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** and the **perimeter** of the rectangle. Be sure to include the correct unit in the answer.

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

3. [5 points] Solve for c. Simplify answers.

$$5(2c + 3) - 4 = -5c + 6$$

4. [5 points] Solve the following equation for y.

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

5. [5 points] Write an algebraic expression for the quantities being compared. "The amount of rainfall in New Haven is 25 inches less than double the amount of rainfall in Seattle."

6. [5 points] Leroy wants to buy a new laptop. After searching online, he found a laptop on sale for 20% off the original price. There was a \$10 charge for shipping, but no tax. The original price was \$500.00. What was his total cost after the discount and shipping charge? Define your variable, solve, and give your answer in a sentence.

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

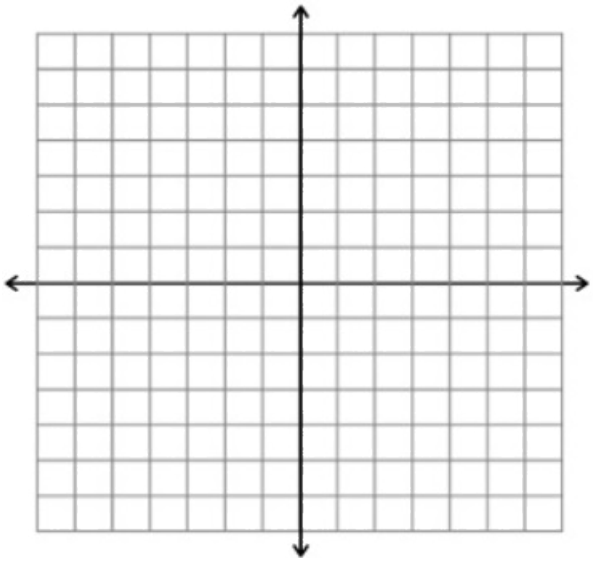
$$\frac{4}{5}x + 2 \leq \frac{3}{10}x$$

8. [5 points] Find the slope, y-intercept, and x-intercept of the line.

$$10x + 7y = -5$$

9. [5 points] Find an equation of the line that passes through $(-5, 7)$ and $(-7, -5)$.

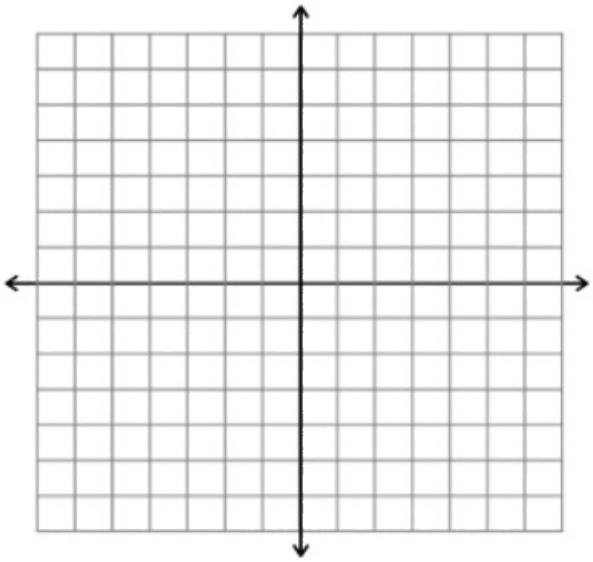
10. [5 points] Solve the system of equations by graphing. Be sure to label axes with x, y, and numbers. Identify and label the point of intersection.



$$\begin{cases} y = -\frac{3}{2}x + \frac{5}{2} \\ y = x + 5 \end{cases}$$

11. [5 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.

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

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 scientific notation.

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

$$-4y^8 + 12y^5 - 8y^3 + 5y$$

    Degree:_____
    Leading Coefficient: _____

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

18. [5 points] Multiply and simplify $-5x^2y(-7x^2 + 8x - y^4)$.

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

$$\frac{(4a^6bc^4)^3}{48a^{20}}$$

20. [5 points] Using long division, divide.

$$(6x^3 + 5x^2 - 16x + 6) \div (2x - 1)$$

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 unit in the 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 c. Simplify answers.

$$5(2c + 3) - 4 = -5c + 6$$

$10c + 15 - 4 = -5c + 6$	1 pt to here
$10c + 5c = -15 + 4 + 6$	2 pts to here
$15c = -5$	3 pts to here
$c = -\dfrac{5}{15}$	4 pts to here
$c = -\dfrac{1}{3}$	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 an algebraic expression for the quantities being compared. "The amount of rainfall in New Haven is 25 inches less than double the amount of rainfall in Seattle."

$r =$ amount of rainfall in Seattle (inches)	2 pts
$2r - 25 =$ amount of rainfall in New Haven (inches)	3 pts
Deduct 1 point if units are missing.	

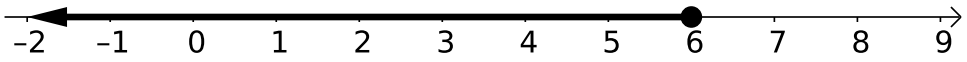
6. Leroy wants to buy a new laptop. After searching online, he found a laptop on sale for 20% off the original price. There was a \$10 charge for shipping, but no tax. The

original price was \$500.00. What was his total cost after the discount and shipping charge? Define your variable, solve, and give your answer in a sentence.

$x =$ the discounted price with the shipping charge	1 pt
$0.20 \cdot 500 =$ the 20% discount	1 pt
$x = 500 - 0.20 \cdot 500 + 10$	1 pt
$x = 410$	1 pt
The cost of his laptop, including shipping, was \$410.	1 pt

7. Solve and graph on the number line.

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



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

8. Find the slope, y-intercept, and x-intercept of the line.

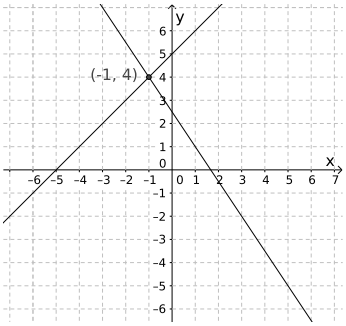
$$10x + 7y = -5$$

slope: $-\frac{10}{7}$	1 pt
y-intercept: $\left(0, -\frac{5}{7}\right)$	2 pts
x-intercept: $\left(-\frac{1}{2}, 0\right)$	2 pts

9. Find an equation of the line that passes through $(-5, 7)$ and $(-7, -5)$.

$m = \frac{-5-7}{-7+5}$	1 pt
$m = 6$	1 pt
$y = 6x + 37$	3 pts for
$y + 5 = 6(x + 7)$	correct equation
$y - 7 = 6(x + 5)$	(any of these)

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



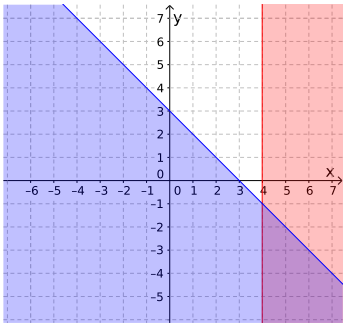
$$\begin{cases} y = -\frac{3}{2}x + \frac{5}{2} \\ y = x + 5 \end{cases}$$

Correct system is graphed	award 2 pts
Axes are labeled	award 2 pts
Intersection point $(-1, 4)$	award 1 pt

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 pts 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.

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

$\dfrac{\dfrac{x^5z^4z^3}{y^2}}{\dfrac{x^5z^7}{y^2}}$	1 pt for each variable with positive exponent 1 pt 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 scientific 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.

$$-4y^8 + 12y^5 - 8y^3 + 5y$$

Degree:_____
Leading Coefficient: _____

Degree: 8	2.5 pts
Leading Coefficient: -4	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 $-5x^2y(-7x^2 + 8x - y^4)$.

$-5x^2y(-7x^2) - 5x^2y(8x) - 5x^2y(-y^4)$	2 pts to here
$= 35x^4y - 40x^3y + 5x^2y^5$	1 pt for each correct term

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

$$\frac{(4a^6bc^4)^3}{48a^{20}}$$

$\frac{4b^3c^{12}}{3a^2}$	1 pt for each variable with correct exponent
	2 pts for the number $\frac{4}{3}$ (or anything equal to $\frac{4}{3}$)

20. Using long division, divide.

$$(6x^3 + 5x^2 - 16x + 6) \div (2x - 1)$$

Set up long division properly	2 points
$3x^2 + 4x - 6$	1 point for each correct term