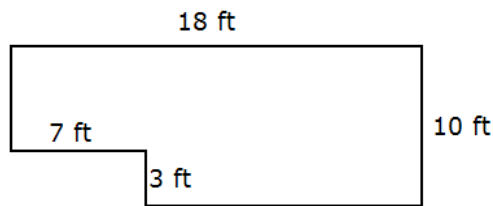


Exam 1 will cover the following sections from the textbook: Chapter 2: 2.1, 2.2, 2.3, 2.4, Chapter 5: 5.5, Chapter 6: 6.8, Chapter 7: 7.1, 7.2, Chapter 9: 9.1, 9.2, Chapter 11: 11.1, Chapter 12: 12.1, 12.2.

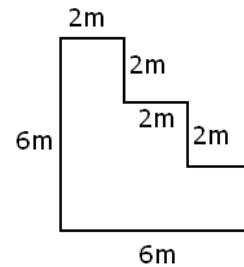
Handouts to study: lecture notes on basic percent problems and on the Pythagorean Theorem, Problem Sets 1,2, and 3. Further practice is available on Blackboard: see reviews for Quiz 1, Quiz 2, and Quiz 3.

1. We drew 30 points on a circle and connect every point with all other points.
  - a) How many line segments do these points determine?
  - b) How many triangles do these points determine?
2. There are 12 people left in the final round of a tournament.
  - a) How many different outcomes are possible for the first, second, and third place?
  - b) How many different ways can we select a committee of 3 from these 12 people?
3. Compute each of the following.
  - a)  $\binom{5}{0} - \binom{5}{1} + \binom{5}{2} - \binom{5}{3} + \binom{5}{4} - \binom{5}{5}$
  - b)  $\binom{5}{0} + \binom{5}{1} + \binom{5}{2} + \binom{5}{3} + \binom{5}{4} + \binom{5}{5}$
4. Let  $U = \{1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12\}$ ,  $A = \{2, 5, 6, 7, 9, 11\}$ ,  $B = \{1, 5, 6, 8, 9, 10, 12\}$ , and  $C = \{2, 4, 5, 7, 9, 12\}$ 
  - a) Draw a Venn diagram depicting these sets.
  - b) Find  $(B \cup C) \cap \bar{A}$
  - c) Find  $(A \cap \bar{C}) \cup (\bar{A} \cap C)$
  - d) Find  $\overline{(A \cup B) \cap C}$
  - e) True or false?  $(A \cap B) \cap \bar{C} \subseteq (A \cup B) \cap \bar{C}$ ?
5. List all subsets of  $\{1, 2, 3, 4, 5\}$ .
6. List all 3–element subsets of the set  $X = \{1, 2, 3, 4, 5, 6, 7\}$ .
7. Suppose that  $M$  is a set with  $|M| = 7$ .
  - a) How many subsets does  $M$  have?
  - b) How many proper subsets does  $M$  have?
8. Find  $|A \cap B|$  if we know that  $|A| = 34$ ,  $|B| = 19$ , and  $|A \cup B| = 47$ .
9. We asked 120 students whether they are currently taking astronomy or biology or chemistry. 46 students take astronomy, 57 take biology, and 52 take chemistry. 22 students take astronomy and biology, 18 take astronomy and chemistry, and 24 take biology and chemistry. 10 students are taking all three.
  - a) Draw a Venn diagram depicting the information given.
  - b) How many students are taking at least two of these courses?
  - c) How many students are taking none of these courses?
  - d) How many students take biology or chemistry?
  - e) How many students take astronomy and biology but not chemistry?
  - f) How many students take exactly two of these courses?
10. The inner angles of a regular polygon measure  $165^\circ$ . How many sides does this polygon have?

11. A license plate consists of two letters and then a four-digit number. How many different license plates are possible if
- repetition of letters and digits is allowed?
  - repetition of letters and digits is not allowed?
12. We toss a coin eight times in a row.
- What is the total number of outcomes?
  - How many outcomes are possible with exactly one tail?
  - How many outcomes are possible with exactly two tails?
  - How many outcomes are possible **at least** three tails?
13. The complement of an angle is  $15^\circ$  less than four times the angle. Find this angle.
14. The supplement of an angle is  $24^\circ$  more than twice the angle. Find this angle.
15. Consider a right triangle with sides 7 ft, 24 ft and 25 ft long.
- Compute the perimeter of the triangle. Include units in your computation and answer.
  - Compute the area of the triangle. Include units in your computation and answer.
16. Compute the area and perimeter for each of the figures shown on the picture below.



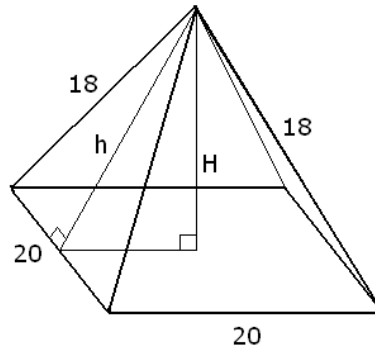
a)



b)

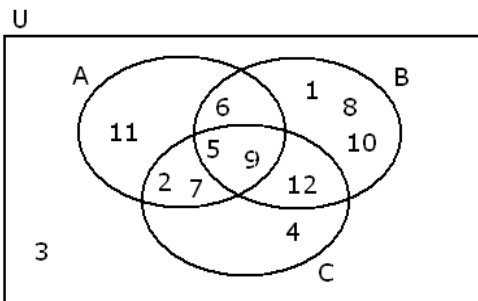
17. The current budget is \$43 125 000. How much was the previous budget if this number represents a
- a 15% increase?
  - a 50% increase?
  - a 500% increase?
18. We placed \$5000 in a bank account that earns 4% per year. How much money do we have in the account after fifteen years under
- simple interest
  - compound interest
19. We borrowed \$3000 for two years, with a simple annual interest rate of 8%. After 8 months, we make a partial payment of \$900. After an additional 7 months, we make another partial payment of \$1000. How much do we owe at the end of the two years?
20. We purchased some stocks two years ago. During the first year, the value of our stock rose by 20%. But then the next year, the value lost 10%. These two changes together can be expressed as a single change by what percent?
21. Find the distance between  $(3, 8)$  and  $(8, -4)$ . Use exact values.
22. Find the length of the main diagonal in a rectangular prism with sides 7 m, 8 m, and 10 m long. Use exact values.

23. Consider the isosceles triangle with sides 7 m (meter), 7 m, and 10 m long.
- Compute the exact value of the height belonging to the 10 m long sides.
  - Compute the exact value of the area of the triangle.
24. Find the length of the line segments denoted by  $h$  and  $H$ , based on the picture shown below. Use exact values.



## Answers

- a) 435    b) 4060
- a) 1320    b) 220
- a) 0    b) 32
- a) see below    b)  $\{1, 4, 8, 10, 12\}$     c)  $\{4, 6, 11, 12\}$     d)  $\{1, 3, 6, 8, 10, 11, 12\}$     e) true



5. All subsets of  $\{1, 2, 3, 4, 5\}$ .

0-element:  $\emptyset$   
 1-element:  $\{1\}, \{2\}, \{3\}, \{4\}, \{5\}$   
 2-element:  $\{1, 2\}, \{1, 3\}, \{1, 4\}, \{1, 5\}, \{2, 3\}, \{2, 4\}, \{2, 5\}, \{3, 4\}, \{3, 5\}, \{4, 5\}$   
 3-element:  $\{1, 2, 3\}, \{1, 2, 4\}, \{1, 2, 5\}, \{2, 3, 4\}, \{2, 3, 5\}, \{3, 4, 5\}$   
 $\{1, 3, 4\}, \{1, 3, 5\}, \{2, 4, 5\}$   
 $\{1, 4, 5\}$   
 4-element:  $\{1, 2, 3, 4\}, \{1, 2, 3, 5\}, \{1, 2, 4, 5\}, \{1, 3, 4, 5\}, \{2, 3, 4, 5\}$   
 5-element:  $\{1, 2, 3, 4, 5\}$

6. All 3–element subsets of  $X = \{1, 2, 3, 4, 5, 6, 7\}$ .

smallest element is 1:  $\{1, 2, 3\}$   $\{1, 3, 4\}$   $\{1, 4, 5\}$   $\{1, 5, 6\}$   $\{1, 6, 7\}$   
 $\{1, 2, 4\}$   $\{1, 3, 5\}$   $\{1, 4, 6\}$   $\{1, 5, 7\}$   
 $\{1, 2, 5\}$   $\{1, 3, 6\}$   $\{1, 4, 7\}$   
 $\{1, 2, 6\}$   $\{1, 3, 7\}$   
 $\{1, 2, 7\}$

smallest element is 2:  $\{2, 3, 4\}$   $\{2, 4, 5\}$   $\{2, 5, 6\}$   $\{2, 6, 7\}$   
 $\{2, 3, 5\}$   $\{2, 4, 6\}$   $\{2, 5, 7\}$   
 $\{2, 3, 6\}$   $\{2, 4, 7\}$   
 $\{2, 3, 7\}$

smallest element is 3:  $\{3, 4, 5\}$   $\{3, 5, 6\}$   $\{3, 6, 7\}$   
 $\{3, 4, 6\}$   $\{3, 5, 7\}$   
 $\{3, 4, 7\}$

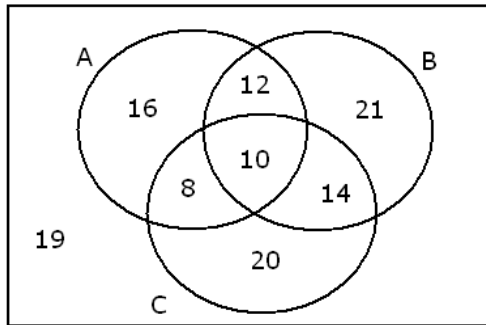
smallest element is 4:  $\{4, 5, 6\}$   $\{4, 6, 7\}$   
 $\{4, 5, 7\}$

smallest element is 5:  $\{5, 6, 7\}$

7. a) 128      b) 127

8. 6

9. a) see below      b) 44      c) 19      d) 85      e) 12      f) 34



10. 24

11. a) 6084 000      b) 2948 400

12. a) 256      b) 8      c) 28      d)  $2^8 - \left( \binom{8}{0} + \binom{8}{1} + \binom{8}{2} \right) = 219$

13.  $21^\circ$

14.  $52^\circ$

15. a)  $P = 56$  ft      b)  $A = 84$  ft<sup>2</sup>

16. a)  $P = 56$  ft       $A = 159$  ft<sup>2</sup>      b)  $P = 24$  m       $A = 24$  m<sup>2</sup>

17. a) \$37 500 000      b) \$28 750 000      c) \$7187 500

18. a) \$8000      b) \$9004.72

19. \$1447.39

20. 8% increase

21. 13 units

22.  $\sqrt{213}$  m

23. a)  $\sqrt{24}$  m =  $2\sqrt{6}$  m      b)  $10\sqrt{6}$  m<sup>2</sup>

24.  $h = \sqrt{224}$  unit =  $4\sqrt{14}$  unit       $H = \sqrt{124}$  unit =  $2\sqrt{31}$  unit