Section 4.2 Worksheet - Theoretical Probability

MDM4U
Jensen

1) Suppose you conduct an experiment in which you draw a card from a standard 52-card deck. Compute the theoretical probability of each of the following events.

a) You draw a seven of diamonds

$P(7\ of\ diamonds) = \frac{1}{52}$

b) You draw an ace

$P(ace) = \frac{4}{52} = \frac{1}{13}$

c) You draw a numbered club

$P(numbered\ club) = \frac{9}{52}$

d) You draw an even-numbered card of any suit

$P(even) = \frac{20}{52} = \frac{5}{13}$

2) Three black marbles and two red marbles are in a box. One marble is secretly drawn from the box.

a) What is the total number of possible outcomes?

$n(S) = 5$

b) What is the probability that the marble selected is black?

$P(black) = \frac{n(black)}{n(S)} = \frac{3}{5}$

c) What is the probability that the marble selected is red?

$P(red) = \frac{n(red)}{n(S)} = \frac{2}{5}$

3) Suppose the two joker cards are left in a standard deck of cards. One of the jokers is red and the other is black. A single card is drawn from the deck of 54 cards. Determine the probability of drawing

a) one of the jokers

$P(joker) = \frac{2}{54} = \frac{1}{27}$

b) the red joker

$P(red\ joker) = \frac{1}{54}$

c) a queen

$P(queen) = \frac{4}{54} = \frac{2}{27}$

d) any black card

$P(black) = \frac{27}{54} = \frac{1}{2}$

e) any card less than 10 (ace = 1)

$P(< 10) = \frac{36}{54} = \frac{2}{3}$

f) the red joker or a red ace

$P(red\ joker\ or\ red\ ace) = P(red\ joker) + P(red\ ace) = \frac{1}{54} + \frac{2}{54} = \frac{3}{54} = \frac{1}{18}$

4) A spinner is divided into eight equal sectors, numbered 1 through 8.

a) What is the probability of spinning an odd number?

$P(odd) = \frac{n(odd)}{n(S)} = \frac{4}{8} = \frac{1}{2}$

b) What is the probability of spinning a number divisible by 4?

$P(divisible\ by\ 4) = \frac{n(divisible\ by\ 4)}{n(S)} = \frac{2}{8} = \frac{1}{4}$

c) What is the probability of spinning a number less than 3?

$P(< 3) = \frac{n(<3)}{n(S)} = \frac{2}{8} = \frac{1}{4}$

5) A bag contains 12 identically shaped blocks, 3 of which are red and the remainder are green. The bag is well-shaken and a single block is drawn.

a) What is the probability that the block is red?

$P(red) = \frac{n(red)}{n(S)} = \frac{3}{12} = \frac{1}{4}$

b) What is the probability that the block is not red?

$P(red') = 1 - P(red) = 1 - \frac{1}{4} = \frac{3}{4}$

6) Each of the letters for the word 'MATHEMATICS' is printed on same-sized pieces of paper and placed in a hat. That hat is shaken and one piece of paper is drawn.

a) What is the probability that the letters S is selected?

$P(S) = \frac{1}{11}$

b) What is the probability that the letter M is selected?

$P(M) = \frac{2}{11}$

c) What is the probability that a vowel is selected?

$P(vowel) = \frac{4}{11}$

7) Many board games involve a roll of two-six sided dice to see how far you may move your pieces.

a) Copy and complete the following table that shows the totals for all possible rolls of two dice.

		First Die					
		1	**2**	**3**	**4**	**5**	**6**
Second Die	**1**	2	3	4	5	6	7
	2	3	4	5	6	7	8
	3	4	5	6	7	8	9
	4	5	6	7	8	9	10
	5	6	7	8	9	10	11
	6	7	8	9	10	11	12

b) What is the probability of rolling a 7?

$P(7) = \frac{6}{36} = \frac{1}{6}$

c) What is the probability of not rolling a 7?

$P(7') = 1 - P(7) = 1 - \frac{1}{6} = \frac{5}{6}$

d) What is the probability of rolling doubles?

$P(doubles) = \frac{6}{36} = \frac{1}{6}$

8) What is the probability that a randomly drawn integer between 1 and 40 is not a perfect square?

Perfect square numbers: {1, 4, 9, 16, 25, 36}

$P(perfect\ square') = 1 - P(perfect\ square) = 1 - \frac{n(perfect\ squares)}{n(S)} = 1 - \frac{6}{40} = \frac{34}{40} = \frac{17}{20}$

9) A picnic cooler contains different types of cola: 12 regular, 8 cherry, 10 diet, 6 diet cherry, 8 caffeine-free, and some caffeine-free diet. You pick a can of cola without looking at its type. There is a 44% chance that the drink selected is diet. How many caffeine-free diet colas are in the cooler?

$P(diet) = \frac{n(diet)}{n(S)}$

$0.44 = \frac{16+x}{44+x}$

$0.44(44 + x) = 16 + x$

$19.36 + 0.44x = 16 + x$

$3.36 = 0.56x$

$x = 6$

There are 6 caffeine-free diet colas in the cooler.