Math 18000   **Final Examination**   **Fall 2013**

Instructions: Please Read Carefully.

- **You must show all your work to receive credit, and explain clearly and completely where required. Be neat, and box your answers. Where applicable, leave π in your answer.**
- **All fractions must be expressed in simplest form. Any decimal answers must be given to two decimal places. Include units where appropriate.**
- **You may use a scientific calculator. All other electronic devices must be turned off and out of sight.**
- **This exam has three (3) parts. Each part has four (4) problems. If you so choose, you may omit one complete question from each part. In such case, please write OMIT under the question(s) you wish to leave out. You may also write "OMIT" in the appropriate "Points earned" section below.**
- **Each problem is worth 11 points, for a total of 99 points. You will receive 1 point for correctly filling out your name and instructor's name below.**
- **Please show all your work in the space provided in this booklet.**

Problem	Points earned		Problem	Points earned
1			7	
2			8	
3			9	
4			10	
5			11	
6			12	

Please fill out the following before completing the exam:

I have read the above instructions:

Your name (sign): _____

Your name (print): _____

Your instructor's name (print): _____

Part I: Laws of Arithmetic and the Meaning of Fractions.
Answer at least three (3) questions in this section. You may omit one.

1. (a) Justify that $(-2) - (-3) = +1$ using:
   (i) The charged particle model (2 points)
   (ii) The Banking model (2 points)

 (b) Justify that $3 \times (-2) = -6$ using:
   (i) The Distributive Law Method (3 points)
   (ii) The method of working from easier cases. Start with 3×3. (2 points)

(c) Create a real life story for the calculation $4 \times (-2)$. (2 points)

2. (a) Compute $4 \div \frac{4}{5}$ and justify your answer using a picture such as a bar or number line. (5 points)

(b) Ask a simple question that could be solved by the above calculation. For example, if I had asked "Compute 7 - 5," a question could be "What is the distance between 7 and 5?" (2 points)

(c) Compute $\frac{1}{2} \times \frac{3}{5}$ and justify with a diagram. (4 points)

3. (a) If
X X X X X X
X X X X X X
represents $3\frac{1}{2}$, show $\frac{3}{2}$.
(You must draw your own pictures and clearly show each step. **Circling anything on the original diagram does not count towards your solution**). (3 points)

(b) In each part below, circle which fraction is bigger. Justify your choice, without converting to decimals or using a common denominator.

(i) $\frac{2}{11}$ or $\frac{4}{11}$ (2 points)   (ii) $\frac{5}{13}$ or $\frac{5}{9}$ (2 points)   (iii) $\frac{8}{13}$ or $\frac{13}{18}$ (2 points)

(c) Calculate 3.26 - 1.47 using the definition of decimals as base-ten fractions. Express your answer as a fraction in simplest form. (2 points)

4. (a) Hodge, Podge and Rodge are sharing a large pizza. Hodge eats ⅓ of the pizza. Podge eats ⅝ths of what's left. Rodge needs to have at least 6/11 of a pizza to be satisfied. Hodge, who fancies himself good at maths, claims that Rodge will be satisfied with what's left. Is Hodge correct? Explain. (6 points)

(b) On the number line below, fill in the missing numbers beneath the vertical lines. Assume all lines are equally spaced. <u>Be sure that all the fractions in your answer are fully reduced!</u> (5 points)

___|____|____|____|____|____|____|____|____|____|____|__

         $1\frac{1}{2}$ $4\frac{1}{6}$
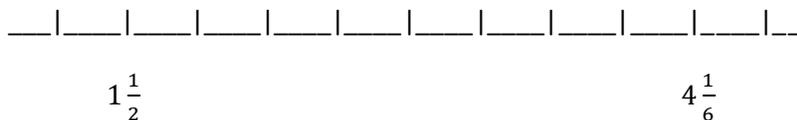
Part II: Percents, decimals, ratios and proportions.
Answer at least three (3) questions in this section. You may omit one.

5. Compute the following:
(a) What is 4/15 % of 150? (3 points)
(b) 33 is 27% of what number? (2 points)
(c) What is 19% of 2300? (2 points)
(d) If x is 47% of y, and y is 12% of z, what percent of z is x? (4 points)

6. You are given that x and y are proportional.
(a) Complete the table (2 points each entry):

x	4		12	7
y	12/7	20		3

(b) Unrelated to part (a), suppose you are given that a and b are *inversely proportional*. When a = 5/7, you have that b = 21/10. Find the equation relating a and b. (3 points)

(c) In a town, 2/3 of the men are married to 7/15 of the women. What is the ratio of men to women in the entire town? (4 points)

7. (a) Suppose that 1 Euro = $1.45, and note that 1 kg = 2.2 pounds. You have a friend visiting from the UK who loves apples so you take him to buy some. The price of apples at your local grocer is $0.63 per pound. Your friend says he usually buys apples for 0.95 Euros per kg, so your local grocer is more expensive than his in the UK. Is your friend correct? Justify your answer. (5 points)

(b) A sale item has an original list price of $180, but is on sale for 10% off. Elementary School teachers qualify for an additional 10% off of the original price. (2 points each)
(i) What is the sale price of the item for an elementary school teacher?
(ii) If a tax of 8.75% is applied (to the sale price), how much would an elementary school teacher pay?
(iii) How much tax would a non-elementary school teacher pay?

8. (a) A student's grade in a certain class depends on 6 quizzes, 3 tests and 1 final exam. If each test is worth twice as much as each quiz and the final is worth twice as much as each test. For 2 points each:
(i) As far as points in the final grade are concerned, what is the ratio of quizzes to tests to final exam?
(ii) What fraction of the final grade is determined by the final exam?
(iii) What is your answer in (ii) written as a percentage?

(b) The scale ratio on the map of an island is 15000 inches on the ground to 4 inches on the map. How long is the map of the island if the actual island is 28000 feet long (that's about 5.3 miles)? (5 points)

Part III: Geometry.
Answer at least three (3) questions in this section. You may omit one.

9. A mailbox looks as follows. The outside is to be painted.
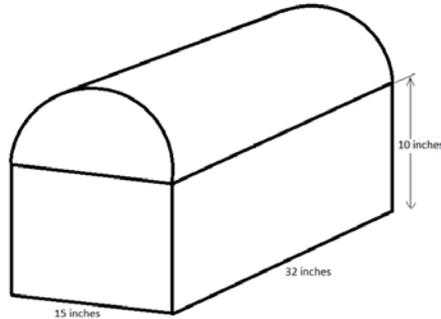
(a) Find the surface area of the mailbox that must be painted. (5 points)
(b) If one can of paint can cover 2350 square inches, is one can of paint enough to paint the mailbox? (2 points)
(c) Find the volume that the mailbox encloses. (4 points)

10. (i) A room is 20 ft by 15 ft by 10 yards. Using any appropriate unit of your choice,
(a) What is the volume of the room? (2 points)
(b) If for some reason you wanted to paint the entire room (including its floor and roof) in a single color of paint (you're obviously all about commitment), what is the total area you would have to paint? (3 points)

(ii) What happens to the indicated measurement in each of the following cases?
(a) The area of a circle if its radius is halved? (2 points)
(b) The volume of a cylinder if its height is quadrupled and its radius is halved? (2 points)
(c) The area of a trapezoid if its height is tripled? (2 points)

11. A geometry teacher cuts some shapes out of a rectangular piece of cardboard for illustrations.
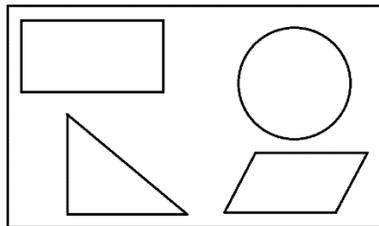
The shapes cut out are a 10cm by 6cm rectangle, a circle of diameter 12cm, a right triangle with height 12cm and hypotenuse 13cm, and a parallelogram with base 15cm and height 12cm.

(a) What is the combined area of the cut-outs? (6 points)
(b) If the original piece of cardboard was a 40cm-by-35cm rectangle, what is the area of the remaining paper? (2 points)
(c) What percentage of the original area was removed? (3 points)

12. (a) Convert 0.579 cubic yards to cubic inches. Remember that 1 yard = 3 feet and 1 foot = 12 inches. (4 points)

(b) Find the area (3 points) and perimeter (4 points) of the shaded region.