DEPARTMENT OF MATHEMATICS
BROOKLYN COLLEGE

Name:_____

FINAL EXAMINATION –SPRING 2019
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.***

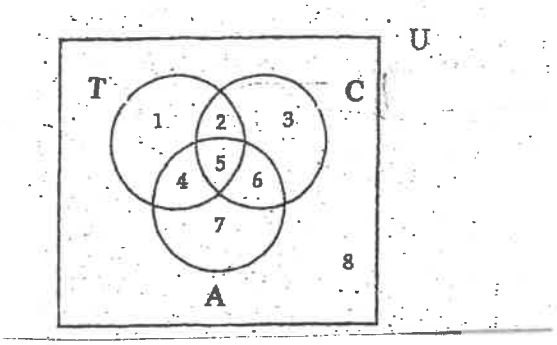
1. (a) Results of a survey of 60 students indicated that 41 students liked basketball, 28 liked hockey, and 8 students liked neither sport.
Let U= {all students surveyed}, B = {students who liked basketball}, H={students who liked hockey}.

(i) How many students liked exactly one of the two sports?

(ii) Find $n(\overline{B \cap H})$

(b) Suppose U ={all people surveyed}, T={tennis players}, C ={chess players}, and A={artists}.

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 artists who do not play tennis.

(ii) Describe region **6** in ***set notation.***

2. (a) Without converting to base ten, find the next *two* numbers in the sequence:
11_{four}, 22_{four}, 110_{four}, 203_{four} ...

(b) Without converting to base ten, subtract the numbers in base TWELVE: $9T2_{twelve} - E3_{twelve}$.
(c) Convert 314 to a number in base TWO.

3. A large theater is set up in such a way that there are 18 seats in the first row, 31 seats in the second row, 44 seats in the third, and so on. Each subsequent row has thirteen more seats than the previous row. The last row has 746 seats.
(a) How many rows are there in the theater?
(b) How many seats are there in the theater? (Hint: use Gauss' method).

4 .(a)Convert the repeating decimal $0.\overline{351}$ to a common fraction. Reduce your answer to lowest terms.

(b) 4 inches is what fraction of a yard? Reduce the fraction to lowest terms. (Hint: 1 yard=3 feet, 1 foot=12 inches).

(c) Write the number described in words as a reduced common fraction **and** as a percentage:
fifty-six thousandths.

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5. (a) Lauren has a large supply of playing cards, each of which measures 96 millimeters by 60 millimeters. She wants to lay them down in the same direction (horizontally) to form a solid square.
   (i) What will be the dimensions of the smallest square that she can form?
   (ii) How many cards will she need?

   (b) Let $n = 264{,}307{,}931{,}632{,}4\_8$. Answer each of the following questions **without performing the actual division:**
   (i) Find all possible single digits that can be placed in the blank so that the number n becomes divisible by 9.
   (ii) Are the numbers n and **25** *relatively prime*? **Fully explain.**

6. (a) (i) A contractor purchased $7\frac{3}{4}$ 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?
   (Give an **exact** answer in **acres** using **a common fraction or a mixed number in SIMPLEST FORM**).
   (ii) Maria picked $7\frac{3}{4}$ cups of blueberries. She poured the blueberries into a jar and noticed that the berries filled $\frac{2}{3}$ of the jar. How many cups of blueberries will it take to fill the whole jar?
   (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 $7\frac{3}{4} \div \frac{2}{3}$?

   (b) Place parentheses, if needed, to make the following statement true: $48 - 24 \div 4 \times 2 + 4 = 49$

7. (a) Amy has 40 in. of ribbon to decorate doll outfits. Each outfit requires $2\frac{13}{16}$ in. of ribbon.
   (i) How many outfits can be decorated?
   (ii) How much ribbon will be left over?
   (Give an **exact** answer **in inches** using a **common fraction or a mixed number in *simplest form***).
   SHOW YOUR WORK STEP BY STEP.

   (b) Find the Greatest Common Factor and The Least Common Multiple of the numbers 1643 and 899.

8. (a) In a history class, there are 27 business majors, 36 education majors, and 12 biology majors. No person has a double major. Suppose one student will be chosen at random to participate in a contest. What is the probability that the contest participant will NOT be a business major?
   (Express your final answer as a percent).

   (b) The salaries of the ten employees at a small business were:
   $7000 $15,000 $15,000 $11,000 $12,000 $15,000 $12,000 $57,000 $7000 $150,000
   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) Let S = {u, v, w, x, y} and L={1, 2, 3, 4, 5}. If v must correspond to **3** and y must correspond to **an odd number** in each one-to-one correspondence, then there will be 18 one-to-one correspondences between the sets S and L.
   (b) The sequence given bellow is *geometric* .
   7, 97, 997, 9997, ...
   (c) $\frac{2}{7}\ of\ 28 = 28 \div 2 \times 7$
   (d) To determine if 697 is prime, we need to test all prime numbers up to 23 as possible divisors of 697.

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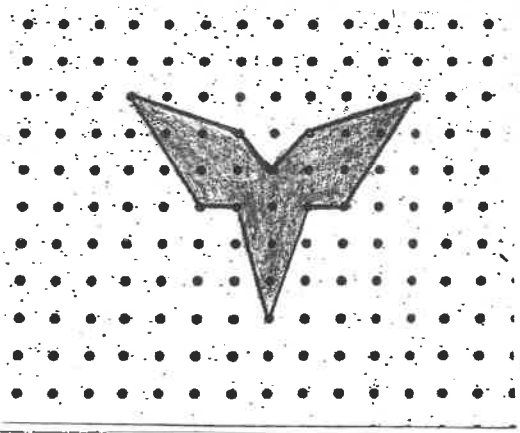
For **problems #10-11,** *PLEASE SHOW ALL YOUR **WORK** AND **ANSWERS** IN THE **SPACES PROVIDED**.*

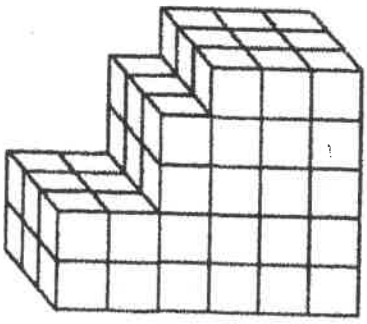
10. In the figure on the right, assume that the distance between two adjacent dots in a row or a column is 1cm.

(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?