

Math 200 - 2nd Final Exam

May 14, 2012

Name key
Score _____

Show all work to receive full credit. Supply explanations where necessary. Multiple choice problems are worth 0, 1, or 2 points depending on your answer and the work shown.

- Choose the subtraction model that best fits the following problem situation: *Oscar must earn a total of \$35 for a field trip. He has already earned \$17. How much more must Oscar earn?*

(a) missing factor
(b) comparison
(c) take away
 (d) missing addend

WHAT plus 17 is 35 ?
- Which one of the following numbers is NOT prime?

(a) 17
(b) 41
 (c) 1
(d) 2
- Based on his performance throughout the semester, Julio made the following conjecture: *If the sun is shining when I take an in-class quiz, I will fail the quiz.* Which of the following would provide Julio with a counterexample?

(a) A take-home quiz that he fails when the sun is shining.
(b) An in-class quiz that he fails when the sun is shining.
(c) An in-class quiz that he passes on a dark, rainy day.
 (d) An in-class quiz that he passes when the sun is shining.
- If A and B are nonempty sets of numbers, describe an element of $A \times B$.

(a) a number that is in both A and B
(b) a number that is in A or B
 (c) an ordered pair of numbers from A and B , respectively
(d) a number that is the product of a number in A and a number in B
- Convert to a numeral in base ten: 4352_{six}

(a) 1004
(b) 4352
(c) 6024
(d) 32052

$4 \times 6^3 + 3 \times 6^2 + 5 \times 6 + 2$
 $= 864 + 108 + 30 + 2 = 1004$

6. Choose the division model that best fits the following problem situation: *Martha is rationing her 36 Hershey's Kisses so that she can eat 4 each day. For how many days can Martha eat her Kisses?*

- (a) set (partition)
- (b) repeated subtraction
- (c) missing factor
- (d) take away

How many groups?

7. When using the 4-step, problem-solving process, which one of these strategies would be considered part of looking back?

- (a) Keep accurate record of your work. ← CARRY OUT PLAN
- (b) Check each step. ← CARRY OUT PLAN
- (c) Consider other possible solution methods. ← LOOK BACK
- (d) Write an equation. ← DEVISE PLAN

8. What type of reasoning are you using when you draw a conclusion based on observation?

- (a) Recursive thinking
- (b) Inductive reasoning
- (c) Circular reasoning
- (d) Deductive reasoning

9. What is the name of the type of sequence shown here?

3, 12, 48, 192, 768, ...

- (a) Geometric sequence
- (b) Arithmetic sequence
- (c) Figurate sequence
- (d) Random sequence

$$3 \times 4 = 12$$

$$12 \times 4 = 48$$

$$48 \times 4 = 192$$

⋮

10. Which one of the fractions below is not equivalent to $\frac{20}{12}$?

- (a) $\frac{200}{120} = \frac{20}{12}$
- (b) $\left(\frac{5}{3}\right) \cdot \left(\frac{4}{4}\right) = \frac{20}{12}$
- (c) $\frac{340}{204} = \frac{5}{3} = \frac{20}{12}$
- (d) $\frac{1820}{1274} = \frac{10}{7}$

11. The GCD of 182 and 520 is 26. What is the LCM of 182 and 520?

- (a) 26
- (b) 3640
- (c) 94640
- (d) 4160

$$\text{LCM} = \frac{182 \times 520}{26} = 3640$$

12. Find the 915th term of the following arithmetic sequence:

$$1, 5, 9, 13, 17, 21, 25, \dots$$

- (a) 3660
- (b) 3661
- (c) 3657
- (d) 2915

$$N^{\text{TH}} \text{ TERM} = 4N - 3$$

$$915^{\text{TH}} \text{ TERM} = 4(915) - 3 = 3657$$

13. Which one of the following divisibility tests is incorrect?

- (a) A whole number is divisible by 4 if the number formed by its last two digits is divisible by 4.
- (b) A whole number is divisible by 12 if it is divisible by both 2 and 6.
- (c) A whole number is divisible by 8 if the number formed by its last three digits is divisible by 8.
- (d) A whole number is divisible by 9 if the sum of its digits is divisible by 9.

14. Suppose x is a negative integer and y is a positive integer.

What is the sign of $-x - (-y)$?

- (a) positive
- (b) negative
- (c) zero
- (d) more information is required

$$-x + y = (-x) + y = \text{POSITIVE} + \text{POSITIVE}$$

15. Choose the multiplication model that best fits the following problem situation: *Fred gave 6 trading cards to each of his 4 best friends. How many cards did Fred give away?*

- (a) Cartesian product
- (b) repeated addition
- (c) set (partition)
- (d) missing factor

16. (5 points) Each of the following strategies is associated with one of the four steps of the problem-solving process. Write the number of the step (1, 2, 3, or 4) that corresponds to each strategy.

(a) Determine other more general problems for which the techniques apply. 4

(b) What information is missing or not needed? 1

(c) Check each step as you proceed. 3

(d) State the problem in your own words. 1

(e) Work backward. 2

(f) Identify a subgoal. 2

(g) Look for a pattern. 2

(h) What are the unknowns? 1

(i) Check your solution in the original wording of the problem. 4

(j) Examine special cases. 2

17. (5 points) Of the following division problems, choose the one whose result is not defined. Then **carefully** explain why it is not defined.

$$0 \div 4, \quad \frac{1}{2} \div \frac{5}{7}, \quad \frac{-9}{2} \div 1, \quad \boxed{3 \div 0}$$

↑
DIVISION BY ZERO
IS NOT DEFINED.

ACCORDING TO THE MISSING FACTOR MODEL,

$3 \div 0$ ASKS "WHAT TIMES 0 IS 3?"

EVERY NUMBER TIMES 0 IS 0, SUCH THERE IS

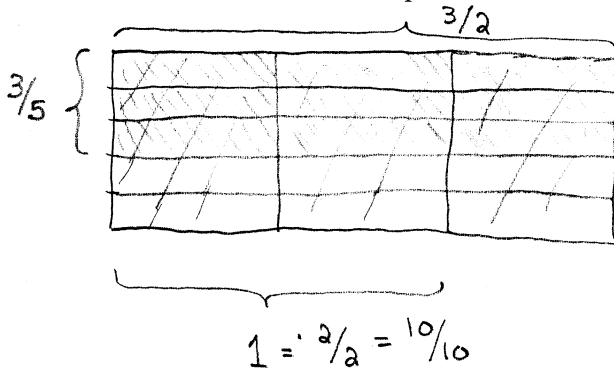
NO SUCH NUMBER.

4 $3 \div 0$ DOES NOT EXIST!

18. (5 points) Use a model to illustrate and compute each of the following.

(a) $\frac{3}{2} \times \frac{3}{5}$

Area

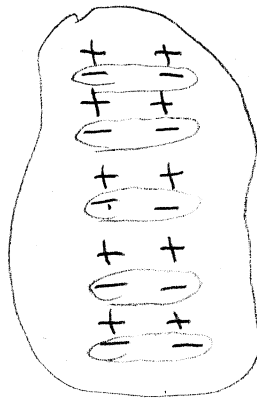


NINE PIECES ARE
SHADED (DARK)
AND 1 WHOLE IS 10
PIECES
 $\Rightarrow \frac{9}{10}$ IS
SHADED.

(b) $-5 \times (-2)$

Charges

START WITH
ZERO



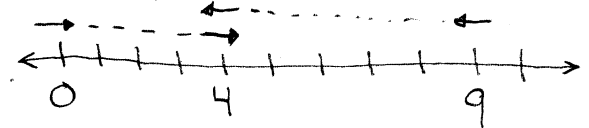
TAKE OUT 5 GROUPS
OF 2 -'s

LEFT WITH 10 +'s.

$-5 \times (-2) = +10$

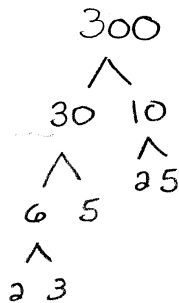
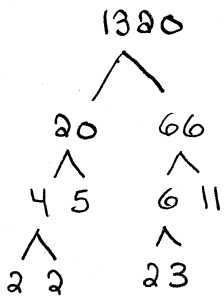
NUMBER LINE

- ① START AT ZERO FACING RIGHT
- ② MOVE FORWARD 4 SPACES
- ③ TURN AROUND
- ④ MOVE BACKWARD 5 SPACES
- ⑤ END AT +9



$4 - (-5) = 9$

19. (5 points) Find the prime factorizations of 1320 and 300. Then use the prime factorizations to find the greatest common divisor and least common multiple. (Be sure to label which is which.)



$1320 = 2^3 \cdot 3 \cdot 5 \cdot 11$

$300 = 2^2 \cdot 3 \cdot 5^2$

$GCD = 2^2 \cdot 3 \cdot 5 = 60$

$LCM = 2^3 \cdot 3 \cdot 5^2 \cdot 11$
 $= 6600$

20. (5 points) Use a NONSTANDARD algorithm to compute each of the following.

(a) $4758 \div 6$

SHORT
DIVISION

$$\begin{array}{r} 793 \\ 6 \overline{) 4758} \end{array}$$

793

(b) $423 - 267$

EQUAL ADDITIONS

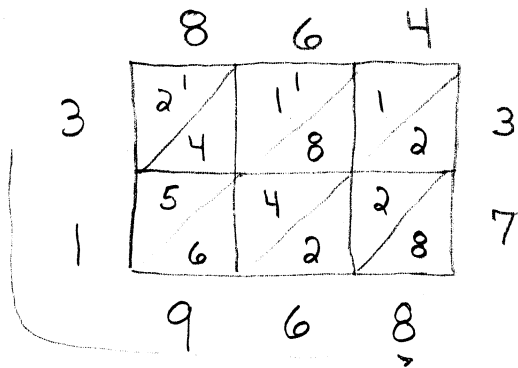
$$\begin{array}{r} 423 \\ - 267 \\ \hline \end{array} \xrightarrow{+3} \begin{array}{r} 426 \\ - 270 \\ \hline \end{array} \xrightarrow{+30} \begin{array}{r} 456 \\ - 300 \\ \hline \end{array}$$

$$\begin{array}{r} 456 \\ - 300 \\ \hline 156 \end{array}$$

156

(c) 864×37

LATTICE



31,968

21. (5 points) Clearly state the rule for adding two integers with opposite signs. Give an example that illustrates your rule. Be absolutely certain that your example actually shows what your rule says!

SUBTRACT THEIR ABSOLUTE VALUES, LEAST FROM GREATEST. THEN GIVE THAT RESULT THE SIGN OF THE ORIGINAL ADDED WITH THE GREATEST ABSOLUTE VALUE.

e.g.

$$4 + (-9) = -(9 - 4) = -5$$

22. (5 points) Use any algorithm to compute each of the following.

(a) $536_{\text{seven}} \times 24_{\text{seven}}$

BASE SEVEN

		5	3	6	
2	1	0	1		2
	3	6	5		
0	2	1	3		4
	6	5	3		
		1	6	3	

20163_{SEVEN}

(b) $2211_{\text{three}} + 2121_{\text{three}} + 1122_{\text{three}} + 2012_{\text{three}}$

3	2	2	2	2	1
1	2	2	1	2	1
2	0	1	2	2	1
1	2	0	2	2	1
+	2	0	1	2	0
	1	0	0	2	0

100020_{THREE}

23. (5 points) Clearly state each of the following divisibility tests.

(a) Test for divisibility by 8

AN INTEGER IS DIVISIBLE BY 8 IF AND ONLY IF THE INTEGER'S LAST THREE DIGITS FORM AN INTEGER THAT IS DIVISIBLE BY 8.

(b) Test for divisibility by 5

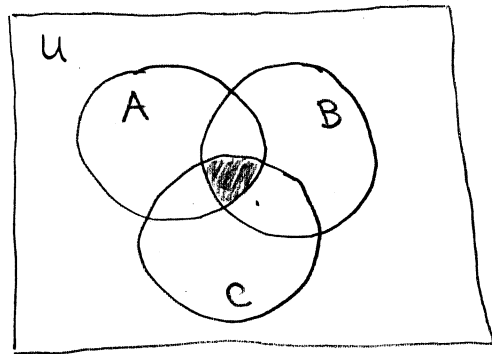
AN INTEGER IS DIVISIBLE BY 5 IF AND ONLY IF ITS ONES DIGIT IS DIVISIBLE BY 5 (i.e. 0 or 5).

(c) Test for divisibility by 9

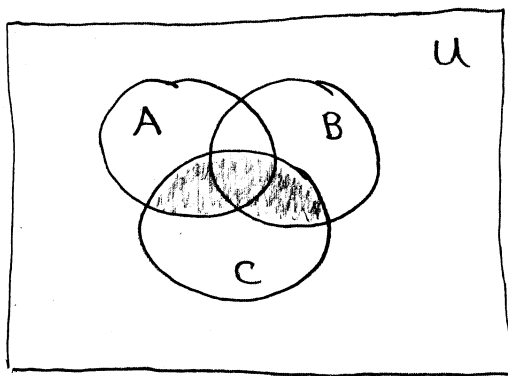
AN INTEGER IS DIVISIBLE BY 9 IF AND ONLY IF THE SUM OF ITS DIGITS IS DIVISIBLE BY 9.

24. (5 points) For each part of the problem, sketch a three-set Venn diagram and shade the region corresponding to the given operation.

(a) $A \cap B \cap C$



(b) $(A \cup B) \cap C$



(c) $B - (A \cup C)$

