Find the probability of each event.

1) One day, seven babies are born at a hospital. Assuming each baby has an equal chance of being a boy or girl, what is the probability that exactly four of the seven babies are girls?

2) A six-sided die is rolled nine times. What is the probability that the die will show an even number exactly seven times?

3) You are dealt five cards from a standard and shuffled deck of playing cards. Note that a standard deck has 52 cards and four of those are kings. What is the probability that you'll have exactly two kings in your hand?

4) A shipment of eleven smartphones contains five with cracked screens. If sold in a random order, what is the probability that exactly three of the first five sold have cracked screens?

5) A meeting takes place between a diplomat and thirteen government officials. However, three of the officials are actually spies. If the diplomat gives secret information to ten of the attendees at random, what is the probability that no secret information was given to the spies?

6) A quiz consists of seven multiple choice questions. Each question has four choices. A student who forgot to study guesses randomly on every question. What is the probability that the student answers exactly five questions correctly?

7) A class has six students. What is the probability that exactly four of the students were born on a weekend?

8) A hotel has three elevators. One of them is a freight elevator. When pressing the button, one of the elevators randomly services your floor. If you use the elevators six times, what is the probability that you use the freight elevator exactly three times?

Find the missing probability.

9) \( P(B) = 0.3 \quad P(A \cap B) = 0.075 \quad P(A|B) = ? \)

10) \( P(A^c) = 0.5 \quad P(A \cap B) = 0.375 \quad P(B|A) = ? \)

11) \( P(B) = 0.5 \quad P(A \cap B) = 0.1225 \quad P(A|B) = ? \)
12) \( P(A) = \frac{1}{4} \quad P(B) = \frac{7}{20} \quad P(A \cap B) = \frac{7}{80} \quad P(A \cup B) = ? \)

13) \( P(A) = \frac{3}{4} \quad P(B) = \frac{11}{20} \quad P(A \cup B) = \frac{71}{80} \quad P(A \cap B) = ? \)

14) \( P(A) = \frac{9}{20} \quad P(B') = \frac{9}{20} \quad P(A \cup B) = \frac{301}{400} \quad P(A \cap B) = ? \)

**Events \( A \) and \( B \) are mutually exclusive. Find the missing probability.**

15) \( P(B) = \frac{1}{5} \quad P(A \cup B) = \frac{11}{20} \quad P(A) = ? \)
16) \( P(A) = \frac{2}{5} \quad P(B) = \frac{2}{5} \quad P(A \cup B) = ? \)

**Events \( A \) and \( B \) are independent. Find the missing probability.**

17) \( P(B) = \frac{9}{20} \quad P(A \text{ and } B) = \frac{9}{100} \quad P(A) = ? \)
18) \( P(A) = \frac{7}{20} \quad P(B) = \frac{1}{5} \quad P(A \text{ and } B) = ? \)

**Find the probability.**

19) A cooler contains fifteen bottles of sports drink: five lemon-lime flavored, five orange flavored, and five fruit-punch flavored. You randomly grab a bottle. Then you return the bottle to the cooler, mix up the bottles, and randomly select another bottle. Both times you get a lemon-lime drink.

20) A basket contains five apples and four peaches. You randomly select a piece of fruit and then return it to the basket. Then you randomly select another piece of fruit. The first piece of fruit is an apple and the second piece is a peach.

21) A bag contains four yellow jerseys numbered one to four. The bag also contains three purple jerseys numbered one to three. You randomly pick a jersey. It is yellow or has an odd number.

22) A bag contains six yellow tickets numbered one to six. The bag also contains four green tickets numbered one to four. You randomly pick a ticket. It is yellow or has a number greater than three.
Find the probability of each event.

1) One day, seven babies are born at a hospital. Assuming each baby has an equal chance of being a boy or girl, what is the probability that exactly four of the seven babies are girls?

\[ P = \frac{7!}{4!3!}(0.5)^4(0.5)^3 = 0.27344 \times 100\% = 27.344\% \]

2) A six-sided die is rolled nine times. What is the probability that the die will show an even number exactly seven times?

\[ P = \left(\frac{3}{6}\right)^7 \left(\frac{1}{6}\right)^2 = 0.007031 \times 100\% = 0.7031\% \]

3) You are dealt five cards from a standard and shuffled deck of playing cards. Note that a standard deck has 52 cards and four of those are kings. What is the probability that you'll have exactly two kings in your hand?

\[ P = \frac{\binom{4}{2}\binom{48}{3}}{\binom{52}{5}} = 0.03993 \times 100\% = 3.993\% \]

4) A shipment of eleven smartphones contains five with cracked screens. If sold in a random order, what is the probability that exactly three of the first five sold have cracked screens?

\[ P = \frac{\binom{5}{3}\binom{6}{2}}{\binom{11}{5}} = 0.32468 \times 100\% = 32.468\% \]

5) A meeting takes place between a diplomat and thirteen government officials. However, three of the officials are actually spies. If the diplomat gives secret information to ten of the attendees at random, what is the probability that no secret information was given to the spies?

\[ P = \frac{\binom{10}{10}\binom{10}{10}}{\binom{13}{10}} = 0.35\% \]

6) A quiz consists of seven multiple choice questions. Each question has four choices. A student who forgot to study guesses randomly on every question. What is the probability that the student answers exactly five questions correctly?

\[ P = \frac{\binom{7}{5}\left(\frac{1}{4}\right)^5\left(\frac{3}{4}\right)^2}{\binom{7}{5}} = 0.001154 \times 100\% = 0.1154\% \]

7) A class has six students. What is the probability that exactly four of the students were born on a weekend?

\[ P = \frac{\binom{4}{4}\binom{2}{2}}{\binom{6}{4}} = 0.051 \times 100\% = 5.1\% \]

8) A hotel has three elevators. One of them is a freight elevator. When pressing the button, one of the elevators randomly services your floor. If you use the elevators six times, what is the probability that you use the freight elevator exactly three times?

\[ P = \binom{6}{3}\left(\frac{1}{3}\right)^3\left(\frac{2}{3}\right)^3 = 0.21948 \times 100\% = 21.948\% \]

Find the missing probability.

9) \[ P(B) = 0.3 \quad P(A \cap B) = 0.075 \quad P(A|B) = ? \]

\[ P(A|B) = \frac{P(A \cap B)}{P(B)} = \frac{0.075}{0.3} = 0.25 \]

10) \[ P(A^c) = 0.5 \quad P(A \cap B) = 0.375 \quad P(B|A) = ? \]

\[ P(B|A) = \frac{P(A \cap B)}{P(A)} = \frac{0.375}{0.5} = 0.75 \]

11) \[ P(B) = 0.5 \quad P(A \cap B) = 0.1225 \quad P(A|B) = ? \]

\[ P(A|B) = \frac{P(A \cap B)}{P(B)} = \frac{0.1225}{0.5} = 0.245 \]
12) \( P(A) = \frac{1}{4} \quad P(B) = \frac{7}{20} \quad P(A \cap B) = \frac{7}{80} \quad P(A \cup B) = ? \)

\[ \frac{41}{80} \]

13) \( P(A) = \frac{3}{4} \quad P(B) = \frac{11}{20} \quad P(A \cup B) = \frac{71}{80} \quad P(A \cap B) = ? \)

\[ \frac{33}{80} \]

14) \( P(A) = \frac{9}{20} \quad P(B) = \frac{9}{20} \quad P(A \cup B) = \frac{301}{400} \quad P(A \cap B) = ? \)

\[ \frac{99}{400} \]

Events \( A \) and \( B \) are mutually exclusive. Find the missing probability.

15) \( P(B) = \frac{1}{5} \quad P(A \cup B) = \frac{11}{20} \quad P(A) = ? \)

\[ \frac{7}{20} \]

16) \( P(A) = \frac{2}{5} \quad P(B) = \frac{2}{5} \quad P(A \cup B) = ? \)

\[ \frac{4}{5} \]

Events \( A \) and \( B \) are independent. Find the missing probability.

17) \( P(B) = \frac{9}{20} \quad P(A \text{ and } B) = \frac{9}{100} \quad P(A) = ? \)

\[ \frac{1}{5} \]

18) \( P(A) = \frac{7}{20} \quad P(B) = \frac{1}{5} \quad P(A \text{ and } B) = ? \)

\[ \frac{7}{100} \]

Find the probability.

19) A cooler contains fifteen bottles of sports drink: five lemon-lime flavored, five orange flavored, and five fruit-punch flavored. You randomly grab a bottle. Then you return the bottle to the cooler, mix up the bottles, and randomly select another bottle. Both times you get a lemon-lime drink.

\[ \frac{1}{9} \approx 0.111 \]

20) A basket contains five apples and four peaches. You randomly select a piece of fruit and then return it to the basket. Then you randomly select another piece of fruit. The first piece of fruit is an apple and the second piece is a peach.

\[ \frac{20}{81} \approx 0.247 \]

21) A bag contains four yellow jerseys numbered one to four. The bag also contains three purple jerseys numbered one to three. You randomly pick a jersey. It is yellow or has an odd number.

\[ \frac{6}{7} \approx 0.857 \]

22) A bag contains six yellow tickets numbered one to six. The bag also contains four green tickets numbered one to four. You randomly pick a ticket. It is yellow or has a number greater than three.

\[ \frac{7}{10} = 0.7 \]