DEPARTMENT OF MATHEMATICS
BROOKLYN COLLEGE

Name:_____

FINAL EXAMINATION – FALL 2018
Mathematics 1401

INSTRUCTIONS: *Answer any TEN questions. Each problem is worth 10 points.*
For **problems #1-9,** *please write all your work and answers in the* **booklet.** *All work must be shown for full credit.*

1.(a) Convert the repeating decimal $0.\overline{216}$ to a common fraction. Reduce your answer to lowest terms.
 (b) 45 seconds is what fraction of an hour? Reduce the fraction to lowest terms
 (c) Write the number described in words as a reduced common fraction **and** as a percentage:
   thirty-six thousandths.

2. (a) A survey on soda preferences is taken at a local mall. Of the 160 people surveyed, 105 liked cola, 82 liked ginger ale, and 20 likes neither cola nor ginger ale.
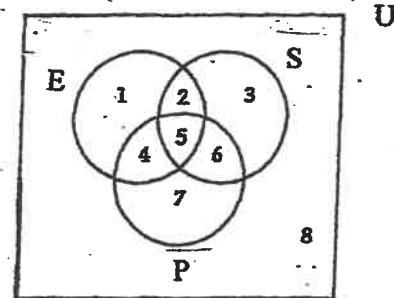   Let U= {all people surveyed}, C = { people who liked cola}, A={ people who liked ginger ale}.

   (i) How many people liked exactly one of the two types of soda?

   (ii) Find $n(\overline{C \cap A})$

(b) Suppose U ={all Brooklyn College students}, S={sophomores},
   E ={education major students},
   and P={students taking courses in psychology}.

   The regions of a Venn diagrams are labeled 1-8.

   (i)) Describe the following sentence in **set notation** *and*
      indicate which **region(regions)** would represent the given set:

        The set of all Brooklyn College freshmen who do not take psychology.
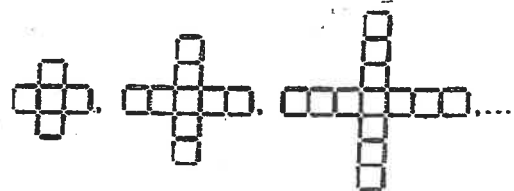
   (ii) Describe region **2** in *set notation.*

3. (a) Without converting to base ten, find the next *three* numbers in the sequence:
        $11_{eight}, 33_{eight}, 55_{eight}, 77_{eight}, \dots$
   (b) Convert 179 to a number in base TWO.
   (c) Without converting to base ten, subtract the numbers in base TWELVE: $T82_{twelve} - 93_{twelve}$

4. Assume that this pattern continues for the following sequence of matchsticks figures.

   (a) How many matchsticks are there in the 4th and the 5th figure?
   (b) How many matchsticks are needed for the nth figure?
   (c) How many matchsticks are needed for the 47th figure?
   (d) What is the total number of matchsticks that is needed for the first 47 figures?
   (e) Is there a figure in the sequence that is made up of exactly 352 matchsticks? If so, which one? If no, why not?

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5. (a) Amy has a rectangular piece of fabric with dimensions 126 inches by 72 inches. Amy 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** squares pieces of **each size** can Amy make?

(b) Let $k = 756{,}524{,}710{,}416{,}604{,}302$. Answer each of the following questions **without performing the actual division**:
(i) Is k divisible by 6?
(ii) Are the numbers k and **125** *relatively prime*? **Fully explain.**

6. (a) (i) Maria made a stack of 18 identical notebooks.. If the stack was $8\frac{7}{16}$ inches high, how thick was each notebook?
(Give an **exact** answer in **inches** using **a common fraction or a mixed number in simplest form**).
(ii) A recipe calls for $8\frac{7}{16}$ cups of flour for a batch of 18 pies. How many pies can be made with 1 cup of flour? (Assume you can make partial pies.)
(Give an **exact** answer using a *common fraction or a mixed number in simplest form*).
(iii) Which of the two problems above can be solved by calculating $8\frac{7}{16} \div 18$?

(b) Find the Greatest Common Factor and The Least Common Multiple of the numbers 1457 and 527.

7. (a) Almonds are sold in packages. Each package weighs $3\frac{2}{3}$ ounces. There is a supply of 72 ounces of almonds.
(i) How many full packages of almonds can be made?
(ii) How many ounces of almonds will be left over?
(Give an **exact** answer **in ounces** using a **common fraction or a mixed number in simplest form**).
SHOW YOUR WORK STEP BY STEP.

(b) Place parentheses, if needed, to make the following statement true: $32 - 24 \div 4 \times 2 + 4 = 33$

8. (a) A draw contains 12 white socks, 10 brown socks, and 8 black socks.
If one sock is picked at random, what is the probability that it will NOT be brown?
(Express your final answer as a percent).

(b) The owner of a small business earned $440,000 last year. The manager earned $120,000. Three assistant managers earned $55,000 each. The secretary earned $25,000 and the other 4 employee each earned $35,000.
Find the **mean, median and mode** of the given salaries.

9. Answer TRUE or FALSE to the following statements. Give a brief **reason or a counterexample to justify each answer.**
(a) The sequence given bellow is *geometric* .
1, 2, 6, 24, 120, ...
(b) To determine if 943 is prime, it is enough to test if it is divisible by 2, 3, 5, 7, and 11.

(c) Let $P = \{a, b, c, d, e\}$ and $L = \{1, 2, 3, 4, 5\}$. If b must correspond to **an even number** in each one-to-one correspondence, then there will be 48 one-to-one correspondences between the sets P and L.

(d) $\frac{1}{5}$ of $\frac{2}{3} = \frac{2}{3} - \frac{1}{5}$

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For **problems #10-11**, *PLEASE SHOW ALL YOUR WORK AND ANSWERS IN THE SPACES PROVIDED*.
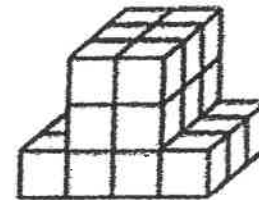
10. In the figure on the right, assume that the distance between two adjacent dots in a row or a column is 1cm.

    (a) Is the figure *convex*?
    (b) Draw all lines of symmetry of the figure.
    (c) Determine the area of the figure.
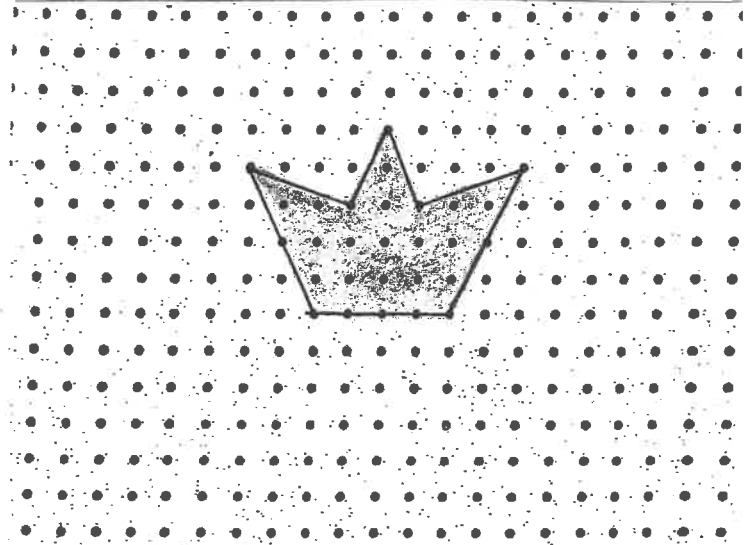
11. The solid in the figure to the right is made out of identical cubes.
    Each cube has sides with a length of 1 cm.

    (a) Find the surface area of the given solid.

    (b) Find the volume of the solid.

    (c) Suppose the solid is decomposed into individual cubes (each with a side length of 1 cm).

      (i) What will the **total** volume of all the cubes be?

      (ii) What will the **total** surface area of all the cubes be?