

FINAL EXAMINATION – SPRING 2014
Mathematics 1401 (1.95)

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) A teacher has 30 students. In a class survey, 12 students said they liked basketball, 17 students said they liked hockey, and 4 students said they liked neither sport.
Let $U = \{\text{all students surveyed}\}$, $B = \{\text{students who liked basketball}\}$, $H = \{\text{students who liked hockey}\}$.

- (i) How many students liked exactly one of the two sports? (ii) Find $n(\overline{B \cap H})$

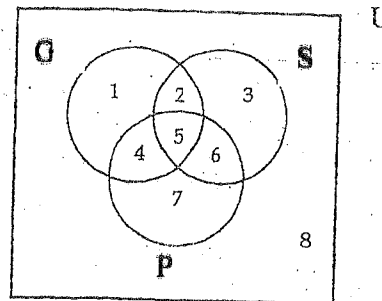
- (b) Let $U = \{\text{all objects}\}$, $G = \{\text{green objects}\}$, $S = \{\text{square objects}\}$, and $P = \{\text{plastic objects}\}$.

The regions of a Venn diagram 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.

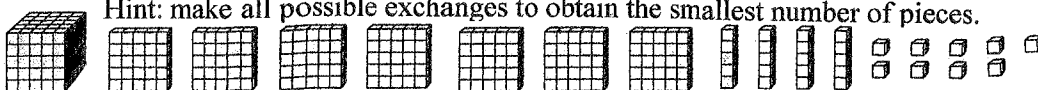
Item x : A red plastic object.

- (ii) Describe region 6 using set notation.



2. (a) What base- five number is represented by the base- five blocks shown below?

Hint: make all possible exchanges to obtain the smallest number of pieces.



- (b) Without converting to base ten, subtract the numbers in base SEVEN: $561_{\text{seven}} - 12_{\text{seven}}$.
(c) Convert 391 to a number in base FOUR.

3. (a) Convert the repeating decimal $0.5833333\dots$ to a common fraction. Reduce your answer to lowest terms.

(b) Find 5 rational numbers between $\frac{4}{13}$ and 0.3 . If you think that there aren't any, then write NONE.

(c) 16 inches is what fraction of a yard? (Hint: 1 yard = 3 feet; 1 foot = 12 inches).

(d) Write the number described in words as a reduced common fraction and as a percentage:
sixty- four thousandths.

4. Assume that this pattern continues for the sequence of figures made of cotton swabs. The first three figures in a sequence are shown.

(a) How many swabs are there in the 4th and the 5th figures?

(b) How many swabs are required to form the n^{th} figure?

(c) How many swabs will it take to build the 46th figure?

(d) What is the total number of swabs that is needed for the first 46 figures? (Hint: use Gauss' method.)

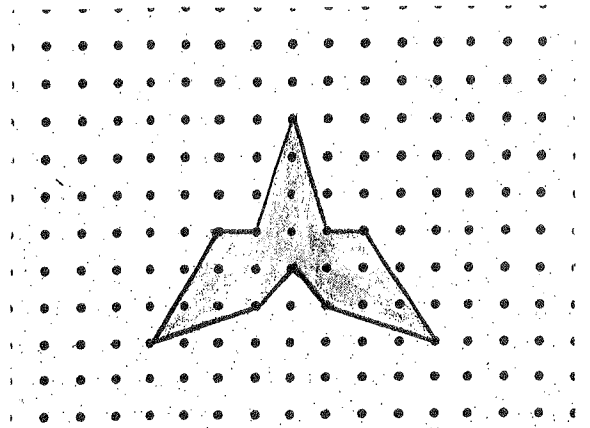
(e) Is there a figure in the sequence that is made up of exactly 245 swabs? If so, which one? If no, why not?



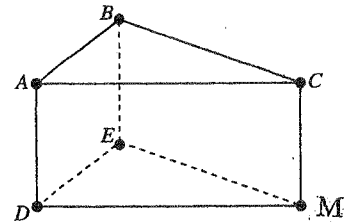
5. (a) Solve each problem in parts (i) and (ii). Conclude which of the problems can be solved by calculating $\frac{1}{3} \div 7$.
- (i) Gabrielle spent $\frac{1}{3}$ hour practicing 7 songs on the piano. She spent the same amount of time on each song.
How long did she practice each song?
(Give an **exact** answer in **hours** using *common fractions or mixed numbers*).
- (ii) Mr. Lee spent 7 hours giving drum lessons yesterday. If he spent $\frac{1}{3}$ of the time working with Maria, how many hours did he spend teaching Maria?
(Give an **exact** answer using **common fractions or mixed numbers**).
- (b) Find the Greatest Common Factor and The Least Common Multiple of the numbers 989 and 713.
6. (a) Almonds are sold in packages. Each package weighs $3\frac{2}{3}$ ounces. There is a supply of 50 ounces of almonds.
- (i) How many packages of almonds can be made?
(ii) How many ounces of almonds will be left over?
(Give an **exact** answer in ounces using **common fractions or mixed numbers**).
- (b) Place parentheses, if needed, to make the following statement true: $96 \div 24 \times 2 + 6 = 32$
7. (a) A store has 84 apples, 72 oranges, and 48 bananas to make holiday fruit baskets. Each basket must contain the same number of each *type* of fruit and no items can be left over. What is the largest number of baskets that the store can make this way?
How many apples, oranges, and bananas will go into each basket?
- (b) Let $N = 809,612,039,716,722$. Without performing the actual division, determine if N is divisible by 6.
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 be an education major?
(Express your final answer as a percent).
- (b) The salaries of the ten employees at a small business were:
\$5000 \$15,000 \$15,000 \$11,000 \$12,000 \$15,000 \$12,000 \$70,000 \$6000 \$160,000
Find the mean, median, and mode of the given salaries. Which measure is most appropriate for this set of data?
9. Answer TRUE or FALSE to the following statements. Give a brief **reason** or a **counterexample** to **justify each answer**.
- (a) $\text{LCM}(36, 100) = 36 \times 100$
- (b) Let $K = \{a, b, c, d\}$ and $L = \{1, 2, 3, 4\}$. There are 16 one-to-one correspondences between the sets K and L .
- (c) To determine if 893 is prime, we need to test all prime numbers up to 29 as possible divisors of 893.
- (d) $\frac{3}{7}$ of 28 = $28 \div 7 \times 3$

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

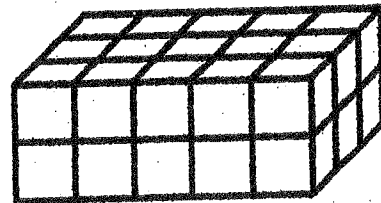
10. In the figure on the right, assume that the distance between two adjacent dots in a row or a column is 1 cm.
- Determine the area of the figure.
 - Draw all lines of symmetry of the figure, if any.
 - Is the figure *convex*?



11. (a) A right triangular prism is drawn to the right.
- How many faces, vertices, and edges does this solid have?
 - Which edges are parallel to CM?
 - Which edges are skew to CM?



- (b) The solid in the figure to the right is made out of identical cubes. Each cube has sides with a length of 1 cm.



Find the surface area of the given solid .

Find the volume of the solid .