Name and section: _____

Instructor's name: _____

- **Please do not open exam until instructed to begin.**

- This exam is to be completed in the allotted time period of 2 hours.

- There are 20 problems which appear on the fronts and backs of the pages of this exam.

- You may earn a total of 100 points.

- Read each question carefully.

- Credit may not be given without sufficient supporting work.

- Simplify answers when possible.

- The use of cell phones, books, or notes are not permitted while taking this exam.

- Approved calculators are allowed.

1. [5 points] A rectangle has a length of 12 inches and an area of 72 square inches. Find the **width** <u>and</u> the **perimeter** of the rectangle. Be sure to include the correct units in each answer.

2. [5 points] Simplify $-2[4x^2 - (5x^2 - 3y)]$.

3. [5 points] Solve for m. Simplify your answer.

$$92m + 12 - 62m = 50 - 16m$$

4. [4 points] Solve the following equation for y.

$$\frac{1}{3}(y - 12) = \frac{1}{6}y + 4$$

5. [5 points] Write the following verbal statement in algebraic form. "x minus 47 equals three times the quantity of six times x plus 5"

6. [5 points] An athlete's average time for all six track meets was 21.8 seconds. The athlete was unable to find their time in the last meet, but knew all of the other times: 21.7 seconds, 21.6 seconds, 22 seconds, 22.1 seconds, 21.9 seconds. What was her running time for her last meet?

7. [5 points] Solve and graph on the number line.

$$\frac{4}{5}x + 2 \leq \frac{3}{10}x$$

8. [5 points] Graph the line with a slope $\dfrac{-3}{4}$ that passes through the point $(-1, 2)$. Be sure to label axes with x, y, and with numbers. Identify at least three points on your line.
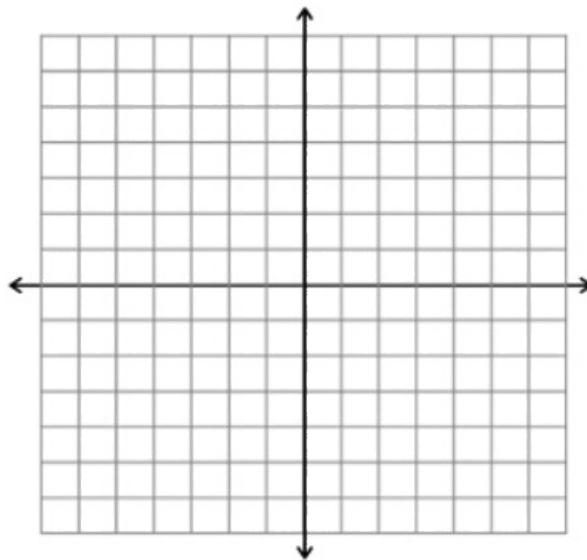
9. [5 points] Find the equation of the line that passes through $(-9, 4)$ and is perpendicular to the line $y = 3x + 10$.

10. [5 points] Solve by graphing the given system of equations. Be sure to label axes with x, y, and with numbers. Identify and label the intersection point.

$$\begin{cases} 3x + 5y = -12 \\ 2x - y = -8 \end{cases}$$
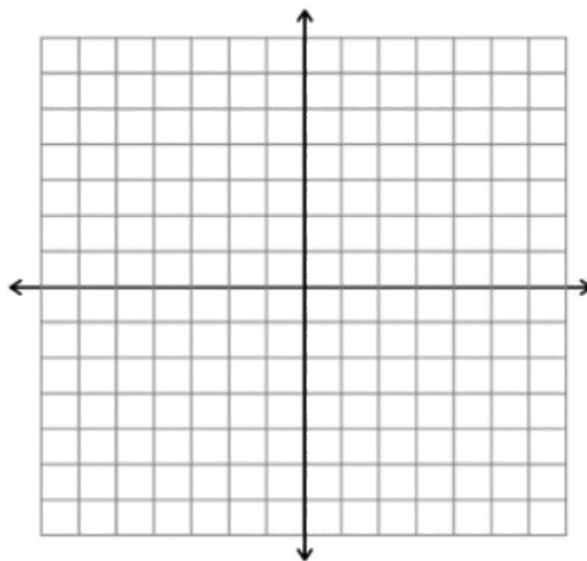
11. [6 points] On Friday, Leah picked up 8 cruellers and 16 cups of tea for the office staff and paid a total of $36.56. On Saturday, Leah picked up 4 cruellers and 12 cups of tea (from the same coffee shop) and paid a total of $22.64. How much does the coffee shop charge for one crueller? How much do they charge for one cup of tea?

12. [5 points] Graph the solution to the system of inequalities. Be sure to label the x and y axes.

$$\begin{cases} y \leq -x + 3 \\ x > 4 \end{cases}$$
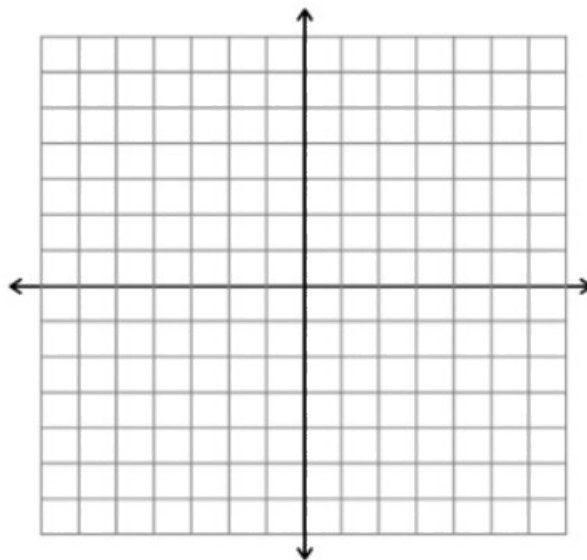
13. [5 points] Multiply and simplify your answer.

$$9x^8 y^7 z^5 \cdot 3x^4 y^{11} z^7 \cdot 2x^6$$

14. [5 points] Simplify. Express your answer with positive exponents. Assume that all variables are nonzero.

$$\frac{y^{-2} z^4}{x^{-5} z^{-3}}.$$

15. [5 points]

    (a) Write 3.814×10^7 in decimal notation.

    (b) Write 9.62×10^{-3} in decimal notation.

16. [5 points] Identify the degree and leading coefficient of the polynomial.

$$-2y^3 + 25y^2 - 8y - 10y^8 + 5y^4$$

Degree:_____
Leading Coefficient: _____

17. [5 points] Simplify $(-8r^2 + 9r - 14) - 4(7r - 9r^2 - 6)$.

18. [5 points] Multiply and simplify $(3x - 4)(4x + 5)$.

19. [5 points] Simplify. Express your answer with only positive exponents.

$$\frac{24a^8b^6c^9}{15a^7b^9}$$

20. [5 points] Divide. Write your answer in standard form, $Q(x) + \dfrac{R}{3x}$.

$$(24x^3 - 6x^2 - 12x + 8) \div (3x)$$

Solutions

1. A rectangle has a length of 12 inches and an area of 72 square inches. Find the **width** and the **perimeter** of the rectangle. Be sure to include the correct units in each answer.

Area $= \ell \times w$	
$72 = 12w$	
Width $= \dfrac{72}{12} = 6$ inches	2.5 pts; if missing units, deduct 0.5 pt.
Perimeter $= 2(12 + 6) = 36$ inches	2.5 pts; if missing units, deduct 0.5 pt.

2. Simplify $-2[4x^2 - (5x^2 - 3y)]$.

$-2[4x^2 - 5x^2 + 3y]$	2 pts to here
$-2[-x^2 + 3y]$	3 pts to here
$2x^2 - 6y$	5 pts to here

3. Solve for m. Simplify your answer.

   $$92m + 12 - 62m = 50 - 16m$$

$30m + 12 = 50 - 16m$	1 pt to here
$30m + 16m = 50 - 12$	2 pts to here
$46m = 38$	3 pts to here
$m = 38/46$	4 pts to here
$m = 19/23$	5 pts total

4. Solve the following equation for y.

   $$\frac{1}{3}(y - 12) = \frac{1}{6}y + 4$$

$\frac{1}{3}y - 4 = \frac{1}{6}y + 4$	1 pt to here
$6\left(\frac{1}{3}y - 4\right) = 6\left(\frac{1}{6}y + 4\right)$	2 pts to here
$2y - 24 = y + 24$	3 pts to here
$y = 48$	4 pts total

5. Write the following verbal statement in algebraic form. "x minus 47 equals three times the quantity of six times x plus 5"

 | | |
   |---|---|
   | $x - 47 = 3(6x + 5)$ | 5 pts |
   | No partial credit. | |

6. An athlete's average time for all six track meets was 21.8 seconds. The athlete was unable to find their time in the last meet, but knew all of the other times: 21.7 seconds, 21.6 seconds, 22 seconds, 22.1 seconds, 21.9 seconds. What was her running time for her last meet?

> $\frac{21.7+21.6+22+22.1+21.9+x}{6} = 21.8$ 2 pts to here
> $109.3 + x = 130.8$ 3 pts to here
> $x = 130.8 - 109.3 = 21.5$ 4 pts to here
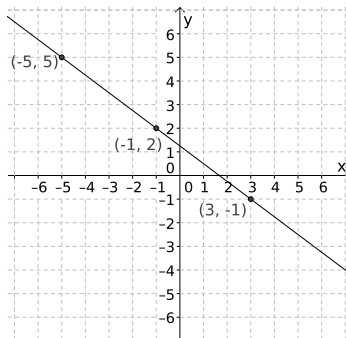> The athlete ran a 21.5 second race.   5 pts total

7. Solve and graph on the number line.

$$\frac{4}{5}x + 2 \le \frac{3}{10}x$$
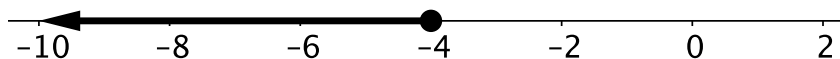
> $\frac{10}{1}\left(\frac{4}{5}x + 2\right) \le \frac{10}{1}\left(\frac{3}{10}x\right)$ 1 pt to here
> $8x + 20 \le 3x$ 2 pts to here
> $x \le -4$ OR $-4 \ge x$ 3 pts to here
> add 2 pts for correct number line.

8. Graph the line with a slope $\dfrac{-3}{4}$ that passes through the point $(-1, 2)$. Be sure to label axes with x, y, and with numbers. Identify at least three points on your line.


> 1 point for correct labeling of axes and numbers on them.
> 3 points for correctly identifying 3 pts.
> 1 pt for the correct line.

9. Find the equation of the line that passes through $(-9, 4)$ and is perpendicular to the line $y = 3x + 10$.

> Slope of the line $y = 3x + 10$ is 3   1 pt to here
> Perpendicular slope: $m = -1/3$ 2 pts to here
> $4 = -\dfrac{1}{3}(-9) + b$ 3 pts to here
> $4 = 3 + b$ so $b = 1$ 4 pts to here
> $y = \dfrac{-1}{3}x + 1$ 5 pts total

10. Solve by graphing the given system of equations. Be sure to label axes with x, y, and with numbers. Identify and label the intersection point.

$$\begin{cases} 3x + 5y = -12 \\ 2x - y = -8 \end{cases}$$
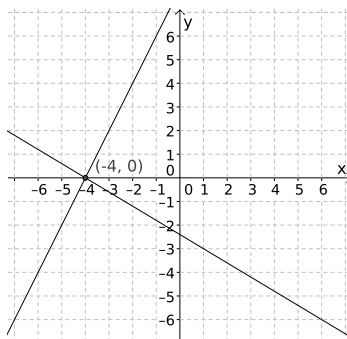
Correct system is graphed	award 2 pts
Axes are labeled	award 1 pt
Intersection point $(-4, 0)$	award 2 pts

11. On Friday, Leah picked up 8 cruellers and 16 cups of tea for the office staff and paid a total of $36.56. On Saturday, Leah picked up 4 cruellers and 12 cups of tea (from the same coffee shop) and paid a total of $22.64. How much does the coffee shop charge for one crueller? How much do they charge for one cup of tea?

Let $x =$ the price of a crueller (in dollars)	
and $y =$ the price of a cup of tea (in dollars)	1 pt to here
$8x + 16y = 36.56$ and $4x + 12y = 22.64$	3 pts to here
$x = 2.39$ and $y = 1.09$	5 pts to here
One crueller costs $2.39	
and one cup of tea costs $1.09.	6 pts total

12. Graph the solution to the system of inequalities. Be sure to label the x and y axes.

$$\begin{cases} y \leq -x + 3 \\ x > 4 \end{cases}$$
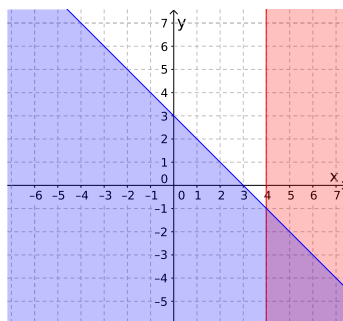
> 1 pt for each correct line
> 1 pt for each correct shading
> 1 pt for the x and y axis labels (5 pts total)

13. Multiply and simplify your answer.

$$9x^8y^7z^5 \cdot 3x^4y^{11}z^7 \cdot 2x^6$$

> $54x^{18}y^{18}z^{12}$ 1 pt for each variable with correct exponent
> and 2 pts for the number 54

14. Simplify. Express your answer with positive exponents. Assume that all variables are nonzero.

$$\frac{y^{-2}z^4}{x^{-5}z^{-3}}.$$

> $\dfrac{x^5z^4z^3}{y^2}$ 1 pt each for variables x and y (with positive exponent)
>
> $\dfrac{x^5z^7}{y^2}$ 2 pts for getting exponent of z correct
> and 1 pt extra for getting it all correct.

15. (a) Write 3.814×10^7 in decimal notation.
    (b) Write 9.62×10^{-3} in decimal notation.

> (a) 38,140,000   2.5 pts
> No partial credit.
> (b) 0.00962   2.5 pts
> No partial credit.

16. Identify the degree and leading coefficient of the polynomial.

$$-2y^3 + 25y^2 - 8y - 10y^8 + 5y^4$$

Degree:_____
Leading Coefficient: _____

> Degree: 8   2.5 pts
> Leading Coefficient: -10   2.5 pts
> No partial credit.

17. Simplify $(-8r^2 + 9r - 14) - 4(7r - 9r^2 - 6)$.

> $-8r^2 + 9r - 14 - 28r + 36r^2 + 24$ 3 pts to here
> $= 28r^2 - 19r + 10$ 5 pts total

18. Multiply and simplify $(3x - 4)(4x + 5)$.

> $12x^2 + 15x - 16x - 20$ 3 pts to here
> $12x^2 - x - 20$ 5 pts total

19. Simplify. Express your answer with only positive exponents.

$$\frac{24a^8b^6c^9}{15a^7b^9}$$

> $\dfrac{8ac^9}{5b^3}$ 1 pt for each variable with correct exponent
>
> 2 pts for the number $\dfrac{8}{5}$

20. Divide. Write your answer in standard form, $Q(x) + \dfrac{R}{3x}$.

$$(24x^3 - 6x^2 - 12x + 8) \div (3x)$$

> $\dfrac{24x^3}{3x} - \dfrac{6x^2}{3x} - \dfrac{12x}{3x} + \dfrac{8}{3x}$ 3 pts to here
>
> $8x^2 - 2x - 4 + \dfrac{8}{3x}$ 5 pts total