

Probability, Odds, Counting Principle, Permutations and Combinations Practice

1. While getting dressed one morning, you have a difficult time deciding between 5 different shirts, 2 different pairs of pants, and 3 different pairs of shoes to wear. How many different outfits are possible?

$$5 \cdot 2 \cdot 3 = \boxed{30 \text{ outfits}}$$

2. How many license plates of 5 symbols can be made using a letter (cannot use O) for the first symbol and digits that cannot repeat for the remaining symbols?

$$\frac{25}{1} \cdot \frac{10}{1} \cdot \frac{9}{1} \cdot \frac{8}{1} \cdot \frac{7}{1} = \boxed{126,000}$$

3. What is the value of  ${}_{12}C_2$  ?

$$\frac{12!}{(12-2)! \cdot 2!} = \frac{12!}{10! \cdot 2!} = \boxed{66}$$

Give a specific example of when you would need to use a combination with  $n = 12$  and  $r = 2$ .

Out of 12 students, 2 will be chosen to represent the group.

4. What is the value of  ${}_7P_3$  ?

$$\frac{7!}{(7-3)!} = \frac{7!}{4!} = \boxed{210}$$

Give a specific example of when you would need to use a permutation with  $n = 7$  and  $r = 3$ .

Pictures of 7 students will be taken in groups of 3. How many ways can they line up?

5. A red, a green, and a yellow die are tossed. What is the probability that the red die shows a 4, the green die shows an odd number, and the yellow die shows a 1 or 2?

$$\frac{1}{6} \cdot \frac{3}{6} \cdot \frac{2}{6} = \frac{6}{216} = \boxed{\frac{1}{36}}$$

6. A dessert cart features 10 desserts, and customers are allowed to pick 3 for a sampler plate. How many different sampler plates are possible?

$${}_{10}C_3 = \frac{10!}{(10-3)! \cdot 3!} = \frac{10!}{7! \cdot 3!}$$

$$= \boxed{120 \text{ plates}}$$

7. How many ways can 5 different books out of a choice of 8 books be arranged on a book shelf?

$${}^8P_5 = \frac{8!}{(8-5)!}$$

$$= \boxed{6,720 \text{ ways}}$$

8. A biology class of 12 girls and 16 boys are forming study groups. How many different groups of 2 girls and 3 boys can be formed?

$${}^{12}C_2 \cdot {}^{16}C_3$$

$$\frac{12!}{(12-2)!2!} \cdot \frac{16!}{(16-3)!3!}$$

$$\frac{12!}{10!2!} \cdot \frac{16!}{13!3!} = 66 \cdot 560 = 36,960$$

A box contains 2 scalene triangles, 3 equilateral triangles, 6 circles, and 4 squares. Use this information for problems 9-14. Be sure to think carefully about whether you must add or multiply probabilities of compound events:

9. What are the odds in favor of pulling out a square on the first try?

$$\frac{4}{11}$$

10. What is the probability of not pulling out a triangle on the first try?

$$\frac{10}{15} = \boxed{\frac{2}{3}}$$

11. What are the odds against pulling out a circle on the first try?

$$\frac{9}{6} = \boxed{\frac{3}{2}}$$

12. What is the probability of picking out a circle, a square, and another circle (in that order) without replacing each?

$$\frac{6}{15} \cdot \frac{4}{14} \cdot \frac{5}{13} \rightarrow \frac{2}{5} \cdot \frac{2}{7} \cdot \frac{5}{13}$$

Dependent!  $\checkmark$   $= \boxed{\frac{20}{455}}$

13. What is the probability of picking out a circle, square and triangle (in that order), replacing each after it is pulled?

$$\frac{6}{15} \cdot \frac{4}{15} \cdot \frac{5}{15} \rightarrow \frac{3}{5} \cdot \frac{4}{15} \cdot \frac{1}{5}$$

$$= \boxed{\frac{12}{375}}$$

14. What is the probability of pulling out a triangle or a polygon with all congruent sides?

# Triangles = 5  
# Polygon w/ congruent sides = 7

# of Triangles w/  $\cong$  sides = 3

$$\frac{5}{15} + \frac{7}{15} - \frac{3}{15} = \frac{9}{15} = \boxed{\frac{3}{5}}$$