

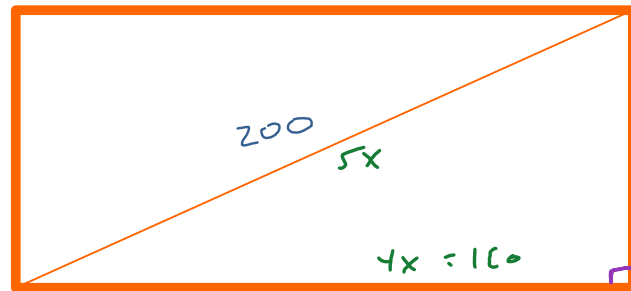
Geometry

Freitag, 25. Januar 2013
08:22

Just a guess → 

86. What is the area of a rectangular garden with diagonal length of 200 feet and a perimeter of 560 feet?

↓
Σ of L and W
is 280



$$x = 40$$

$$3x = 120$$

$$4x = 160$$

$$160 \cdot 120$$

$$19200$$

$$160 + 120 =$$

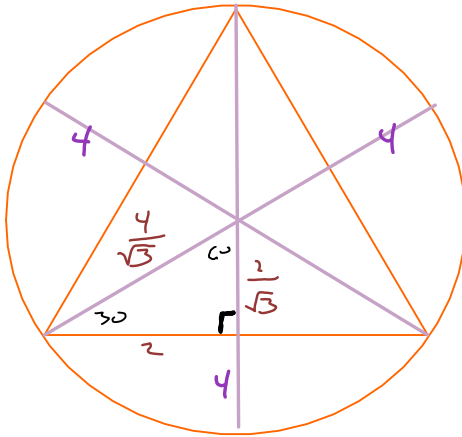
good

$$280$$

$$\text{Since } 120 + 160 = 280$$

I would know it was 3:4:5

87. What is the area of a circle that has an equilateral triangle with an area of $4\sqrt{3}$ inscribed in it?



Area of equilateral triangle

$$\frac{s^2 \sqrt{3}}{4}$$

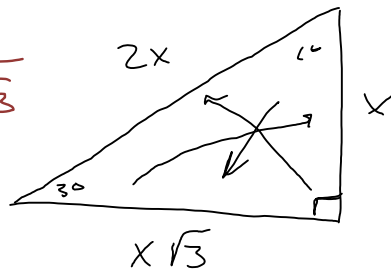
$$\frac{s^2 \sqrt{3}}{4} = 4\sqrt{3}$$

$$s^2 = 16$$

$$s = 4$$

$$x \sqrt{3} = 2$$

$$x = \frac{2}{\sqrt{3}}$$

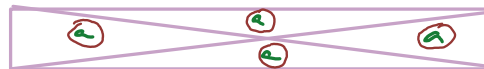


$$r = \frac{4}{\sqrt{3}}$$

$$A_0 = \pi r^2$$

$$= \frac{16}{3} \pi$$

All the triangles created here in any rectangles have equal areas

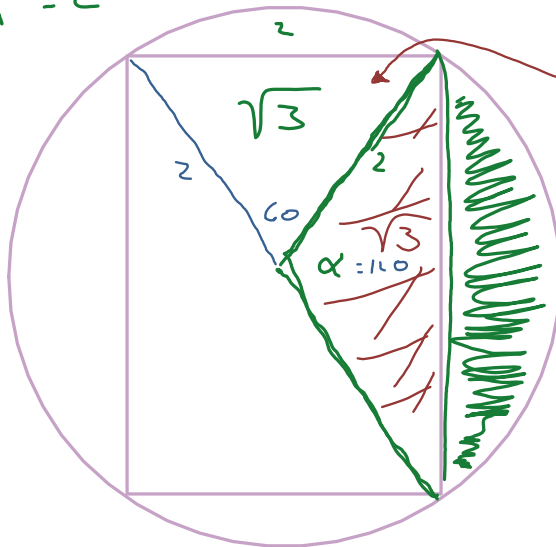


88. If Radius BC equals 2, What is the area of the shaded region of the circle formed by the rectangle inscribed in the circle?

area
 $\frac{s^2\sqrt{3}}{4}$

$\frac{4\sqrt{3}}{4} = \sqrt{3}$

$r = 2$

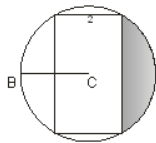


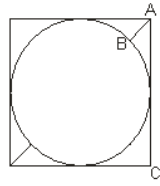
$\frac{120}{360} \cdot \pi r^2$

$\frac{1}{3} \pi r^2$

$\frac{4}{3} \pi =$ [shaded sector icon]

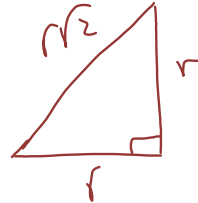
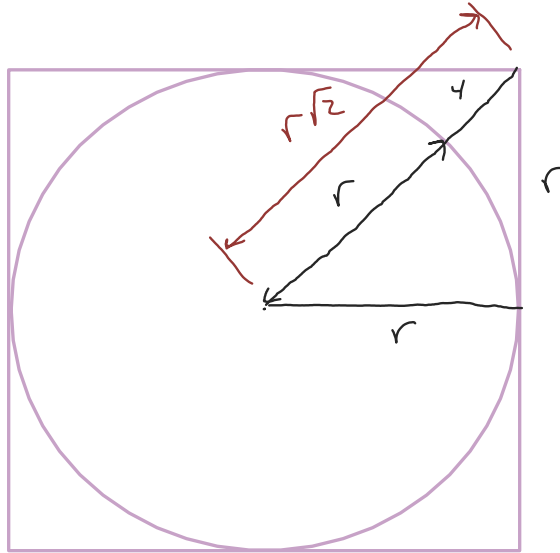
$\frac{4}{3} \pi - \sqrt{3}$





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?

$$C = 2\pi r$$



$$\begin{aligned} r\sqrt{2} &= r + 4 \\ 1.4r &\approx r + 4 \\ 0.4r &\approx 4 \\ 4r &\approx 40 \\ r &\approx 10 \end{aligned}$$

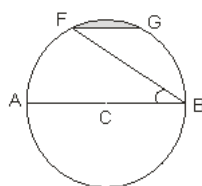
$$(20\pi)$$

$$5x : 12x : 13x$$

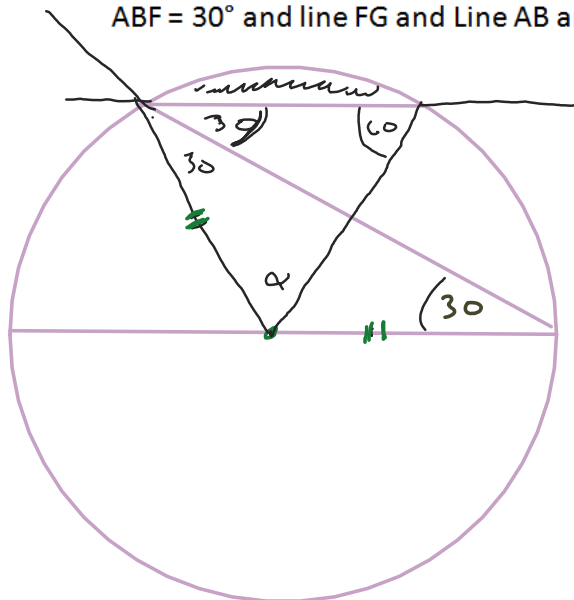
$$3x : 4x : 5x$$

$$\begin{aligned} x &: x &: x\sqrt{2} \\ 45 & 45 & 90 \end{aligned}$$

$$\begin{aligned} x &: x\sqrt{3} &: 2x \\ 30 & 60 & 90 \end{aligned}$$



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



$$\alpha = 60$$

$$\frac{5^2 \sqrt{3}}{4}$$

$$\frac{4\sqrt{3}}{4}$$

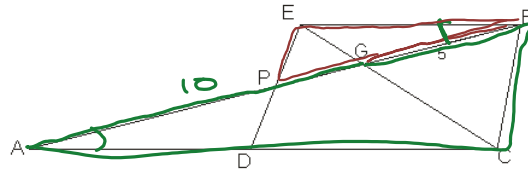
$$\frac{60}{360} \pi r^2$$

$$\frac{1}{6} \pi r^2$$

$$\frac{4}{6} \pi - \sqrt{3}$$

$$\frac{2}{3} \pi - \sqrt{3}$$

$$r = 2$$



$$\frac{2}{CB} : \frac{1}{BC}$$

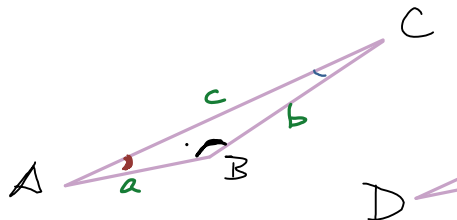
$$\overline{BA} = 15$$

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

$$\overline{GB} : \overline{PA}$$

$$5 : 10$$

Similar Triangles



$$\angle CAB = \angle FDE$$

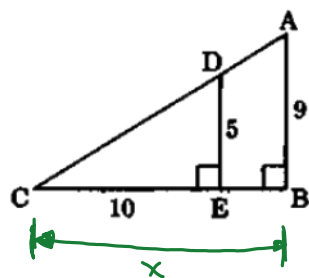
$$\angle ABC = \angle DEF$$

$$\angle ACB = \angle DFE$$

IF TWO TRIANGLES HAVE TWO INTERNAL ANGLES EQUAL THEN THE THIRD MUST ALSO BE EQUAL.

IF **ALL** THE INTERNAL ANGLES OF TWO TRIANGLES ARE EQUAL THEN THEY ARE SAID TO BE SIMILAR

$$\frac{a}{d} = \frac{b}{e} = \frac{c}{f}$$



$$\frac{9}{x} = \frac{5}{10}$$

$$x = 18$$

$$\overline{EB} = 18 - 10 = 8$$

9. In the figure above, what is the length of EB?

(A) 8

(B) $1\frac{1}{2}$

(C) 18

(D) 5

(E) 2

$$a_n = a_1 + d(n-1)$$

Sequences and Series

$$\frac{a_1 + a_n}{2} \cdot n = \Sigma$$

Arithmetic Progressions

$$\Sigma = \frac{a_n + a_1}{2} \times n$$

$$a_n = a_1 + d(n-1)$$

a_n = last term in sequence

a_1 = first term in sequence

n = amount of numbers in sequence

d = common difference in sequence

note: average of the series is the middle of the series. If the sequence has an even amount of numbers the average is between the two middle numbers. If the sequence has an odd amount of numbers the average is the middle number.

LCM 4, 5, 6

$$\begin{array}{r} 2 \cdot 2 \\ 5 \\ 2 \cdot 3 \end{array}$$

60

92. How many numbers between 200 and 3600 inclusive are divisible by 4, 5 and 6?

$$a_n = a_1 + d(n-1)$$

$$3600 = 240 + 60(n-1) \quad] : 60$$

$$60 = 4 + n - 1$$

$$\boxed{57 = n}$$

$$a_n = a_1 + d(n-1)$$

$$\frac{a_1 + a_n}{2} \cdot n = \Sigma$$

93. Find the sum of all two digit numbers which leave a remainder of 3 when divided by 7?

$$10 \quad 17 \quad \dots \quad 94$$

$$94 = 10 + 7(n-1)$$

$$84 = 7(n-1)$$

$$12 = n-1$$

$$13 = n$$

$$\frac{10+94}{2} \cdot 13$$

$$52 \cdot 13$$

$$\begin{array}{r} 52 \\ 13 \\ \hline \end{array}$$

$$156$$

$$520$$

$$\boxed{676}$$

Σ →

94. If the sum of 10 consecutive integers is 1005 how many of the numbers are prime?

$$\Sigma = \bar{x} \cdot n$$

↑
middle



100.5

3 primes

96 97 98 99 100 101 102 103 104 105

(97) 7
8
3
2

(101) 7
8
3
2

(103) 7
8
3
2

95. If the sequence $x_1, x_2, x_3, \dots, x_n$, is such that $x_1 = 3$ and $x_{n+1} = 2x_n - 1$ for $n \geq 1$, then $x_{20} - x_{19}$

equals?

- a) 2^{19}
- b) 2^{20}
- c) 2^{21}
- d) $2^{20} - 1$
- e) $2^{21} - 1$

$$\begin{array}{lcl} x_2 = 2x_1 - 1 & \downarrow & x_1 = 3 \} 2^1 \\ x_3 = 2x_2 - 1 & \downarrow & x_2 = 5 \} 2^2 \\ x_4 = 2x_3 - 1 & \downarrow & x_3 = 9 \} 2^3 \\ x_5 = 2x_4 - 1 & \downarrow & x_4 = 17 \} 2^4 \\ & & x_5 = 33 \end{array}$$

$$\begin{aligned} x_1 &= 2^1 + 1 \\ x_2 &= 2^2 + 1 \\ x_3 &= 2^3 + 1 \\ x_{19} &= 2^{19} + 1 \\ x_{20} &= 2^{20} + 1 \end{aligned}$$

$$\begin{aligned} x_{20} - x_{19} &= (2^{20} + 1) - (2^{19} + 1) \\ &= 2^{20} - 2^{19} = 2^{19}(2 - 1) \\ &= 2^{19} \end{aligned}$$

The sequence $a_1, a_2, a_3, \dots, a_n$ is such that $a_n = \frac{a_{n-1} + a_{n-2}}{2}$ for all $n \geq 3$. If $a_3 = 4$ and $a_5 = 20$, what is the value of a_6 ?

- a) 12
- b) 16
- c) 20
- d) 28
- e) 56

$$2a_n = a_{n-1} + a_{n-2}$$

$$2a_4 = a_3 + a_2$$

$$2a_5 = a_4 + a_3 \rightarrow \begin{aligned} 2(20) &= a_4 + 4 \\ 36 &= a_4 \end{aligned}$$

$$2a_6 = a_5 + a_4 \rightarrow 2a_6 = 20 + 36$$

$$a_6 = 10 + 18$$

$$\underline{28}$$

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

(1) $a_1 = 2$

(2) $a_3 = 16$

$$\begin{array}{lcl} & a_n^2 = a_{n+1} & - (1) \quad a_1 = 2 \\ n=1 & a_1^2 = a_2 & a_2 = 4 \\ & a_2^2 = a_3 & a_3 = 16 \\ n=2 & a_3^2 = a_4 & - (2) \quad a_3 = 16 \\ n=3 & & a_2 = 4 \\ & & a_1 = 2 \end{array} \quad ; \text{Never}$$

D

Question

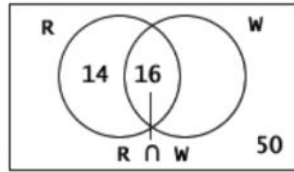
In a room of 50 people whose dresses have either red or white color, 30 are wearing red dress, 16 are wearing a combination of red and white. How many are wearing dresses that have only white color?

Explanatory Answer

Number of people wearing a red dress = 30
i.e., $n(R) = 30$

Number of people wearing a combination of red and white = 16
i.e., $n(R \cap W) = 16$

The total number of people in the room = number of people who are wearing dresses that have either red or white color = $n(R \cup W) = 50$.



We know,

$$n(R \cup W) = n(R) + n(W) - n(R \cap W)$$

$$50 = 30 + n(W) - 16$$

$$50 - 14 = n(W) - 16$$

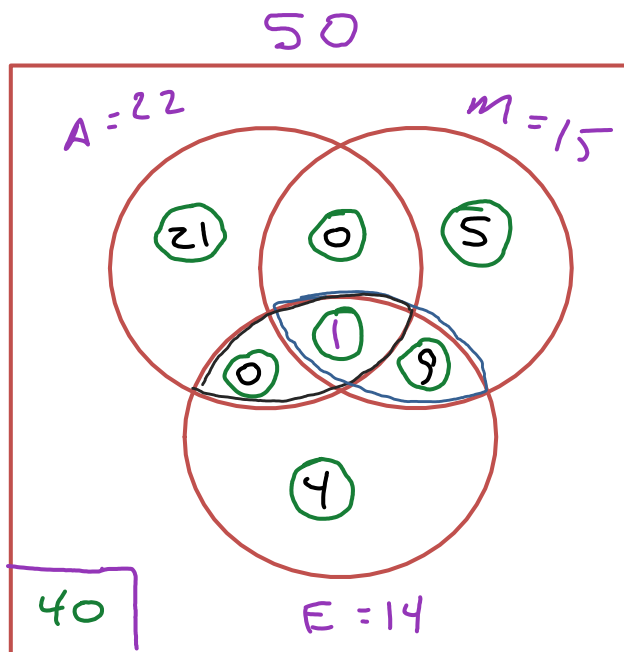
$$n(W) = 36$$

i.e., the number of people who are wearing a white dress = 36.

Therefore, number of people who are wearing white dress only = $n(W) - n(R \cap W) = 36 - 16 = 20$

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?

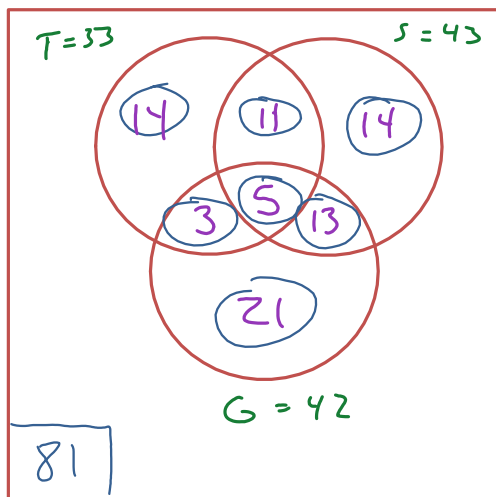


$$N = ?$$

$$50 - 40 = 10$$

$$\begin{aligned} A \cup M \cup E &= 22 + 15 + 14 - 1 - 1 - 10 + 1 \\ &= 40 \end{aligned}$$

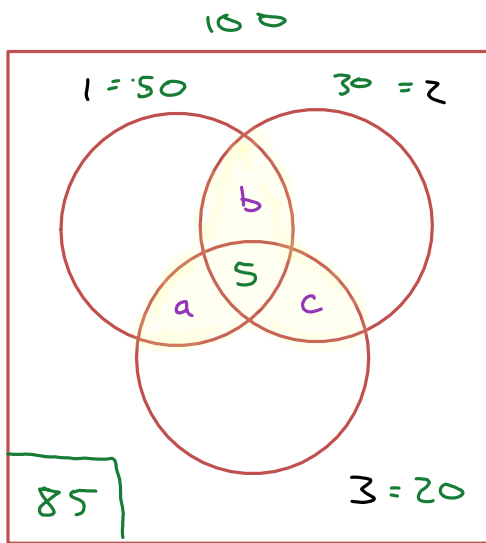
98. At alpha athletics club the members are required to play at least one sport besides their normal fitness training. In fact 33 members play tennis, 43 members play squash, and 42 members play golf. 16 members play at least tennis and squash, 18 members play at least squash and golf and 8 members play golf and tennis. If 5 members play all three sports, how many members are in the club?



81

$$\begin{aligned}
 T \cup S \cup G &= 33 + 43 + 42 - 18 - 16 - 8 + 5 \\
 &= 81
 \end{aligned}$$

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?



$$a + b + c + 5 = ?$$

$$10$$

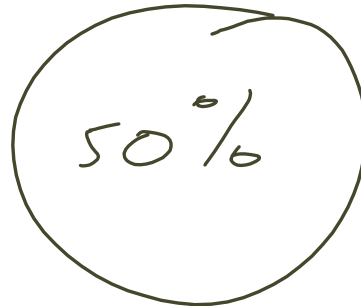
15

$$85 = 50 + 30 + 20 - (a+5) - (b+5) - (c+5) + 5$$

$$85 = 100 - 15 + 5 - a - b - c$$

$$a + b + c = 5$$

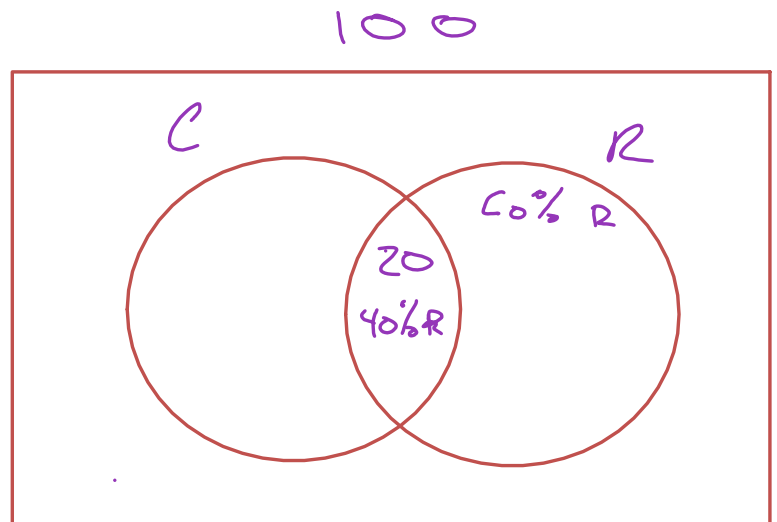
100. At a certain health club, 30% of the members use both the pool and the sauna, but 40% of the members who use the pool do not use the sauna. What percent of the members use the pool?



On a certain transatlantic crossing, 20 percent of a ship's passengers held round-trip tickets and also took their cars aboard the ship. If 60 percent of the passengers with round-trip tickets did not take their cars aboard the ship, what percent of the ship's passengers held round-trip tickets?

- A. $33\frac{1}{3}\%$
B. 40%
C. 50%
D. 60%
E. $66\frac{2}{3}\%$

$40\% R = 20$
 $R = 50$



On a certain road 10 percent of the motorists exceed the posted speed limit and receive speeding tickets, but 20 percent of the motorists who exceed the posted speed limit do not receive speeding tickets. What percent of the motorists on the road exceed the posted speed limit?

- (A) $10\frac{1}{2}\%$
(B) $12\frac{1}{2}\%$
(C) 15%



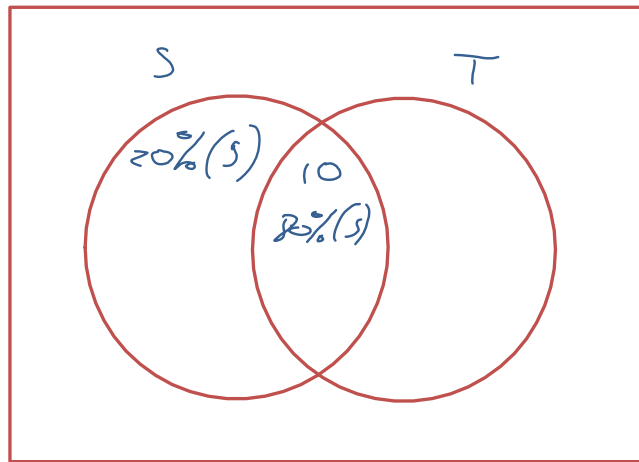
$80\% (S) = 10$
 $S = 12.5$

(B) $12\frac{1}{2}\%$

(C) 15%

(D) 22%

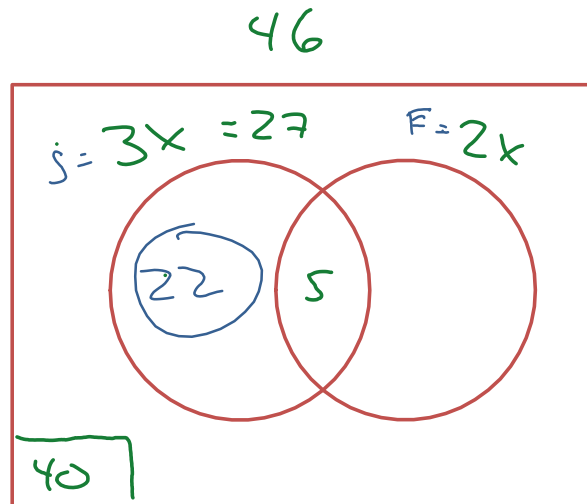
(E) 30%



$$J = 12.5$$

4

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?



$$\begin{array}{lcl} S & : & E \\ 3 & : & 2 \\ 3x & & 2x \end{array}$$

$$\begin{aligned} 40 &= 3x + 2x - 5 \\ 45 &= 5x \\ 9 &= x \end{aligned}$$

Relative speed: $\begin{matrix} \longrightarrow S_1 \\ \longrightarrow S_2 \end{matrix} \quad S_2 - S_1 \quad 120 - 90 = 30$

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 120 mph. At this rate how long will it take for our friendly copper to catch the speeder?

$\frac{90 \text{ mph} \cdot 2 \text{ min}}{30 \text{ mph}} \leftarrow \text{Distance cop has to catch up.}$
6 min.

METHOD EQUATION

$$D_1 = D_2$$

$$90 \text{ mph} (T + 2 \text{ min}) = 120 \text{ mph} (T)$$

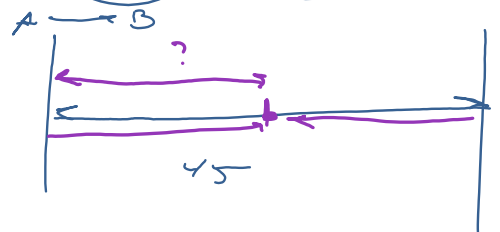
$$90 \cdot 2 \text{ min} = 30T$$

$$6 \text{ min} = T$$

NOTE: When both objects travel in the same direction their distances will be the same.

Point A is 45 miles west of point B. If Mark leaves point A towards point B traveling 5 miles per hour at 8am and Betty leaves point B towards point A traveling 3 miles per hour at 9am, how far from point A will the two meet each other?

Mark 8am 5mph How far does Mark Travel?
Betty 9am 3mph



$D_1 + D_2 = \text{Total distance}$

$$D = S \cdot T$$

$$5 \cdot T + 3(T - 1) = 45$$

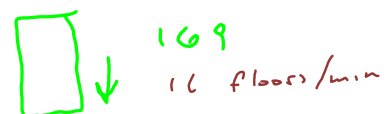
$$8T - 3 = 45$$

$$8T = 48$$

$$T = 6$$

$$5 \cdot 6 = \boxed{30}$$

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?



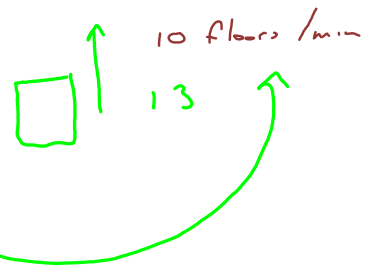
$$10(T) + 16(T) = 156$$

$$26T = 156$$



$$2GT = 156$$

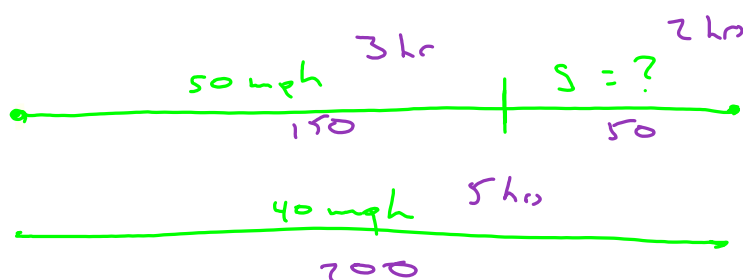
$$T = 6 \text{ min}$$



$$13 + 60 = 73$$

$$6 \cdot 10 = 60 \text{ floors}$$

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?



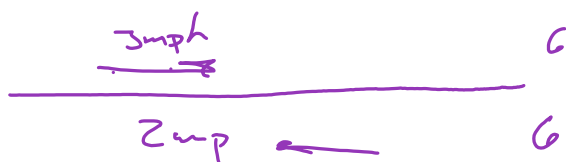
Insert 200 miles

$$\frac{50}{2} = 25 \text{ mph}$$

Ave speed

$$\frac{\text{Total Dist}}{\text{Total Time}}$$

- If Mike walks 3 mph to work and 2 mph home, what is his average speed?



$$\frac{12}{2+3} = \frac{12}{5} = 2.4$$

Dist are the same

$$\frac{2 \cdot s_1 \cdot s_2}{s_1 + s_2} = \frac{2 \cdot 2 \cdot 3}{2 + 3} = \frac{12}{5}$$

A racing car driver qualifies for a race by making one circuit of a 10-kilometer track at 120 kph and a second circuit at 200 kph. What is his average speed for the two laps?

$$\frac{2 \cdot 120 \cdot 200}{120 + 200}$$

- (A) 170
(B) 165
(C) 160
(D) 155
(E) 150

$$\frac{TD}{TT}$$

$$\frac{10}{120} + \frac{10}{200}$$

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

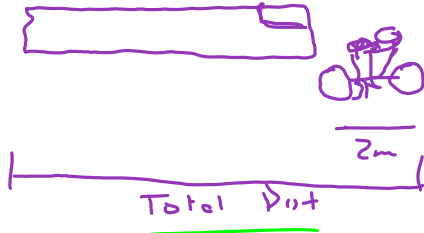
S	D	T
60	360	6
56		7
<u>40</u>	360	9
36	360	10

1

$$S_2 - S_1$$

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?

$$72 - 36 = 36$$



$$D = \frac{36 \text{ km}}{\text{hour}} \cdot \frac{40 \text{ sec}}{1}$$

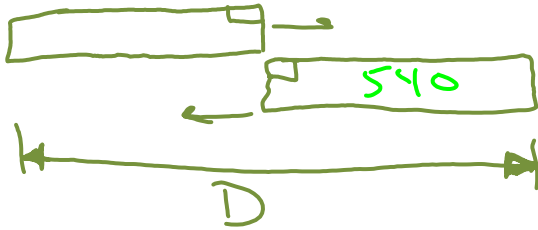
$$\frac{\cancel{36} \text{ km}}{\cancel{\text{km}}} \cdot \frac{40 \text{ sec}}{1} \cdot \frac{1 \text{ hr}}{\cancel{60} \text{ min}} \cdot \frac{1 \text{ min}}{\cancel{60} \text{ sec}} \cdot \frac{\cancel{1000} \text{ meters}}{1 \text{ km}}$$

$$400$$

$$400 - 2 = \underline{398}$$

$$S_1 + S_2$$

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?



$$D = \frac{72 \cdot 1000 \text{ meters}}{\text{hr}} \cdot \frac{80 \text{ sec}}{1} \cdot \frac{1 \text{ min}}{60 \text{ sec}} \cdot \frac{1 \text{ hr}}{60 \text{ min}}$$

$$D = 1600 \text{ meters}$$

$$\begin{array}{r} 1600 \\ - 540 \\ \hline 1060 \text{ meters} \end{array}$$

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?

$$\frac{2 \cdot s_1 \cdot s_2}{s_1 + s_2} = \text{ave speed}$$

$$x - 10 = ?$$

$$\frac{2 \cdot (x+10)(x-10)}{x+10 + x-10} = 48$$

$$\boxed{40}$$

$$\frac{2(x^2 - 100)}{2x} = 48$$

$$x^2 - 100 = 48x$$

$$x^2 - 48x - 100 = 0$$

$$(x - 50)(x + 2)$$

$$x = 50$$

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?

$$\frac{1000}{A} = \frac{940}{5}$$

$$\text{Bill} = \frac{60}{12} = 5 \text{ m/s}$$

The trick here is not to worry about Andy's speed.

Simply calculate

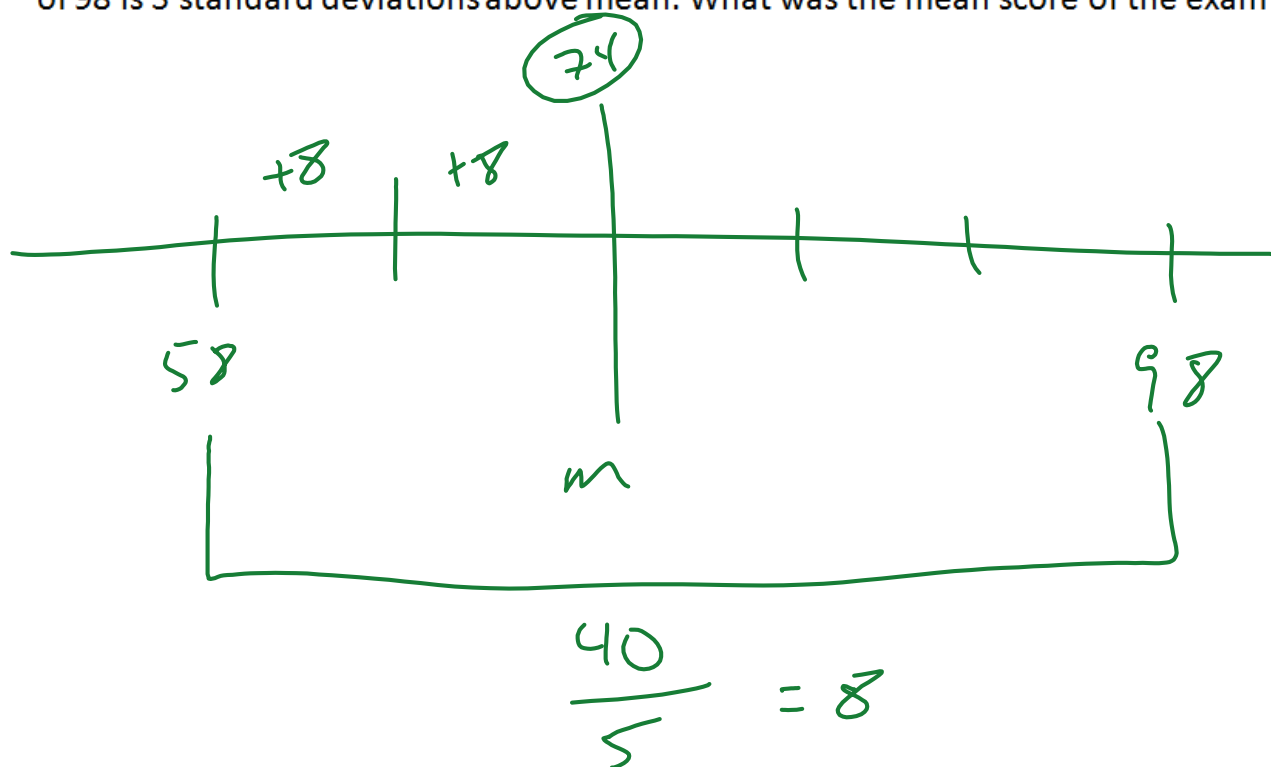
Bill's time to do

940 and you will get Andy's time as well

188 sec

$$\frac{1000}{399} = \frac{1000}{X}$$

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

0	2	4	6	8
4	2	0	2	4
16	4	0	4	16

$$\frac{40}{5} = 8 \rightarrow \sqrt{8}$$

0	8
4	4
16	16

$$\frac{72}{7} \approx \sqrt{10}$$

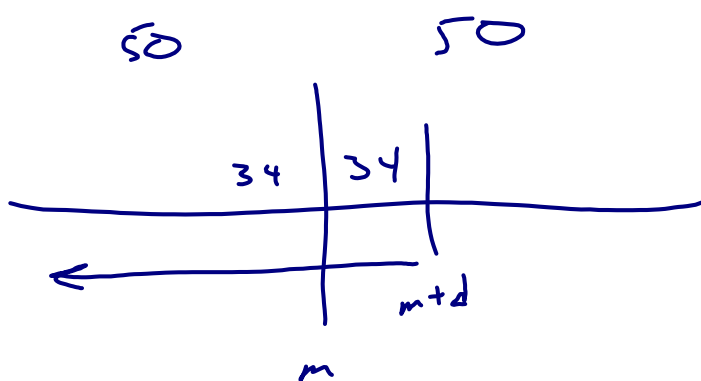
4	4
0	0
0	0
$\frac{40}{7}$	$\sqrt{5.8}$

3	5
1	1
1	1
$\frac{42}{7}$	$\approx \sqrt{6}$

2	6
---	---

2	2
4	4
$\frac{48}{7}$	$\approx \sqrt{6.9}$

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 $m + d$?



$$50 + 34 = 84$$

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) $R + Z$

1 2 3

101 102 103

1 0 1

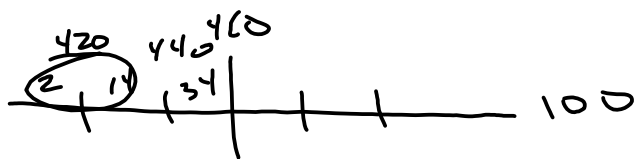
1 0 1

1 0 1

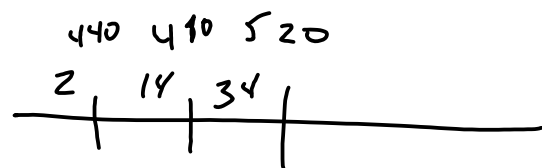
$$\frac{2}{3} \quad \sqrt{\frac{2}{3}}$$

$$= \sqrt{\frac{2}{3}}$$

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?



$$A : 16$$



$$B : 2$$

$$\frac{2}{18} = \left(\frac{1}{9} \right)$$

Work Problems

$$Work = Rate \times Time$$

$$\frac{\text{jobs}}{\text{time}} + \frac{\text{jobs}}{\text{time}} = \frac{\text{jobs}}{\text{time}}$$

$N_1 \times H_1 = N_2 \times H_2$ If a group of size N_1 completes a job in H_1 hours, and another group of size N_2 , complete the same job in H_2 hours

Fraction of Job + another Fraction of the Job + the rest of the Job = The Job

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?

$$\left[\frac{1}{40} + \frac{1}{20} - \frac{1}{120} = \frac{\frac{1}{2}}{x} \right] 120x$$

$$3x + 6x - x = 60$$

$$8x = 60$$

$$x = 7.5$$

SECOND METHOD

$$W = R \cdot T$$

$$\left[\frac{1}{40}(x) + \frac{1}{20}(x) - \frac{1}{120}(x) = \frac{1}{2} \right] 120$$

$$3x + 6x - x = 60$$

$$8x = 60$$

$$x = 7.5$$

115. Three small pumps and a large pump are filling a tank. Each of the three small pumps works at $\frac{2}{3}$ 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?

$$\begin{array}{c} \text{large} \\ \hline 1 \\ \hline x \end{array} + \begin{array}{c} \frac{2}{3} \\ \hline x \end{array} + \begin{array}{c} \frac{2}{3} \\ \hline x \end{array} + \begin{array}{c} \frac{2}{3} \\ \hline x \end{array} = \begin{array}{c} \text{all pumps} \\ \hline 3 \\ \hline x \end{array}$$

$\left(\frac{1}{3} \right)$

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?

$$\frac{1}{10} + \frac{1}{15} = \frac{1}{x} \quad \left. \begin{array}{l} 30x \\ x = \text{Time it should normally take} \end{array} \right\}$$

$$3x + 2x = 30$$

$$x = 6$$

$$W = R \cdot T$$

	R	I	II
Pipe X-dr	$\frac{1}{6}$	6	2
Drain	$\frac{1}{D}$	6	-

$$\frac{1}{6}(6) + \frac{1}{6}(2) - \frac{1}{D}(6) = 1$$

$$x + \frac{1}{3} - \frac{6}{D} = x$$

$$\frac{1}{3} = \frac{6}{D}$$

$$D = 18$$

Pipe A can fill a tank in 20 minutes and pipe B can fill the same tank in 30 minutes. First pipe A is opened, then after 5 minutes pipe B is opened. If the tank is empty when pipe A is turned on, how long will it take to fill the tank from the time pipe A was opened?

	R	I	II
Pipe A	$\frac{1}{20}$	5	x
Pipe B	$\frac{1}{30}$	-	x

$$x + 5 = ?$$

$$\frac{1}{20}(5+x) + \frac{1}{30}(x) = 1 \quad \left. \begin{array}{l} 60 \end{array} \right\}$$

$$3(5+x) + 2x = 60$$

$$15 + 3x + 2x = 60$$

$$5x = 45$$

$$9 + 5 = 14$$

$$x = 9$$

Working alone, Andy can do a job in 20 days and Beth can do the same job in 30 days. When the two work together Andy has to leave 5 days before the job is finished. If Beth finishes the rest of the job herself, how long does the entire job take?

$$\frac{1}{20}(x) + \frac{1}{30}(x+5) = 1 \quad \text{60}$$

$$3x + 2x + 10 = 60$$

$$5x = 50$$

$$x = 10$$

$$x + 5 = \boxed{15}$$

	Rate	I	II
A	$\frac{1}{20}$	x	—
B	$\frac{1}{30}$	x	5

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?

$$\frac{1}{x} + \frac{2}{x} + \frac{5}{x} = \frac{1}{4}$$

$$\frac{8}{x} = \frac{1}{4}$$

$$x = 32$$

John

1 job in 16

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?

1 job 5000
6 machines in 4 hrs
3 machines in 8 hrs

$$\frac{3000}{5000} \cdot 8 = \left(\frac{24}{5} \right)$$

If 50 workers can do a job in 4 hours, how long will it take 30 workers to do the same job?

$$\frac{200}{30} = \frac{20}{3}$$