

SP.2 Exercises

1. Which of the following numbers cannot be the probability of some event? Explain your reasoning for each.
- | | | | | |
|------|-----|---------------|-------|----------------|
| 0.71 | 4.1 | $\frac{1}{8}$ | - 0.5 | 1.21 |
| 0.5 | 0 | 1 | 150% | $\frac{13}{5}$ |

2. Isabel Briggs Myers was a pioneer in the study of personality types. Do married couples choose similar or different personality types in their mates? The following data give an indication.

Number of Similar Preferences	Number of Married Couples
All 4 type preferences	34
Three type preferences	131
Two type preferences	124
One type preference	71
None	15

Suppose that a married couple is selected at random.

- a) What is the probability that they will have no preferences in common? One preference? 2 preferences? 3 preferences? 4 preferences?
- b) What is the sample space? What do the probabilities add up to? Does this make sense?
3. A botanist has developed a new hybrid cotton plant that can withstand insects better than other cotton plants. However, there is some concern about the germination of seeds from the new plant. A random sample of 3000 seeds planted in warm, moist soil showed 2430 to germinate.
- a) What is the probability that a seed will germinate?
- b) What is the complement of this event? What is its probability?
4. When do creative people get their best ideas? USA Today did a survey of inventors who hold U.S. patents.
- | Time | Number of Inventors |
|----------------------|---------------------|
| 6 a.m – 12 noon | 290 |
| 12 noon – 6 p.m. | 135 |
| 6 p.m. – 12 midnight | 319 |
| 12 midnight – 6 a.m. | 222 |

- a) What is the probability that an inventor has a “best idea” from 12 noon to 12 midnight? from 12 midnight to 12 noon?
- b) What is the sample space?
5. About 56% of the general population wears corrective eyeglasses, while 3.6% wears contact lenses. [Assume that no one wears both at once...]
- a) What ‘events’ form the sample space? What are their probabilities? Make sure they add up to one...
- b) What idea of the ‘complement’ do you see in this problem?
- c) Draw a Venn diagram that represents this information
6. Xavier runs a computer store. Yesterday, 127 people walked by his store. Of those, 58 came into the store. Of those 58, 25 bought something.
- a) Draw a Venn diagram to represent this sample space.
- b) What is the probability that a person who walks by the store will enter the store?
- c) What is the probability that a person who enters the store will buy something?
- d) What is the probability that a person who walks by the store will buy something?
- e) What is the probability that a person who comes into the store will buy nothing?

SP.3 Homework Exercises

The more complicated the problem, the easier it will be to solve if you use a TREE diagram...

1. A bowl contains 5 oranges and 4 tangerines. Marie randomly selects one, puts it back, and then selects another. What is the probability that both selections were oranges?
2. Find the probability of being dealt 5 hearts from a standard deck of 52 cards.
3. Badriya's wallet contains four 1BD notes, three 5BD notes, and two 10BD notes. a) Find the probability of selecting three 5BD notes. b) Find the probability of selecting three 10BD notes.
4. For a bingo game, wooden balls numbered consecutively from 1 to 75 are placed in a box. Five balls are drawn at random without replacement. Find the probability of selecting five even numbers.
5. There are 5 pennies, 7 nickels, and 9 dimes in Venika's coin collection. She chooses two coins at random from the collection. What is the probability that both are pennies if a) no replacement occurs; b) replacement occurs?
6. Two dice are tossed. a) Find $P(\text{no 2s})$. b) Find $P(\text{two different numbers})$.
7. A bag contains 4 red, 4 green, and 7 blue marbles. Three are selected in sequence without replacement. What is the probability of selecting a red, a green, and a blue marble in that order?
8. A bag contains 4 red, 4 green, and 7 blue marbles. Three are selected in sequence without replacement. What is the probability of selecting a red, a green, and a blue marble in any order?
9. There are two traffic lights along the route that Aly rides home from school. one traffic light is red 50% of the time. The next traffic light is red 60% of the time. a) What is the probability that Aly will hit both green lights on the way home? b) What is the probability that he will hit one green light on the way home?
10. A student runs the 100m, 200m, and 400m races at the school athletics day. She has an 80% chance of winning any given race. a) Find the probability that she will win all 3 races. b) Find the probability that she will win any 2 races.
11. Dale and Kritt are trying to solve a physics problem. Dale has a 65% chance of solving the problem, while Kritt has a 75% chance. a) What is the probability that the problem gets solved? b) What is the probability that the problem does not get solved?
12. a) If $P(A) = \frac{2}{5}$ and $P(B) = \frac{2}{3}$, find $P(A \cap B)$ if A and B are independent.
b) Given that $P(A) = \frac{2}{3}$, $P(B) = \frac{1}{2}$, and $P(A \cap B) = \frac{1}{3}$, determine whether A and B are independent events.
13. A platform diving squad of 25 members has 18 members who dive from 10 m and 17 who dive from 4 m. What is the probability that a member of the squad dives from both platforms?
14. A badminton club has 31 playing members. 28 play singles and 16 play doubles. What is the probability that a member plays both singles and doubles?
15. In a factory, 56 people work on the assembly line. 47 work day shifts and 29 work night shifts. What is the probability that an employee works both day shifts and night shifts?
16. In a group of 120 students, 75 know how to use a Macintosh, 65 know how to use a PC, and 20 do not know how to use either. Find the probability that a student knows how to use both kinds of computers.
17. A city has three newspapers A, B and C. Of the adult population, 1% read none of these newspapers, 36% read A, 40% read B, 52% read C, 8% read A and B, 11% read B and C, 13% read A and C and 3% read all three papers. What percentage of the adult population read newspaper A only?

18. Given $P(C) = 0.44$, $P(C \cap D) = 0.21$ and $P(C \cup D) = 0.83$, find $P(D')$.

19. If $P(A) = 0.6$ and $P(B) = 0.5$ and $P(A \cap B) = 0.2$, find

a) $P(A \cup B)$ b) $P(B')$ c) $P(A \cap B')$

20. If $P(A) = 0.6$ and $P(B) = 0.5$ and A and B are independent events, find

a) $P(A \cup B)$ b) $P(B')$ c) $P(A \cap B')$

21. Given $P(A) = \frac{1}{3}$, $P(B) = \frac{3}{8}$, and $P(A \cup B) = \frac{7}{12}$, show that A and B are independent events.

SP.3 Homework Answers:

1. Independent: $\frac{5}{9} * \frac{5}{9} = \frac{25}{81} \approx 0.309$
2. Dependent: 0.000495
3. a) Dependent: $\frac{3}{9} * \frac{2}{8} * \frac{1}{7} = \frac{1}{84} \approx 0.0119$
 b) Dependent: $\frac{2}{9} * \frac{1}{8} * \frac{0}{7} = 0$
4. Dependent: 0.0253
5. a) Dependent: $\frac{5}{21} * \frac{4}{20} = \frac{1}{21} \approx 0.0476$
 b) Independent: $\frac{5}{21} * \frac{5}{21} = \frac{25}{441} \approx 0.0567$
6. a) Independent: $\frac{25}{36} \approx 0.694$
 b) Independent: $\frac{5}{6} \approx 0.833$
7. Dependent: $\frac{4}{15} * \frac{4}{14} * \frac{7}{13} = \frac{8}{195} \approx 0.0410$
8. Dependent: $\frac{48}{195} \approx 0.246$
9. a) Independent: $P(GG) = 0.50 * 0.40 = 0.20$
 b) Independent: $P(RG \cup GR) = (0.50 * 0.40) + (0.50 * 0.60) = 0.50$
10. Independent: a) 0.512
 b) 0.384
11. Independent: From a tree diagram:
 a) $P(\text{it gets solved}) = 1 - P(\text{doesn't get solved}) = 0.9125$
 b) $P(\text{doesn't get solved}) = 0.35 * 0.25 = 0.0875$
12. a) Independent, so $P(A \cap B) = \frac{4}{15}$
 b) They are independent ONLY IF $P(A \cap B) = P(A) \times P(B)$, so check...
13. $\frac{10}{25}$
14. $\frac{13}{31}$
15. $\frac{20}{56}$
16. $\frac{40}{120}$
17. 18%
18. 0.40
19. a) 0.9 b) 0.5 c) 0.4
20. a) 0.8 b) 0.5 c) 0.3
21. Using the information, we can find that
 $P(A \cap B) = \frac{3}{24}$. Since this is the same as
 $P(A) * P(B)$, these events are independent.

SP.4 Homework Exercises:

For each problem, tell whether the event is combined or mutually exclusive. Then solve the problem using the appropriate technique, formula, or diagram.

1. Lara has 4 pennies, 3 nickels, and 6 dimes in her pocket. She takes one coin from her pocket at random. What is the probability that it is a penny or a dime?
2. After a recent disaster, 200 people in a community were asked what kind of help they gave to the victims. 65 said they donated food. 50 people said they donated money, and 30 people said they donated both. What is the probability that a person selected at random from the sample donated neither food nor money?
3. Two cards are chosen from a standard deck of 52 cards. What is the probability that both are spades or both are red cards?
4. Given that the events X and Y are mutually exclusive with $P(X) = \frac{4}{7}$ and $P(Y) = \frac{1}{3}$, find $P(X \cap Y)$ and $P(X \cup Y)$.
5. Given $P(S) = 0.34$, and $P(T) = 0.49$, and $P(S \cup T) = 0.83$, show that the events S and T are mutually exclusive.
6. As a result of a survey of the households in a town, it is found that 80% have a video recorder and 24% have satellite television. Given that 15% have both a video recorder and satellite television, find the proportion of households with neither a video recorder nor satellite television.
7. When a roulette wheel is spun, the score will be a number from 0 through 36. Each score is equally likely. Find the probability that the score is
 - a. an even number
 - b. a multiple of 3
 - c. a multiple of 6
8. From a group consisting of Alvin, Bob, Carol and Donna, two people are to be randomly selected to serve on a committee. Use a tree diagram to give the sample space. What is the probability that Bob or Carol is selected?
9. In a homeroom, 5 of the 12 girls have blonde hair and 6 of the 15 boys have blonde hair. What is the probability of randomly selecting a boy or a blonde-haired person as homeroom representative to the student council?

SP.4 Homework Answers:

1. Mutually exclusive: $\frac{10}{13} \approx 0.769$

2. Combined: $\frac{115}{200} = 0.575$

3. Mutually exclusive and dependent: $P(SS)+P(RR) = \left(\frac{13}{52} * \frac{12}{51}\right) + \left(\frac{26}{52} * \frac{25}{51}\right) = \frac{31}{102} \approx 0.304$

4. Mutually exclusive, so $P(X \cap Y) = 0$

Mutually exclusive, so $P(X \cup Y) = \frac{19}{21} \approx 0.905$

5. The events are mutually exclusive if $P(S \cap T) = 0$. So see if it works...

6. Combined: 0.11

7. a. $\frac{19}{37}$ b. $\frac{12}{37}$ c. $\frac{6}{37}$

8. $\frac{5}{6}$

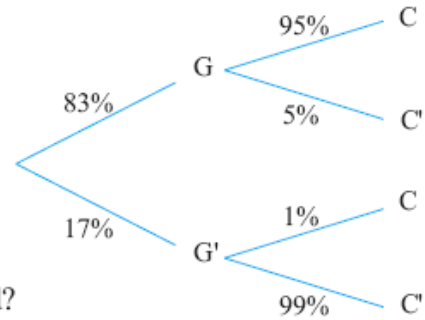
9. $\frac{20}{27}$

SP.5 Homework Exercises

- Dana and Lana are trying to solve a physics problem. Dana has a 65% chance of solving the problem, and Lana has a 75% chance. Find the probability that
 - only Lana solves the problem.
 - Lana solves the problem.
 - both solve the problem.
 - Dana solves the problem, given the problem was solved.
- What is the probability that the total of two dice will be greater than 8 given that the first die is a 6?
- In a class of 25 students, 14 like pizza and 16 like coffee. One student likes neither. One student is randomly selected from the class. What is the probability that the student:
 - likes pizza, but not coffee
 - likes pizza given that s/he likes coffee?
- Given $P(A \cap B) = \frac{1}{3}$ and $P(B) = \frac{3}{5}$, find $P(A|B)$.
- A drawer contains three good light bulbs and two defective light bulbs. Two light bulbs are chosen at random without replacement. Find each probability:
 - $P(2^{\text{nd}} \text{ good} | 1^{\text{st}} \text{ defective})$
 - $P(\text{good} \cup \text{defective})$
 - $P(2^{\text{nd}} \text{ good} | 1^{\text{st}} \text{ good})$
 - $P(\text{good} \cap \text{good})$
- Three cards are drawn from a standard deck of 52 cards. What is the probability that the third card is a spade if the first two cards are hearts?
- 400 families were surveyed. It was found that 90% had a TV set and 60% had a computer. Every family had at least one of these items. If one of these families is randomly selected, find the probability it has a TV set given that it has a computer.
- Given $P(A|B) = \frac{1}{5}$ and $P(B) = \frac{1}{2}$, find $P(A \cap B)$.
- Given $P(A|B) = \frac{5}{6}$, $P(A) = \frac{3}{4}$, and $P(B) = \frac{2}{3}$, find $P(A \cup B)$.

- 10** A sociologist examined the criminal justice system. Following exhaustive interviews which included the use of lie detector test results, she published her findings. Her results were given on a tree diagram.

$G \equiv$ guilty $C \equiv$ convicted
 $G' \equiv$ not guilty $C' \equiv$ not convicted



- What percentage of people were correctly judged?
 - What is the probability of convicting a person given he/she is guilty?
 - What is the probability of acquitting a person given he/she is innocent?
 - Which of the answers to **b** and **c** would you prefer to be the higher?
 - What is the probability that a randomly selected person on trial will be convicted?
 - What is the probability that a randomly selected person on trial is guilty given that he/she is not convicted?
- Urn 1 contains 4 red and 6 green balls while Urn 2 contains 7 red and 3 green balls. An urn is chosen at random and then a ball is chosen from the selected urn. Draw a tree diagram. Find $P(\text{Urn 1} | G)$.
 - Thirty students sit for an examination in both French and English. 25 pass French, 24 pass English, and 3 fail both. Determine the probability that a student who
 - passed French also passed English
 - failed English passed in French
 - The probability that a animal will still be alive in 12 years is 0.55. The probability that its mate will still be alive in 12 years is 0.60. Find the probability that the mate is still alive in 12 years given that only one is still alive
 - In a certain town, 3 newspapers are published. 20% of the population read A, 16% read B, 14% read C, 8% read A and B, 5% read A and C, 4% read B and C, and 2% read all newspapers. A person is selected at random.

Determine the probability that the person reads:

 - none of the papers
 - at least one of the papers
 - exactly one of the papers
 - either A or B
 - A, given that the person reads at least one paper
 - C, given that the person reads either A or B or both

SP.5 Homework Answers

1. a) 0.2625 b) 0.75 c) 0.4875 d) 0.712

2. $\frac{4}{6} \approx 0.667$

3. a) $\frac{8}{25} = 0.32$ b) $\frac{6}{16} = 0.375$

4. $\frac{5}{9} \approx 0.556$

5. a) $\frac{3}{4}$ b) 1 c) $\frac{1}{2}$ d) $\frac{3}{10}$

6. $\frac{13}{50} = 0.26$ 7. $\frac{5}{6} \approx 0.833$ 8. $\frac{1}{10}$

9. $\frac{31}{36} \approx 0.861$

10. a) 0.9568 b) 0.95 c) 0.99

d) it would be great if both were higher -- if 100% of innocent people were
100% of guilty people were convicted

acquitted and

e) 0.7902 f) 0.1978

11. $\frac{2}{3} \approx 0.667$

12. a) $\frac{22}{25} = 0.88$ b) $\frac{3}{6}$

13. $\frac{27}{49} \approx 0.551$

14. a. 0.65 b. 0.35 c. 0.22 d. 0.28 e. 0.571 f. 0.25