Math 099 - Fall 2009 - Test 4

Instructor: Dr. Francesco Strazzullo Name KEY

Instructions. Only calculators are allowed on this examination. Point values of each problem are indicated. **Always use the appropriate wording and units of measure in your answers (when applicable). SHOW YOUR WORK NEATLY, PLEASE (no work, no credit).**

1. (15*pts*) Solve the proportion $\frac{7}{3} = \frac{5}{x}$.

FLIP $\longrightarrow$ $\frac{X}{5} = \frac{3}{7}$ MULTIPLY BY 5 $\longrightarrow$ $X = \frac{3 \cdot 5}{7} = \frac{15}{7} \approx 2.143$

2. (15*pts*) A staircase has a slope of 7 to 11. What horizontal distance is needed for an 8-foot vertical distance?

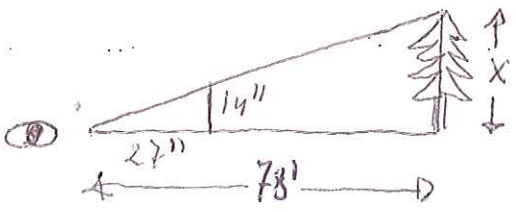
$\text{SLOPE} = \frac{\text{VERT.}}{\text{HORIZ.}} = \frac{7}{11}$

VERT = 8 ft, FIND HORIZ = X

$\frac{8}{X} = \frac{7}{11}$ FLIP $\longrightarrow$ $\frac{X}{8} = \frac{11}{7} \longrightarrow X = \frac{11 \cdot 8}{7} = \frac{88}{7} \approx 12.57$

WE NEED A HORIZONTAL DISTANCE OF ABOUT 12.57 ft.

3. (15*pts*) A timber cruiser holds her arm parallel to the ground. In her hand she holds a stick, vertically, 27 inches from her eye. A 14-inch length on the stick lines up with the top and bottom of a tree. The distance from the cruiser to the tree is 78 feet. How tall is the tree?



SIMILAR RIGHT TRIANGLES:

$\frac{X}{78} = \frac{14}{27} \longrightarrow X = \frac{14 \cdot 78}{27}$

$X = \frac{364}{9} \approx 40.\overline{4}$

THE TREE IS ABOUT 40.4 FEET TALL.

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P_5 P_1 P_3 P_2

4. (15*pts*) At a car dealer there are several used SUV. Their prices are: \$28,988, \$20,988, \$23,988, \$23,750, and \$28,750. What are the median and the average prices?

P_4

WE CAN USE OUR CALCULATOR: WE HAVE FIVE ENTRIES $P_1, P_2, \dots, P_5$ (SAY IN INCREASING ORDER).

MEDIAN $= P_3 =$ \$23,988. (2ND + STAT → MATH)

MEAN $= \dfrac{P_1+P_2+P_3+P_4+P_5}{5} =$ \$ 25,292.80

5. (15*pts*) Solve the system of linear equations

$$\begin{cases} 4x-2y=2 \\ 4x+3=y \end{cases}$$

WE COULD GRAPH IT:

$$\begin{cases} 4X-2Y=2 \\ Y=4X+3 \end{cases} \xrightarrow{\text{PLUG IN}} 4X-2\cdot(4X+3)=2 \to 4X-2\cdot 4X-2\cdot 3=2$$

$$\begin{cases} 4X-8X-6=2 \to -4X=2+6 \to X=\dfrac{8}{-4}=-2 \\ Y=4X+3 \xrightarrow{\text{PLUG IN}} Y=4\cdot(-2)+3=-8+3=-5 \end{cases}$$

$X=-2,\ Y=-5$ OR $(X,Y)=(-2,-5)$

6. (15*pts*) Casey has 140 coins. He has \$ 31.10 altogether. If he has only dimes and quarters, how many of each does he have?

	QUANTITY	RATES	Q.R
DIMES	X	\$.10 EA	.10X
QUARTERS	Y	\$.25 EA	.25Y
TOTALS	140		\$31.10

$$\begin{cases} .10X+.25Y=31.10 \xrightarrow{\text{PLUG IN}} .10X+.25(140-X)=31.10 \\ X+Y=140 \to Y=140-X \end{cases}$$

$$\begin{cases} \to .10X+.25(140-X)=31.10 \to .10X+\overbrace{.25\cdot 140}^{35}-.25X=31.10 \to \\ \to -.15X=-3.9 \to X=\dfrac{-3.9}{-.15}=26 \\ Y=140-X \xrightarrow{\text{PLUG}} Y=140-26=114 \end{cases}$$

CASEY HAS 26 DIMES AND $114\frac{2}{2}$ QUARTERS.

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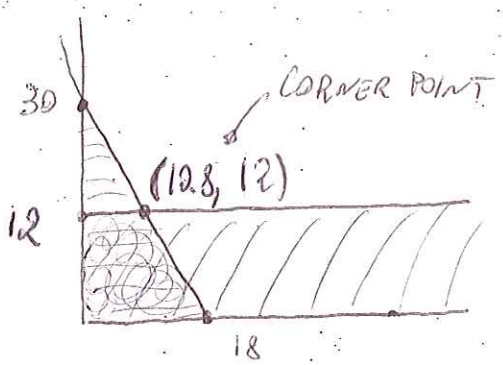
7. (15*pts*) A birthday brunch caterer charges \$20 for adults and \$12 for young people between 6 and 15. Children under 6 are free. The total budget for a party is \$360. Let x = the number of adults and y = the number of young people. There are a maximum of 12 young people who might attend. Write a system of inequalities to describe the possible numbers of people age 6 and over who can attend. Graph and show the solution set (according to the context). Label the corner point and provide at least one possibility for the attendant.

	QUANT.	RATE	Q·R.
ADULT	X	\$20 AE	20X
YOUNG	Y	\$12 AE	12Y
TOTAL			≤ 360

$$\begin{cases} 20X + 12Y \leq 360 \\ Y \leq 12 \end{cases}$$

MAXIMUM NUMBER OF YOUNG



IN THIS CONTEXT BOTH $X \geq 0$, $Y \geq 0$

BOUNDARY LINES: $\begin{cases} 20X + 12Y = 360 \\ Y = 12 \end{cases}$ $\rightarrow 12Y = 360 - 20X \rightarrow Y = 30 - \frac{5}{3}X \rightarrow 12 = 30 - \frac{5}{3}X \rightarrow$

PLUG

$\rightarrow -18 = -\frac{5}{3}X \rightarrow X = \frac{3}{5}18 \approx 10.8$. A POSSIBILITY IS 10 ADULT AND 12 YOUNG.

8. Simplify the following polynomials:

(a) (6*pts*) $(x^2 - 2x + 3) - (2x^2 - 4x + 6)$

$x^2 - 2x + 3 - 2x^2 + 4x - 6$

$\boxed{-x^2 + 2x - 3}$

(b) (7*pts*) $(a+b)(a-b) = a^2 - b^2$

FOIL DIFFERENCE OF SQUARES

$a \cdot a + a \cdot (-b) + b \cdot a + b \cdot (-b) = a^2 - \cancel{ab} + \cancel{ab} - b^2$

(c) (7*pts*) $2(x+3)^2$

$2 \cdot (x^2 + 3^2 + 2 \cdot x \cdot 3) = 2 \cdot (x^2 + 6x + 9) = 2x^2 + 12x + 18$

$(x+3)^2 = (x+3)(x+3) = x^2 + 3x + 3x + 3^2$

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