SOL HW 8.3

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Pre Calculus 11: HW Section 8.3 Solving Problems Involving Linear & Quadratic Systems

1. Three basketballs and one volleyball costs $155. Two basketballs and three volleyballs costs $220. Determine the cost of one basketball and the cost of one volleyball.

$3b+V=155$ $(\times 3)$ $\quad 9b+3V=465$

$2b+3V=220$ $\quad -(2b+3V=220)$

$7b=245 \rightarrow b=35$

$155-(3\times 35)=V$

$50=V$

$B=\$35$

$V=\$50$

2. Tickets for a school baseball game cost $4 for adults and 2.50 for students. If 1300 people attended and ticket sales was $4000, how many students and adults attended?

$A+S=1300$ $\quad 4A+2.5S=4000$

$A=1300-S$ $\quad 4(1300-S)+2.5S=4000$

$5200-4S+2.5S=4000$

$5200-1.5S=4000 \rightarrow S=800$

$A=1300-S$

$A=1300-800$

$A=500$

3. Tom invested $500, part at BMO earning 7% interest, and part in equity stocks earning 10% a year. After one year, he earned $44. How much of the $500 did he invest with BMO?

$B+E=500 \rightarrow E=500-B$

$0.07B+0.1E=44$

$0.07B+0.1(500-B)=44$

$0.07B+50-0.1B=44$

$-0.03B=-6 \rightarrow B=200$

$E=500-200$

$E=300$

4. Steve invested a total of $2500 between stocks and bonds, divided unevenly. The Bonds paid 8% a year and stocks made a return of 12% a year. If the amount earned from each investment yielded the same amount of interest, how much did he invest with each?

$B+S=2500 \rightarrow B=2500-S$

$0.08B=0.12S$

$0.08(2500-S)=0.12S$

$200-0.08S=0.12S$

$200=0.2S \rightarrow S=1000$

$B=2500-1000$

$B=1500$

5. The relationship between Celsius and Fahrenheit is a linear relationship. 20 degrees Celsius is 68 degrees Fahrenheit. 10 degrees Celsius is 50 degrees Fahrenheit. Write an equation for Celsius and Fahrenheit.

$20C=68F$

$10C=50F$

$y=mx+b$

$(68,20)$

$(50,10)$

$\frac{(20-10)}{(68-50)}=\frac{10}{8}=\frac{5}{9}$

$y=\frac{5}{9}x+b$

$10=\frac{5}{9}(50)+b$

$\frac{-160}{9}=b$

$y=\frac{5}{9}x-\frac{160}{9}$

$C=\frac{5}{9}F-\frac{160}{9}$

6. 100km/hr is equivalent to 62.1 miles per hour. 60km/hr is equivalent to 37.3 miles per hour. If the relationship between the two speeds is linear, write an equation to convert km/hr to miles per hour.

100km/hr = 62.1 m/hr
60km/hr = 37.3m/hr
(62.1, 100)
(37.3, 60)

$\frac{(100-60)}{(62.1-37.3)} = \frac{50}{31}$

$y = mx + b$

$100 = \frac{50}{31}(62.1) + B$

$B = -0.16129$

$y = \frac{50}{31}(x) - 0.16129$

$km/h = \frac{50}{31}\, m/hr - 0.16$

7. The monthly cost for a phone plan with Rogers is $50 a month for 200 free day time minutes and then 5cents for each additional minute. The monthly cost for Bell is $25 a month for 100 free day time minutes and then 15 cents for each additional minute. How many minutes would I need to use a month for the phone plans to cost the same?

$25 + 0.15(x-100) = 50 + 0.05(x-200)$

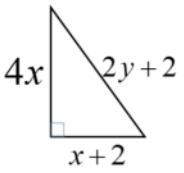
$25 + 0.15x - 15 = 50 + 0.05x - 10$

$10 + 0.15x = 40 + 0.5x$

$0.1x = 30 \rightarrow x = 300$

x = number of minutes

8. Given the right triangle below, the perimeter is 112 and the area is $33y+12$.



a) Write an expression for the perimeter in terms of "x" and "y"

$4x + x + 2 + 2y + 2 = 112$

$5x + 2y + 4 = 112$

b) write an expression for the area

$\frac{(x+2)4x}{2} = 33y + 12 \rightarrow (x+2)2x = 33y + 12$

$2x^2 + 4x = 33y + 12$

c) Solve the system for "x" and "y"

$5x + 2y - 108 = 0$

$2x^2 + 4x - 33y - 12 = 0$

$2y = 108 - 5x$

$y = 54 - 2.5x$

$2x^2 + 4x - 33(54 - 2.5x) - 12 = 0$

$2x^2 + 4x - 1782 + 82.5x - 12 = 0$

$2x^2 + 86.5x - 1794 = 0$

$\frac{-86.5 \pm \sqrt{86.5^2 - (4 \times 2 \times -1794)}}{(2 \times 2)}$

$x = 15.316$
$x = -58.566$

plug in to find y

9. In physics, the distance an accelerating object travels is given by the formula: $d = v_0 t + \frac{1}{2}at^2$. The final velocity is given by: $v_f = v_0 + at$, where "a" is the acceleration, "t" is the amount of time, and "v_o" is the initial speed. A moving vehicle accelerates at $5m/s^2$ [acceleration] to $25m/s$ [v_f] and travels 52.5m. What was the initial velocity and the time required?

$d = V_0 t + \frac{1}{2}at^2$

$V_f = V_0 + at$

$a = 5m/s^2$

$V_f = 25m/s$

$d = 52.5m$

$52.5 = V_0 t + \frac{1}{2}(5)(t^2)$

$V_0 = -V_f + at$

$V_0 = -25 + 5t$ ↑ plug in

$52.5 = (-25 + 5t)t + \frac{1}{2}(5)(t^2)$

$52.5 = -25t + 5t^2 + \frac{1}{2}(5)(t^2)$

$52.5 = -25t + 5t^2 + 2.5 + \frac{1}{2}t^2$

$0 = 5.5t^2 - 25t - 50$

$\frac{25 \pm \sqrt{25^2 - (4 \times 5.5 \times -50)}}{(2 \times 5.5)}$

$t = \frac{25 \pm 5\sqrt{69}}{11}$

$V_0 = 5.24, -32.515$