

For problems 1-5, please show set up for problem as well as answer. All answers need to be fully simplified.

$$1. {}_{10}C_6 = \frac{10!}{4!6!} = \boxed{210}$$

$$2. {}_{10}P_2 = \boxed{90}$$

$$3. \frac{4!8!}{6!} = \boxed{1344}$$

$$4. \binom{n+1}{n} = \frac{(n+1)!}{((n+1)-n)!n!} = \frac{(n+1)!}{n!} = \frac{(n+1)A(n-1)!}{\cancel{A(n-1)!}} = \boxed{n+1}$$

5. A telephone number is composed of 7 digits where the first digit can't be 0 or 1. What is the probability that a random phone number begins and ends with a 7 or an 8?

$$\text{Total \#}: \underline{8} \cdot \underline{10} \cdot \underline{10} \cdot \underline{10} \cdot \underline{10} \cdot \underline{10} \cdot \underline{10} \quad \text{Favorable}: \underline{2} \quad \underline{10} \quad \underline{10} \quad \underline{10} \quad \underline{10} \quad \underline{10} \quad \underline{2}$$

$$\frac{400000}{8,000,000}$$

6. 12 people are running the 500 m race. How many ways can the top 3 finishers be decided?

$${}_{12}P_3 = \boxed{1320}$$

7. A swim coach must form a girls IM relay (4 swimmers with one swimming one of each of the following: butterfly, backstroke, breaststroke, freestyle). He has 11 girls on his team. How many different relays can he form?

*order matters because swimming backstroke isn't same as butterfly.

$${}_{11}P_4 = \boxed{7920}$$

8. How many different ways can a committee of 6 students be chosen from 24 members of a club?

$${}_{24}C_6 = \boxed{134,596}$$

9. How many different "words" can be made by rearranging the letters in the word "ARKANSAS"?

$$\frac{8P8}{3!2!} = \boxed{3360}$$

3 A's 2 S's

10. You are packing for a trip. You want to take 5 shirts, 2 pairs of pants, and 2 pairs of shoes. If you have 10 shirts, 8 pairs of pants, and 5 pairs of shoes in your closet, how many different ways could you pack the necessary items?

$${}_{10}C_5 \cdot {}_8C_2 \cdot {}_5C_2 = \boxed{70,560}$$

For question 11, answer each part. Show all work for full credit.

11. You are playing a card game with a standard deck of 52 playing cards.

a. How many different 6-card hands could you pick?

$$52C_6 = 20358520$$

b. What is the probability that your 6-card hand is all diamonds?

$$13C_6 = 1716$$

$$\frac{1716}{20358520}$$

c. What is the probability that you pick 3 Queens and 2 Fours? $6^{th} \text{ card}: 44C_1 = 4$

$$\frac{96}{20358520}$$

$$4C_3 = 4 \quad 4C_2 = 6$$

d. What is the probability that you get all odd cards? (Face cards are not even or odd)

$$20C_6 = 38760$$

$$\frac{38760}{20358520}$$

e. What is the probability that you pick 3 clubs, 2 hearts, and 1 spade?

$$13C_3 \quad 13C_2 \quad 13C_1$$

$$286$$

$$\frac{290,004}{20,358,520}$$

f. What is the probability that you DON'T pick a spade?

$$39C_6 = 3262623$$

$$\frac{3262623}{20358520}$$

