

Name: Key

Period: _____

SECTION 15-7: Combinations

1. Evaluate ${}_{100}C_2$.

$$\frac{100!}{98!2!} = \frac{100 \cdot 99 \cdot \cancel{98!}}{2! \cdot \cancel{98!}} = \boxed{4950}$$

2. Find the number of three-letter combinations of the letters in the word STINGER.

$${}_7C_3 = \frac{7!}{3!4!} = \boxed{35}$$

3. You can order a hamburger with cheese, onion, pickles, ketchup, relish, mustard, lettuce, tomato, or mayonnaise. How many combinations of four "extras" can you make?

9 extras

$${}_9C_4 = \frac{9!}{4!5!} = \boxed{126}$$

4. 12 points lie randomly on the circumference of a circle. How many inscribed hexagons can you make using these points as vertices? (p. 740 in your text has a similar example).

 ${}_{12}C_6 \leftarrow$ hexagon

$$\frac{12!}{6!6!} = \boxed{924}$$

5. Suppose a club has 10 boys and 12 girls and needs to select a committee to decide on next year's activities. How many 6-person committees can you make if:

 $\frac{22 \text{ total}}{\text{people}}$

(A) All members are equally eligible?

$${}_{22}C_6 = \frac{22!}{6!16!} = \boxed{74,613}$$

(B) There must be an equal number of boys and girls on the committee? 3 B, 3 G

$${}_{10}C_3 \cdot {}_{12}C_3 = \frac{10!}{3!7!} \cdot \frac{12!}{3!9!} = \boxed{26,400}$$

6. From a standard 52-card deck, how many 13-card hands can you make having exactly 8 clubs?

8 clubs, 5 other

$${}_{13}C_8 \cdot {}_{39}C_5$$

$$\frac{13!}{8!5!} \cdot \frac{39!}{5!34!} = \boxed{740,999,259}$$

From the same deck, how many 5-card hands can you make with exactly 3 aces?

$${}_4C_3 \cdot {}_{48}C_2$$

$$4 \cdot 1128$$

$$\boxed{4512}$$

7. Three dice are rolled, one green, one red, and the other blue. The outcome is an ordered triple (r, g, b).

(A) How many elements are there in the sample space? (hint: in how many ways can each die turn up?)

$$R \cdot G \cdot B = 6 \cdot 6 \cdot 6 = \boxed{216}$$

(B) Write the event when all three dice show the same number.

$$(1,1,1) (2,2,2) (3,3,3) (4,4,4) (5,5,5) (6,6,6)$$

(C) Write the event when the red die is a multiple of 3, the green die is 6, and the blue die is even.

$$(R,G,B) \rightarrow (3,6,2) (3,6,4) (3,6,6) (\cancel{6},6,2) (6,6,4) (6,6,6)$$

8. A bag contains 4 red rocks, 5 blue rocks, 6 yellow rocks, and 7 green rocks. An experiment consists of drawing ONE rock and noting its color. Find the probability of each event.

A: The rock is not green.
 $4+5+6=15$

$$\frac{15}{22}$$

B: The rock is red or blue.
 $4+5=9$

$$\frac{9}{22}$$

C: The rock is blue or not yellow.

$$5+4+7=16 \quad \frac{16}{22} = \frac{8}{11}$$

D: The rock is a primary color.
 (R, B, Y)

$$\frac{15}{22}$$

9. An experiment consists of tossing three coins one time and noting their outcomes.

Write the sample space for this experiment.

$$\{HHH, HHT, HTH, THH, TTH, THT, HTT, TTT\}$$

Find the probability of each event:

A: None are tails \rightarrow all heads

$$\frac{1}{8}$$

B: Exactly one is heads

$$\frac{3}{8}$$

C: Exactly two are tails
 (same as B)

$$\frac{3}{8}$$

D: At least two are tails

$$2T \text{ or } 3T \quad \frac{4}{8} = \frac{1}{2}$$

10. Using the same bag of rocks from above, a new experiment is done. This time, TWO rocks are drawn from the bag and each color is recorded.

How many elements are in the sample space?

$$22C_2 = 231$$

Find the probability of each event:

A: Both are red

$$\frac{4C_2}{231} = \frac{6}{231} = \frac{2}{77}$$

B: Neither is red

$$\frac{18C_2}{231} = \frac{153}{231} = \frac{51}{77}$$

C: One is blue and one is yellow

$$\frac{5 \cdot 6}{231} = \frac{30}{231} = \frac{10}{77}$$

D: Both are blue or both are green

$$\frac{5C_2 + 7C_2}{231} = \frac{31}{231}$$

11. An experiment consists of randomly selecting 3 cards from a 52-card deck.

How many items are in the sample space?

$$52C_3 = 22,100$$

Find the probability of each event:

A: All three are hearts

$$\frac{13C_3}{22100} = \frac{286}{22100} = \frac{11}{850}$$

B: All three are kings

$$\frac{4C_3}{22100} = \frac{4}{22100} = \frac{1}{5525}$$

C: Two are diamonds and one is clubs

$$\frac{13C_2 \cdot 13}{22100} = \frac{78 \cdot 13}{22100} = \frac{39}{850}$$