

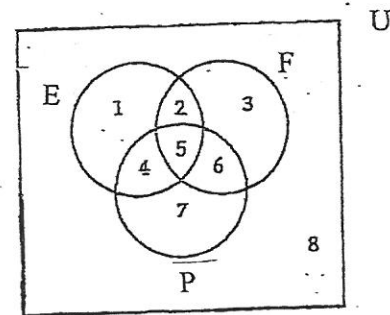
FINAL EXAMINATION – FALL 2017  
Mathematics 1401 (1.95)INSTRUCTIONS: *Answer any TEN questions.* Each problem is worth 10 points.*For problems #1-9, please write all your work and answers in the booklet. All work must be shown for full credit.*

1. (a) A cosmetics magazine conducts a survey that has 145 respondents. Of the respondents, 95 wear lipstick, 80 wear mascara, and 12 wear neither lipstick nor mascara.  
Let  $U = \{\text{all people surveyed}\}$ ,  $L = \{\text{respondents who wear lipstick}\}$ ,  $M = \{\text{respondents who wear mascara}\}$ .
- (i) How many respondents wear exactly one of the two types of makeup?

(ii) Find  $n(\overline{L \cap M})$

- (b) Suppose  $U = \{\text{all Brooklyn College students}\}$ ,  
 $E = \{\text{education major students}\}$ ,  $F = \{\text{freshmen}\}$ ,  
and  $P = \{\text{students who take courses in psychology}\}$ .

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



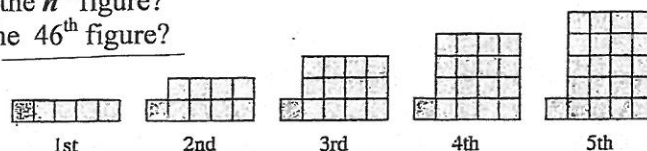
- (i) Place the following student in the appropriate region.  
If the student could appear in more than one location, indicate **all regions** in which he/she might be placed.

*A sophomore student who does not take psychology.*

- (ii) Describe region 4 using set notation.

2. (a) Find the next two numbers in the sequence:  $11_{\text{seven}}, 22_{\text{seven}}, 44_{\text{seven}}, 110_{\text{seven}}, \dots$   
 (b) Without converting to base ten, subtract the numbers in base TWELVE:  $942_{\text{twelve}} - T3_{\text{twelve}}$ .  
 (c) Convert 347 to a number in base THREE.  
 (d) Convert  $1011110_{\text{two}}$  to a number in base TEN.
3. (a) Convert the repeating decimal  $0.583333 \dots$  to a common fraction. Reduce your answer to lowest terms.  
 (b) 50 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:  
**sixty-four thousandths.**
4. Assume that this pattern continues for the following sequence of square tile figures.

- (a) How many square tiles are there in the 6<sup>th</sup> and the 7<sup>th</sup> figures?  
 (b) How many square tiles does it take to build the  $n^{\text{th}}$  figure?  
 (c) How many square tiles will it take to build the 46<sup>th</sup> figure?



- (d) What is the **total** number of square tiles 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 389 square tiles? If so, which one? If no, why not?

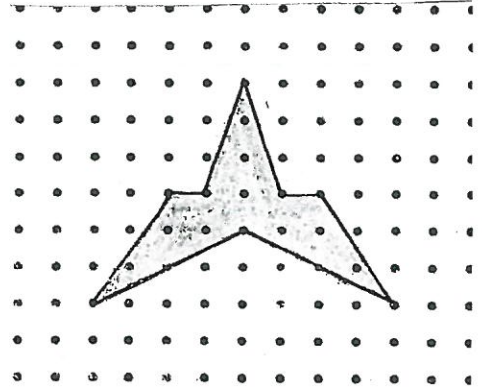
## Final Exam Math 1401 (1.95) FALL 2017

5. (a) Individual cereal boxes contain  $4\frac{2}{3}$  ounces of cereal. There is a supply of 81 ounces of cereal.
- How many full boxes of cereal can be made?
  - How many ounces of cereal will be left over?  
(Give an **exact** answer in ounces using a **common fraction or a mixed number in simplest form**).
- (b) Place parentheses, if needed, to make the following statement true:  $32 - 24 \div 4 \times 2 + 4 = 30$
6. (a) (i) Maria pumped  $1\frac{1}{6}$  gallons of gasoline into the empty gas tank of her car. Now the tank is  $\frac{1}{8}$  full.  
How many gallons does her tank hold?  
(Give an **exact** answer in *gallons* using a **common fraction or a mixed number in simplest form**).
- A recipe calls for  $1\frac{1}{6}$  cups of sugar for a batch of 8 muffins. How many muffins can be made with 1 cup of sugar? (Assume you can make partial muffins.)  
(Give an **exact** answer using a **common fraction or a mixed number in simplest form**).
  - Conclude* which of the problems can be solved by calculating  $1\frac{1}{6} \div \frac{1}{8}$ .
- (b) Find the Greatest Common Factor and The Least Common Multiple of the numbers 1517 and 851.
7. (a) Three racing cars leave the starting line at the same time. The first car completes a lap every 175 seconds, the second car completes a lap every 126 seconds, and the third one every 90 seconds.
- How long will it take for the three cars to meet at the starting line for the first time after the race begins?  
(Express your answer in **minutes**).
  - At this point in time, how many laps will each car have completed?
- (b) Let  $k = 267,608,931,237,846$ . Answer each of the following questions **without performing the actual division**:
- Is  $k$  divisible by 11?
  - Are the numbers  $k$  and 55 *relatively prime*? **Fully explain**.
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 biology 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.
9. Answer TRUE or FALSE to the following statements. Give a brief **reason or a counterexample to justify each answer**.
- The sequence given below is *geometric*.  
2, 92, 992, 9992, 99992 ...
  - Let  $K = \{a, b, c, d, e\}$  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  $K$  and  $L$ .
  - To determine if 893 is prime, it is enough to test if it is divisible by 2, 3, 5, 7, and 11.
  - $\frac{1}{3}$  of  $\frac{5}{8} = \frac{5}{8} - \frac{1}{3}$

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

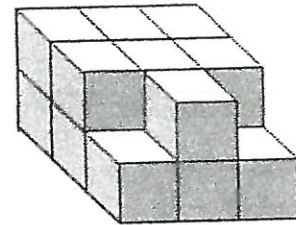
10. In the figure on the right, assume that the distance between two adjacent dots in a row or a column is 1 cm.

- (a) Is the figure *convex*?  
 (b) 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?