

Random Algebra Recitation Problems

- 1) Let B = bob's age, C = carol's age

$$B + C = 100 \rightarrow B = 100 - C$$

$$B - 16 = 3(C - 16)$$

$$B - 16 = 3C - 48$$

$$(100 - C) - 16 = 3C - 48$$

$$84 - C = 3C - 48$$

$$4C = 84 + 48 = 132$$

$$C = 132/4 = 33$$

$$B = 67$$

Double check 16 yrs ago Bob was 51, Carol was 17, yes this works out.

Bob was $67 - 33 = 34$ years old when Carol was born.

$$2) \frac{x}{x-1} = \frac{y^2+2y-1}{y^2+2y-2}$$

$$\frac{(x-1)+1}{x-1} = \frac{(y^2+2y-2)+1}{y^2+2y-2}$$

$$1 + \frac{1}{x-1} = 1 + \frac{1}{y^2+2y-2}$$

$$\frac{1}{x-1} = \frac{1}{y^2+2y-2}$$

$$x - 1 = y^2 + 2y - 2$$

$$x = y^2 + 2y - 1, x \neq 1.$$

- 3) Let x be the number of hours they complete the job together. Bob completes the job by himself in x+6 hours, John completes the job in x+1 hours, Steven completes the job in 2x hours. So our equation is:

$$1 = \frac{x}{x+6} + \frac{x}{x+1} + \frac{x}{2x}$$

$$1 = \frac{x}{x+6} + \frac{x}{x+1} + \frac{1}{2}$$

$$\frac{1}{2} = \frac{x}{x+6} + \frac{x}{x+1}$$

$$\frac{1}{2x} = \frac{1}{x+6} + \frac{1}{x+1}$$

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

$$\frac{1}{2x} = \frac{2x+7}{(x+6)(x+1)}$$

$$(x+6)(x+1) = 4x^2 + 14x$$

$$x^2 + 7x + 6 = 4x^2 + 14x$$

$$0 = 3x^2 + 7x - 6$$

$$(3x-2)(x+3) = 0$$

So $x = 2/3$ is the only useful root. So together, they get the job done in $2/3$ of an hour. John by himself would take $5/3$ hours, Bob would take $20/3$ hours, and Steven would take $4/3$ hours. (So when working together, Steven does 50%, John does 40% and Bob does 10%)

- 4) Let the time now be 10 hours x minutes. 6 minutes from now is $x+6$ minutes, and the degree angle will be $6(x+6)$. At the time 10 hours and $x-3$ minutes, the hour hand will be at: (each hour the hour hand moves 30 degrees, so it moves $\frac{1}{2}$ a degree a minute.) The hour hand is at the angle $300 + (x-3)/2$

$$\text{So } 300 + (x-3)/2 = 180 + 6(x+6)$$

$$300 + x/2 - 3/2 = 180 + 6x + 36$$

$$11x/2 = 300 - 3/2 - 180 - 36$$

$$11x/2 = 120 - 36 - 3/2 = 84 - 3/2 = 82 \frac{1}{2}$$

$$11x/2 = 165/2$$

$$11x = 165$$

$X = 15$ minutes. The current time is 10:15 =)