers x, $*x = x^2$ -6. What are all possible values of b if *(b-1)=10?
- 33. If $f(x) = \frac{125}{x^3}$, what is the value of $(f(5x)) \times (f(x/5))$ in terms of f(x)?
 - a) (f(x))²
 - b) f(x²)
 - c) (f(x))³
 - d) f(x³)
 - e) 1
- 34. For which of the following functions f is f(x) = f(1-x) for all x?
 - a) f(x) = 1-x
 - b) $f(x) = 1 x^2$
 - c) $f(x) = x^2 (1-x)^2$
 - d) $f(x) = x^2(1-x)^2$
 - e) f(x) = x/(1-x)

Mixture Problems

- 35. A drink contains 40% gin and 60% vodka. If the volume of the drink is (n) how much vodka must be added in terms of (n) to be left with a 25% concentration of gin?
- 36. Solution Y is 30 percent liquid X and 70 percent water. If 2 kilograms of water evaporate from 8 kilograms of solution Y and 2 kilograms of solution Y are added to the remaining 6 kilograms of liquid, what percent of this new solution is liquid X?
- 37. A room contains 160 people, 15% of whom are women. A group of people, 30% of whom are women, leaves the room. Of the people remaining in the room, 10% are women. How many people left the room?
- 38. Seed mixture X is 40 percent ryegrass and 60 percent bluegrass by weight; seed mixture Y is 25 percent ryegrass and 75 percent fescue. If a mixture of X and Y contains 30 percent ryegrass, what percent of the weight of this mixture is X?
- 39. There are two alloys of copper and zinc. In the first alloy, the ratio of copper to zinc is 3:4 and in the second alloy the ratio of copper to zinc is 6:1 In what proportion should these two alloys be mixed so that a new alloy containing equal parts of copper and zinc may be obtained?

Number Properties

- 40. What is the units-digit of 3¹⁷×17⁵⁴×135¹⁹×31²¹×42¹⁷?
- 41. Which of the following fractions has a decimal equivalent that is a terminating decimal?
 - a) 10/189
 - b) 15/196
 - c) 16/225
 - d) 25/144
 - e) 39/256
- 42. If $n = 8^{111} 8$, what is the units-digit of n?
- 43. If M and N are positive integers that have remainders of 1 and 3, respectively, when divided by 6, which of the following could NOT be a possible value of M+N?
 - a) 86
 - b) 52
 - c) 34
 - d) 28
 - e) 10
- 44. When the integer n is divided by 17, the quotient is x and the remainder is 5. When n is divided by 23, the quotient is y and the remainder is 14. Which of the following is true?
 - a) 23x + 17y =19 b) 17x -23y = 9 c) 17x +23y =19
 - d) 14x + 5y = 6 e) 5x - 14y = -6
- 45. When N is divided by 10 the remainder is 1 and when N is divided by 3 the remainder is 2. What is the remainder when N is divided by 30?

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- 46. What is the remainder when 2⁹¹ is divided by 7?
- 47. If y+2 is divisible by 4 then is y/2 odd or even?
- 48. If k is an even integer and p and r are odd integers, which of the following cannot be an integer?
 - a) r/k
 - b) k/p
 - c) p/r
 - d) kp/r
 - e) kr/p
- 49. How many divisors does 39690 have?
- 50. Which of the following is not a prime number?
 - a) 323
 - b) 263
 - c) 241
 - d) 197
 - e) 131
- 51. What is the least common multiple of 8, 9, 10, 11, 12 and 24?
- 52. When the product of 3070956 and n divided by 720 there will be no remainder. If n > 0, what is the smallest value of n?
- 53. How many of the positive factors of 42 are not factors of 56?
 - a) 1
 - b) 2
 - c) 3
 - d) 4
 - e) 5

54. What is the smallest positive integer n for which 324 is a factor of 6ⁿ?

- a) 2
- b) 3
- c) 4
- d) 5
- e) 6
- 55. $10^{25} 560$ is divisible by all the following EXCEPT?
 - a) 11
 - b) 8
 - c) 5
 - d) 4
 - e) 3
- 56. What is the smallest integer that 10584 must be multiplied by so that the resulting number is a perfect cube?
- 57. By using the numbers 1,2,3,5 and 7 only once, how many five digit numbers can be made that are divisible by 25?
- 58. What is the smallest sum of integers m and n so that the five digit number 7m1n0 is divisible by 72?

- 59. How many positive integers less than 1000 have no factors (other than 1) in common with 1000? a) 400
 - b) 410
 - c) 411
 - d) 412
 - e) None of the above
- 60. The sum of two numbers is 588 and their HCF is 49. How many such pairs of numbers can be formed?
- 61. How many zeros does 100! end with?
- 62. What is the highest integer power of 12 that divides 27! evenly?
- 63. Which is bigger 89! 88! or $87! \times 88^2$?
- 64. If n is the product of the integers from1 to 20 inclusive, which of the following is the greatest integer k for which 2k is a factor of n?
 - a) 408
 - b) 437
 - c) 486
 - d) 532
 - e) 1242
- 65. Is 22 a factor of x?
 - (1) 22 is a factor of 15x
 - (2) 22 is a factor of 16x

Percents

- 66. In addition to the price of the meal, Janet paid sales tax equal to 8.5% of the price of the meal, and a tip equal to 15% of the price of the meal. If she paid \$2.04 in sales tax, how much was the tip?
- 67. During a four-day sale, a store sells 20% of its stock of kitchen tables on the first day, 25% of the remaining stock on the second day and one-third of the unsold tables on the third day and 50% of what was left on the last day. If 18 tables remained after the sale was over, how many tables were in the stock at the beginning of the sale?
- 68. Two items are sold for 1200 each if the merchant made a profit of 25% on one and a loss of 25% on the other, what is his overall profit or loss?
- 69. Mr. Johnson invested \$50,000 into two investments. Part of it he put in a gold mine stock from which he hoped to receive a 20% return per year. The rest he invested in a bank stock which was paying 6 percent per year. If he received \$400 more the first year from the bank stock than from the mining stock, how much did he invest in each stock?
- 70. If an item is sold at 80% of its present selling price, the merchant will make a loss of 4%. What percent profit does he make by selling at the current selling price?
- 71. A merchant marks his goods in such a way that his profit on sale of 50 items equals the selling price of 10 items. What percent profit does he make?
- 72. Bob bought a goat. He expected to sell it at a price that would give him a 10% profit on his purchase. However, he had to sell it for \$50 less than he expected, which was a loss of 15% on what it cost him. What did Bob pay for the goat?
- 73. The interest compounded annually on a certain sum of money is \$41.60 after two years. The simple interest on the same amount of money after two years would be \$40.00. Find the amount invested if the interest rate would be the same in each investment.

Probability

- 74. If any number from set A is multiplied by any number from set B, what is the probability that the product is a multiple of 4?
 A = {21, 22, 23, 24, 25}
 B = {23, 24, 25, 26, 27}
- 75. A bowl contains 10 apples, 2 of which are bad. If someone randomly selected four apples from the bowl, what is the probability that at least one of the apples is bad?
- 76. In a five day period the chance of rain each day is 50% what is the chance that it will rain only twice?
- 77. The probability of picking two red balls from a container of red and blue balls is 2/9. If there are 5 blue balls in the container, how many red balls were in the container?
 - a) 4
 - b) 5
 - c) 6
 - d) 7
 - e) 8
- 78. The probability of a man hitting a bull's-eye in one throw at a dart board is ¼. What is the least number of throws he must take in order for the probability of hitting the bulls eye at least once to be more than 50%?

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Ratios

- 79. Exactly 3/7 of the people in the room are under the age of 21, and exactly 5/13 of the people in the room are over the age of 65. If the total number of people in the room is greater than 50 and less than 100, how many people in the room are under the age of 21?
 - a) 21
 - b) 35
 - c) 39
 - d) 60
 - e) 65
- 80. A certain bag contains a mixture of nuts and raisins, in the ratio of 3:2, nuts to raisins by weight. If 15 pounds of nuts are removed, and are replaced with 20 pounds of raisins, so that the new ratio is 3:4, how many pounds of raisins were in the original mixture?
- 81. Andy, Ben, Carl and Dave bought a car for \$6000. Andy paid half the sum of the other boys, Ben paid one third the sum of the other boys and Carl paid one fourth the sum of the other boys. How much did Dave have to pay?
- 82. Bag A contains red, white and blue marbles such that the red to white marble ratio is 1:3 and the white to blue marble ratio is 2:3. Bag B contains red and white marbles in the ratio of 1:4. Together, the two bags contain 30 white marbles. How many red marbles could be in bag A?
 - a) 1
 - b) 3
 - c) 4
 - d) 6
 - e) 8
- 83. Michael sells twice as many \$20 tickets as Thomas, and Thomas sells three times as many \$10 tickets as Michael does. If there are only \$10 and \$20 tickets, how many tickets does Michael sell?
 (1) Thomas sold a total of 35 tickets.
 (2) The ticket are only \$10 and \$20 tickets.
 - (2) Together Michael and Thomas sold 70 tickets for a total of \$1,000
- 84. An investment fund manager is considering three stocks, P, Q, and R for her portfolio. For the cost of 1 share of P, she could buy 3 shares of Q or 5 shares of R. If she invested an amount equal to the cost of 4,500 shares of Q but purchased equal numbers of shares of P and R and no shares of Q, how many shares of R did she buy?
- 85. Andy and Bob enter into a partnership. Andy invests \$5000. At the end of 3 months, he withdraws \$500 and at the end of 7 months he withdraws \$900. If Bob does not withdraw any money throughout the year and gets \$800 as his share of the total profit of \$1800 at the end of the year, how much did he invest?

Right Triangles and other Geometry

- 86. What is the area of a rectangular garden with diagonal length of 200 feet and a perimeter of 560 feet?
- 87. What is the area of a circle that has an equilateral triangle with an area of 4v3 inscribed in it?
- 88. If Radius BC equals 2, what is the area of the shaded region of the circle formed by the rectangle inscribed in the circle?



89. In the Square above the length of line AB is 4 and angle BAC is 45 degrees. Approximately what is the circumference of the circle?



90. In the circle above with center C and radius 2 what is area of the shaded region if angle ABF = 30° and line FG and Line AB are parallel?



91. CDEB is a parallelogram and P is the midpoint of ED. If GB = 5 what is the length of BA =?

Sequences and Series

- 92. How many numbers between 200 and 3600 inclusive are divisible by 4, 5 and 6?
- 93. Find the sum of all two digit numbers which leave a remainder of 3 when divided by 7?
- 94. If the sum of 10 consecutive integers is 1005, how many of the numbers are prime?
- 95. If the sequence x_1 , x_2 , x_3 , ... x_n , is such that $x_1 = 3$ and $x_{n+1} = 2x_n 1$ for $n \ge 1$, then $x_{20} x_{19}$ equals?
 - a) 2¹⁹
 - b) 2²⁰
 - c) 2²¹
 - d) 2²⁰ 1
 - e) 2²¹-1
- 96. A sequence of numbers a_1 , a_2 , a_3 ... is given by the rule $a_n^2 = a_{n+1}$. Does 3 appear in the sequence? (1) $a_1 = 2$ (2) $a_3 = 16$

Set Problems and Venn Diagrams

- 97. One evening at a party with 50 people it was discovered that 22 people study accounting, 15 people study marketing and 14 people study economics. If there are 9 people that study exactly two subjects and 1 person studies all three, how many people study none of the topics?
- 98. At alpha athletics club the members are required to play at least one sport besides their normal fitness training. In fact 33 members play tennis, 43 members play squash, and 42 members play golf. 16 members play at least tennis and squash, 18 members play at least squash and golf and 8 members play golf and tennis. If 5 members play all three sports, how many members are in the club?
- 99. In a consumer survey, 85% of those surveyed liked at least one of three products: 1, 2, and 3. 50% of those asked liked product 1, 30% liked product 2, and 20% liked product 3. If 5% of the people in the survey liked all three of the products, what percentage of the survey participants liked more than one of the three products?
- 100. At a certain health club, 30% of the members use both the pool and the sauna, but 40% of the members who use the pool do not use the sauna. What percent of the members use the pool?
- 101. At a chess tournament there are 46 participants. The ratio of the participants that speak Spanish and English is 3:2 and 6 speak neither of these languages. If the number of participants that speak both Spanish and English is 5, how many participants speak only Spanish?

Speed Problems

- 102. A cop clocks a motorcyclist speeding down the highway at 90 mph. 2 minutes later the cop tears off after him averaging a speed of 120mph. At this rate how long will it take for our friendly copper to catch the speeder?
- 103. A man travels 75% of the way from point A to point B traveling at a speed of 50mph. How fast must he travel the rest of the trip in order to maintain an overall average speed of 40 mph?
- 104. It takes an hour more by train to cover a distance of 360 miles when the usual speed of the train is decreased by 4 mph. What is the usual speed of the train?
 - a) 60
 - b) 55
 - c) 50
 - d) 45
 - e) 40
- 105. A train traveling at 72 km/h passes a man on a bicycle traveling at 36 km/h completely in 40 seconds. If the length of the bicycle is 2 meters, what is the length of the train?
- 106. Two trains pass each other in 80 seconds, one traveling at 40 km/h and the other at 32 km/h. If the length of one of the trains is 540 meters, what is the length of the other?
- 107. A boat travels up the river and down the river the same distance. If the average relative speed of the boat 48 mph and the speed of the river is 10 mph, what is the upriver speed of the boat?
- 108. A track is exactly 1 km in length. If Andy gives Bill a head start of 60 m or 12 seconds, they both finish at the same time. How long does Andy need to run around the track?

Standard Deviation

- 109. For a certain exam a score of 58 is 2 standard deviations below the mean and a score of 98 is 3 standard deviations above mean. What was the mean score of the exam?
- 110. A set of data consists of the following 5 numbers: 0,2,4,6, and 8. Which two numbers, if added to create a set of 7 numbers, will result in a new standard deviation that is close to the standard deviation for the original 5 numbers?
 - a) -1 and 9
 - b) 4 and 4
 - c) 3 and 5
 - d) 2 and 6
 - e) 0 and 8
- 111. A certain characteristic in a large population has a distribution that is symmetric about the mean m. If 68 percent of the distribution lies within one standard deviation d of the mean, what percent of the distribution is less than m + d?
- 112. A series of x consecutive numbers where the mean has a value of R and a standard deviation of Q. What would be the new standard deviation if each number in the series increased equally in order to create a new mean of R + Z?
 - a) Q
 - b) Q + Z
 - c) Qx + Z
 - d) QR +Z
 - e) R + Z
- 113. Two different groups of test-takers received scores on the GXYZ standardized test. Group A''s scores had a normal distribution with a mean of 460 and a standard deviation of 20. Group B''s scores had a normal distribution with a mean of 520 and a standard deviation of 40. If each group has the same number of test-takers, what fraction of the test-takers who scored below 440 belonged to Group B?

Work Problems

- 114. After 40 minutes pipe A can fill a tank. Pipe B can fill the same tank in 20 minutes. A leak at the bottom of the tank can empty the tank in 120 minutes. If both pipes are open and the tank is already half full, how long will it take to fill the tank?
- 115. Three small pumps and a large pump are filling a tank. Each of the three small pumps works at 2/3 the rate of the large pump. If all pumps work at the same time, they should fill the tank in what fraction of the time that it would have taken the large pump alone?
- 116. Pipe X can fill the tank in 10 minutes. Pipe Y can fill the tank in 15 minutes. Drain A is used to drain the tank. After opening pipe X and pipe Y, a man returns when the tank should have been full. However he finds that the drain was also left open. At that point he shuts the drain and in the next two minutes the tank is full. How many minutes will it take for Drain A to empty the tank?
- 117. The ratio of the rates of Bob, John and Craig is 1 to 2 to 5 respectively, if the three work together on the project it takes 4 hours to complete. How long does it take John to do the job alone?
- 118. At a bottling factory six machines working together can bottle 5000 bottles in 4 hours. If only three machines are operational, how long will it take them to bottle 3000 bottles?

Sentence Correction

General hints:

- take the shortest cleanest version of the original sentence
- don't take answers that contain unnecessary fill words
- 31% of the time the shortest answer is probably correct

The utility company has announced that it will permanently close its Unit I nuclear power plant, the first plant <u>that had been built by private industry and</u> the model for a generation of modern nuclear reactors.

- a) that had been built by private industry and
- b) built by private industry and which was
- c) to be built by private industry and which was
- d) built by private industry and
- e) to have been built by private industry and was

3:2 Patterns

- Wrong answers
- Almost right answers
- Best answers
- 1. Trumpeting the victory of her team in the volleyball semifinals, <u>the coach's attitude</u> <u>was one of exuberance and guarded optimism.</u>
 - a) the coach's attitude was one of exuberance and guarded optimism.
 - b) the coach's attitude reflected her exuberance and guarded optimism.
 - c) the attitude of the coach was exuberant and guardedly optimistic.
 - d) the coach displayed an attitude of exuberance and guarded optimism.
 - e) the coach displayed an attitude of exuberance which was guardedly optimistic.
- 2. <u>While some of the blood samples were contaminated today, rendering them useless</u> for further experiments, the scientists already finished their research.
 - a) While some of the blood samples were contaminated today, rendering them useless for further experiments, the scientists
 - b) While some of the blood samples had been contaminated today, rendering them useless for further experiments, the scientists
 - c) Some of the blood samples had been contaminated today, rendering them useless for further experiments; fortunately, the scientists had
 - d) While some of the blood samples were contaminated today, rendering them useless for further experiments, the scientists had
 - e) Today some of the blood samples were contaminated, rendering them useless for further experiments, but the scientists
- 3. <u>Whereas warriors in centuries past</u> counted among their nation's heroes, so too do today's sport stars, as Michael Jordan and Ronaldo, embody the physical and competitive aspirations of their countrymen.
 - a) Whereas warriors in centuries past
 - b) Much like warriors in centuries past, who
 - c) Just like warriors in centuries past, who
 - d) Just as warriors in centuries past
 - e) Just as warriors in centuries past, who

Rules to know:

A sentence needs to have a subject and a verb.

A clause starting with *before, after, although because, if, when, while* cannot stand alone, another complete clause must follow it.

A clause beginning with *which* or *who* cannot be the main clause of a sentence.

Two independent sentences must be separated by either a ; or a .

Do not join clauses with the following: thus, therefore, however, nevertheless, instead.

Subject-Verb Agreement questions

- Since 1981, when the farm depression began, the number of acres overseen by professional farm-management companies <u>have grown from 48 million to nearly 59</u> <u>million, an area that is about Colorado's size</u>.
 - a) have grown from 48 million to nearly 59 million, an area that is about Colorado's size
 - b) have grown from 48 million to nearly 59 million, about the size of Colorado
 - c) has grown from 48 million to nearly 59 million, an area about the size of Colorado
 - d) has grown from 48 million up to nearly 59 million, an area about the size of Colorado's
 - e) has grown from 48 million up to nearly 59 million, about Colorado's size

Rules to know:

- 1) Ignore "comma crap" (the appositive): words between the commas are NOT part of the subject.
 - e.g. John and Mary like movies e.g. John, as well as Mary, likes movies
- Ignore words after "of" these are *not* part of the subject.
 e.g. The king of the nerds is crazy
 - Singular subject
- Gerund subjects (the "ing" form of the verb") are always singular Planting all these trees is such a tough job. Gerund subject
- 4) Collective nouns (one big thing representing several smaller things are usually *singular*). Words such as management, government, committee, board, orchestra etc. Pronouns such as everyone, everybody.
 e.g. The management has decided to cut the budget by 10% this year. *Singular subject (collective noun)*
- Neither X nor Y
 Either X or Y Y is the subject NOT x
 e.g. Neither John nor his sisters like dancing
 Y
 - e.g. Neither John's sisters nor John likes dancing
- 6) The number of X (countable noun plural) is singular e.g. A number of X (countable noun plural) are - plural e.g. The number of players on the team is getting smaller Singular subject

γ

e.g. A number of players on the team want to quit *Plural subject*

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Can you detect any subject/verb agreement errors in the following sentences?

- 1. The travelling salesman was dismayed to learn that neither his sons nor his daughter were interested in moving.
- 2. I was so thirsty that either of the two drinks were fine with me.
- 3. A number of players on the team have improved since last season.
- 4. Jack, along with some of his closest friends, is sharing a limo to the prom.
- 5. The recent string of burglaries, in addition to poor building maintenance, have inspired the outspoken woman to call a tenants meeting.
- 6. There is, according to my doctor, many courses of treatment available to me.
- 7. The sun shining on the flower beds make a beautiful sight.
- 8. The placement of the unusual artwork in the mansion's various rooms was impressive.
- 9. Just around the corner is a bakery and a supermarket.
- 10. Planting all these seeds is more involved than I thought.
- 11. Whoever rented these movies has to take them back before midnight.
- 12. Tired of practicing, the orchestra decide to walk out on their astonished conductor.
- 13. The young bride, as well as her husband, were amazed by the generosity of the wedding guests.
- 14. Neither she nor her parents understands the challenging math problem
- 15. A majority of voters is opposed to the current policy.

Modifier Questions

- 5. In addition to having more protein than wheat does, <u>the protein in rice is higher</u> <u>quality than that in</u> wheat, with more of the amino acids essential to the human diet.
 - a) the protein in rice is higher quality than that in
 - b) rice has protein of higher quality than that in
 - c) the protein in rice is higher in quality than it is in
 - d) rice protein is higher in quality than it is in
 - e) rice has a protein higher in quality than

Rules to know:

In most cases, a modified noun/subject must come immediately after a modifying phrase, usually after the comma ",". Otherwise, you have a dangling or misplaced modifier

RIGHT: **Tired and hungry**, <u>we</u> happily sat down to a well-deserved dinner. *Modifying phrase* / <u>modified noun/subject</u>

WRONG: Tired and hungry, **our plane** landed late and there was no meal served. **MISPLACED MODIFIER**

Therefore, in many cases, the passive form must be used when dealing with modifiers.

Do the following have any modifier errors?

- 1. Upon entering the restaurant, the *maitre d'* handed us a menu.
- 2. Working diligently and carefully, the faucet was fixed in no time at all.
- 3. Employing groundbreaking techniques in alternative medicine, the patient's health improved in a few days.
- 4. David tried a handful of desserts from the table, which ultimately gave him an upset stomach.
- 5. Like other students in his class, Jim doesn't like to be singled out for making mistakes.
- 6. Uninterested in the lecture, the orator put most of the audience to sleep.
- 7. Weary from travel, a dip in the hot tub sounded like a great idea to us.
- 8. John was thrilled, like the other members of the debate team, to participate in the tournament.
- 9. The quick-witted hostess pitched a tent over the garden party, a way to protect the guests from the imminent rain.
- 10. Similar in so many ways, the parents were still able to distinguish between the twins.
- 11. Based on the recent decline in enrollment, the admissions office decided to reevaluate its recruitment strategies.
- 12. Unaccustomed to the rigors of college life, James' grades dropped.
- 13. Mary returned the dress to the store, which was torn at one of the seams.
- 14. We enjoy meeting people having different interests.
- 15. Obstinate and surly, the manager's attitude prevented his staff from befriending him.

Pronoun Questions

- 6. Delighted by the reported earnings for the first quarter of the fiscal year, <u>it was</u> decided by the company manager to give her staff a raise.
 - a) it was decided by the company manager to give her staff a raise.
 - b) the decision of the company manager was to give her staff a raise.
 - c) the company manager decided to give her staff a raise.
 - d) the staff was given a raise by the company manager.
 - e) a raise was given to the staff by the company manager.

Rules to know:

A pronoun must agree in gender and in number with its antecedent (or referent).

The boy walked his dog.

antecedent	pronoun
masculine	masculine = gender
singular	singular = number

• However, if there is no clear-cut antecedent to the pronoun, then the pronoun CANNOT be used. e.g. Sally's books were so heavy that *Sally* couldn't carry them.

NOT she

Subject pronoun vs. object pronoun:

A subject pronoun can NEVER be used as an object; likewise, an object pronoun can NEVER be used as a subject.

I /me	who/whom
Subject/object	subject/object

WRONG: *Who* are you taking out for dinner tonight?

Subject pronoun

RIGHT: **Whom**_are you taking out for dinner tonight? Object pronoun

WRONG: *Me* and Bob went to the ball game last night.

Object pronoun

RIGHT: Bob and *I* went to the ball game last night.

Subject pronoun

WHICH/WHO relative pronouns are POSITION SENSITIVE: namely, the antecedent to the pronoun must come immediately before *which/who*.

- RIGHT: *The book*, <u>which</u> was situated at the back of the store, was sold at a discount. antecedent <u>relative pronoun</u>
- WRONG: *The book* at the back of the *store*, *which* was sold at a discount, could not be returned. antecedent <u>NOT the antecedent</u> relative pronoun

NB: Which/who cannot replace groups of words

Do the following have any pronoun errors?

- 1. Who are you going to take to the movies?
- 2. Kathy's suitcase was so stuffed that she decided to pack another one.
- 3. The students' work improved over the course of the semester, and they should be commended for it.
- 4. The players' helmets need to be repainted so that they will be ready to be used at practise on Sunday.
- 5. I don't understand why me and Bob always have to take out the garbage.
- 6. Some people believe that the benefits of a healthy diet outweigh that of regular exercise.
- 7. We finally chose the coffee table towards the back of the store, which we thought would complement our living room furniture.
- 8. At the end of the day, the chaperones took the fourth graders back to school, who were exhausted from running after the children.
- 9. Everyone here needs their own copy of the textbook in order to take this class.
- 10. Samantha's face looked blurry in the photo, but I could tell she wasn't smiling.
- 11. We finally returned all the books to the library, which we left at the front desk.
- 12. Jim may not be elected CEO by the board because he does not meet their standards.
- 13. Meg left all her class notes at school because she decided that she could do her homework without it.
- 14. The person who cheated on the test should raise their hand.
- 15. Only pack the clothes that you are planning to wear.

Parallel Construction Questions

- The end of the eighteenth century saw the emergence of prize-stock breeding, with individual bulls and cows receiving awards, fetching unprecedented prices, and <u>excited</u> enormous interest whenever they were put on show.
 - a) excited
 - b) it excited
 - c) exciting
 - d) would excite
 - e) it had excited

Rules to know:

Elements of the sentence should be parallel in these four ways: 1) Proper word sequencing Verb, verb Noun, noun, noun Adjective, adjective, adjective e.g. There is a difference between hard work and natural talent. adjective noun adjective noun

aujective noun auje

WRONG: Jane is violent, alcoholic, and hates people adjective, adjective verb phrase

RIGHT: Jane is violent, alcoholic, and anti-social. adjective, adjective adjective

2) Repetitive motif:

Parts of the sentence are repeated so that it becomes parallel.

e.g. The way you look and the way you dress determine the outcome.

3) Ellipsis rule:

Certain words in the sentence are NOT repeated so that it becomes parallel. (usually *to* and the help verb)

e.g. We decided to walk rather than (to) take a taxi.

e.g. Tomorrow, we will go shopping, (will go) dancing and (will go) partying.

4) LEARN PARALLEL IDIOMS: A handful of parallel idioms: X as to Y X rather than Y Both X and Y Liable to be X and Y Between X and Y Not only X but also Y More X than Y

Do the following have any parallelism construction errors?

- 1. The connection between regular exercise and performing well in school continues to elude us.
- 2. Although we were sitting in the bleachers, the baseball game was as exciting to us as the people sitting behind home plate.
- 3. Many teachers have chosen to seek employment in the suburbs rather than facing low salaries in the city.
- 4. If he is not given ample recovery time after the operation, he is liable to be disoriented and may not perform routine tasks well.
- 5. Many agree that how you dress for a job interview and even the way you position yourself in your seat leave a lasting impression on your interviewer.
- 6. A good night's sleep not only gives your body a chance to rest, but energizing you for the following day.
- 7. The joint business venture will increase employee satisfaction and start improving the relations between upper management and staff
- 8. The works displayed in the photography exhibit were contributed by numerous artists, both those who already had mass appeal and who never had much exposure.
- 9. We were dismayed to learn that most of our neighbors were unfriendly, disagreeable, and were uninteresting to make new friends.
- 10. The students didn't do well on the test more because they didn't study than not understanding the material.
- 11. The snow covered the train tracks by more than a foot, prompted the transit authority to shut down service temporarily, and causing discontent among commuters who were left stranded for hours.
- 12. The experiences we have when children still influence our behavior in adulthood.
- 13. The band chosen for the annual spring concert appealed to the student body and the administration as well.
- 14. The new toy was the young mother's trying to appease her sobbing child.
- 15. We decided to walk to the cinema rather than taking the bus.
Faulty Comparison Questions

- Unlike a typical automobile loan, which requires a fifteen to twenty-percent down payment, <u>the lease-loan buyer is not required to make</u> an initial deposit on the new vehicle.
 - a) the lease-loan buyer is not required to make
 - b) with lease-loan buying there is no requirement of
 - c) lease-loan buyers are not required to make
 - d) for the lease-loan buyer there is no requirement of
 - e) a lease-loan does not require the buyer to make

Rules to know:

1) LIKE vs AS

We use *like* for nouns and/or noun phrases We use *as* for verbs and verbs phrases

Like the other members of the Jones family, Sarah has a drug and alcohol problem. Noun phrase noun

Sarah *can run* **as** fast **as** John *can.* parallel verb

NB: If an answer choice does not have the parallel verb, then that answer choice is WRONG. "The two to tango" principle. You need to have 2 verbs in order to make a comparison.

2) APPLES TO APPLES (NOT APPLES TO ORANGES):

WRONG: The *wallpaper* in the living room looks shinier than the *bedroom*. apples oranges

RIGHT: The *wallpaper in the living room* looks shinier than *that in the bedroom*. apples apples

3) LEARN COMPARISON IDIOMS

List of comparison idioms: There are as many X as there are Y X rather than Y More X than Y Likening X to Y

Do the following have any comparison errors?

- 1. As with other children in her neighborhood who were home schooled, Joan sometimes missed being in a classroom with her peers.
- 2. In contrast to the trapeze artists who fumbled their routine, the antics of the circus clowns kept the audience entertained for hours.
- 3. The clothes hanging on the racks inside the store looked more appealing than in the store window.
- 4. There are about the equivalent number of gym members in the boxing class as in the aerobics class.
- 5. Brett decided to use his own money, but not his parents' credit card, to pay for the stereo.
- 6. Julia was able to climb the tree so fast as her brothers.
- 7. The blue dress looks more flattering on you than the red one.
- 8. Three times more students attended the prom this year than last year.
- 9. Joe went to bed early because his will to succeed in the race the following morning was greater than playing pool with his friends.
- 10. Sam was away on vacation longer than his friends.
- 11. Most of the audience did not enjoy the concert, likening it to grinding up metal.
- 12. Owning a car is still Dan's goal, like than of his parents when they were his age.
- 13. Covering the floors with tiles costs twice as much as linoleum.
- 14. Like a woman I once met on the bus, the hostess' attire was somewhat flamboyant.
- 15. The tycoon contributed more to the candidate's campaign than anyone else in the industry.

Idiom Questions

- 9. Paleontologists believe that fragments of a primate jawbone unearthed in Burma and estimated <u>at 40 to 44 million years old provide evidence of</u> a crucial step along the evolutionary path that led to human beings.
 - a) at 40 to 44 million years old provide evidence of
 - b) as being 40 to 44 million years old provides evidence of
 - c) that it is 40 to 44 million years old provides evidence of what was
 - d) to be 40 to 44 million years old provide evidence of
 - e) as 40 to 44 million years old provides evidence of what was

Rules to know:

Do idioms questions from the GMAT Official Guide file (12th Ed.)

Please refer to the idioms list on your CD-ROM.

Learn word partnerships: Interested in Devoted to Satisfied with Worried about

*Remember that "consider" has NO preposition or verb after it. In fact, there is nothing after "consider."

*Remember that "or not" NEVER accompanies "whether." It is only implied but never stated.

MEMORIZE, INTERNALIZE AND APPLY IDIOMS LISTS

Are the following sentences using the wrong idioms. If so, what are the correct ones?

- 1. Unaccustomed to being spontaneous, Jill couldn't decide whether she should be spending her bonus on a new computer.
- 2. The new mother spent most of the day worrying over her son's safety.
- 3. The reclusive playwright has been known as declining invitations to speak at college forums across the country.
- 4. Current office policy requires that all employees should submit vacation requests to their supervisors before taking those requests to the human resources department.
- 5. Someone who enrolls in an advanced dance class without having prior experience is likely severely disadvantaged.
- 6. All the history professors considered the visiting lecturer as an expert in his field.
- 7. The success of the new restaurant depends on if it can appeal to a broad range of palates.
- 8. The sign in front of the Baker residence prohibits anyone to trespass on the property.
- 9. The chemical's potential was determined as a result of extensive research and numerous experiments.
- 10. The Pilgrims are credited as having celebrated the first Thanksgiving.
- 11. Jeff claims that he is the best quarterback his team has ever seen.
- 12. Although it was expected that Kelly would win the spelling bee, she stumbled on a fairly simple word.
- 13. The union demanded that its members should be receiving better pay.
- 14. Peter viewed babysitting his sister like a chore rather than a chance to become close to his sibling.
- 15. Cheryl mistook the handsome boy's sudden appearance at her locker as a sign that he was interested in her.

Tense Questions

- 10. Native American burial sites dating back 5,000 years indicate that the residents of Maine at that time were part of a widespread culture of Algonquian-speaking people.
 - a) were part of a widespread culture of Algonquian-speaking people
 - b) had been part of a widespread culture of people who were Algonquian-speaking
 - c) were people who were part of a widespread culture that was Algonquianspeaking
 - d) had been people who were part of a widespread culture that was Algonquianspeaking
 - e) were a people which had been part of a widespread, Algonquian-speaking culture

Rules to know:

Conditional tenses:

Type 1 (likely outcome	2)
lf you <i>buy</i> 100 units fro	om me, I <i>will</i> give you a 10% discount
Present simple	future simple

Type 2 (less likely outcome/hypothetical situation)

If you *bought* 100 units from me, I *would give* you a 10% discount Past simple would + verb (infinitive) Present conditional

• For the verb to be in the *if* clause, use WERE not WAS.

If I were you...

If John were here...

Type 3 (impossible or opposite outcome/ never happened) If you had bought 100 units from me, I would have given you a 10% discount. past perfect would+have+verb (past participle) past conditional

Active vs. passive voice

Whenever possible, take the active answer choice. Why? Because active is a) clearer and b) shorter than passive.

- e.g. John did his homework. (ACTIVE) John's homework was done by John. (PASSIVE)
 - However, the active answer choice must be grammatically correct.
 - When describing a PROCESS, take the passive answer choice. Why? Because the agent (the person or people performing the action) is irrelevant.
- e.g. 50 ml of nitrus oxide *were added* to the solution.

Most common tenses on GMAT SC:

Present simple: for general descriptions/habits

e.g. Every morning, I get up at 6.00.

Past simple: for single completed actions in the past, but with a time indicator (e.g., yesterday, last week etc.) e.g. Yesterday, I *went* to the dentist

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Future simple: for actions that will take place in the future. A time indicator (tomorrow, next week etc.) is often used. e.g. Tomorrow, we *will go* shopping, partying and dancing.

2nd action

More problematic tenses:

1st action

Past perfect: a) For tense sequencing in the past

e.g. He had never met an English woman until he met the Queen.

b) For reported speech (the reporting verb is usually say, tell or think): John *told* us that he *had gone* to the party last weekend. Reporting verb action verb is one tense back from reporting verb.

Present perfect:

- a) For actions started in the past but still relevant in the present. *For/since* are trigger words for the present perfect.
- e.g. I *have been living* in Frankfurt for 10 years / since 2000.b) For completed actions but WITHOUT a time indicator:

I have drunk 3 cups of coffee. BUT Yesterday, I drank 3 cups of coffee.

NB: GMAT HATES being. If you see being in an answer choice, eliminate it. (This is true is 98% of cases)

Do the following sentences consist of any verb tense, mood and voice errors? If so, rewrite them in the correct form.

- 1. I propose that Amy apologizes to Mark, and we forget this ever happened.
- 2. We are walking all over the countryside since last weekend.
- 3. Dylan's work was quickly done by him.
- 4. Alexandra never insists that Michael calls her after a date, but he does anyway.
- 5. We thought that Joe didn't go to the museum with the rest of the class.
- 6. She had gotten up in the morning and was brushing her teeth when the phone rang.
- 7. Fifty millimeters of sodium chloride solution were added in the second step of the experiment.
- 8. The attorney proposed that the session was adjourned until the following day.
- 9. They never met an Australian before they met Crocodile Dundee.
- 10. Because Helen had homework to do, the television was turned off by her mother.
- 11. We could start the meeting if Sam was here.
- 12. If she had had more money, she will have bought herself a new dress.
- 13. He often asks that Freddy bring a tape recorder to the interview sessions.
- 14. If I wait around any longer, I will be losing my patience.

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Style Questions

- 11. The Napoleonic code requires <u>that all voting citizens must have</u> a fixed address and at least three different kinds of identification.
 - a) that all voting citizens must have
 - b) that all voting citizens should have
 - c) that all voting citizens that they must have
 - d) that all voting citizens have
 - e) of all voting citizens the having of

Rules to know:

The Subjunctive form in the GMAT follows this pattern:

I propose that he go home. suggest (action verb is in the infinitive without to) require recommend request demand insist ask mandate

Trigger verbs for the subjunctive.

Meaning

- 12. According to the professor's philosophy, the antidote to envy is <u>one's own work</u>, <u>always one's own work: not thinking about it, not assessing it, but simply doing it</u>.
 - a) one's own work, always one's own work: not thinking about it, not assessing it, but simply doing it
 - b) always work; because you don't think about it or assess it, you just do it
 - c) always one's own work: not thinking about or assessing it, but simply to do it
 - d) not to think or assess, but doing one's own work
 - e) neither to think about one's own work nor to assess it, it is always simply doing it

Rules to know:

Beware of meaning changes! If the answer choice's meaning is different from that in the original statement, then that answer choice is NOT correct. However, if the meaning in the original statement is faulty, then the answer is NOT A).

Now try these rather difficult SC questions:

- 13. Acid rain and snow result from the chemical reactions between industrial emissions of sulfur dioxide and nitrogen oxides with atmospheric water vapor to produce highly corrosive sulfuric and nitric acids.
 - a) with atmospheric water vapor to produce highly corrosive sulfuric and nitric acids
 - b) with atmospheric water vapor producing highly corrosive sulfuric and nitric acids
 - c) and atmospheric water vapor which has produced highly corrosive sulfuric and nitric acids
 - d) and atmospheric water vapor which have produced sulfuric and nitric acids which are highly corrosive
 - e) and atmospheric water vapor to produce highly corrosive sulfuric and nitric acids
- 14. Balzac drank more than fifty cups of coffee a day and died of caffeine poisoning; <u>furthermore, caffeine did not seem to bother</u> Samuel Johnson, the great writer and lexicographer, who was reported to have drunk twenty-five cups of tea at one sitting.
 - a) furthermore, caffeine did not seem to bother
 - b) however, caffeine did not seem to bother
 - c) however, caffeine did not seem to have bothered
 - d) furthermore, caffeine did not seem to have bothered
 - e) in addition, caffeine did not seem to bother
- 15. <u>Because paper of all kinds is the biggest single component of municipal trash, many</u> <u>municipalities have tried recycling to reduce the cost of trash disposal</u>.
 - a) Because paper of all kinds is the biggest single component of municipal trash, many municipalities have tried recycling to reduce the cost of trash disposal.
 - b) Because paper of all kinds is the biggest single component in municipal trash, many municipalities tried to recycle so that the cost of trash disposal is reduced.
 - c) Because paper of all kinds are the biggest single components in municipal trash, many municipalities have tried to recycle to reduce the cost of trash disposal.
 - d) All kinds of paper are the biggest single components of municipal trash, and so many municipalities have tried recycling to reduce the cost of trash disposal.
 - e) All kinds of paper is the biggest single component of municipal trash, so many municipalities have tried to recycle so that the cost of trash disposal could be reduced.

- 16. <u>Being a United States citizen since 1988 and born in Calcutta in 1940, author Bharati</u> <u>Mukherjee has</u> lived in England and Canada, and first came to the United States in 1961 to study at the Iowa Writers' Workshop.
 - a) Being a United States citizen since 1988 and born in Calcutta in 1940, author Bharati Mukherjee has
 - b) Having been a United States citizen since 1988, she was born in Calcutta in 1940; author Bharati Mukherjee
 - c) Born in Calcutta in 1940, author Bharati Mukherjee became a United States citizen in 1988; she has
 - Being born in Calcutta in 1940 and having been a United States citizen since 1988, author Bharati Mukherjee
 - e) Having been born in Calcutta in 1940 and being a United States citizen since 1988, author Bharati Mukherjee
- 17. Believed to originate from a small area on their foreheads, elephants emit lowfrequency sounds that may be used as a secret language to communicate with other members of the herd.
 - a) Believed to originate from a small area on their foreheads, elephants emit lowfrequency sounds that may be used
 - b) Elephants emit low-frequency sounds that are believed to originate from a small area on their foreheads, and they may use this
 - c) Elephants emit low-frequency sounds, believed to originate from a small area on their foreheads, that they may use
 - d) Originating, it is believed, from a small area on their foreheads; elephants emit low-frequency sounds they may use
 - e) Originating, it is believed, from a small area on their foreheads, low-frequency sounds are emitted by elephants that may be used
- 18. <u>Chronic low-level leaking and the routine discharge of drilling mud and mineral salts</u> present considerable environmental risk during offshore oil drilling.
 - a) Chronic low-level leaking and the routine discharge of drilling mud and mineral salts present considerable environmental risk during offshore oil drilling.
 - b) The reason offshore oil drilling presents a considerably environmental risk is because of chronic low-level leaking and the routine discharge of drilling mud and mineral salts.
 - c) A considerable risk to the environment is presented during offshore oil drilling, where low-level leaks are chronic and the routine discharge of mud and mineral salts.
 - d) Offshore oil drilling presents a considerable risk to the environment due to the fact of chronic low-level leaks, and mud and mineral salts are routinely discharged.
 - e) Chronic low-level leaking, along with the routine discharge of drilling mud and mineral salts, are what make offshore oil drilling environmentally risky.

- 19. Concerned at the increase in accident fatalities, Tennessee adopted a childpassenger protection law requiring <u>the parents of children under four years of age to</u> <u>be restrained in a child safety seat</u>.
 - a) the parents of children under four years of age to be restrained in a child safety seat
 - b) the restraint of parents of children under four years of age in a child safety seat
 - c) that parents restrain children under four years of age in a child safety seat
 - d) that children be restrained under four years of age in a child safety seat by their parents
 - e) children to be restrained under four years of age by their parents in a child safety seat
- 20. <u>Fifty-two percent of United States high school graduates go on to college, compared</u> with Canada's thirty-five percent and Great Britain, Japan, and West Germany's <u>fifteen percent.</u>
 - a) Fifty-two percent of United States high school graduates go on to college, compared with Canada's thirty-five percent and Great Britain, Japan, and West Germany's fifteen percent.
 - b) Fifty-two percent of United States high school graduates go on to college; in Canada it is thirty-five percent and in Great Britain, Japan, and West Germany it is fifteen percent.
 - c) In the United States, Fifty-two percent of high school graduates go on to college, compared with thirty-five percent in Canada and fifteen percent in Great Britain, Japan, and West Germany.
 - d) The percentage of high school graduates in the United States who go on to college is fifty-two, compared with Canada's thirty-five percent, Great Britain's fifteen, Japan's fifteen, and West Germany's fifteen.
 - e) The percentage of United States high school graduates going on to college is fifty-two that in Canada is thirty-five, and that in Great Britain, Japan, and West Germany is fifteen.

- 21. Formulas for cash flow and the ratio of debt to equity do not apply to new small businesses in the same way as they do to established big businesses, because they are growing and are seldom in equilibrium.
 - a) Formulas for cash flow and the ratio of debt to equity do not apply to new small businesses in the same way as they do to established big businesses, because they are growing and are seldom in equilibrium.
 - b) Because they are growing and are seldom in equilibrium, formulas for cash flow and the ratio of debt to equity do not apply to new small businesses in the same way as they do to established big businesses.
 - c) Because they are growing and are seldom in equilibrium, new small businesses are not subject to the same applicability of formulas for cash flow and the ratio of debt to equity as established big businesses.
 - d) Because new small businesses are growing and are seldom in equilibrium, formulas for cash flow and the ratio of debt to equity do not apply to them in the same way as to established big businesses.
 - e) New small businesses are not subject to the applicability of formulas for cash flow and the ratio of debt to equity in the same way as established big businesses, because they are growing and are seldom in equilibrium.
- 22. <u>The rules that govern political contributions are less stringent in local elections than</u> <u>they are in national elections because they typically involve smaller amounts of</u> <u>money and present less opportunity for abuse.</u>
 - a) The rules that govern political contributions are less stringent in local elections than they are in national elections because they typically involve smaller amounts of money and present less opportunity for abuse.
 - b) Because they typically involve smaller amounts of money and present less opportunity for abuse, the rules that govern political contributions are less stringent in local elections than the rules are less stringent in local elections than the rules are in national elections.
 - c) The rules that govern political contributions are less stringent in local elections than national elections because they typically involve smaller amounts of money and present less opportunity for abuse.
 - d) Because local elections typically involve smaller amounts of money and present less opportunity for abuse than national elections, the rules that govern local political contributions are less stringent than national contributions.
 - e) The rules that govern political contributions are less stringent in local elections than they are in national elections because local elections typically involve smaller amounts of money and present less opportunity for abuse.

- 23. The school board ruling mandating that physically handicapped students <u>be placed</u> in regular classroom settings whenever possible also assured all children who have a reading problem of special aid.
 - a) be placed in regular classroom settings whenever possible also assured all children who have a reading problem
 - b) should be placed in regular classroom settings whenever possible also assures all children that have a reading problem
 - c) are placed in regular classroom settings whenever possible also assures those children who are having reading problems
 - d) be placed in regular classroom settings whenever possible also assured children with reading problems
 - e) should be placed in regular classroom settings whenever possible also has assured all those children with a reading problem
- 24. The spraying of pesticides can be carefully planned, but accidents, <u>weather</u> <u>conditions that could not be foreseen, and pilot errors often cause much larger</u> <u>deposits of spray than they had</u> anticipated.
 - a) weather conditions that could not be foreseen, and pilot errors often cause much larger deposits of spray than they had
 - b) weather conditions that cannot be foreseen, and pilot errors often cause much larger deposits of spray than
 - c) unforeseeable weather conditions, and pilot errors are the cause of much larger deposits of spray than they had
 - d) weather conditions that are not foreseeable, and pilot errors often cause much larger deposits of spray than
 - e) unforeseeable weather conditions, and pilot errors often cause much larger deposits of spray than they had
- 25. The task force is reviewing the company's hiring practices <u>for the determination of</u> <u>whether they are meeting the requirements set by the Office of Equal Opportunity</u>.
 - a) for the determination of whether they are meeting the requirements set by the Office of Equal Opportunity
 - b) for the determining of whether or not it meets the requirement set by the Office of Equal Opportunity
 - c) for the determining of whether the requirements set by the Office of Equal Opportunity are being met or not
 - d) determining whether the requirements set by the Office of Equal Opportunity are met
 - e) to determine whether they meet the requirements set by the Office of Equal Opportunity

- 26. The use of gravity waves, which do not interact with matter <u>in the way</u> <u>electromagnetic waves do, hopefully will enable</u> astronomers to study the actual formation of black holes and neutron stars.
 - a) in the way electromagnetic waves do, hopefully will enable
 - b) in the way electromagnetic waves do, will, it is hoped, enable
 - c) like electromagnetic waves, hopefully will enable
 - d) like electromagnetic waves, would enable, hopefully
 - e) such as electromagnetic waves do, will, it is hoped, enable
- 27. The visiting pharmacologists concluded that the present amalgam of Chinese and Western medicine is probably <u>as good</u>, <u>or better than</u>, <u>any system that might be</u> <u>devised for the patients who are</u> treated at the Nan Kai hospital in Tian-jing.
 - a) as good, or better than, any system that might be devised for the patients who are
 - b) as good, or better, than any system that might be devised for patients being
 - c) as good, or better than, any system that might be devised for patients which are being
 - d) good as, or even better than, any other system that may be devised for the patients who are
 - e) as good as, or better than, any other system that might be devised for the patients
- 28. The voluminous personal papers of Thomas Alva Edison reveal that his inventions typically <u>sprang to life not in a flash of inspiration but evolved slowly</u> from previous works.
 - a) sprang to life not in a flash of inspiration but evolved slowly
 - b) sprang to life not in a flash of inspiration but were slowly evolved
 - c) did not spring to life in a flash of inspiration but evolved slowly
 - d) did not spring to life in a flash of inspiration but had slowly evolved
 - e) did not spring to life in a flash of inspiration but they were slowly evolved
- 29. The work of mathematician Roger Penrose in the early 1970s, on the geometry of what are called aperiodic tiles, turned out to describe the architecture of a previously unknown class of crystals.
 - a) what are called aperiodic tiles, turned out to describe
 - b) what is called aperiodic tiles, describes
 - c) aperiodic tiles, describing
 - d) so-called aperiodic tiles, describe
 - e) aperiodic tiles, it turned out to describe

Data Sufficiency

Memorize the answers; they are always the same...

- a) Statement 1 alone is sufficient to answer the question, but statement 2 alone is not sufficient
- b) Statement 2 alone is sufficient to answer the question, but statement 1 alone is not sufficient
- c) Both statements together are needed to answer the question, but neither statement alone is sufficient
- d) Either statement by itself is sufficient to answer the question
- e) Not enough facts are given to answer the question

Is ab positive?

(1)
$$(a + b)^2 > (a - b)^2$$

(2) $\frac{a}{b} = 1$

Go the distance

Don't bail out too quickly, sometimes the problems require effort.



- In the multiplication problem shown above, each of the symbols ♣, ♥, ♦ and ♠ represents a positive digit. If ♦ > ♠ and ♣ > ♥, what is the value of ♥?
 - (1) 📥 = 8
 - (2) ♦ = 3
 - a) Statement 1 alone is sufficient to answer the question, but statement 2 alone is not sufficient
 - b) Statement 2 alone is sufficient to answer the question, but statement 1 alone is not sufficient
 - c) Both statements together are needed to answer the question, but neither statement alone is sufficient
 - d) Either statement by itself is sufficient to answer the question
 - e) Not enough facts are given to answer the question

Spend more time on the question

Ask yourself what information you need to know before plunging into the statements.

- 2. A group of theater owners made an arrangement with an acting company that the theater owners would get \$5 in profit for every ticket sold to a show. How much profit did the theater owners earn from ticket sales?
 - (1) The total revenue from ticket sales was \$700.
 - (2) If 30 more tickets had been sold, the theater owner's profit would have been increased by 30 percent.
 - a) Statement 1 alone is sufficient to answer the question, but statement 2 alone is not sufficient
 - b) Statement 2 alone is sufficient to answer the question, but statement 1 alone is not sufficient
 - c) Both statements together are needed to answer the question, but neither statement alone is sufficient
 - d) Either statement by itself is sufficient to answer the question
 - e) Not enough facts are given to answer the question

Find the value and the yes/no questions

- 3. What is the value of x?
 - (1) $x^2 + 25 = 10x$
 - (2) $x^2 8x = -15$
 - a) Statement 1 alone is sufficient to answer the question, but statement 2 alone is not sufficient
 - b) Statement 2 alone is sufficient to answer the question, but statement 1 alone is not sufficient
 - c) Both statements together are needed to answer the question, but neither statement alone is sufficient
 - d) Either statement by itself is sufficient to answer the question
 - e) Not enough facts are given to answer the question
- 4. Is x/y < 0?
 - (1) |x| ≠ x
 - (2) |x| = -y
 - a) Statement 1 alone is sufficient to answer the question, but statement 2 alone is not sufficient
 - b) Statement 2 alone is sufficient to answer the question, but statement 1 alone is not sufficient
 - c) Both statements together are needed to answer the question, but neither statement alone is sufficient
 - d) Either statement by itself is sufficient to answer the question
 - e) Not enough facts are given to answer the question
- 5. Two intersecting lines form four angles. Are the lines perpendicular?
 - (1) Each of the angles is equal to exactly one of the other three angles.
 - (2) The sum of three of the angles does NOT equal to 270 degrees.
 - a) Statement 1 alone is sufficient to answer the question, but statement 2 alone is not sufficient
 - b) Statement 2 alone is sufficient to answer the question, but statement 1 alone is not sufficient
 - c) Both statements together are needed to answer the question, but neither statement alone is sufficient
 - d) Either statement by itself is sufficient to answer the question
 - e) Not enough facts are given to answer the question

Stupid easy traps:

Solve each of the following and match each with the appropriate trap.

Assumption Trap No Relation Trap Redundancy Trap Whole Story Trap Amnesia Trap Distraction Trap Stating the Obvious Fraction Trap Delay Trap Yes/No Trap Month Trap Unnecessary Info Trap Average Trap Find the Value Trap Name Game Trap The C Trap

- 6. What was the combined average attendance of the Economics class for the months of December and January?
 - (1) The average attendance for the month of December was 45, and the Average attendance for the month of January was 52.
 - (2) On the days the attendees are not in class they go fishing.
- 7. Two masons build a wall alternately. How many hours do they take to build the entire wall?
 - (1) The first mason needs 10 hours to build the wall alone.
 - (2) The second mason needs 14 hours to build the wall alone.
- 8. How many adults Ride bicycles in City A if all adults in City A ride bicycles or drive cars?
 - (1) 85% of the 10,000 adults in city A drive cars.(2) 8,500 adults in city A drive cars.
- 9. Is ay = 6 ax?

(1) 2a(x +y) = 12
(2) a = 0.75

- 10. Michael sells twice as many \$20 tickets as Thomas, and Thomas sells three times as many \$10 tickets as Michael does. If there are only \$10 and \$20 tickets, how many tickets does Michael sell?
 - (1) Thomas sold a total of 35 tickets.
 (2) Together Michael and Thomas sold 70 tickets for a total of \$1,000
- 11. Two intersecting lines form four angles. Are the lines perpendicular?
 - (1) Each of the angles is equal to exactly one of the other three angles.(2) The sum of three angles does NOT equal to 270 degrees.
- 12. In what year did Grant and Kerry get married?
 - (1) Grant's sister Loraine, who got married 2.5 years before Grant and Kerry got married, got married in 1964.
 - (2) Grant and Kerry's 16th wedding anniversary was in 1982.

- 13. How old was Janet 2 years ago?
 - (1) Jane is 6 years older than Carl.
 - (2) In 4 years Jane will be twice as old as Carl.
- 14. Series T is a sequence of numbers in which each term after the first term is x greater than the term that precedes it. What is the value of the fourth term in the sequence?
 - (1) The first number of the series is twice the value of the first two digit number which is a multiple of a prime number.
 - (2) $y^3 = 27$
- 15. Does abc = 1?
 - (1) ab = 1 (2) bc = 1
- 16. What is the value of integer x?
 - (1) x² < 13
 (2) x⁴ > 60
- 17. In a clothing store, 60 percent of the shirts are short-sleeved and 70 percent of the shirts are cotton. If 20 percent of the cotton shirts are white, how many of the cotton shirts are white?
 - (1) There are 300 short-sleeved shirts in the store.
 - (2) Of the shirts that are not cotton, 1/3 are white.
- 18. Of the 50 students who came to a party what percent of them study both chemistry and calculus?
 - (1) 40% of them study chemistry.
 - (2) 80 % of them study calculus.



- 19. In the figure above ABCDEF is a regular hexagon inscribed in a circle with its center at O. What is the length of minor arc AB?
 - (1) OA = 6 inches
 - (2) Triangle OAB is equilateral.
- 20. Is x > y?
 - (1) 3x = 4y
 (2) k/3 = x, k/4 = y and k > 0

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The Killer Number Property Problems

What does it mean???

x ≠ x	
x = -y	
-2x < 0	
x ³ < 0	
$\mathbf{x}^2 = \mathbf{x}$	
x - y = y + 2	
1	
$x-y=\frac{1}{x+y}$	
$x^2 > x^3$	
$x^2 < x^4$	
$x^2 = y^2$	
$x^2 = xy$	
Average of a. b. c is b	
a-b=b-c	
$n^4 + 19 = 100$	
xy > 0 or x/y > 0	
$x^{y} = x^{2y-3}$	
$z = \sqrt{\frac{y}{x}}$	
m – 7 is odd	
ab + cd + ac + bd = 6	
m/2 is not an even integer	
v^3 is divisible by 9	
$2^{vx} = 8$	
m is what percent of n	
3x + 3y = 12	
2x + 1 is odd	
$x^4 v^5 < 0$	
x is a factor of y	
xy = 6	
x - y > 0	
av > hv	
$x^3 > 0$	
$v^2 < v$	
$x^4 - y^4$	
a = y	
2x - 5v	
2x - 3y	
y + 2 is divisible by 4 $(2 \pm b)^2 = 2^2 = b^2$	
$\frac{d+U}{d+U} = d^{-} - U^{-}$	
SUIS an OUU NUMBER	

Have you considered everything?

- 21. What is the value of integer x?
 - (1) $x^2 < 13$
 - (2) $x^4 > 60$
 - a) Statement 1 alone is sufficient to answer the question, but statement 2 alone is not sufficient
 - b) Statement 2 alone is sufficient to answer the question, but statement 1 alone is not sufficient
 - c) Both statements together are needed to answer the question, but neither statement alone is sufficient
 - d) Either statement by itself is sufficient to answer the question
 - e) Not enough facts are given to answer the question
- 22. Is $x^2 > x^3$?
 - (1) |x| ≠ x
 - (2) $x^2 < x^4$
 - a) Statement 1 alone is sufficient to answer the question, but statement 2 alone is not sufficient
 - b) Statement 2 alone is sufficient to answer the question, but statement 1 alone is not sufficient
 - c) Both statements together are needed to answer the question, but neither statement alone is sufficient
 - d) Either statement by itself is sufficient to answer the question
 - e) Not enough facts are given to answer the question
- 23. Is x odd?
 - (1) x^3 is odd
 - (2) $x^2 = x$
 - a) Statement 1 alone is sufficient to answer the question, but statement 2 alone is not sufficient
 - b) Statement 2 alone is sufficient to answer the question, but statement 1 alone is not sufficient
 - c) Both statements together are needed to answer the question, but neither statement alone is sufficient
 - d) Either statement by itself is sufficient to answer the question
 - e) Not enough facts are given to answer the question

Insert for the Fact and Solve for what x could be.

- 24. If 4 students were added to a dance class, would the teacher be able to divide her students evenly into a dance team (or teams) of 8?
 - (1) If 12 students were added, the teacher could put everyone in teams of 8 without any leftovers.
 - (2) The number of students in the class is currently not divisible by 8.
- 25. Is the integer m odd?
 - (1) m is a multiple of both 3 and 7.
 - (2) m 7 is an odd integer.
- 26. Is n an integer?
 - (1) 7 × n is odd.
 - (2) 2 × n is even.
- 27. Is the odd integer x a prime number?
 - (1) x + 2 is a prime number.
 - (2) x 3 is a prime number.
- 28. If a, b and c are all integers greater than 0, is the product of a, b and c even?
 - (1) a + b is prime
 - (2) c + b is even
 - a) Statement 1 alone is sufficient to answer the question, but statement 2 alone is not sufficient
 - b) Statement 2 alone is sufficient to answer the question, but statement 1 alone is not sufficient
 - c) Both statements together are needed to answer the question, but neither statement alone is sufficient
 - d) Either statement by itself is sufficient to answer the question
 - e) Not enough facts are given to answer the question

Look for an equation...

Remember on Data Sufficiency it is not necessary to solve the problem but only to know if the problem can be solved?

- 29. If a train, traveling at a constant speed passes a man standing on platform, which is 50 meters long, in 9 seconds, what is the length of the train (assume that the man occupies only a point in space)?
 - (1) The train passes the platform completely in 12seconds.
 - (2) The train is traveling at a speed of 60km/h.
- 30. If a certain photograph collection consists of some black-and-white photographs and some color photographs, how many color photographs are in the collection?
 - (1) If 5 more photographs, all of them black-and-white, were added to the collection, the ratio of color photographs to black-and-white photographs would then be 8 to 5.
 - (2) There are 35 more color photographs than black-and-white photographs in the collection.
- 31. A credit card company offered a promotion in 1995 such that all users of credit card X would get a travel voucher at the end of the year equal in value to a fixed percentage of the amount of money charged on the credit card for that year. Mr. Pavlov charged d dollars on credit card X and Mrs. Pavlov charged \$3,400 on credit card X. If Mr. Pavlov got a travel voucher equal in value to \$380, what was the value of Mrs. Pavlov's travel voucher?

(1) The vouchers were equal in value to 0.05 for each dollar charged to credit card X in 1995. (2) d = 7,600

- 32. On a new manager's first day at an express mail delivery company, 25 percent of the first 60 packages were delivered late. After the first 60, all other packages that day were delivered on time. What is the total number of packages delivered on time the manager's first day?
 - (1) A total of 120 packages were delivered on the manager's first day.
 - (2) Of the packages delivered on the manager's first day, 87.5 percent were delivered on time.
- 33. How many students are in the school?
 - (1) 40 more than 1/3 of all the students in the school are taking a science course and, of these, 1/4 are taking Physics.
 - (2) Exactly 1/8 of all the students in the school are taking Physics.

MORE FUN...

34. Is y an integer?

(1) y^3 is a multiple of 9.

(2) 2y + 1 is odd.

35. If A+B \neq 0, what is the sum of the three digit numbers 3A5 and 4B7?

(1) A is even and B is a multiple of 3.(2) A + B is divisible by 9

36. Is n a multiple of 35?

(1) 21 is a factor of 14n(2) 10 is a factor of 12n

37. If y is real, is x > 2?

(1) $x^5y^2 - 32y^2$ is positive (2) $16y^2 - x^4y^2$ is negative

38. If x is an integer, is x/2 an even integer?

(1) x/4 is an integer(2) x/2 is an integer

39. If integer n is a 2-digit number, is n divisible by 9?

(1) When n is divided by 3 the remainder is 2.

(2) When n is divided by 7 the remainder is 1.

40. What is the value of C in the equation $Ax^2 + Bx + C = 0$, if the sum of the roots is 10?

- (1) The product of the roots is 16
- (2) One root is 4 times the other.

41. Is ab positive?

(2)
$$(a + b)^2 > (a - b)^2$$

(2) $\frac{a}{b} = 1$

42. Who is the slowest among the three workers X, Y and Z?

(1) X & Y together fence a garden of a perimeter of 500m in 14 hours

(2) X, Y and Z together can fence a garden of a perimeter of 500m in 6 hours.

43. Does the average of x, y and z = 24?
(1) z - y = x - z

(2) x + y = 46

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44. The set S of numbers has the following properties:

i. If x is in S, then 1/x is also in S.

ii. If both x and y are in S, then so is x + y. Is 3 in S?

(1) 1/3 is in S.(2) 1 is in S.

45. If a certain guadrilateral has 4 equal angles, what is its area?

- (1) If the length is doubled, the area would increase by 64 square meters.
- (2) If the width is reduced by half, the area would decrease by 32 square meters.
- 46. What is the fifth number in a sequence of consecutive even numbers?
 - (1) The sum of the first three numbers in the sequence is 12.
 - (2) The sum of the last three numbers in the sequence is 24.
- 47. If x, y and z are real numbers, is x < y?

(1) x > y - z(2) $x^2 + y^2 + z^2 = 0$

48. If x = 6386B, and B is the units digit of x, what is the value of B?

(1) $\frac{1}{2}$ x has a remainder of 1.

(2) x/7 is an integer.

- 49. If x = 7495B, and B is the units digit of x, what is the value of B?
 - (1) x is an even number(2) x/11 is an integer
- 50. What is the radius of the circle that circumscribes the triangle PQR?
 - (1) The sides of the triangle are 9, 12 and 15.
 - (2) Triangle PQR is a right triangle.

$$\frac{(x^2y^3z^7)^8}{(4-2-14)^4}$$

51. What is the value of $(x^4y^2z^{14})^4$?

(1) x = z = 12
(2) y = 5

52. ls n > p?

(1) m/n = p + n (2) n > m

53. A sequence of numbers is given by the rule $a_n = (a_{n-1})^2$. What is the value of a_5 ?

(1) $a_1 = -1$ (2) $a_3 = 1$

54. A sequence of numbers a_1 , a_2 , a_3 ... is given by the rule $a_n^2 = a_{n+1}$ Does 3 appear in the sequence?

(1) a₁ = 2
(2) a₃ = 16

55. Is the positive integer n equal to the square of an integer?

(1) For every prime number p, if p is a divisor of n, then so is p².
(2) Vn is an integer.

56. Is c > d ?

(1) 1 - c/d > -1
(2) ½ < c/d < 2.0

- 57. If the square root of the product of three distinct positive integers is equal to the largest of the three numbers, what is the product of the two smaller numbers?
 - (1) The largest number of the three distinct numbers is 12.
 - (2) The average (arithmetic mean) of the three numbers is 20/3

58. If $x \neq 2$, what is the value of

$$\frac{(x-2)}{5} + \frac{(2-x)}{5}$$
?

(1) x³ = 27
(2) ½ n has a remainder of 1.

- 59. A sequence of different numbers beginning with 7 is created by multiplying a preceding number by the positive integer, N. What is the fifth number in the sequence?
 - (1) The 4th and 5th numbers differ by four times as much as the difference between the 2nd and 3rd numbers.
 - (2) The product of the 3^{rd} and 4^{th} numbers is 14 times the 5^{th} number.

60. Is $\frac{x}{12} > \frac{y}{40}$?

- (1) 10x > 3y
- (2) 12x < 4y

61. If n is an integer, is 3ⁿ less than 100?

- (1) $3^{n+1} > 100$
- (2) $3^{n-1} = 3^n 162$

62. k is a positive integer. Is k a prime number?

- (1) No integer between 2 and vk inclusive divides k evenly.
- (2) No integer between 2 and k/2 inclusive divides k evenly, and k is greater than 5.

63. Is 22 a factor of x?

- (1) 22 is a factor of 15x
- (2) 22 is a factor of 16x

NUMBER PROPERTIES

How can number properties help me across-the-board?

- 1. What is the product of the highest 2-digit multiple of 7 and the highest 2-digit prime number?
 - a) 10986
 - b) 9827
 - c) 9713
 - d) 9593
 - e) 9506
- 2. A farmer has two fields of cows with the same number cows in each field. In each field he has three different breeds of cows. In the first field he has 3 times as many Burlina as Holstein. In the second field he has half as many Danish red as Chinese black pied. If in the second field he has 5 fewer Jersey than the Milking Shorthorn, which are grazing in the first field, which of the following could be the number of cows the farmer has?
 - a) 47
 - b) 55
 - c) 73
 - d) 94
 - e) 111
- 3. A certain ice cream company is coming out with a new flavor, Almond-Pecan-Chip, the recipe for which includes almonds, pecans, and chocolate chips in a 7 : 4 : 2 ratio. If each gallon of ice cream contains a total of 182 pieces of almonds, pecans, and chocolate chips, what is the difference between the number of almonds and the number of chocolate chips in one gallon of ice cream?
 - a) 98
 - b) 70
 - c) 64
 - d) 42
 - e) 28
- 4. You are given three distinct prime numbers all greater than 20. The first is 6 less than the number formed by the reverse of the digits of the third number. The second is 2 greater than three times the number formed by the reverse of the digits of the first number. If difference between the first and second is 10 and the difference between the digits of the last is 4, which of the following could be the product of the three numbers?
 - a) 2431
 - b) 18946
 - c) 28546
 - d) 37521
 - e) 92783

Factors / Divisors vs. Multiples

Little guys vs. Big Guys

How Many Factors?

5. How many distinct factors does 2100 have?

6. How many distinct divisors does 39690 have?

- 7. If n and p are different positive prime numbers, which of the integers n⁴, p³ and np has (have) exactly 4 positive divisors?
 - a) n⁴ only
 - b) p³ only
 - c) np only
 - d) n⁴ and np
 - e) p³ and np
- 8. If X = the product of four distinct prime numbers, how many factors does X have besides 1 and itself?

- 9. How many of the positive factors of 42 are not factors of 56?
 - a) 1
 - b) 2
 - c) 3
 - d) 4
 - e) 5

LCM – Least common multiple

What is the first number that can be divided by all numbers in question

8-10-12

8-9-10-11-12-24-36-72

10. What is the smallest positive integer n for which 324 is a factor of 6^{n} ?

- a) 2
- b) 3
- c) 4
- d) 5
- e) 6

$n = \frac{2 \cdot 3 \cdot 5 \cdot 7 \cdot 11 \cdot 13}{2 \cdot 3 \cdot 5 \cdot 7 \cdot 11 \cdot 13}$

- 11. If n is an integer and 77k then which of the following could be the value of k?
 - a) 22
 - b) 26
 - c) 35
 - d) 54
 - e) 60

12. If both 5^2 and 3^3 are factors of n × $2^5 \times 6^2 \times 7^3$, what is the smallest possible positive value of n?

- a) 75
- b) 50
- c) 27
- d) 25
- e) 15
- 13. Is 22 a factor of x?
 - (1) 22 is a factor of 15x
 - (2) 22 is a factor of 16x

14. What is the smallest integer that 10584 must be multiplied by so that the resulting number is a perfect cube?

15. When the product of 14 and m is divided by 60 there will be no remainder. If m > 0, what is the smallest value of m?

16. When the product of 3070956 and n divided by 720 there will be no remainder. If n > 0, what is the smallest value of n?

HCF – Highest common factor

12 and 18

17. The sum of two numbers is 588 and their HCF is 49. How many such pairs of numbers can be formed?

Divisibility Rules

A number is divisible by 2 if it is even. A number is divisible by 4 if its last 2 digits are a multiple of 4. A number is divisible by 8 if its last 3 digits are divisible by 8 (look for blocks of 200). A number is divisible by 3 if the sum of all its digits is a multiple of 3. A number is divisible by 9 if the sum of all its digits is a multiple of 9.

A number is divisible by 5 if it ends with a 5 or zero. A number is divisible by 10 if it ends with a zero. A number is divisible by 11 by rule of ABABA. If $\Sigma A - \Sigma B$ is zero or a multiple of 11 then the number is a multiple of 11. In 374 $\Sigma A = 7$ and $\Sigma B = 7$ and $\Sigma A - \Sigma B = 0$, therefore 374 is a multiple of 11.

Α	В	А
3	7	4

A number is divisible by 6 if it has at least one factor of 2 and at least one factor of 3. A number is divisible by 12 if it has at least two factors of 2 and at least one factor of 3. A number is divisible by 18 if it has at least one factor of 2 and at least two factors of 3. A number is divisible by 24 if it has at least three factors of 2 and at least one factor of 3. A number is divisible by 24 if it has at least three factors of 2 and at least one factor of 3. A number is divisible by 36 if it has at least two factors of 2 and at least two factors of 3.

BLOCK METHOD

For any number which you do not know a rule think BLOCKS. Is 263 divisible by 13? Well 130 is. 260 is. And the difference between 260 and 263 is 3, which is not a multiple of 13 so 263 is not divisible by 13.

Note:

if a number is divisible by 2 it has at least 1 factor of 2 if a number is divisible by 4 it has at least 2 factors of 2 if a number is divisible by 8 it has at least 3 factors of 2 if a number is divisible by 4 and not by 8 it has exactly 2 factors of 2

if a number is divisible by 3 it has at least 1 factor of 3

if a number is divisible by 9 it has at least 2 factors of 3

if a number is divisible by 3 and not by 9 it has exactly 1 factors of 3

Is it Prime?
Odds and Evens – integers only

odd x odd is odd	odd + odd is even
even x even is even	odd + even is odd
even x odd is even	even + even is even

18. If y+2 is divisible by 4 then is y/2 odd or even?

Number Properties – Remainders

Numerator – Denominator – Quotient – Remainder

- 19. When x is divided by 9 the remainder is 6 and when y is divided by 10 the remainder is 8. What is the remainder when the product of x and y are divided by 6?
 - a) 0
 - b) 4
 - c) 5
 - d) 7
 - e) 8

- 20. If the remainder is 7 when positive integer n is divided by 18, what is the remainder when n is divided by 6?
 - a) 0
 - b) 1
 - c) 2
 - d) 3
 - e) 4

- 21. If M and N are positive integers that have remainders of 1 and 3, respectively, when divided by 6, which of the following could NOT be a possible value of M+N?
 - a) 86
 - , b) 52
 - c) 34
 - d) 28
 - e) 4

- 22. When the integer n is divided by 17, the quotient is x and the remainder is 5. When n is divided by 23, the quotient is y and the remainder is 14. Which of the following is true?
 - a) 23x + 17y =19
 - b) 17x –23y = 9
 - c) 17x +23y =19
 - d) 14x + 5y = 6
 - e) 5x 14y = -6

23. When N is divided by 10 the remainder is 1 and when N is divided by 3 the remainder is 2. What is the remainder when N is divided by 30?

24. What is the remainder when 2^{91} is divided by 7?

Units Digit

Fun with Factorials

5! = 1×2×3×4×5 = 120 6! = 1×2×3×4×5×6 = 720

Both 1! And 0! = 1

 $7! - 3! \neq 4!$ $4! + 2! \neq 6!$ $5! \times 3! \neq 15!$ $12! / 3! \neq 4!$

25. How many zeros does 100! end with?

26. If n is the product of the integers from1 to 20 inclusive, which of the following is the greatest integer k for which 2k is a factor of n?

- a) 408
- b) 437
- c) 486
- d) 532
- e) 1242

Permutations Combinations and Probabilities

Permutations of letters in a line

Basic Probabilities – Part of whole

1. When two 6-sided dice are thrown simultaneously what is the probability that the sum of the numbers is greater than 4?

2. At a certain high school 30 juniors have an older brother or sister in the senior class. If there are 250 juniors and 200 seniors, what is the probability that one junior and one senior taken at random will be related?

Conditional Probability

1) pick an order

- 2) solve for that order
- 3) multiple by permutations
- 3. A jar contains 6 red balls and 4 blue balls. If you reached in and took two balls out in one grab (no replacement), what is the probability that both balls would be red?

4. A jar contains 6 red balls and 4 blue balls. If you reached in and took four balls out in one grab (no replacement), what is the probability that two balls would be blue and the other two would be red?

5. In a five day period the chance of rain each day is 25% what is the chance that it will rain only twice?

How many different ways?



Combinations of groups and permutations in each group

mba.help



6. How many ways can two people sit at the table?

7. How many ways can two people sit at the table so that they do not sit directly across from each other?

8. How many ways can 3 people sit so that they do not sit directly next to each other?

Combinations of groups without the permutations in each group

and vs. or

9. At the local PTA meeting there are 8 men and 10 women. How many different committees can be formed that has (a) two men and 4 women? (b) 4 men or 4 women?

at least

10. A farmer has 10 sheep 4 black and 6 white. He would like to take 3 of the sheep to get shaved. How many different groups of 3 sheep can he select that would have at least one black one?

11. A bowl contains 10 apples, 2 of which are bad. If someone randomly selected four apples from the bowl in one grab, what is the probability that at least one of the apples is bad?

12. There are 8 football clubs that would each like to play each other 3 times during the season. How many different games will be played?

13. There are 2 lines drawn parallel to each other, one that has 5 points on it and the other that has 4 points drawn on it. How many different triangles can be drawn by connecting the points?