Instructions: *Your job over the coming weeks is to review all the material from the semester by doing the problems in this worksheet. It will serve as your Practice Final (no other will be given). When you come across a problem that you can't do, you should start by looking the topic up in your books and/or notes. If you still aren't successful then you should seek tutoring. I have gone through the learning outcomes and sought examples of problems that exhibit each. In some cases the learning outcomes are duplicated, but I am trying to give you extra practice. You will hand this in on Tuesday, December 8 as your homework assignment. We will go over it in class as much as possible. Try to keep your work on this paper.*

Learning Outcome #1

1.   Simplify. Show all intermediate steps. Remember mixed numbers and reducing.

a) $\dfrac{5\,\frac{1}{2} \;+\; 2\,\frac{1}{3}}{\frac{1}{6} \;-\; \frac{4}{5}}$ b) $2\,\frac{1}{3} \cdot 3$ c) $\frac{4}{5} \div 1\,\frac{1}{5}$

d) $3 \cdot 4 \;+\; 20 \div 4 \;-\; 2^3$ e) $\dfrac{7 \;+\; \text{-}7}{21}$ f) $\dfrac{\frac{1}{9} \cdot 9}{18 \;+\; \text{-}18}$

2.   Simplify. Show all intermediate steps.

a) $5^0 - 2^{-2}$ b) $(\text{-}3)^2$ c) $\text{-}3^2$ d) $(3x^2y)^2$

e) $\dfrac{x^{-6}\,x^{-2}\,y^2}{(x\,y^{-2})^2}$ f) $\dfrac{x^2\,y^6}{x^3\,y^3}$

3.   Simplify completely.

a) $\sqrt{\text{-}16}$ b) $\sqrt[3]{\text{-}8}$ c) $\sqrt{25x^6y^{16}}$

4.   Simplify. Show all intermediate steps.

a) $-\,|\,-9 \cdot 5\,|$ b) $(-\tfrac{1}{3})^2$ c) $-\,3^2$

5.   Write an equivalent expression using addition? $-295 - (-172)$

6.   Subtract. Remember all work must be shown!

a) $\tfrac{3}{18} - \tfrac{7}{10}$ b) $-5 + -\tfrac{12}{23}$

Learning Outcome #2

1.   Solve the following linear equations in one variable.

a) $2(x + 5) - 9x = 13 - 3(x + 1)$ b) $5x + 12 = 5(x + 12)$

c) $2(x - 5) - 9 = 2x - 19$

2.   Check your solution to #1a

3.   Solve the following. **Clear fractions** first for full credit. Graph the solution.

$$\tfrac{1}{2} < \tfrac{2}{3} - \tfrac{1}{4}x \le 1\tfrac{1}{2}$$

4. Give an expression for Joe's age in terms of Sally's age from the following story.
    Joe's age is 7 more than twice Sally's age. Let Sally's age be "x".

5. A certain college's enrollment was 4,000 students in 2005. Every year thereafter
    the college's enrollment increases by 2,000 students.

    a) Fill in the table below for this scenario

# of years since 2005	enrollment (in thousands)
0	
1	
2	
n	

    b) Make a scattergram for the ordered pairs represented in the table in part a)
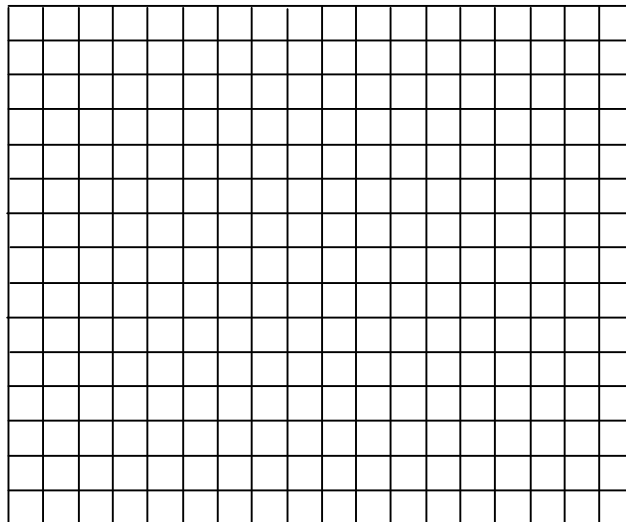
    c) On the scattergram in part b) draw a linear model.

    d) Predict the enrollment in 2010. Show your work with lines on the model.
        Give the answer here with correct units _____

    e) Use your model to estimate how many years after 2005 the enrollment will
        be 12,000 students. Give the answer here with correct units

        _____

Learning Outcome #3

1. What is the equation of the line through (5, -2) and (6, -8), in correct slope-intercept form.
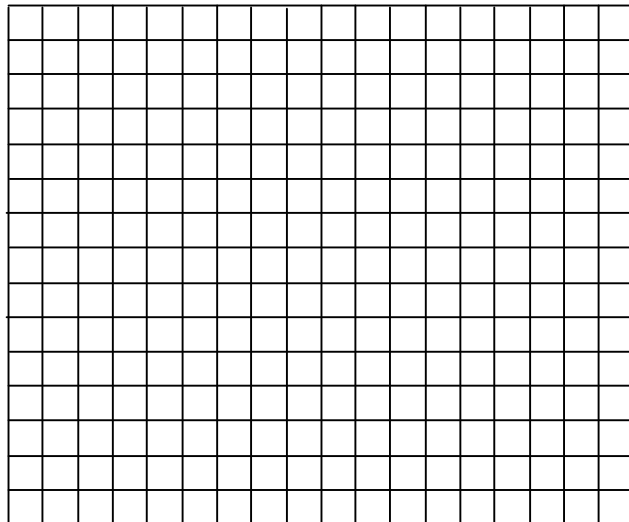
2. What is the equation of the line that is perpendicular to the line $2x + 3y = 6$
    through (0, 9)? (Give in slope-intercept form)

3. What is the equation of the line through (6,5) and (-9, 5)
    (Give in slope-intercept form)

4. The line that is vertical through (-5, -2)

5. Give 3 solutions to the following equation and then use them to plot the line.
    Make sure that one is an intercept.
        $2x - 3y = 9$

6.   Graph the following to show the solution. I need to see the boundary lines graphed using 3 labeled points. Show how you used the slope and the y-intercept to get these 3 points. Give the check points (showing all work) above and below the boundary line to show validation of your solution.

$$x - y > 5$$
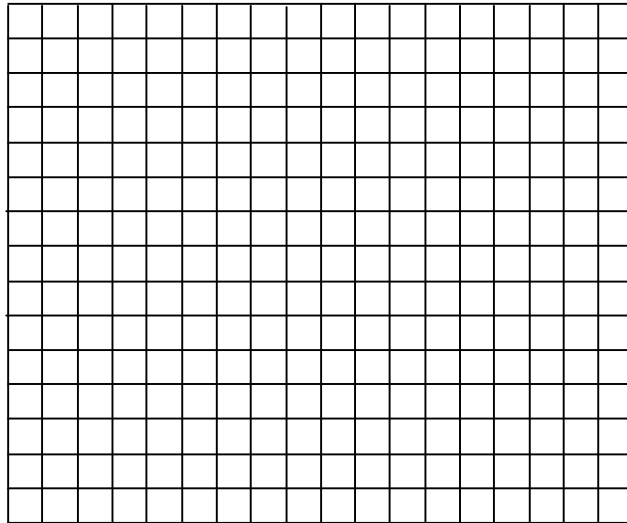
7.   A student enrolled for a semester in a certain community college pays $35 per unit to enroll in classes and two fees totaling $51. The total cost of enrolling in "n" units will cost the student some total amount of money "T". Answer the questions that follow for t his story.

a)   Give the independent variable (as a variable based on the story above).

b)   Give the dependent variable (as a variable based on the story above). Use function notation to represent it as a function of the independent.

c)   What is the baseline (start value)?

d)   What is the rate of change?

e)   Give the linear equation for this situation. Use function notation

f)   Give a t-table of 3 values for the model that you gave that satisfy the scenario.

x	y

8.   Using the following table of values, answer the questions that follow.

x	y
2	2
3	-3
4	-8

a)   Is this a linear function? How can you tell?

b)   What is the rate of change? How did you arrive at it?

c)   For a linear function what do we call the rate of change?

d)   Use the point-slope form of a line to find the y-intercept of this linear function.
     Plug in and then show simplification to slope-intercept form.

Learning Outcome #4

1.   Find the solution to the following system of equations in 2 variables **by graphing**.
     $$y = x^2 + 1 \qquad \text{and} \qquad y - 2 = \tfrac{1}{5}(x - 5)$$
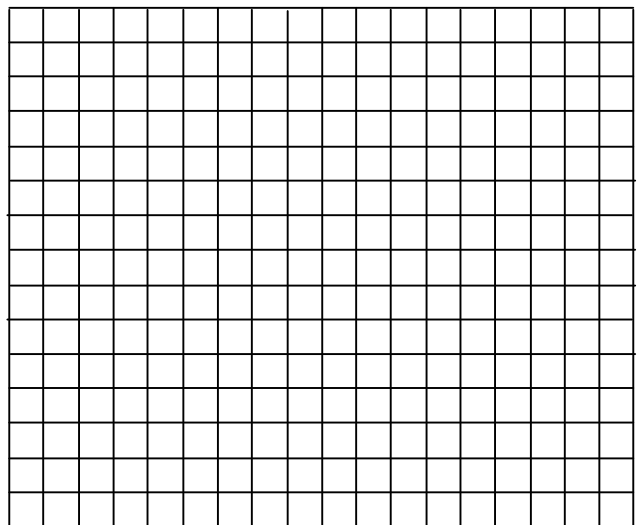
2.   Solve the following system of linear equations in 2 variables by substitution. Give the
     solution as an ordered pair.
     $$5x - 2y = 10$$
     $$-x + y = 1$$

3. Solve the following system of linear equations in 2 variables by elimination. Give the solution as an ordered pair.

$$\frac{7}{2}x + \frac{7}{3}y = \frac{49}{2}$$
$$\frac{1}{4}x + \frac{1}{3}y = \frac{11}{4}$$

4. Which of the following i) or ii) answer the questions that follow?

   i) $6x - 9y = -39$ ii) $9x - 21y = 6$

          $-4x + 6y = 26$ $-6x + 14y = -5$

a) Is a dependent/consistent system? _____

b) Is an independent/inconsistent system? _____

c) Has infinite solutions? _____

d) Has no solution or a solution of "null set"? _____

5. In 2008, the price of Car A was $15,177 and had a depreciation of $1507 per year. In 2008, the price of Car B was $12,965 and had a depreciation of $1094 per year. Answer the questions that follow.

a) Give a linear equation for the value of Car A, t years after 2008.

b) Give a linear equation for the value of Car B, t years after 2008.

c) In what year will the value of Car A & Car B be the same? Show your work for finding that value.

d) What will the value of both Car A & Car B be in the year found in part c)?

Learning Outcome #5

1.   Simplify by expanding and/or combining like terms.

a) $3(2x + 4) - (x - 4)$

b) $(5x^2 + 5x - 9) - (3x + x^2 - 10)$

c) $(x + 2)(x - 2)(x - 1)$

d) $3x^3y(5x^2y + 2xy^3 - xy)$

e) $5xy + 6xy - xy$

f) $\frac{1}{5}x - \frac{2}{7} + \frac{1}{6}(5x - \frac{2}{3})$

2.   Using $f(x) = 2x + 3,$ $g(x) = 5x - 1$ & $h(x) = -2$
      complete the following:

a) $(f \cdot g)(x)$

b) $g(x) - h(x) \cdot f(x)$

c) $h(x) \cdot f(x) + g(x)$

*d) $f(x) = h(x)$

*Note: This one really belongs with learning outcome #2.

4.   Find the quotient by separating into individual terms and using the quotient rule for exponents.
$$(12x^3y^3 + 16x^5y^4 - 18x^5 y) \div (3xy^3)$$

5.   Use the "formula" for expanding the square of a binomial to multiply/expand.
$$(15x + 7)^2$$

6.   Use the "formula" for multiplying conjugates to multiply.
$$(25x + 13)(25x - 13)$$

Learning Outcome #6
1.   Factor Completely

a) $9xy - 3x - 9y + 3$ b) $10a^2b^3 + 5ab^2 - 15ab^3$

c) $4x^2 + 6x + 9$ d) $6x^2 - 5x + 4$

e) $9x^2 - 42x + 49$ f) $9x^2 - 64$

g) $8x^3 + 64$ h) $27x^3 - y^3$

The following are an extension of Learning Outcome #6 & the testing for rational expression work that we have done.

2. Give the domain of $\dfrac{x^2 - 3x - 54}{x^2 + 13x + 40}$ using set builder notation.

3. Simplify the following: $\dfrac{x^2 - 2x - 15}{x^3 - 7x^2 + 10x}$

4. Divide: $\dfrac{2x^2 + 5x + 2}{2x^2 - 9x - 5} \cdot \dfrac{5x^2 - 45x + 100}{x^2 - 2x - 8}$

5. Divide. Don't forget to simplify.

$\dfrac{x^2 - 4x + 4}{x^2 + 5x + 4} \div \dfrac{2x^2 - 8}{x^2 + 3x - 4}$

6. Add or Subtract. Don't forget to simplify.

a) $5 + \dfrac{3}{y}$

b) $\dfrac{1}{2x + 2} - \dfrac{x}{x^2 - 1}$

c) $$\frac{x^2 - 4x - 5}{x^2 - 3x + 2} + \frac{x^2 + 4x - 3}{x^2 - 3x + 2}$$

7. Solve the following using the zero factor property. If you do not use the zero factor property you will not get credit. Give your answer in <u>roster form.</u>
$$6x^2 - 19x = 7$$

Learning Outcome #7

1. An 81-inch string is to be cut into two pieces. One piece is to be 11 inches longer than the other. Find the length of each piece?

2. The sum of two numbers is 110. The difference of the two numbers is 52. Find the numbers. Use two equations & two unknowns.

3. One angle of a triangle is 6 more than twice the smallest angle. The third angle is 6 less than 2 times the smallest angle. Find the three angles.

4.   How many liters of a 40% solution and a 70% solution must be
      mixed to obtain 30 liters of a 55% solution?

5.   An actuary invests $26,000 in a bond and a money market. If the bond yields
      12% and the money market 7% simple annual interest, how much is invested in
      each, if the annual interest from both is $2,420? Use two equations & two
      unknowns.

6.   The length of a rectangle is 8 more than the width. If the area is 105 square
      inches, find the dimensions. This will use a quadratic equation to solve.

*7.   The hypotenuse of a right triangle is 10 inches. Leg "a" is 4 less than twice leg b.
      Find the length of leg a. (You may use the quadratic formula, but a hint is that one root is
      - $^{14}/_5$, and 5 is prime.) You should know the Pythagorean Theorem. Look it up if you don't. This
      will also use a quadratic equation to solve.

Additional Items Taught During the Semester
1.   Draw a number line, and correctly place (graph)   -1 $^1/_5$ and 0.7
      When placing a decimal or fraction the number line must be broken into appropriate increments
      between 2 whole #'s to accurately show the decimal or fraction

2.   Compare the following using <, > or =.   a) $^2/_5$ _____ $^7/_9$

b)   -0.751 _____ -0.715

c) $-^1/_3 \cdot 3$ _____ -1

3.   State whether the following **is or is not** a function (state reasons).
a)   {(0,2),(5, 2),(3, 2)}   b)   f(x)= 3|x − 3| c)

2 → 6
3 → 7
4
5 → 9
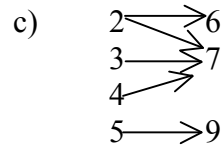
4.   Give the **domain** and **range** of the relation in 3 a).

5.   Using $g(x) = 3x^2 - x - 4$ find   g(-1)

I am going to be teaching a quick lesson on scientific notation in class.
6.   Put into **correct** scientific notation.
a)   0.00021   b)   210,501,000

7.   Write in standard form.
a) 5.01×10^6 b) 7.0201×10^{-5}

8.   Simplify. Use scientific notation (exponent rules) to solve and correct scientific notation to give
          your final answer.
a) $(3 \times 10^5)(4 \times 10^3)$ b) $\dfrac{2.5 \times 10^5}{5 \times 10^7}$