

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 18 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.

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

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

$$4 - 7m - 13 = 8m - 3 - 5m$$

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

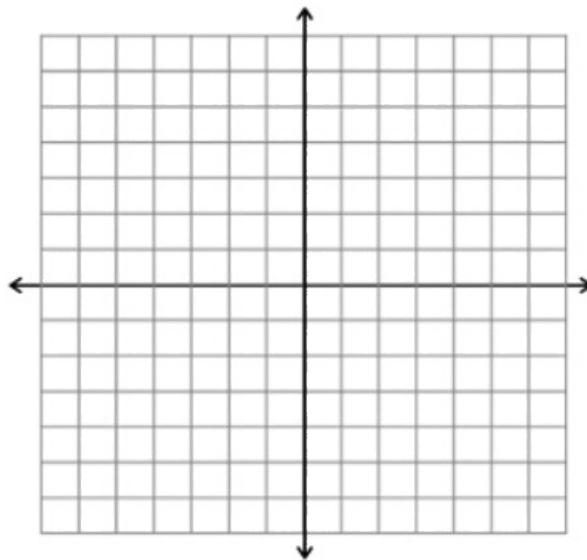
$$\frac{1}{4}(y - 12) = \frac{1}{12}y + 2$$

5. [5 points] Write the following verbal statement in algebraic form. “ $x$  minus 3 equals four times the quantity of two times  $x$  minus 9”
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.

$$\frac{1}{2}x + 3 \leq \frac{3}{4}x$$



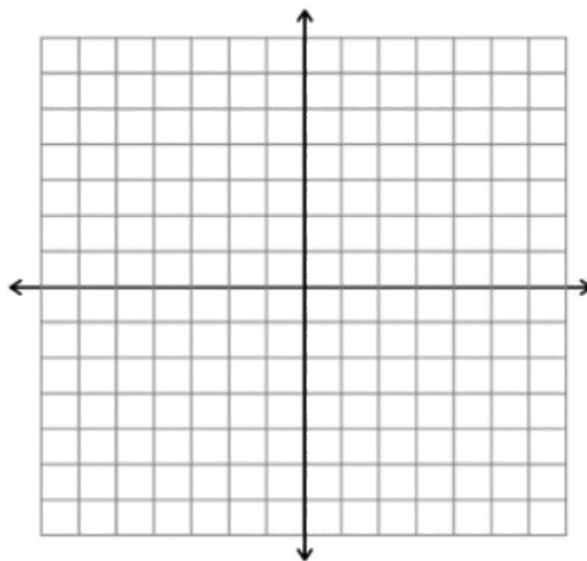
8. [5 points] Graph the line with a slope  $-\frac{3}{4}$  that passes through the point  $(-1, 2)$ . Be sure to label axes with  $x$ ,  $y$ , and with numbers. Identify at least three points on your line.



9. [5 points] Find the equation of the line that passes through  $(2, -3)$  and is perpendicular to the line  $y = 2x - 9$ .

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.

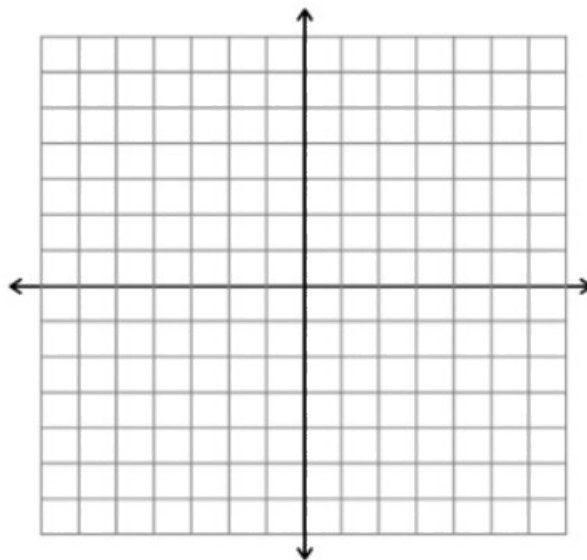
$$\begin{cases} 5x + 3y = 4 \\ 2x - y = 6 \end{cases}$$



11. [6 points] On Wednesday, Gabriel picked up 10 cookies and 30 cups of hot cider for the office staff and paid a total of \$56.60. On Tuesday, Gabriel picked up 9 cookies and 18 cups of hot cider (from the same coffee shop) and paid a total of \$38.43. How much does the coffee shop charge for one cookie? How much do they charge for one cup of hot cider?

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

$$\begin{cases} y \geq -x + 2 \\ x < -3 \end{cases}$$



13. [5 points] Multiply and simplify your answer.

$$6x^3y^8z^4 \cdot 3x^7y^9z^{13} \cdot 5x^{10}$$

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

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

15. [5 points]

(a) Write  $3.814 \times 10^7$  in decimal notation.

(b) Write  $9.62 \times 10^{-3}$  in decimal notation.

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

$$2x^2 - 10 + 2x^6 - 5x^4 + 3x$$

Degree: \_\_\_\_\_

Leading Coefficient: \_\_\_\_\_

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

18. [5 points] Multiply and simplify  $(5x + 3)(3x - 2)$ .

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

$$\frac{12a^5b^9c^7}{20a^8c^3}$$

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

$$(15x^3 + 20x^2 - 30x + 4) \div (5x)$$



## Solutions

1. A rectangle has a length of 18 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.

$$\begin{aligned} \text{Area} &= \ell \times w \\ 72 &= 18w \\ \text{Width} &= \frac{72}{18} = 4 \text{ inches} && 2.5 \text{ pts; if missing units, deduct 0.5 pt.} \\ \text{Perimeter} &= 2(18 + 4) = 44 \text{ inches} && 2.5 \text{ pts; if missing units, deduct 0.5 pt.} \end{aligned}$$

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

$$\begin{array}{ll} -3[2x^2 - 4x^2 + y] & 2 \text{ pts to here} \\ -3[-2x^2 + y] & 3 \text{ pts to here} \\ 6x^2 - 3y & 5 \text{ pts to here} \end{array}$$

3. Solve for  $m$ . Simplify your answer.

$$4 - 7m - 13 = 8m - 3 - 5m$$

$$\begin{array}{ll} -7m - 9 = 3m - 3 & 1 \text{ pt to here} \\ -7m - 3m = -3 + 9 & 2 \text{ pts to here} \\ -10m = 6 & 3 \text{ pts to here} \\ m = -6/10 & 4 \text{ pts to here} \\ m = -3/5 & 5 \text{ pts total} \end{array}$$

4. Solve the following equation for  $y$ .

$$\frac{1}{4}(y - 12) = \frac{1}{12}y + 2$$

$$\begin{array}{ll} \frac{1}{4}y - 3 = \frac{1}{12}y + 2 & 1 \text{ pt to here} \\ 12\left(\frac{1}{4}y - 3\right) = 12\left(\frac{1}{12}y + 2\right) & 2 \text{ pts to here} \\ 3y - 36 = y + 24 & 3 \text{ pts to here} \\ y = 30 & 4 \text{ pts total} \end{array}$$

5. Write the following verbal statement in algebraic form. “ $x$  minus 3 equals four times the quantity of two times  $x$  minus 9”

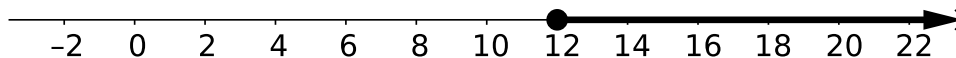
$$\begin{array}{l} x - 3 = 4(2x - 9) \quad 5 \text{ pts} \\ \text{No partial credit} \end{array}$$

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

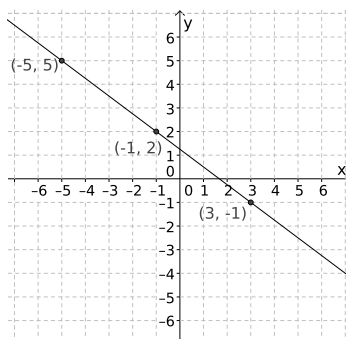
7. Solve and graph on the number line.

$$\frac{1}{2}x + 3 \leq \frac{3}{4}x$$



$\frac{4}{1} \left( \frac{1}{2}x + 3 \right) \leq \frac{4}{1} \left( \frac{3}{4}x \right)$	1 pt to here
$2x + 12 \leq 3x$	2 pts to here
$12 \leq x$ OR $x \geq 12$	3 pts to here
add 2 pts for correct number line.	

8. Graph the line with a slope  $-\frac{3}{4}$  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.



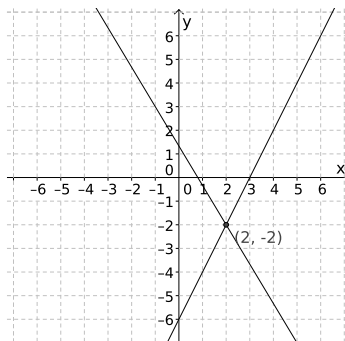
1 point for correct labeling of axes and numbers on them.  
 3 points for correctly identifying 3 pts.  
 1 pt for the correct line.

9. Find the equation of the line that passes through  $(2, -3)$  and is perpendicular to the line  $y = 2x - 9$ .

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

$$\begin{cases} 5x + 3y = 4 \\ 2x - y = 6 \end{cases}$$



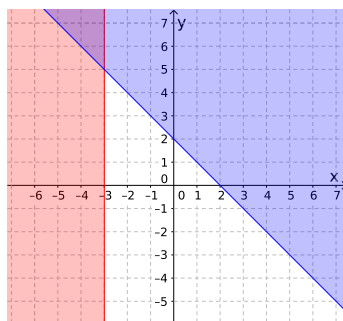
Correct system is graphed	award 2 pts
Axes are labeled	award 1 pt
Intersection point $(2, -2)$	award 2 pts

11. On Wednesday, Gabriel picked up 10 cookies and 30 cups of hot cider for the office staff and paid a total of \$56.60. On Tuesday, Gabriel picked up 9 cookies and 18 cups of hot cider (from the same coffee shop) and paid a total of \$38.43. How much does the coffee shop charge for one cookie? How much do they charge for one cup of hot cider?

Let $x$ = the price of a cookie (in dollars)	
and $y$ = the price of a cup of hot cider (in dollars)	1 pt to here
$10x + 30y = 56.60$ and $9x + 18y = 38.43$	3 pts to here
$x = 1.49$ and $y = 1.39$	5 pts to here
One cookie costs \$1.49	
and one cup of hot cider costs \$1.39.	6 pts total

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

$$\begin{cases} y \geq -x + 2 \\ x < -3 \end{cases}$$



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.

$$6x^3y^8z^4 \cdot 3x^7y^9z^{13} \cdot 5x^{10}$$

$90x^{20}y^{17}z^{17}$  1 pt for each variable with correct exponent  
 and 2 pts for the number 90

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

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

$\frac{z^2}{x^4x^5y^3}$  1 pt each for variables  $y$  and  $z$  (with positive exponent)

$\frac{z^2}{x^9y^3}$  2 pts for getting exponent of  $x$  correct  
 and 1 pt extra for getting it all correct.

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

$$2x^2 - 10 + 2x^6 - 5x^4 + 3x$$

Degree: \_\_\_\_\_

Leading Coefficient: \_\_\_\_\_

Degree: 6 2.5 pts  
 Leading Coefficient: 2 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  $(5x + 3)(3x - 2)$ .

$15x^2 - 10x + 9x - 6$	3 pts to here
$15x^2 - x - 6$	5 pts total

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

$$\frac{12a^5b^9c^7}{20a^8c^3}$$

$\frac{3b^9c^4}{5a^3}$	1 pt for each variable with correct exponent
	2 pts for the number $\frac{3}{5}$

20. Divide. Write your answer in standard form,  $Q(x) + \frac{R}{5x}$ .

$$(15x^3 + 20x^2 - 30x + 4) \div (5x)$$

$\frac{15x^3}{5x} + \frac{20x^2}{5x} - \frac{30x}{5x} + \frac{4}{5x}$	3 pts to here
$3x^2 + 4x - 6 + \frac{4}{5x}$	5 pts total