

Probability Exam Review

Represent the sample space using set notation.

1) There is one quarter, one dime, and one nickel in your pocket. You randomly pick a coin.

$$S = \{Q, D, N\}$$

Find the number of possible outcomes in the sample space.

2) A basket contains two apples and a peach. You randomly pick a piece of fruit to eat. Then you pick another piece to eat later.

~~3~~ ~~3~~  $A_1, A_2, P$   $3P_2 = 6$

3) Six rooms in a house need to be painted. Each room can be painted white, yellow, or pink.

$$3 \times 3 \times 3 \times 3 \times 3 \times 3 = 3^6 = 729$$

Determine if the scenario involves mutually exclusive events.

4) A magazine contains fifteen pages. You open to a random page. The page number is five or thirteen.

M.E.

5) A cooler contains eleven sports drinks: seven lemon-lime and four orange. Four of the lemon-lime and three of the orange drinks are cold. The others are still warm. You randomly grab a bottle. It is orange flavored or warm.

N.M.E.

Find the probability.

6) You roll a fair six-sided die. The die shows an odd number or a number less than three.

N.M.E.  $P(E_1) + P(E_2) - P(E_1 \cap E_2)$

$$\frac{3}{6} + \frac{2}{6} - \frac{1}{6} = \frac{4}{6}$$

7) A spinner has an equal chance of landing on each of its eight numbered regions. After spinning, it lands in region four or eight.

M.E.

$$\frac{1}{8} + \frac{1}{8} = \frac{2}{8}$$

8) There are nine shirts in your closet, four blue and five green. Three of the blue shirts and two of the green shirts fit well. The others are too big. You randomly select a shirt to wear. It is green or fits well.

N.M.E.

$$\frac{5}{9} + \frac{5}{9} - \frac{2}{9} = \frac{8}{9}$$

9) A spinner has an equal chance of landing on each of its seven numbered regions. After spinning, it lands in region six or seven.

M.E.

$$\frac{1}{7} + \frac{1}{7} = \frac{2}{7}$$

Determine if events A and B are mutually exclusive.

10)  $P(A) = \frac{3}{4}$   $P(B) = \frac{1}{2}$   $P(A \cup B) = \frac{7}{8}$

If M.E., then  $P(A \cup B) = P(A) + P(B)$   
 $\frac{3}{4} + \frac{1}{2} = \frac{5}{4} \neq \frac{7}{8}$   
 N.M.E.

11)  $P(A) = \frac{3}{10}$   $P(B) = \frac{9}{20}$   $P(A \cup B) = \frac{3}{4}$

$\frac{3}{10} + \frac{9}{20} = \frac{15}{20} = \frac{3}{4}$  ✓  
 M.E.

**Determine whether the scenario involves independent or dependent events.**

12) A bag contains four red marbles and eight blue marbles. Another bag contains six green marbles and seven yellow marbles. You randomly pick one marble from each bag. One marble is blue and one marble is yellow.

Ind.

13) A box of chocolates contains seven milk chocolates and five dark chocolates. You randomly pick a chocolate and eat it. Then you randomly pick another piece. The first piece is milk chocolate and the second piece is dark chocolate.

~~Ind.~~ Dep.

**Find the probability.**

14) You flip a coin and then roll a fair six-sided die. The coin lands tails-up and the die shows an odd number.

2nd

$$\left(\frac{1}{2}\right)\left(\frac{3}{6}\right) = \frac{3}{12} = 0.25$$

15) A bag contains eight red marbles and seven blue marbles. You randomly pick a marble and then pick a second marble without returning the marbles to the bag. Both marbles are red. Def.

$$\left(\frac{8}{15}\right)\left(\frac{7}{14}\right) = \frac{56}{210} \approx 0.27$$

16) There are five nickels and five dimes in your pocket. You randomly pick a coin out of your pocket and place it on a counter. Then you randomly pick another coin. The first coin is a nickel and the second coin is a dime. Def.

$$\left(\frac{5}{10}\right)\left(\frac{5}{9}\right) = \frac{25}{90} \approx 0.28$$

17) A basket contains seven apples and eight peaches. You randomly select a piece of fruit and then return it to the basket. Then you randomly select another piece of fruit. Both pieces of fruit are apples. Ind.

$$\left(\frac{7}{15}\right)\left(\frac{7}{15}\right) = \frac{49}{225} \approx 0.22$$

**Determine if events A and B are independent.**

18)  $P(A) = \frac{1}{4}$   $P(B) = \frac{9}{20}$   $P(A \cap B) = \frac{9}{80}$

If Ind. then  $P(A \cap B) = P(A)P(B)$

$$\left(\frac{1}{4}\right)\left(\frac{9}{20}\right) = \frac{9}{80} \checkmark \text{ Ind.}$$

19)  $P(A) = \frac{3}{4}$   $P(B) = \frac{3}{10}$   $P(A \cap B) = \frac{3}{16}$

$$\left(\frac{3}{4}\right)\left(\frac{3}{10}\right) = \frac{9}{40} \neq \frac{3}{16} \text{ Dep.}$$

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

20)  $P(A) = \frac{1}{2}$   $P(A \text{ and } B) = \frac{11}{40}$   $P(B) = ?$

~~$P(A \cap B) = P(A)P(B)$~~

$$P(A)P(B) = P(A \cap B)$$

$$\left(\frac{1}{2}\right)(?) = \frac{11}{40} \Rightarrow \boxed{\frac{11}{20}}$$

**Find the missing probability.**

22)  $P(B) = \frac{1}{4}$   $P(A|B) = \frac{14}{25}$   $P(A \text{ and } B) = ?$

$$P(A|B) = \frac{P(A \cap B)}{P(B)} \Rightarrow \frac{P(A \cap B)}{\frac{1}{4}} = \frac{14}{25} \left(\frac{1}{4}\right)$$

$$P(A \cap B) = \frac{14}{100}$$

21)  $P(A) = \frac{2}{5}$   $P(B) = \frac{2}{5}$   $P(A \text{ and } B) = ?$

$$\left(\frac{2}{5}\right)\left(\frac{2}{5}\right) = \frac{4}{25}$$

23)  $P(A \text{ and } B) = \frac{3}{25}$   $P(B|A) = \frac{1}{5}$   $P(A) = ?$

$$(?)\left(\frac{1}{5}\right) = \frac{3}{25}$$

$$? = \boxed{\frac{3}{5}}$$

**Find the probability of each event.**

24) A gambler places a bet on a horse race. To win, he must pick the top three finishers in any order. Twelve horses of equal ability are entered in the race. Assuming the horses finish in a random order, what is the probability that the gambler will win his bet?

$$n(S) = 12C_3 = \frac{1}{220} \approx 0.00455$$

$$n(E) = 1$$

26) A test consists of six true/false questions. A student who forgot to study guesses randomly on every question. What is the probability that the student answers at least two questions correctly?

use complement. less than 2 correctly  
only 1 correct or 0 correct.

$$n(S) = 2^6 = 64$$

$$n(E_1) = 6C_1 = 6$$

$$n(E_2) = 6C_0 = 1$$

$$n(\text{correct or 0 correct}) = \frac{6}{64} + \frac{1}{64} = \frac{7}{64}$$

$$P(E) = 1 - \frac{7}{64} = \frac{57}{64}$$

28) Julio is carrying six pages of math homework and six pages of English homework. A gust of wind blows the pages out of his hands and he is only able to recover seven random pages. What is the probability that he recovers at least five pages of his math homework?

at least 5 = 5, 6

$$n(S) = 12C_7 = 792$$

$$n(E) = 6C_5 + 6C_6 = 60 + (6C_1) = 96$$

$$P(E) = \frac{96}{792} \approx 0.121$$

30) Gabriella is carrying five pages of math homework and four pages of English homework. A gust of wind blows the pages out of her hands and she is only able to recover five random pages. What is the probability that she recovers all of her math homework?

$$n(S) = 9C_5 = 126$$

$$n(E) = 5C_5 = 1$$

$$P(E) = \frac{1}{126} \approx 0.00794$$

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

$$n(S) = 6 \times 6 \times 6 \times 6 \times 6 \times 6 \times 6 = 279,936$$

$$n(E) = 7C_2 \cdot (3 \times 3 \times 3 \times 3 \times 3 \times 3) = 45,927$$

$$P(E) = \frac{45,927}{279,936} \approx 0.164$$

25) One day, six 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 six babies are girls?

$$n(S) = 2 \cdot 2 \cdot 2 \cdot 2 \cdot 2 \cdot 2 = 64$$

$$n(E) = 6C_4 = 15$$

$$P(E) = \frac{15}{64} \approx 0.234$$

27) Eduardo is carrying four pages of math homework and four pages of English homework. A gust of wind blows the pages out of his hands and he is only able to recover four random pages. What is the probability that he recovers exactly two pages of his math homework?

$$n(S) = 8C_4 = 70$$

$$n(E) = 2 \text{ math and } 2 \text{ Eng.} = (4C_2)(4C_2) = 36$$

$$P(E) = \frac{36}{70} \approx 0.51$$

29) 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 at least three kings in your hand?

$$n(S) = 52C_5 \text{ at least } 3 = 3 \text{ or } 4$$

$$n(E) = (4C_3)(48C_2) + (4C_4)(48C_1) = 4560$$

$$P(E) = \frac{4560}{52C_5} \approx 0.0018$$

31) A basketball player has a 50% chance of making each free throw. What is the probability that the player makes exactly six out of nine free throws?

$$n(S) = 2^9 = 512$$

$$n(E) = 9C_6 = 84$$

$$P(E) = \frac{84}{512} \approx 0.164$$

33) A class has eight boys and eight girls. If the teacher randomly picks seven students, what is the probability that he will pick exactly three girls?

$$n(S) = 16C_7 = 11,440$$

$$n(E) = (8C_3)(8C_4) = 3920$$

$$P(E) = \frac{3920}{11,440} \approx 0.343$$