AM Objective 20: WP: Linear Equations

The sum of three consecutive even integers is 528. What is the largest of the three integers?

① x = the first integer

$x+2$ = the second integer

$x+4$ = the third integer

How does this work?
- Start w/ a number.
- If it is even, two more will be the next even #.

Ex. $x = 258$, $x+2 = 260$

② $x + (x+2) + (x+4) = 528$ (1st, 2nd, 3rd)

Combine like terms to get

③ Solve for x

$3x + 6 = 528$

$-6 \quad -6$

$\frac{3x}{3} = \frac{522}{3}$

$x = 174$ ← this is the 1st integer

⇒ The third integer is $x+4$, so the answer is $174+4 = \boxed{178}$

The sum of three consecutive odd integers is 489. What is the largest of the three integers?

① x = the first integer

$x+2$ = the second integer

$x+4$ = the third integer

How does this work?
- Start w/ an odd number. Two more will be the next odd number.

Ex. $x = 427$, $x+2 = 429$

② $x + (x+2) + (x+4) = 489$ (1st, 2nd, 3rd)

Combine like terms to get

③ Solve for x

$3x + 6 = 489$

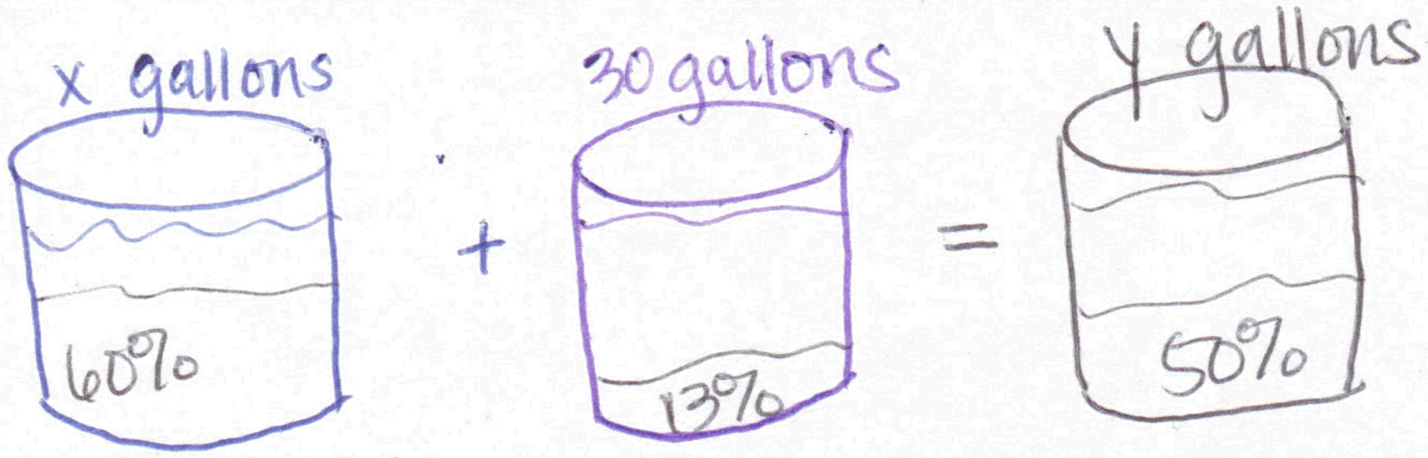
$-6 \quad -6$

$\frac{3x}{3} = \frac{483}{3}$

$x = 161$ ← This is the 1st integer

⇒ The third integer is $x+4$, so the answer is $161+4 = \boxed{165}$

How much of a 60%-acid solution must be mixed with 30 gallons of a 13%-acid solution to obtain a solution that is 50% acid?



WHEN IN DOUBT, DRAW IT OUT!

Step1: Identify variables

X = # of gallons of 60% acid solution

y = total # of gallons in final solution

Step2: Write the equations

$.60x + .13 * 30 = .50y$

$x + 30 = y$

Why do we write .60 instead of 60? .60 is the decimal representation of 60%.

Step3: Solve a) Graphically b) Algebraically

a) $y_1 = x + 30$ READY TO GRAPH ALREADY!

$y_2 = \frac{(.60x + .13 * 30)}{.50}$ we need y=? now, we're READY TO GRAPH!

Intersection Point = (111, 141)

b)

$y = x + 30$

$.50y = .60x + .13 * 30$

$.50(x + 30) = .60x + 3.9$

$.50x + 15 = .60x + 3.9$

$-.50x \quad -3.9 \quad -.50x \quad -3.9$

$11.1 = .10x$

$111 = x$

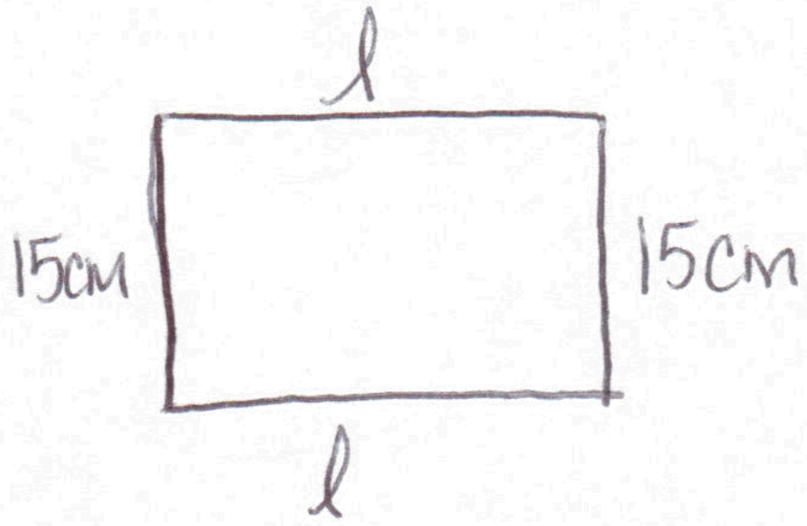
$y = x + 30 \quad y = 111 + 30$

$y = 141$

Step4: Write paragraph with complete sentences

111 gallons of a 60%-acid solution must be mixed with 30 gallons of a 13% solution to obtain a solution that is 50% acid. There will be 141 gallons in the total solution.

The width of a rectangle is 15cm. Find all possible values for the length of the rectangle if the perimeter is at least 392 cm.



DRAW A PICTURE!

Perimeter = $2w + 2l$

For this case $P = 2(15) + 2l$

$\Rightarrow$

$392 \leq 30 + 2l$

Why is it $\leq$? The $30+2l$ is greater than or equal to 392.

$\Rightarrow 392 \leq 30 + 2l$

$-30 \quad -30$

$\frac{362}{2} \leq \frac{2l}{2}$

$181 \leq l$

the length is greater than or equal to 181cm.

We can also write this as

{ means "the set of" $\rightarrow \{ x \mid x \geq 181\text{cm} \}$

x | such that | x is greater than or equal to 181cm.

$17 \leq P \leq 56$

The perimeter of a square is to be between 17 and 56 feet, inclusively.
Find all possible values for the length of its sides.

Perimeter of a square $= 2l + 2w$ $\quad l = w$

$\Rightarrow 4l$

All four sides are the same, so $P = 4l$

This means "includes" so, we use the $\leq$ sign.

If it said, exclusively, we would use the $<$ sign.

$17 \leq P \leq 56$

$17 \leq 4l \leq 56$

$\frac{17}{4} \quad \frac{4l}{4} \quad \frac{56}{4}$

$4.25 \leq l \leq 14$

$\Rightarrow \{x \mid x \geq 4.25 \text{ and } x \leq 14\}$

Martin purchased municipal bonds yielding 6% annually and certificates of deposit yielding 9% annually. If Martin's investments amounted to $18,486 and the annual income is $1280.58, how much money is invested in bonds and how much money is invested in certificates of deposit?

① b = Amount of money invested in municipal bonds.
C = Amount of money invested in certificates of deposit.

②
$$.06b + .09C = 1280.58$$
$$b + C = 18{,}486$$

③ Let b = x an C = y

Graph

$$.06x + .09y = 1280.58$$
$$-.06x \qquad -.06x$$
$$\frac{.09y}{.09} = \frac{1280.58 - .06x}{.09}$$
$$\boxed{y = \frac{(1280.58 - .06x)}{.09}}$$

$$x + y = 18486$$
$$-x \qquad -x$$
$$\boxed{y = 18486 - x}$$

Ready to graph!

Intersection Point = (12772, 5714)

Algebraically

$$y = 18486 - x$$
$$.06x + .09y = 1280.58$$
$$.06x + .09(18486 - x) = 1280.58$$
$$.06x + 1663.74 - .09x = 1280.58$$

Combine like terms

$$-.03x + 1663.74 = 1280.58$$
$$-1663.74 \quad -1663.74$$
$$-.03x = -383.16$$
$$x = 12772$$

$y = 18486 - x$ $\quad y = 18486 - 12772$

$$y = 5714$$

④ Martin purchased $12,772 in municipal bonds, yielding 6% annually and $5,714 in certificates of deposit yielding 9% annually. Martin's investments amounted to $18,486 with an annual income of $1280.58.