

The problems on this exam do not represent all of the material covered in this course. Each semester we test a subset of the many problems that are done during the semester. Be sure to check out the list of topics for this year's final at http://www.utm.edu/staff/lkolitsc/math_191.htm.

Math 191, Final Exam

Name _____

There are 17 problems on this exam. Show work and explain in order to receive full credit. Those problems that require explanations are clearly indicated. Answers that require explanations will be given at most half credit if work appears with no explanation. For all models draw the appropriate pictures and include enough written details to explain the pictures. Be sure to follow all directions.

1. Put the following list of numbers in order from smallest to largest. Explain the process used. (10 points)

$$7, -4, \frac{12}{5}, \frac{16}{-3}, 4\frac{1}{2}, -1\frac{1}{3}, 0$$

2. Calculate each of the following values. (4 points)

$$919 \times 1 = \underline{\hspace{2cm}}$$

$$919 \times 2 = \underline{\hspace{2cm}}$$

$$919 \times 3 = \underline{\hspace{2cm}}$$

$$919 \times 4 = \underline{\hspace{2cm}}$$

Explain the pattern you observe in your answers. Use your pattern to predict the values for each of the following products. (10 points)

$$919 \times 5 = \underline{\hspace{2cm}}$$

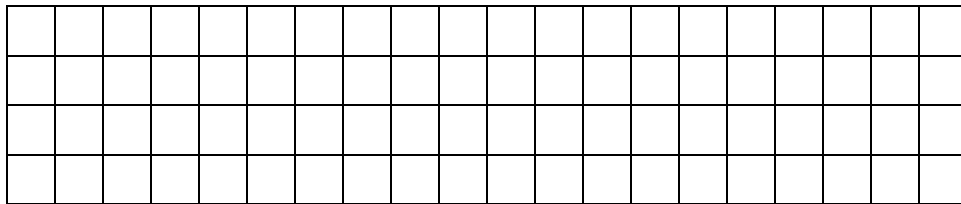
$$919 \times 6 = \underline{\hspace{2cm}}$$

3. Count the number of squares shown below using BASE SIX. (10 points)

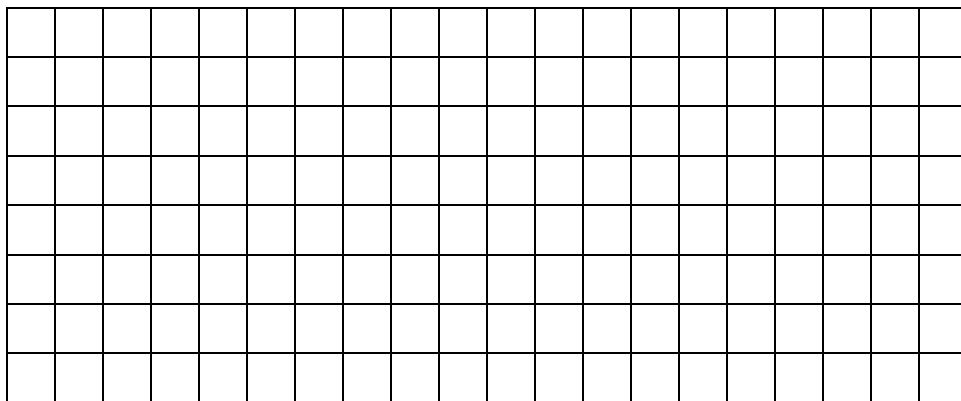


4. An orange Cuisenaire rod is the same length as a White-Purple-Yellow train.

(a) Write this relationship as a whole number equation. Draw and label rod pictures to explain. (6 points)



(b) Write this relationship as a fraction equation using an Orange-Orange train as your WHOLE. Draw and label rod pictures to explain. (10 points)



5. (a) Perform the following division using a pattern block model. Briefly explain the diagrams that you draw. (10 points)

$$YYYY \div BB$$

- (b) Using Y as your WHOLE, write the problem in part (a) as a division of fractions problem. Explain. (8 points)

- (c) Use our algorithm for division of rational numbers to determine the quotient for the problem in part (b). Include all intermediate steps in your calculation. (10 points)

6. Use pattern blocks to model $\frac{10}{3}$ and explain how to convert this improper fraction to a mixed number. Be sure to identify your WHOLE. (10 points)

7. Use pattern blocks to model $2\frac{3}{4}$ and explain how to convert this mixed number to an improper fraction. Be sure to identify your WHOLE. (10 points)

8. Use an appropriate model to determine each of the following calculations. Include all necessary explanation for each. Draw your models on the separate sheets of graph paper or typing paper provided. (10 points each)

(a) $\frac{3}{4} \times \frac{1}{5}$

(b) $1\frac{1}{3} + 2\frac{1}{2}$

(c) $2\frac{1}{6} - 1\frac{1}{4}$

(d) $3 \times^{-} 4$

(e) $12 - (^{-} 3)$

(f) $350 - 158$

9. Perform the following calculations in BASE SIX. Model one using your BASE SIX blocks and use the instructional algorithm for the other. Include all necessary explanation. (10 points each)

(a)
$$\begin{array}{r} 421 \\ + 325 \\ \hline \end{array}$$

(b)
$$\begin{array}{r} 421 \\ - 325 \\ \hline \end{array}$$

10. Explain how to use Cuisenaire rods to find GCF(20, 16). No pictures are necessary on this problem. (10 points)

11. Determine all possible values of the digit d if $73d0$ is a multiple of 12. Explain how the appropriate divisibility tests are applied to solve this problem. (10 pts)

12. (a) Determine a formula for the n th term in the following sequence. Explain. (6 points)

28, 21, 14, 7, . . .

(b) Is -243 a term in this sequence? Explain. (5 points)

(c) Find the sum of the first 200 terms in this sequence. Explain. (10 points)

13. (a) Use the Euclidean algorithm to find $\text{GCF}(510, 590)$. (10 points)

(b) Use your answer to part (a) to find $\text{LCM}(510, 590)$. (4 points)

(c) Use your answer to part (a) to write the fraction $\frac{590}{510}$ in simplest form. (5 pts)

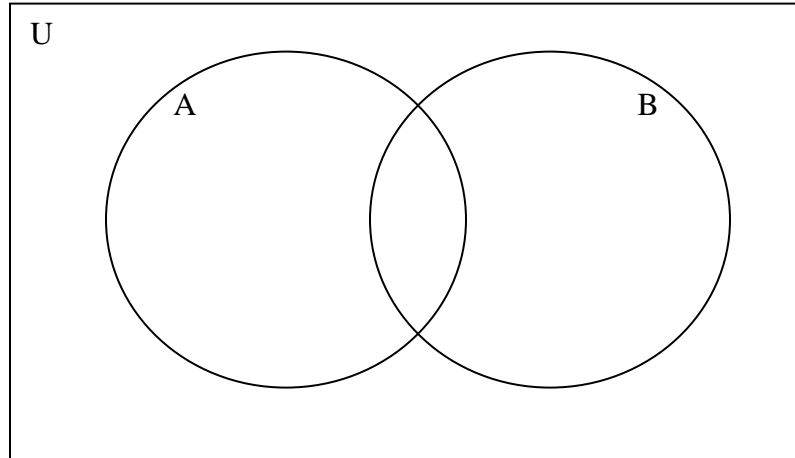
(d) Use the algorithm for addition of rational numbers to determine the following sum. (8 points)

$$\frac{3}{510} + \frac{4}{590}$$

14. Let U be the set of whole numbers from 1 to 20 inclusive.

Let $A = \{ x \in U \mid x \text{ is a multiple of } 5 \}$ and let $B = \{ x \in U \mid x \text{ is a factor of } 27170 \}$.

Place the elements of U in the following two-set Venn diagram. (10 points)



15. Use your completed Venn diagram from problem 14 to list the elements in each of the following sets. (5 points each)

(a) $A \cap B$

(b) $B - A$

(c) $A \cup \bar{B}$

16. Identify the operation(s) and an appropriate model(s) that can be used to solve each of the following story problems. Then use the model(s) specified to solve problem.
(10 points each)

(a) Jan has twelve dollars. She gives five dollars to Marcia. How much money does Jan have left?

(b) Greg has to walk five blocks to the high school. Bobby walks with Greg as far as the elementary school. If Bobby only walks two blocks how many more blocks does Greg have to walk than Bobby?

(c) Cindy's Mom is serving cupcakes at Cindy's birthday party. The cupcakes come in packages of twelve. Cindy's Mom buys four packages of cupcakes. If each guest at the party will eat three cupcakes, how many guests will the cupcakes serve?

17. Identify the property illustrated by each of the following equations. Be sure to correctly spell the answer. (2 points each)

(a) $2 \times (3 + 5) = (2 \times 3) + (2 \times 5)$

(b) $3 + (5 - 2) = (5 - 2) + 3$

(c) $\frac{3}{4} + \frac{-3}{4} = 0$

(d) $12 \times (18 \times 3) = (12 \times 18) \times 3$