MAT 011, Exam #1, Fall 2015   Name _____ KEY _____

Instructions: Show all work. Answers without work will be worth only one point per problem. Give exact answers (fractions!) unless specifically asked to round. Complete all parts of each problem.

1. Simplify.

   a. $\dfrac{3}{4} - \dfrac{3}{20} =$ $\quad \dfrac{5}{5} \cdot \dfrac{3}{4} - \dfrac{3}{20} = \dfrac{15}{20} - \dfrac{3}{20} = \dfrac{12}{20} = \boxed{\dfrac{3}{5}}$ (3 pts)

   b. $\dfrac{4+16-21+8^2}{4+6\cdot4}$ $= \dfrac{20-21+64}{4+24} = \dfrac{63}{28} = \boxed{\dfrac{9}{4}}$ (4 pts)

2. Evaluate $\dfrac{|y-4x|}{2x}$ for $x = 3, y = -6$.   (4 pts)

   $\dfrac{|-6-4(3)|}{2(3)} = \dfrac{|-6-12|}{6} = \dfrac{|-18|}{6} = \dfrac{18}{6} = \boxed{3}$

3. Simplify.   (5 pts ea.)
   a. $-8(2y + 9) - 1$

   $-16y - 72 - 1 = \quad -16y - 73$

   b. $6x - 5x + x - 3 + 2x$

   $4x - 3$

4. Translate each English statement into an algebraic expression.   (5 pts ea.)
   a. Two-thirds of a number increased by eleven.

   $\dfrac{2}{3}x + 11$

   b. Six times the difference of a number and five.

   $6(x-5)$

5. Solve each problem for the variable. Clearly write the solution for the variable.

a. $-2(x + 1) + 3x = 14$ (5 pts)

$$-2x - 2 + 3x = 14$$
$$x - 2 = 14$$
$$ +2 \quad +2$$
$$\boxed{x = 16}$$

b. $\overset{4}{\cancel{3}}\left(\dfrac{3}{4}n = \dfrac{-15}{1}\right) \cdot \dfrac{4}{3}$ (4 pts)

$$n = \dfrac{-\overset{5}{\cancel{15}}}{1} \cdot \dfrac{4}{\cancel{3}} = -20$$

$$\boxed{n = -20}$$

c. $5 - 6(2 + b) = b - 14$ (5 pts)

$$5 - 12 - 6b = b - 14$$
$$-7 - 6b = b - 14$$
$$ +6b \quad +6b$$
$$-7 = 7b - 14$$
$$+14 +14$$
$$\dfrac{7}{7} = \dfrac{7b}{7} \implies \boxed{b = 1}$$

d. $\overset{5}{\cancel{1}}\left(\dfrac{3(y+3)}{5} = 2y + 6\right)\dfrac{5}{1}$ (6 pts)

$$3(y + 3) = 5(2y + 6)$$
$$3y + 9 = 10y + 30$$
$$-3y -3y$$
$$9 = 7y + 30$$
$$-30 -30$$
$$\dfrac{-21}{7} = \dfrac{7y}{7} \implies \boxed{y = -3}$$
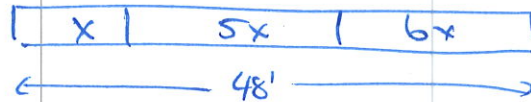
e. $3(2x - 1) + 5 = 6x + 2$ (6 pts)

$6x - 3 + 5 = 6x + 2$

$6x + 2 = 6x + 2$

$$\boxed{X \text{ is all real \#'s}}$$

6. A 48-foot piece of cable is to be cut into three pieces so that the second piece is five times longer than the first piece, and the third piece is six times longer than the first piece. If x is the length of the first piece, how long is each piece? (6 pts)

X	5x	6x

← 48' →

$X + 5x + 6x = 48$

$\dfrac{12x = 48}{12 \quad 12}$

$x = 4$

Shortest piece = 4 feet
middle piece is 20 feet
long piece is 24 feet

7. Solve the equation $S = 2\pi rh + 2\pi r^2$ for h. (Do NOT replace π with 3.14. Leave π in your final answer.) $-2\pi r^2 \qquad -2\pi r^2$ (5 pts)

$\dfrac{S - 2\pi r^2}{2\pi r} = \dfrac{2\pi rh}{2\pi r}$ or $\dfrac{S}{2\pi r} - \dfrac{2\pi r^2}{2\pi r} = h$
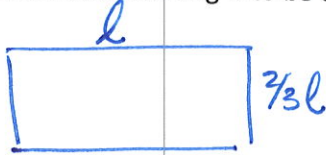
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$$\boxed{\dfrac{S - 2\pi r^2}{2\pi r} = h} \text{ or } \boxed{\dfrac{S}{2\pi r} - r = h}$$

8. An architect designs a rectangular flower garden such that the width is exactly 2/3 of the length. If 260 feet of fencing is to be used to enclose the garden, find the dimensions. (6 pts)

l

$\frac{2}{3}l$

$\boxed{78 \text{ by } 52 \text{ feet}}$

$2l + 2(\frac{2}{3}l) = 260$

$2l + \frac{4}{3}l = 260$

$\frac{6}{3}l + \frac{4}{3}l = 260$

$\frac{3}{10} \cdot \frac{10}{3}l = 260 \cdot \frac{3}{10}$

$l = 78$

9. Find last year's salary if, after a 4% raise, the current salary is $44,200. (6 pts)

$X + .04X = 44,200$

$\dfrac{1.04X}{1.04} = \dfrac{44,200}{1.04}$

$\boxed{X = \$42,500}$

10. Zoya Lon invested part of her $25,000 bonus at 8% annual simple interest, and the rest at 9% simple interest. If her total yearly interest from both was $2135, find the amount at each rate. (6 pts)

$.08X + .09(25000 - X) = 2135$

$.08 + 2250 - .09X = 2135$
$-2250 \qquad\qquad -2250$

$\dfrac{-.01X}{.01} = \dfrac{-115}{-.01}$

$X = \$11,500 \text{ at } 8\%$

$25000 - X = \$13,500 \text{ at } 9\%$

11. Solve. Draw each solution on a number line, and write the solution in interval notation. (7 pts ea.)

a. $4 - x < 8x + 2x = 10x$

$$\underline{+x \quad +x}$$

$$\frac{4}{11} < \frac{11x}{11}$$
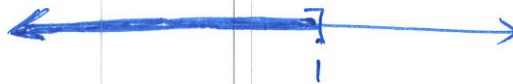
$$\frac{4}{11} < x \quad \text{or} \quad x > \frac{4}{11}$$

$$\left(\frac{4}{11}, \infty\right)$$

b. $4x - 1 \leq 5x - 2x$

$$4x - 1 \leq 3x$$

$$\underline{-3x \qquad -3x}$$

$$x - 1 \leq 0$$

$$\underline{+1 \qquad +1}$$

$$x \leq 1$$

$$(-\infty, 1]$$

Bonus: Solve the equation $\dfrac{5}{6}x + \dfrac{1}{10} = -\dfrac{3(x-1)}{4} - \dfrac{1}{5}$.   LCD = 60   (7 pts)

$$\frac{\cancel{60}^{10}}{1} \cdot \frac{5}{\cancel{6}}x + \frac{\cancel{60}^{6}}{1} \cdot \frac{1}{\cancel{10}} = -\frac{\cancel{60}^{15}}{1} \cdot \frac{3(x-1)}{\cancel{4}} - \frac{\cancel{60}^{12}}{1} \cdot \frac{1}{5}$$

$$50x + 6 = -45(x-1) - 12$$

$$50x + 6 = -45x + 45 - 12$$

$$50x + 6 = -45x + 33$$

$$\underline{+45x \qquad\qquad +45x}$$

$$95x + 6 = 33$$

$$\underline{-6 \qquad -6}$$

$$95x = 27$$

$$\frac{95x}{95} = \frac{27}{95}$$

$$x = \frac{27}{95}$$