

*Independent vs. Dependent, Mutually Exclusive/Inclusive, And vs. Or, Venn Diagrams*

For Exercises 1–3, determine whether the events are *independent* or *dependent*.

1. You roll a 2 on a number cube and spin a 3 on a spinner. **I**
2. You choose a King from a deck of cards and get heads in a coin toss. **I**
3. You roll a number cube and get a 6, and roll again if the first roll is a 6. **D**
4. You choose an ice cream flavor and choose a topping **I**
5. Raffle tickets are placed in a jar. You select three tickets, one after the other, without replacing the ticket after it is chosen. **D**

Solve each problem.

6. How many 7-digit phone numbers can be formed if the first digit cannot be 0 or 1, and any digit can be repeated?

$$\underline{8} \underline{10} \underline{10} \underline{10} \underline{10} \underline{10} \underline{10} = 8,000,000$$

7. How many 5-character passwords can be formed if the first 4 characters are non-repeating numbers and the last one is a letter?

$$\underline{10} \underline{9} \underline{8} \underline{7} \underline{26} = 131040$$

8. How many 4 letter arrangements can be made with the letters in the word HOCKEY if the letters cannot be repeated?

$$\underline{6} \underline{5} \underline{4} \underline{3} = 360$$

9. Two marbles are randomly selected from a bag containing 10 blue and 8 red marbles, without replacement.

a) What is the probability that 2 red marbles are selected?

$$\frac{8}{18} \cdot \frac{7}{17} = \frac{56}{306} = \frac{28}{153}$$

b) What is the probability that the first will be red and the second will be blue?

$$\frac{8}{18} \cdot \frac{10}{17} = \frac{80}{306} = \frac{40}{153}$$

10. A single die is rolled. What is the probability that the number is greater than 3 or even?

$$\frac{3}{6} + \frac{3}{6} - \frac{2}{6} = \frac{4}{6} = \frac{2}{3}$$

(4, 5, 6) + (2, 4, 6)

11. What's the difference between mutually EXCLUSIVE versus INCLUSIVE.

no overlap

overlap

12. Vanessa has a stack of playing cards consisting of 5 diamonds, 10 hearts, 3 spades, and 2 clubs. If she selects a card at random from this stack, what is the probability that she will pick: **20 Total!**

a) P(a club or a heart)

$$\frac{2}{20} + \frac{10}{20} = \frac{12}{20} = \frac{3}{5}$$

b) P(a diamond or a spade)

$$\frac{5}{20} + \frac{3}{20} = \frac{8}{20} = \frac{2}{5}$$

c) P(a diamond or a club or

$$\frac{5}{20} + \frac{2}{20} + \frac{10}{20} = \frac{17}{20}$$

13. A card is randomly selected from a standard deck of cards. What is the probability that ...

a) P(an Ace or a red card)

$$\frac{4}{52} + \frac{26}{52} - \frac{2}{52} = \frac{7}{13}$$

b) P(Queen or Heart)

$$\frac{4}{52} + \frac{13}{52} - \frac{1}{52} = \frac{16}{52} = \frac{4}{13}$$

c) P(Queen and a Heart)

$$\frac{1}{52}$$

d) P(Diamond or a black card)

$$\frac{13}{52} + \frac{26}{52} = \frac{39}{52}$$

14. Two cards are selected from a standard deck, without replacement. What is the probability of choosing...

a) an Ace and then another Ace?

$$\frac{4}{52} \cdot \frac{3}{51} = \frac{12}{2652} = \frac{1}{221}$$

b) a Jack and then a 2?

$$\frac{4}{52} \cdot \frac{4}{51} = \frac{16}{2652} = \frac{4}{663}$$

15. Denise has 2 math, 4 history, and 6 science books in a pile on her desk. She randomly selects a book and does not replace it to the pile. She then randomly selects another book. **12 TOTAL**

a) What is the probability that she selects 1 history and 1 math?

$$\frac{4}{12} \cdot \frac{2}{11} = \frac{8}{132} = \frac{2}{33}$$

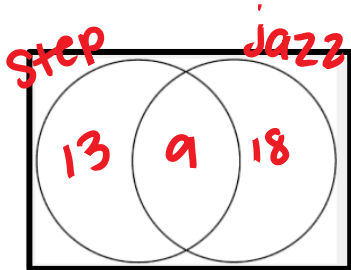
b) What is the probability that she selects 1 math and 1 science?

$$\frac{2}{12} \cdot \frac{6}{11} = \frac{12}{132} = \frac{1}{11}$$

c) What is the probability that she selects 1 math, 1 history, and then another history?

$$\frac{2}{12} \cdot \frac{4}{11} \cdot \frac{3}{10} = \frac{24}{1320} = \frac{1}{55}$$

16. There are **40** members at the local gym, 22 take a step aerobics class and 27 take a jazzercise class. They all take at least one class. Determine each probability if a person is selected at random from the participants.



$$22 + 27 = 49$$

$$49 - 40 = 9$$

i. P(step aerobics or jazzercise, but not both)

$$\frac{13}{40} + \frac{18}{40} = \frac{31}{40}$$

ii. P(step aerobics and jazzercise)

$$\frac{9}{40}$$

iii. P(only step aerobics)

$$\frac{13}{40}$$