DEPARTMENT OF MATHEMATICS
BROOKLYN COLLEGE

Name:_____

FINAL EXAMINATION – SPRING 2012
Mathematics 1401 (1.95)

INSTRUCTIONS: *Answer any TEN questions.* Each problem is worth 10 points.
For problems #1-8, please write all your work and answers in the booklet. **All work must be shown for full credit.**

1. (a) Convert the repeating decimal 0.63888888... to a fraction in reduced form.
   (b) Find 4 rational numbers between 5/11 and 0.45 . If you think that there aren't any, then write NONE.
   (c) Find the number if 3/7 of that number is 42.
   (d) Convert into a reduced common fraction **and** a percentage: sixty-four thousandths.

2. (a) One day, 120 Brooklyn College students were surveyed to determine what sports they played. The survey showed that 75 students played basketball, 50 played volleyball, and 30 played neither sport. Let U= { all students surveyed}, B= { students who play basketball}, V={students who play volleyball}.
   (i) How many students played both sports?

   (ii) Find: $n(\overline{V})$ and $n(\overline{B \cap V})$.

   (b) Let U = {all objects}, R = {red objects}, W= {wooden objects}, and C = {circular objects}. The regions of a Venn diagrams are labeled 1-8.

   (i) Place the following object in the appropriate region.
   If the object could appear in more than one location, indicate **all regions** in which it might be placed.

   Item x: A blue wooden object.
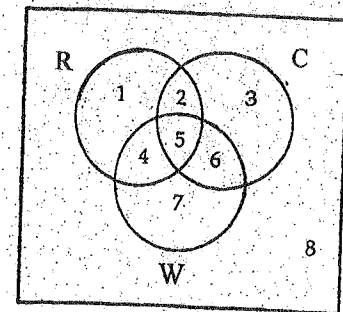
   (ii) Describe the following sentence in *set notation* and indicate which **region (regions)** would represent the given set: *The set of all rectangular objects that are made of plastic* .

3. (a) Without converting to base ten, find the two numbers immediately before $8T1_{twelve}$.
   (b) What base-three number is represented by the base-three blocks shown below? Hint: make all possible exchanges to obtain the smallest number of pieces.


   (c) Convert 397 to a number in base FOUR.

   (d) Find the next two numbers in the sequence: 11_{six}, 22_{six}, 44_{six}, ...

4. (a) Let M= 6,840,829,874,637. Find two prime factors of M *without actual division* .

   (b) Find the Greatest Common Divisor and the Least Common Multiple of the numbers 989 and 851.

   (c) A contractor purchased 10 ¾ acres of land for a building project. One third of that land was set aside for a park. How much land is available for building ? (Express your answer **in acres in exact** form using **common fractions and mixed numbers)**.

5. (a) Samantha has a rectangular piece of fabric that is 63 inches wide and 105 inches long. Samantha wants to cut her fabric into identical square pieces, leaving no fabric remaining. She wants the sides of the squares to be whole numbers of inches long.
   What *size* squares are possible and *how many* square pieces of **each size** can Samantha make?

   (b) Find the least number divisible by every **even** counting number from 2 to 18.

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6. Assume that the pattern continues for the following sequence of figures made of small circles.

1st   2nd   3rd   4th   5th
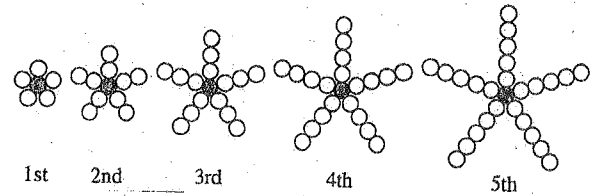
(a) How many small circles are there in the 6th, the 7th, and the 8th figures?
     What type of sequence (arithmetic, geometric, etc) is this?
(b) How many small circles are there in the nth figure?
(c) How many circles will it take to build the 45th figure?
(d) What is the **total** number of circles that is needed for the first 45 figures? (Hint: use Gauss' method.)
(e) Is there a figure in the sequence that is made up of exactly 436 circles? If so, which one? If no, why not?

7. (a) There are 12,500 students at Brooklyn College. About 1500 of them are in the Elementary Education program.
     Suppose one student will be picked at random and given a full scholarship. What is the probability that the
     winner will NOT be in the Elementary Education program? (Express your final answer as a percent).

    (b) The owner of a small business earned $450,000 last year. The manager earned $ 130,000. Three assistant
     managers earned $ 65,000 each. The secretary earned $25,000 and the other 4 employees each earned
     $40,000. Find the mean, median, and mode of the given salaries.
     Which measure is most appropriate for this set of data?

8. (a) . Walnuts are sold in packages that weigh $4\frac{2}{3}$ ounces. There is a supply of 54 ounces of walnuts.

    (i) How many packages of walnuts can be made?
    (ii) How many ounces of walnuts will be left over?
        (Express your answer in **exact form using common fractions and mixed numbers**).

    (b) Place parentheses, if needed, to make the following statement true: $72 \div 4 \times 3 + 6 = 4$

    (c) Suppose P ={a, b, c, d } and L={1, 2, 3, 4}. How many one -to- one correspondences are there between the
     sets P and L if in each correspondence c must correspond to an odd number?

9. (a) A right triangular prism is drawn to the right.
     How many edges does it have?
     Which edges are parallel to AK?
   Which edges are <u>skew</u> to AK?
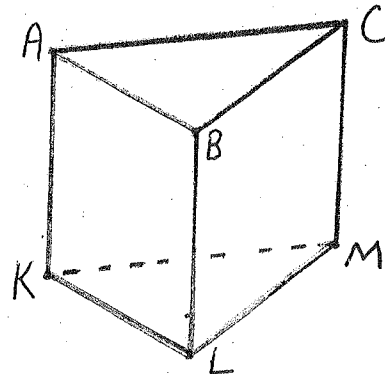
    (b) The volume of a cube is 64 cubic inches.
     Find the surface area of the cube.

    (c) Answer TRUE or FALSE to the following statement:
     Every pyramid must have an even number of vertices .
     Explain your answer.

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For problems #10-11, *PLEASE SHOW ALL YOUR WORK AND ANSWERS IN THE SPACES PROVIDED.*

10. In the figure on the right, assume that the distance between two adjacent dots in a row or a column is 1cm.
    (a) Determine the area of the figure.
    (b) Draw all lines of symmetry of the figure, if any.
    (c) Determine all rotational symmetries of the figure.
    (d) Locate the point of symmetry of the figure (if it exists).
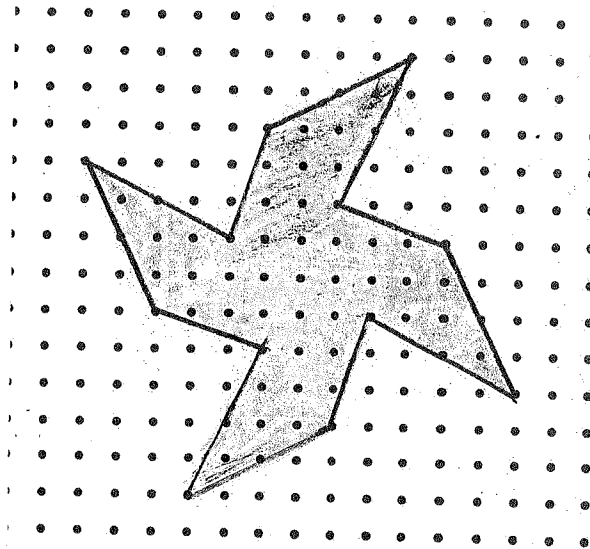
11. The following questions refer to the figure below. You may assume that BEGK is a rectangle formed by various transformations (translations, rotations, reflections) of trapezoid ABCD.
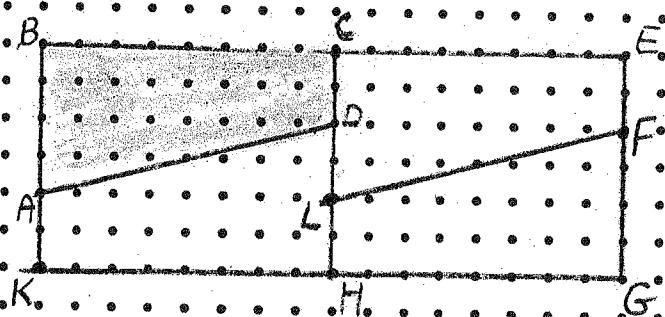
(a) Identify the specific transformation (or a sequence of transformations) needed to produce trapezoid FGHL from trapezoid ABCD.
(b) Draw the image of ABCD under a 90° counterclockwise rotation about point A.