Probability

1. Jerome’s family raises rabbits. Each year, Jerome is responsible for recording the gender and
fur color of the newborn rabbits.

This year, Jerome notices that the probability a randomly selected rabbit is male is $\frac{2}{5}$. He also notices that the probability that a randomly selected rabbit is both male and has brown fur is $\frac{1}{8}$.

What is the probability that a randomly selected rabbit in this population has brown fur, given the rabbit is male?

1. A carnival organizer made a dart toss game. To play the dart toss game, a player throws two darts. A player wins a small prize if one dart hits the target. A player wins a large prize if both darts hit the target. The table shows the experimental probabilities recorded for the first day of the game.

| **Outcome** | **Experimental Probability** |
| --- | --- |
| Both darts miss the target. | $$\frac{1}{2}$$ |
| The first dart hits the target, and the second dart misses the target. | $$\frac{27}{100}$$ |
| The first dart misses the target, and the second dart hits the target. | $$\frac{3}{20}$$ |
| Both darts hit the target. | $$\frac{2}{25}$$ |

The first player on the second day hits the target with the first dart. Based on the experimental probability from the first day, what is the probability that player wins a large prize?

1. On April 15, 1912, the Titanic struck an iceberg and rapidly sank with only 710 of her 2204 passengers and crew surviving. Data on survival of passengers are summarized in the table below:

|  | **Survived** | **Did not Survived** | **Total** |
| --- | --- | --- | --- |
| **First Class Passengers** | 201 | 123 | 324 |
| **Second Class Passengers** | 118 | 166 | 284 |
| **Third Class Passengers** | 181 | 528 | 709 |
| **Total** | 500 | 817 | 1317 |

\*Data source: [www.encyclopedia-titanica.org/titanic-statistics](http://www.encyclopedia-titanica.org/titanic-statistics)

**Part A**
Determine the following probabilities. Write your answer as a percent to one decimal place.

***a.*** The probability that one randomly selected passenger was in first class, given the

 passenger survived.
***b.*** The probability a randomly selected passenger survived, given the passenger was a first

 class passenger.

**Part B**
Explain how the two probabilities from Part A could be used to compare the number of passengers in first class who did not survive to the number of passengers who survived and were not in first class.

1. On school days, Janelle sometimes east breakfast and sometimes does not. After studying probability for a few days, Janelle says, “The events ‘I eat breakfast’ and ‘I am late for school’ are independent.”

Explain what this means in terms of the relationship between Janelle eating breakfast and her probability of being late for school in language that someone who hasn’t studied probability would understand.
2. A weather forecaster makes the following statement:

“Today there is a 55% chance of rain, a 20% chance of lightning, and a 11% chance of both rain and lightning.”

Based on this statement, are the events “rain today” and “lightning today” independent events? Justify your answer.
3. A weather forecaster makes the following statement:

“Today there is a 55% chance of rain, a 20% chance of lightning, and a 11% chance of both rain and lightning.”

Based on this statement, what is the probability that there will be rain or lightning today?
4. Students in a random sample of seniors at a local school participated in a survey. These students were asked to indicate their gender and eye color. The following table summarizes the results of the survey.

|  | **Brown Eyes** | **Blue Eyes** | **Green Eyes** | **Total** |
| --- | --- | --- | --- | --- |
| **Male** | 53 | 36 | 21 | 110 |
| **Female** | 39 | 43 | 8 | 90 |
| **Total** | 92 | 79 | 29 | 200 |

One of the males in the survey population is selected at random. What is the probability that the selected student has blue eyes?

**Teacher Material**

S-CP.A

Understand independence and conditional probability and use them to interpret data.

S-CP.B

Use the rules of probability to compute probabilities of compound events in a uniform probability model

| **Question** | **Claim** | **Key/Suggested Rubric** |
| --- | --- | --- |
| 1[[1]](#footnote-1) | 1 | **1 point:** $\frac{5}{16}$, or equivalent. NOTE: A decimal equivalence is accepted as correct; decimal approximations are not. |
| 21 | 4 | **1 point:** $\frac{8}{35}$, or equivalent. NOTE: Decimal approximations are not accepted as correct. |
| 3[[2]](#footnote-2) | 1 and 3 | **2 points:** Writes 40.2% (***a.***) and an number in the interval 62% to 62.1%, inclusive (***b.***)AND Explains how the probabilities can be used to show there were fewer passengers in first class who did not survive than passengers who survived and were not in first class. **Example:** There were fewer passengers in first class who did not survive than passengers who survived and were not in first class because the 201 survivors are being divided by different amounts to get a probability, and the probability that is larger means it’s being divided by a smaller number.**1 point:** Writes 0.402 (***a.***) and an number in the interval 0.620 to 0.621, inclusive (***b.***)OR Explains how the probabilities can be used to show there were fewer passengers in first class who did not survive than passengers who survived and were not in first class. |
| 4[[3]](#footnote-3) | 3 | **1 point:** Answers will vary. **Example 1:** Janelle is saying that being late to school isn’t influenced by whether or not she eats breakfast; she’s either late or not and it’s not because of eating or not eating breakfast. **Example 2:** The probability that Janelle is late for school is the same when she eats breakfast as it is when she doesn’t eat breakfast. |
| 5[[4]](#footnote-4) | 3 | **1 point:** Answers will vary. **Example:** Yes, they are independent. To be independent, P(rain) x P(lightning) = P(rain and lightning). And P(rain) x P(lightning) = 0.11 and P(rain and lightning) = 0.11. |
| 64 | 1 | **1 point:** 64%, or equivalent. |
| 7[[5]](#footnote-5) | 1 | **1 point:**$ \frac{36}{110}$, or equivalent. NOTE: A decimal equivalence is accepted as correct; decimal approximations are not. |

1. Adapted from the Mathematics K–12 Learning Standards. Internet. Available from <http://www.k12.wa.us/Mathematics/Standards.aspx>; accessed 11/2015. [↑](#footnote-ref-1)
2. <https://www.illustrativemathematics.org/content-standards/HSS/CP/B/6/tasks/949> [accessed on November 1](https://www.illustrativemathematics.org/content-standards/HSG/GMD/A/3/tasks/514%20accessed%20on%20November%201), 2015, is licensed by [Illustrative Mathematics](https://www.illustrativemathematics.org/) under [CC BY-NC-SA 4.0](http://creativecommons.org/licenses/by-nc-sa/4.0/). [↑](#footnote-ref-2)
3. <https://www.illustrativemathematics.org/content-standards/HSS/CP/A/5/tasks/1019> [accessed on November 1](https://www.illustrativemathematics.org/content-standards/HSG/GMD/A/3/tasks/514%20accessed%20on%20November%201), 2015, is licensed by [Illustrative Mathematics](https://www.illustrativemathematics.org/) under [CC BY-NC-SA 4.0](http://creativecommons.org/licenses/by-nc-sa/4.0/). [↑](#footnote-ref-3)
4. <https://www.illustrativemathematics.org/content-standards/HSS/CP/A/2/tasks/1112> [accessed on November 1](https://www.illustrativemathematics.org/content-standards/HSG/GMD/A/3/tasks/514%20accessed%20on%20November%201), 2015, is licensed by [Illustrative Mathematics](https://www.illustrativemathematics.org/) under [CC BY-NC-SA 4.0](http://creativecommons.org/licenses/by-nc-sa/4.0/). [↑](#footnote-ref-4)
5. <https://www.illustrativemathematics.org/content-standards/HSS/CP/A/4/tasks/2045> [accessed on November 1](https://www.illustrativemathematics.org/content-standards/HSG/GMD/A/3/tasks/514%20accessed%20on%20November%201), 2015, is licensed by [Illustrative Mathematics](https://www.illustrativemathematics.org/) under [CC BY-NC-SA 4.0](http://creativecommons.org/licenses/by-nc-sa/4.0/). [↑](#footnote-ref-5)