Answers: Introduction to probability

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Summary

Answers to questions relating to the guide on introduction to probability.

These are the answers to Questions: Introduction to probability.

Please attempt the questions before reading these answers!

Q1

(Note: accept all simplified fractions, or probabilities represented in decimal and percentage forms)

1.1. PUT FIGURE HERE TOM

1.2. PUT FIGURE HERE TOM

The events are independent.

1.3. PUT FIGURE HERE TOM

The events are dependent.

1.4. PUT FIGURE HERE TOM

The events are independent.

Q2

(Note: accept all simplified fractions, or probabilities represented in decimal and percentage forms)

2.1. $\mathbb{P}(gummy\,bear) = \frac{7}{12}$. Therefore, apply the complement rule to calculate the complement of $\mathbb{P}(gummy\,bear)$, so $\mathbb{P}(gummy\,bear') = 1 - \frac{7}{12} = \frac{5}{12}$.

2.2. The probability of drawing a gummy ring the first time is $\frac{2}{12}$, and the probability of drawing a gummy ring the second time is also $\frac{2}{12}$. Therefore, $\mathbb{P}(gummy\ ring, gummy\ ring) = (\frac{2}{12})(\frac{2}{12}) = \frac{4}{144} = \frac{1}{36}$.

2.3. The probability of drawing a gummy bear the first time is $\frac{7}{12}$, and the probability of drawing a gummy worm the second time is $\frac{3}{11}$. Therefore, $\mathbb{P}(gummybear, gummyworm) = (\frac{7}{12})(\frac{3}{11}) = \frac{21}{132} = \frac{7}{44}$.

2.4. The probability of drawing a soda flavored jelly bean the first time is $\frac{10}{30}$, and the probability of drawing a strawberry flavored jelly bean the second time is $\frac{20}{38}$. Therefore, $\mathbb{P}(soda, strawberry) = (\frac{10}{30})(\frac{20}{38}) = \frac{200}{1140} = \frac{10}{57}$.

Q3

3.1. This is an example of experimental probability.

3.2. The total number of spins is 60, and it lands on white 17 times. Therefore, $\mathbb{P}(white) = \frac{17}{60}$, so by complement rule, $\mathbb{P}(white') = 1 - \frac{17}{60} = \frac{43}{60}$.

3.3. The spinner is unbiased (meaning the probability is uniform), so there are four possible colors that the spinner is equally likely to land on. Calculating the theoretical probability, $\mathbb{P}(red) = \frac{1}{4}$.

3.4. As you spin the spinner more times, the experimental probabilities of each color will get closer to their theoretical probabilities.

Q4

4.1. The sample space is $\{1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20\}$, which contains 20 possible outcomes. The subset of the sample space with a value above 12 is $\{13, 14, 15, 16, 17, 18, 19, 20\}$, which contains 8 out of the 20 possible outcomes. Therefore, $\mathbb{P}(success) = \frac{8}{20} = \frac{2}{5}$.

4.2.The possible outcomes of the 5-sided dice roll are $\{1, 2, 3, 4, 5\}$. Adding 3 to each number, the sample space becomes $\{(1+3), (2+3), (3+3), (4+3), (5+3)\} = \{4, 5, 6, 7, 8\}$. The sample space contains 5 possible outcomes, and the subset of the sample space that contains values 5 and above is $\{5, 6, 7, 8\}$, which contains 4 out of 5 possible outcomes. Therefore, $\mathbb{P}(x \geq 5) = \frac{4}{5}$ where x points of damage are dealt to the dragon.

4.3. Here is the sample space represented as a table:

	1	2	3	4
1	(1,1)	(1,2)	(1,3)	(1,4)
2	(2,1)	(2,2)	(2,3)	(2,4)
3	(3,1)	(3,2)	(3,3)	(3,4)
4	(4,1)	(4,2)	(4,3)	(4,4)

For convenience purposes, all outcomes that do not contain a 4 are then marked with an

asterisk (although any way of marking or counting these outcomes are acceptable):

	1	2	3	4
1	(1,1)*	(1,2)*	(1,3)*	(1,4)
2	(2,1)*	(2,2)*	(2,3)*	(2,4)
3	(3,1)*	(3,2)*	(3,3)*	(3,4)
4	(4,1)	(4,2)	(4,3)	(4,4)

There are 16 total possible outcomes in the sample space, and there are 9 outcomes that do not contain a 4. Therefore, $\mathbb{P}(failure) = \frac{9}{16}$.

4.4. Here is the sample space represented as a table:

	1	2	3	4
1	(1,1)	(1,2)	(1,3)	(1,4)
2	(2,1)	(2,2)	(2,3)	(2,4)
3	(3,1)	(3,2)	(3,3)	(3,4)
4	(4,1)	(4,2)	(4,3)	(4,4)
5	(5,1)	(5,2)	(5,3)	(5,4)
6	(6,1)	(6,2)	(6,3)	(6,4)
7	(7,1)	(7,2)	(7,3)	(7,4)
8	(8,1)	(8,2)	(8,3)	(8,4)
9	(9,1)	(9,2)	(9,3)	(9,4)

The results of the two dice rolls can then be added together:

	1	2	3	4
1	2	3	4	5
2	3	4	5	6
3	4	5	6	7
4	5	6	7	8
5	6	7	8	9
6	7	8	9	10
7	8	9	10	11

	1	2	3	4
8	9	10	11	12
9	10	11	12	13

For convenience purposes, all outcomes with skill levels that are greater than 9 are then marked with an asterisk (although any way of marking or counting these outcomes are acceptable):

	1	2	3	4
1	2	3	4	5
2	3	4	5	6
3	4	5	6	7
4	5	6	7	8
5	6	7	8	9
6	7	8	9	10*
7	8	9	10*	11*
8	9	10*	11*	12*
9	10*	11*	12*	13*

There are 36 total possible outcomes in the sample space, and there are 10 outcomes where the skill level exceeds 9 points. Therefore, $\mathbb{P}(x > 9) = \frac{10}{36} = \frac{5}{18}$ where x is the number of skill level points.

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v1.0: initial version created

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