Review Problems

1. There are 100 people in a convention. If everyone shakes hands with everyone else in the room, how many handshakes are taking place?

2. Compute each of the following.

   a) $\binom{6}{0} - \binom{6}{1} + \binom{6}{2} - \binom{6}{3} + \binom{6}{4} - \binom{6}{5} + \binom{6}{6}$

   b) $\binom{6}{0} + \binom{6}{1} + \binom{6}{2} + \binom{6}{3} + \binom{6}{4} + \binom{6}{5} + \binom{6}{6}$

3. Let $U = \{a, b, c, d, e, f, g, h, i, j\}$, $A = \{a, b, c, d, g, i\}$, $B = \{a, c, e, i, j\}$, and $C = \{b, e, f, h, j\}$

   a) Draw a Venn diagramm depicting these sets.

   b) Find $(B \cup C')'$

   c) Find $(A \cap C')' \cup (A' \cap C)$.

   d) Find $(A \cup B') \setminus C'$

   e) List all subsets of B.

   f) True or false? $(A \cap B) \cap C' \subseteq (A \cup B) \cap C'$

4. List all 3−element subsets of the set $X = \{1, 2, 3, 4, 5, 6, 7\}$.

5. Find $n(P)$ if we know that $n(Q) = 18$, $n(P \cup Q) = 27$, and $n(P \cap Q) = 4$.

6. We asked 120 people if they listen to radio, watch TV or read books. 85 watch TV, 69 listen to radio, and 74 read books. 51 watch TV and listen to radio, 57 watch TV and read books, and 43 listen to radio and read books. 29 do all three.

   a) Draw a Venn diagram depicting the information given.

   b) How many people only listen to radio?

   c) How many people read books or watch TV?

   d) How many people do neither of these?

7. The inner angles of a regular polygon measure 140°. How many sides does this polygon have?]

8. How many different 3−digit numbers can be formed using the digits 1, 3, 4, 5, 7, and 9, if

   a) repetition of digits is allowed?

   b) repetition of digits is not allowed?

9. How many different **even** 3−digit numbers can be formed using the digits 1, 3, 4, 5, 7, and 9, if

   a) repetition of digits is allowed?

   b) repetition of digits is not allowed?

10. We toss a coin seven times in a row.

    a) What is the total number of outcomes?

    b) How many outcomes are possible with exactly one tail?

    c) How many outcomes are possible with exactly two tails?

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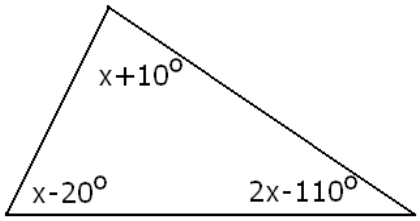
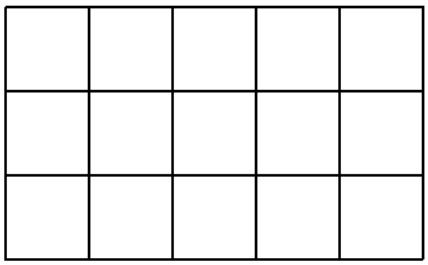
d) How many outcomes are possible **at most** five tails? (At most means five or less).

11. Find x based on the picture below.



12. Consider a rectangle with sides 25 ft and 18 ft long.
    a) Compute the perimeter of th rectangle. Include units in your computation and answer.
    b) Compute the area of th rectangle. Include units in your computation and answer.
13. There are 12 points on a circle. We connect every point with all other points.
    a) How many line segments did we draw? b) How many triangles did we draw?
14. Consider the figure shown on the picture below.



    a) How many rectangles are there in the figure? b) How many squares are there in the figure?
15. Currently, there are 60000 residents living in town T.
    a) This is a 20% decrease from last year's population. How many residents lived in the town a year ago?
    b) The town plans to increase its population to its previous size. What percent of an increase would this represent?
16. A year ago we placed some money in a bank account that earns 12% per year. How much money did we place in the account if it now contains \$3920?
17. We placed \$2000 into a bank account with an annual simple interest rate of 8%. How much money do we have after 15 years?
18. We borrowed \$2400 for two years, with a simple annual interest rate of 10%. After 7 months, we make a partial payment of \$900. After an additional 6 months, we make another partial payment of \$1000. How much do we owe at the end of the two years?

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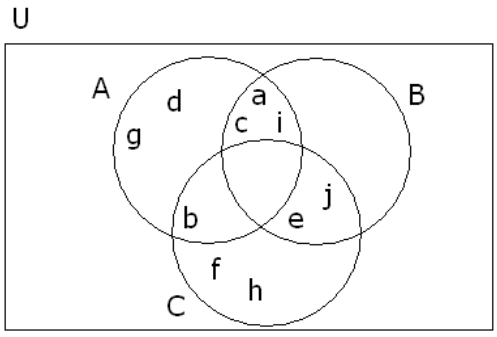
Review Problems - Answers

1.) 4950 2.) a) 0 b) 64

3,) a) see below b) $\{b, f, h\}$ c) $\{b, e, f, h, j\}$ d) $\{b, f, h\}$



e)

0-element:	$\varnothing$
1-element:	$\{a\}, \{c\}, \{e\}, \{i\}, \{j\}$
2-element:	$\{a, c\}, \{a, e\}, \{a, i\}, \{a, j\}, \{c, e\}, \{c, i\}, \{c, j\}, \{e, i\}, \{e, j\}, \{i, j\}$
3-element:	$\{a, c, e\}, \{a, c, i\}, \{a, c, j\}$ $\{c, e, i\}, \{c, e, j\}$ $\{e, i, j\}$ $\{a, e, i\}, \{a, e, j\}$ $\{c, i, j\}$ $\{a, i, j\}$
4-element:	$\{c, e, i, j\}, \{a, e, i, j\}, \{a, c, i, j\}, \{a, c, e, j\}, \{a, c, e, i\}$
5-element:	$\{a, c, e, i, j\}$

f) true

4.)

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:	$\{5,6,7\}$

5.) 13

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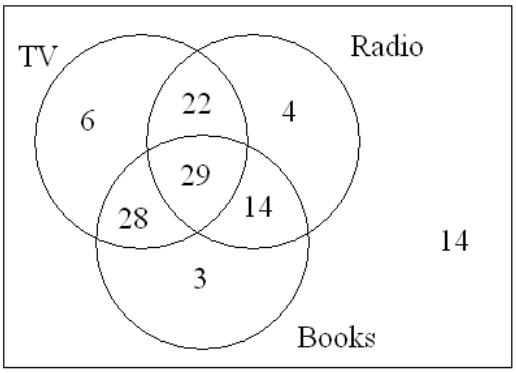
6.) a) see below b) 4 c) 102 d) 14



7.) 9 8.) a) $6^3 = 216$ b) $6 \cdot 5 \cdot 4 = 120$ 9.) a) $6^2 \cdot 1 = 36$ b) $5 \cdot 4 \cdot 1 = 20$

10.) a) $2^7 = 128$ b) $\binom{7}{1} = 7$ c) $\binom{7}{2} = \frac{7 \cdot 6}{2!} = 21$

d) $2^7 - \left(\binom{7}{6} + \binom{7}{7}\right) = 128 - (7 + 1) = 120$

11.) 75° 12.) a) $P = 86\,\text{ft}$ b) $A = 450\,\text{ft}^2$ 13.) a) $\binom{12}{2} = 66$ b) $\binom{12}{3} = 220$

14.) a) 90 b) 26 15.) a) 75000 b) 25% 16.) \$3500 17.) \$4400

18.) \$788. 18

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