Michigan State University
MTH 201 Final Exam – Fall 2008

Name:_____ Section: _____

PID: _____ Exam Score: _____

1. There are 26 problems on this exam for a total of 200 points. You have 120 minutes to answer these questions. **[POINT VALUES ARE GIVEN IN SQUARE BRACKETS.]**

2. No scrap paper is allowed. Please write all your responses in this test booklet. If you need more space, use the back of one of the pages, and indicate where the rest of your solution can be found.

3. **No calculators, cell phones, or other electronic devices are allowed**.

Number of points earned per page.

p. 2	_____	p. 3	_____
p. 4	_____	p. 5	_____
p. 6	_____	p. 7	_____
p. 8	_____	p. 9	_____

subtotal (even) _____ + subtotal (odd) _____ = total _____

Questions 1 - 10 are multiple-choice items. Circle the letter of the *one best* response for each item. [6 points each]

1. (3 + 6) + 8 = 3 + (6 + 8) by what property?

   (a) Additive Identity (b) Commutative Property

   (c) Distributive Property (d) Associative Property

2. Which of the following word problems makes use of BOTH the set model and the part-whole interpretation?

   (a) You are painting a 12 foot long board. You start off using red paint, but you run out and finish painting the board with blue paint. If you painted 8 feet red, how much did you paint blue?

   (b) Pietro's Math 201 class has 23 students. Ahmet's Math 201 class has 19 students. How many more students are in Pietro's class?

   (c) There are 20 students in a class. Eleven are girls. How many are boys?

   (d) Bob has 6 apples. He eats 2. How many does he have left?

3. A whole number is divisible by 3 if

   (a) its last digit is divisible by 3

   (b) it is of the form $3k$, where k is a whole number

   (c) the remainder is one when you divide that number by 3

   (d) the last two digits are a number divisible by 3

4. Let k be a whole number. The number $2k+1$ is always

   (a) divisible by 3 (b) prime

   (c) odd (d) composite

5. Which of the following fractions is smallest?

(a) $\frac{13}{12}$ (b) $\frac{14}{13}$ (c) $\frac{15}{14}$ (d) $\frac{16}{15}$

6. Which of the following numbers is largest?

(a) 432_5 (b) $\frac{2}{3} \cdot 240$ (c) 135 (d) CXLIV (Roman)

7. What is the **whole unit** in the following story problem?

A baker made 480 cookies. 120 of them were ginger snaps and the rest were chocolate chip. How many percent fewer chocolate chip cookies were there than ginger snaps?

(a) Ginger snaps (b) Chocolate chip cookies

(c) All of the cookies (d) The difference in the number of cookies

8. A number is divisible by 8 if….

(a) the sum of the digits is divisible by 8

(b) its last digit is divisible by 8

(c) its last 2 digits are a number divisible by 8

(d) its last 3 digits are a number divisible by 8

9. Which one of the following is NOT an algebraic expression?

(a) $8m$ (b) $5y + 3 = 8$ (c) $(c + d)^2$ (d) $4\pi - 2$

10. Estimate 33 + 42 + 54 by rounding to the nearest 10.

(a) 130 (b) 129 (c) 125 (d) 120

Questions 11 – 23 are free-response items. Please read each item carefully.

11. [12 points: 3 points each] Use a **mental math strategy** to solve each of the following problems. (Show appropriate steps. Do not use the standard or alternative algorithm.)

    (a) 17×9

    (b) $26 + 123 + 45 + 74 + 55$

    (c) $1250 \div 5$

    (d) $83 - 49$

12. [6 points] Illustrate a non-standard algorithm for finding the product of 381 and 27.

13. [6 points] Draw a picture to illustrate why the ratios 3:9 and 6:18 are equal.

14. [6 points] Illustrate 43 – 15 using a chip model.

15. [8 points: 4 + 4]

(a) Write a word problem using the measurement interpretation for $14 \div 4$.

(b) Illustrate $14 \div 4$ on a number line using the measurement interpretation.

16. [6 points] Use the identity $(a + m)(a - m) = a^2 - m^2$ to calculate 12×16. Show all work.

17. [6 points] Let a and b be non-zero whole numbers. Simplify as much as possible, factoring the numbers and leaving the answer in exponential form. Show all work.

$$\frac{(ab)^2 \cdot (3^2)^5}{(3 \cdot b^4)^2 \cdot 9^2}$$

18. [8 points] Prove that $a^m \cdot b^m = (ab)^m$ using the appropriate definitions and arithmetic properties. State the name of the property or definitions used for each step.

19. [10 points] Give a full Teacher's Solution (**with a diagram**) for the following problem using **algebra**:

Dan saved twice as much as Brett. Maria saved $60 more than Brett.
If they saved $600 altogether, how much did Maria save?

20. [8 points] Let a be an odd number. Prove, **algebraically or pictorially**, that a^2 is odd.

21. [8 points: 4 + 4] Let $M = 3^2 \cdot 5^3 \cdot 7 \cdot 11$ and $N = 2^4 \cdot 3 \cdot 5^3 \cdot 7$. Evaluate the following leaving the answers in exponential form.

    (a) GCF (M, N) =

    (b) LCM (M, N) =

22. [8 points] Use the Primality Test and the divisibility tests discussed in class to determine whether 187 is prime or composite. If 187 is composite, determine its *prime factorization*.

23. [6 points] Draw an area model for $\frac{2}{3} \times \frac{2}{7}$ and give the final product below.

$\frac{2}{3} \times \frac{2}{7}$ = ___

24. [6 points] Make up a short, realistic, one step division word problem which corresponds to $24 \div \frac{2}{3}$.

25. [26 points: 8 + 8 + 10] Write a complete Teacher's Solution using a **bar diagram** for the following three problems:

(a) *At the community center softball game, there were 236 children, parents, and employees in attendance. If 19 employees were present and 84 of the attendees were children, how many parents attended?*

(b) *The price of a breadmaker was marked down 40% to $48. What was the original price?*

25. (continued from previous page. Write a complete Teacher's Solution using a **bar diagram** – part c is 10 points)

(c) *A bottle is* $\frac{2}{3}$ *full of milk. When 100 mL of milk is poured out, the bottle becomes* $\frac{7}{12}$ *full. Find the capacity of the bottle.*

26. [10 points] Assuming only the arithmetic properties, prove $\frac{1}{a} \cdot \frac{1}{b} = \frac{1}{ab}$ whenever a and b are nonzero. State the name of the property used for each step.