For problems 1 through 3, use the following:

\[ U = \{10, 11, 12, 13, 14, 15, 16, 17, 18\} \]
\[ A = \{10, 11, 12, 13, 14\} \]
\[ B = \{11, 13, 15, 17\} \]
\[ C = \{15, 16, 17, 18\} \]

1. Find \( A \cap C \).
   (a) \( \{14\} \)  (b) \( U \)  (c) \( B \)  (d) \( \{14, 15\} \)  (e) \( \emptyset \)

2. Consider the following statements:
   I. \( A \cup C = U \)
   II. \( B \subseteq A \)
   III. \( 14 \in B \)
   IV. \( A' = C \).
   (a) I and II are true  (b) II and III are true  (c) II and IV are true
   (d) I and IV are true  (e) III and IV are true.

3. Find \( A' \cap B' = \{15, 16, 17, 18\} \cap \{10, 12, 14, 16, 18\} \)
   (a) \( \{14\} \)  (b) \( \{16, 18\} \)  (c) \( \{11, 13\} \)  (d) \( \{10, 12, 14, 15, 16, 17\} \)  (e) \( \{10, 12, 14, 15, 17\} \)

4. Compute \( P(6, 2) \)
   (a) 720  (b) 360  (c) 30  (d) 15  (e) 12

5. Compute \( C(6, 2) \)
   (a) 720  (b) 360  (c) 30  (d) 15  (e) 3

6. How many different "words" could be made by
rearranging the letters of "ARKANSAS". \[ \frac{8!}{3! \cdot 2!} = 3360 \]

(a) 56  (b) 28  (c) 3360  (d) 6720  (e) 40,320

7. Selecting from among ten students who qualified at a college, in how many ways could four students be selected as delegates?

(a) \( P(10,4) \)  (b) \( C(10,4) \)  (c) \( P(10,4) \)  (d) \( C(10,4) \)  (e) \( P(10,6) \)

8. A bag contains 7 orange balls, 5 red balls, and 3 green balls. In how many ways can a person draw out 3 orange, 3 red, and 1 green?

(a) \( P(7,3) \cdot P(5,3) \cdot P(3,1) \)  (b) \( C(7,3) \cdot C(5,3) \cdot C(3,1) \)  (c) \( P(7,3) + P(5,3) + P(3,1) \)
(c) \( C(7,3) + C(5,3) + C(3,1) \)  (d) \( P(7,3) \cdot P(5,3) \cdot P(3,1) \)  (e) \( P(7,3) + P(5,3) + P(3,1) \)

9. A bag contains 7 orange balls, 5 red balls, and 3 green balls. In how many ways can a person draw out 3 orange or 3 red or 1 green?

(a) \( P(7,3) \cdot P(5,3) \cdot P(3,1) \)  (b) \( C(7,3) \cdot C(5,3) \cdot C(3,1) \)  (c) \( P(7,3) + P(5,3) + P(3,1) \)
(c) \( C(7,3) + C(5,3) + C(3,1) \)  (d) \( C(7,3) \cdot C(5,3) \cdot C(3,1) \)  (e) \( C(7,3) \cdot C(5,2) \cdot C(3,1) \)

10. How many 6 character passwords are possible if the first 3 characters are the digits 0 through 9 not allowing for repetition and the remaining 3 characters are letters of the alphabet allowing for repetition.

(a) \( P(10,3) \cdot P(26,3) \)  (b) \( 10^3 \cdot P(26,3) \)  (c) \( P(10,3) \cdot 26^3 \)  (d) \( 10^3 \cdot 26^3 \)  (e) \( P(10,3) \cdot C(26,3) \)
11. After a weekend camp, 100 students could be classified as follows: 47 played Twister, 46 played backgammon, 23 played chess, 26 played Twister and backgammon, 11 played Twister and chess, 18 played backgammon and chess, and 15 played all three. How many played none of the three games?

(a) 71  (b) 38  (c) 10  (d) 29  (e) 62

12. Find the periodic payment of an ordinary annuity whose present value is $4000 and whose annual interest rate is 7.2% compounded quarterly for 5 years.

(a) $4000 = R \left[ \frac{1 - (1.018)^{-5}}{1.018} \right]  
(b) P = 4000 \left[ \frac{1 - (1.018)^{-5}}{0.018} \right] 
(c) 4000 = R \left[ \frac{1 - (1.072)^{-5}}{0.072} \right]  
(d) P = 4000 \left[ \frac{1 - (1.018)^{-20}}{0.018} \right] 

(\text{Correct Answer:} (d)) 
13. Simplify $P(6,4) \cdot C(7,2)$ 

Show work on remaining problems.
14. Draw a tree diagram to show the number of ways that Betsy Boop can select a pair of earrings and a lapel. She has gold dangling earrings, white pearl earrings, red hoop earrings, a black-n-gold lapel, an American-flag lapel, and a horse-shaped lapel.

15. A family wants to accumulate $20,000 in a sinking fund after 10 years of investing. Find the monthly payment if the fund pays 6% compounded monthly.

16. Elmer Fudd wins $2,000,000 in a lottery. In order to reduce tax on it, he chooses not to get it as one lump sum, but instead to receive $200,000 annually for 10 years. In order to make the annual payments to him, how much should the lottery place in an annuity that earns 10% compounded annually.
7. \[ \frac{8!}{3! \cdot 3!} = \frac{8 \cdot 7 \cdot 6 \cdot 5 \cdot 4}{2} = 3360 \]

11. (Venn Diagram)

18. \[ P(3,4) \cdot C(7,2) = \frac{6!}{(2-4)!} \cdot \frac{7!}{2!(7-2)!} = \frac{6!}{3! \cdot 2!} \cdot \frac{7!}{2! \cdot 5!} = \frac{6 \cdot 5 \cdot 4}{2} = \frac{7560}{360 \cdot 2} = 1 \]

15. Keywords: "sinking"

\[ A = R \left[ \frac{(1+i)^n - 1}{i} \right] \]

\[ 20,000 = R \left[ \frac{(1.05)^{120} - 1}{0.05} \right] \]

\[ 20,000 = R \left[ \frac{163.8793}{0.05} \right] \]

\[ R = \# 122.04 \pm 0.10 \text{ ok} \]

16. Keywords: "annual" and present tense of "place"

\[ P = R \left[ \frac{1 - (1.05)^n}{i} \right] \]

\[ 200,000 \left[ \frac{1 - (1.10)^{-10}}{0.10} \right] = \# 1,228,913.42 \]

8. Keywords: "and" \Rightarrow +

"or" \Rightarrow +

Each orange ball looks same \Rightarrow C(5,3) not P(5,3)

red " " " \Rightarrow C(5,3) not P(5,3)

green " " " \Rightarrow C(3,1) not P(3,1)

Digits not allow for repetition \Rightarrow P(9,3) or C(9,3)

and common sense says select P(9,3).

Key word "premise" \Rightarrow use annuity formula with P not A.

\[ i = \frac{r - m}{q} = 0.018 \quad n = m \cdot t = 4 \cdot 5 = 20 \]