Date: _____

CHAPTER 2

Probability

Get Set

Answer these questions to check your understanding of the Prerequisite Skills concepts on pages 58–59 of the *Foundations for College Mathematics 11* textbook.

Fractions, Decimals, and Percents

1. Express each decimal as a fraction in lowest terms.

a) 0.83 **b)** 0.65

c) 0.148 **d)** 0.6666...

2. Express each percent as a fraction in lowest terms.

a) 42% **b)** 39%

c) 24.6% **d)** $33.\overline{3}\%$

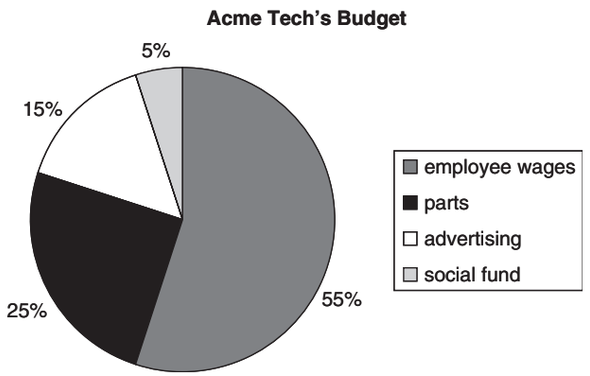
3. Evaluate without the use of a calculator.

a) $1 - \frac{1}{3}$ **b)** $\frac{1}{2} - \frac{3}{4}$

c) $\frac{1}{4}$ of 8 **d)** $\frac{2}{5} \times \frac{3}{4}$

Interpreting Data

4. Acme Tech's yearly budget is about $235 000. The breakdown of expenses is shown in the circle graph.



a) About how much money is spent on parts?

b) What fraction of the budget is spent on advertising?

c) What percent of the budget is spent on the social fund?

Date: _____

2.1 Probability Experiments

Textbook pp. 60–67

Warm-Up

1. Number Skills

Evaluate.

a) $3^2 + \sqrt{81} - (12)(4)$

b) $1^2 + 2^2 + \sqrt{1} + \sqrt{2^2}$

2. Algebra

Simplify.

a) $(3x + 7) - (2x + 5)$

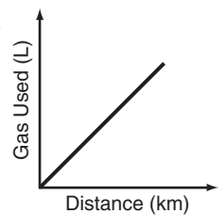
b) $(4x - 3y) - (3x + y)$

c) $(3x^2 - 2x - 1) - (4x^2 - 6x - 2)$

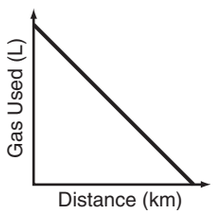
3. Relations

The number of litres of gas used by a car depends on the distance driven. Which graph best shows gas consumption?

A



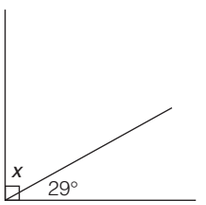
B



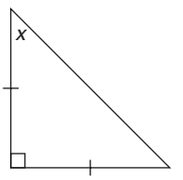
4. Geometry/Measurement

Solve for x.

a)



b)



5. Data/Probability

The heights, in centimetres, of students in Jane's class are shown.

166, 167, 160, 160, 161, 162, 163, 164, 167, 161, 199, 195, 167, 168, 169, 170, 161, 162, 164, 172, 174, 180, 177, 162, 168, 162, 168

a) Calculate the mean, the median, and the mode height.

b) Which measure best represents the data?

6. Problem Solving

It takes Brian 3 h to cut a rectangular lawn that is 10 m by 30 m. How long will it take him to cut a similar-shaped lawn that is twice as wide and three times as long?

7. Math Literacy

What is the name for an angle that is greater than 90° but less than 180°?

A straight angle
B acute angle
C obtuse angle
D reflex angle

8. Previous Section

Use a calculator to express each fraction as a decimal. Round your answers to four decimal places, if necessary.

a) $\frac{3}{5}$ **b)** $\frac{3}{45}$ **c)** $\frac{3}{454}$

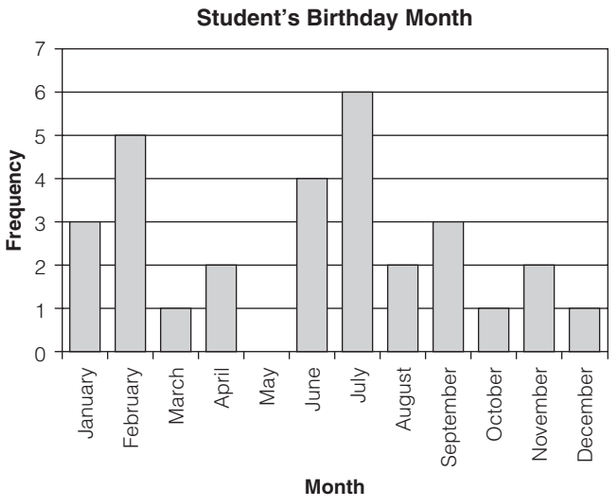
Date: _____

Practise

Section 2.1

1. The students in a mathematics class were asked in which month they were born. The results are shown in the graph.

a) How many students are in the class?



b) Find the experimental probability of a student being born in January or September. Express your answer as a fraction in lowest terms, as a decimal, and as a percent.

c) Find the experimental probability of a student being born in May. Is the experimental probability what you expected? Explain.

2. A probability experiment was conducted with 48 trials. The experimental probability of a successful trial was found to be $\frac{3}{8}$.

a) How many trials of the probability experiment were successful?

b) How many trials of the probability experiment were unsuccessful? Describe two different methods of finding the answer.

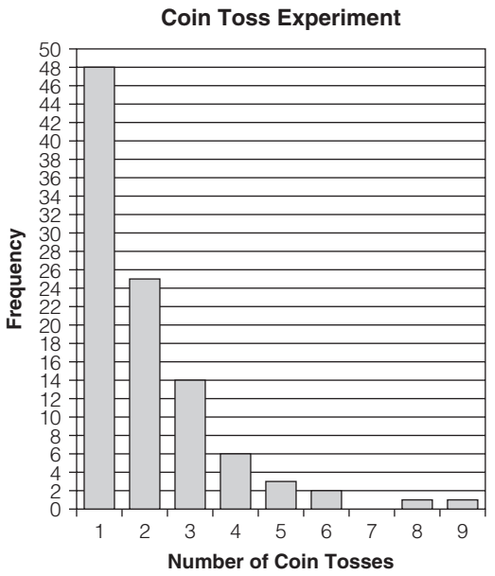
c) Is it possible that a successful trial and an unsuccessful trial were equally likely? Explain your reasoning.

3. Three coins were tossed a total of 40 times. The event "three heads" occurred 6 times. Determine the experimental probability of not getting the event "three heads". Express your answer as a fraction in lowest terms, as a percent, and as a decimal.

Date: _____

Section 2.1

4. A probability experiment was conducted with 100 trials, where each trial consisted of a coin being tossed until a tails turned up. The number of coin tosses for each trial was recorded and the results are shown in the graph. Find the experimental probability for each event. Express your answer as a fraction in lowest terms.



a) a trial consisting of 2 tosses

$\frac{\_\_\_\_}{100} =$

b) a trial consisting of 4 tosses

$\frac{\_\_\_\_}{100} =$

c) a trial consisting of less than 10 tosses

d) a trial consisting of more than 1 toss

5. A probability experiment consisted of 5 trials. Ten red tiles and ten blue tiles were placed in a bag. A tile was drawn, the colour was recorded, and the tile was put back into the bag. The colour of the tile drawn was red for all 5 trials.

a) Determine the experimental probability of drawing a blue tile.

b) Suggest a method of increasing the accuracy of the experiment.

6. A month ago, there was an estimated population of 950 polar bears on the west coast of Hudson Bay. To test this estimate, scientists tagged 190 polar bears.

a) A group of 10 polar bears are caught. How many would you expect to be tagged? Explain your reasoning.

b) A group of 40 polar bears are spotted, 8 of which are tagged. Does this confirm the population estimate of 950 polar bears? Explain.

Date: _____

2.2 Theoretical Probability

Textbook pp. 68–75

Warm-Up

1. Number Skills

Evaluate.

a) $3 + [2 + (7 - 4)]$

b) $5 - [7(11 - 6)]$

2. Algebra

Solve.

a) $2x + 3 = 7$

b) $5x - 7x + 3 = 4x + 6$

c) $-2x + x - 4 = 0$

3. Relations

Write the slope of each line.

a) x-intercept 2, y-intercept 3

b) x-intercept -4, y-intercept 5

4. Geometry/Measurement

A round table needs a glass tabletop. The diameter of the table is 1.1 m. What is the cost of the tabletop if the glass costs \$13.95/m^2?

5. Data/Probability

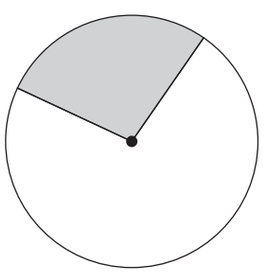
Iana has written 5 tests. Her mean test score is 82 out of 100. What mark does she need on her next test to raise her mean test score to 85?

6. Problem Solving

Each year, the value of a car decreases by 18%. This year, a car is worth \$19 500. How much was the car worth 2 years ago?

7. Math Literacy

What is the term for the shaded area shown?

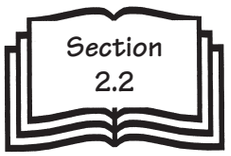


8. Previous Section

Two dice are rolled and the result is recorded. In 10 rolls, doubles occurred once. Determine the experimental probability of not rolling doubles. Express your answer as a fraction in lowest terms, as a percent, and as a decimal.

Date: _____

Practise



1. A card is randomly drawn from a standard deck of 52 playing cards plus two jokers. Write the theoretical probability of each event as a fraction in lowest terms.

a) drawing a red king

$\frac{\quad}{54} =$

b) not drawing a queen

$\frac{\quad}{54} =$

c) drawing an ace or face card

d) drawing a spade, a diamond, or a heart

e) drawing a joker or jack

2. A local charity decides to hold a fundraising barbecue one day in the month of June, July, or August. If the day is randomly selected, find the theoretical probability of the day being in

a) June

b) July or August

$\frac{\quad}{92} =$

3. A letter is chosen randomly from the word MATHEMATICAL. Find the theoretical probability of each event. Express your answer as a fraction in lowest terms.

a) choosing an A

b) choosing an M or a T

$\frac{\quad}{12} =$

c) choosing a vowel

d) choosing an R

4. Kerry is putting up posters for a concert. She has 12 green posters, 7 yellow posters, 21 blue posters, and 2 pink posters. If she randomly chooses a poster to put up first, find the theoretical probability of the first poster being

a) green

b) blue

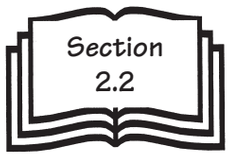
$\frac{\quad}{42} =$

c) pink or yellow

d) not yellow

5. Suppose a deck of playing cards is separated into the four suits. Twice, a suit is chosen randomly and a card is drawn. What is the theoretical probability of drawing a club and a spade? Express your answer as a fraction in lowest terms.

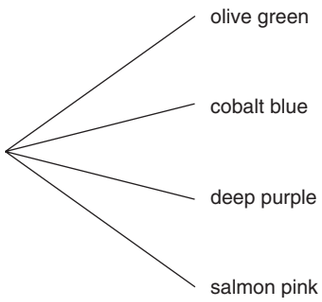
Date: _____



6. There are approximately 14 min of advertisements in every hour of television. Determine the theoretical probability of turning on the television during an advertisement. Express your answer as a fraction in lowest terms.

7. A certain make and model of a car comes in four colours: olive green, cobalt blue, deep purple, and salmon pink. Each colour can be applied with a matte, satin, or gloss finish.

a) Complete the tree diagram to show how many different colour and finish combinations are possible.



b) If a colour and finish is randomly selected, what is the probability of the car being

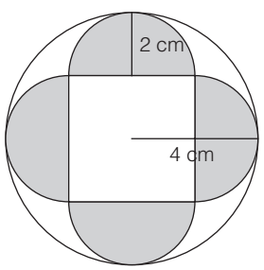
i) deep purple with a satin finish?

ii) cobalt blue or salmon pink with either a matte or gloss finish?

iii) any colour with a matte or satin finish?

iv) saffron yellow with any finish?

8. The radius of this unique dartboard is 4 cm. The radius of each semi-circle is 2 cm. If a dart is thrown at random, find the probability that it will land in a white area.



Date: _____

2.3 Compare Experimental and Theoretical Probabilities

Textbook pp. 76–85

Warm-Up

1. Number Skills

Estimate.

a) $345 + 690 + 111$

b) 45×81

c) $9.7 \div 2.6$

2. Algebra

Simplify.

a) $\frac{3x^2 + 5x}{x}$

b) $\frac{8x^4 + 16x^2}{4x}$

c) $\frac{4a^3 - 6a^2 + 8a}{2a}$

3. Relations

Which equation represents a horizontal line?

A $x + y = 1$
B $x = 1$
C $y = 1$
D $x = y$

4. Geometry/Measurement

Calculate the volume of each solid.

a) a rectangular prism with base area 10.4 cm^2 and height 8 cm

b) a cylinder with diameter 20 cm and height 13 cm

5. Data/Probability

Give an example of each event.

a) an event with a probability of 1

b) an event with a probability of 0

6. Problem Solving

Baseball cards come in packs of 10 or packs of 20. Lisa bought 9 packs and got 150 cards. How many of each type of pack did she buy?

7. Math Literacy

What does the term bi-weekly mean?

A twice a week
B once every two weeks
C twice a month
D once a week

8. Previous Section

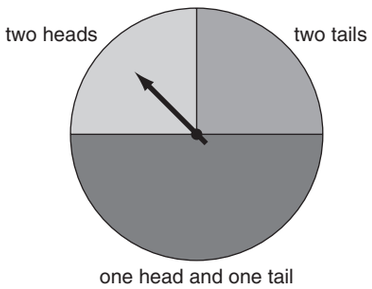
A student council president is to be elected from 9 candidates, 6 of which are female. What is the probability that the student council president will be male if all candidates are equally likely to win?

Date: _____

Practise

Section 2.3

1. The spinner shown was used to simulate tossing two coins for 60 trials.



a) What is the theoretical probability of the spinner landing on "one head and one tail" or "two tails"?

b) The spinner landed on "two heads" in 21 out of 60 trials. What is the experimental probability of the event "two heads"?

c) Why does the sum of the answers for parts a) and b) not equal 1? Explain.

d) Describe how you could use a graphing calculator to simulate the same situation using the **rand** command.

e) Describe how you could use a graphing calculator to simulate the same situation using the **randInt(** command.

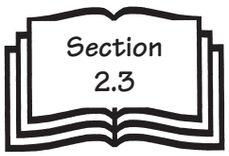
2. A probability experiment is conducted with a coin being tossed. The first trial results in the coin turning up heads.

a) After one trial, what is the experimental probability of tossing heads?

b) What is the theoretical probability of tossing heads?

c) What do you expect to happen to the experimental probability as the number of trials increases?

Date: _____

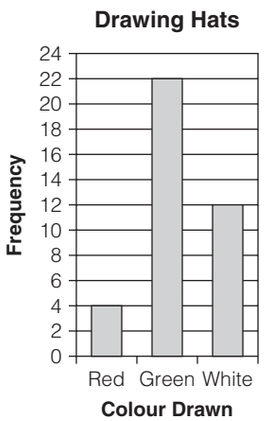


3. A supermarket is holding a prize giveaway. Each customer to enter the store has the same theoretical probability of winning a prize. Forty out of the last 240 customers to enter the supermarket won a prize.

a) Determine the experimental probability of winning a prize as a fraction in lowest terms.

b) Can the experimental probability of winning a prize be used to determine the theoretical probability of winning prize? Can it be used to estimate the theoretical probability of winning a prize?

4. In a bag, there are red, green, and white hats. A hat is drawn from the bag, the colour is recorded, and then it is put back into the bag. The results are displayed on the bar graph.



a) How many trials were performed?

b) Determine the experimental probability of drawing each colour hat.

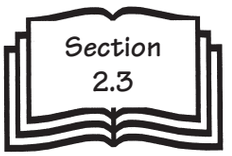
c) The theoretical probability of drawing a red hat is $\frac{11}{20}$ and the bag contains 33 red hats. How many hats does the bag contain in total?

5. Two dice are rolled for a game of chance. If the sum of the numbers is less than or equal to 6, player A wins 6 tokens from player B. If the sum if greater than 6, player A loses 6 tokens to player B. A roll of doubles is not counted.

a) Is this a fair game or does it favour one of the players?

b) Does not counting doubles have an effect on the fairness of the game?

Date: _____



6. When rolling two dice 45 times, a sum greater than 4 turned up 42 times.

a) What is the experimental probability of rolling a sum greater than 4?

b) What is the theoretical probability of rolling a sum less than 4?

c) How can you use your answer to part b) to determine the theoretical probability of rolling a sum greater than 4?

7. **a)** Conduct a probability experiment or use the **randInt(** command on a graphing calculator to simulate tossing three coins for a total of 15 trials. Record the number of heads that turn up for each trial in the table.

Trial Number	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Number of Heads															

b) According to your results, what is the experimental probability of 1 head turning up out of 3 tosses?

c) What is the theoretical probability of 1 tail turning up out of 3 tosses? How can you use this to find the theoretical probability of 1 head and 2 heads turning up out of 3 tosses? An organized list or tree diagram can help you find all the outcomes.

d) Suggest a method using the **randInt(** command on a calculator to simulate this situation.

Date: _____

2.4 Interpret Information Involving Probability

Textbook pp. 86–93

Warm-Up

1. Number Skills

Evaluate.

a) $\frac{1}{2}$ of 42

b) $\frac{3}{4}$ of 21

c) $\frac{1}{3}$ of $\frac{1}{2}$

2. Algebra

Factor.

a) $x^2 - 3x - 70$

b) $x^2 + 6x - 40$

c) $x^2 + 10x + 25$

3. Relations

Solve the linear system.

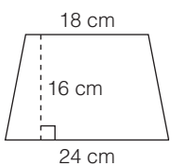
$5x + 2y = 23$

$x + 2y = 11$

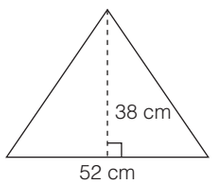
4. Geometry/Measurement

Calculate the area of each figure.

a)



b)



5. Data/Probability

A single card is drawn from a deck of 52 cards.

a) Write the probability that the card is red.

b) Write the probability that the card is a red face card.

c) Write the probability that the card is an odd number and a club.

6. Problem Solving

In a single round-robin tournament, each team plays every other team once. There are 6 teams registered in the tournament. How many games must be played in the tournament?

7. Math Literacy

What is the term for one of the four regions formed by the intersection of the x-axis and y-axis in a coordinate grid?

8. Previous Section

Which statement is true?

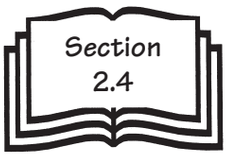
A As the number of trials increases, the theoretical probability approaches the experimental probability.

B As the number of trials increases, the theoretical probability decreases.

C As the number of trials increases, the experimental probability decreases.

D As the number of trials increases, the experimental probability approaches the theoretical probability.

Date: _____



Practise

1. A weather forecaster predicts that there is a 40% probability of precipitation for each of the next four days. A probability experiment was conducted to model this situation and the results are shown in the table.

Day Number	Precipitation
1	no
2	yes
3	yes
4	no

a) What was the experimental probability of precipitation?

b) What is the theoretical probability of precipitation?

c) Which probability is more useful in this situation, the experimental probability or the theoretical probability? Explain.

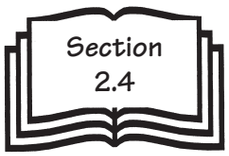
2. A number of people were surveyed to determine which form of exercise they enjoy best. The results are shown in the table.

Form of Exercise	Percent of People Surveyed
walking	55%
running	20%
cycling	15%
weight training	10%

a) If 300 more people are surveyed, how many would you expect to enjoy walking best? How many would you expect to enjoy running or weight training best?

b) What information is needed to determine if it is likely that the predictions in part a) are accurate?

Date: _____



3. In basketball, a field goal is worth 2 points, a three-point field goal is worth 3 points, and a free throw is worth 1 point. After 8 games, a point guard has scored 41 field goals, 15 three-point field goals, and 17 free throws.

a) How many points does the point guard have after 8 games?

b) Predict how many points the point guard will have if she plays 70 games during the regular season.

c) Explain why your prediction in part b) might not be accurate.

4. A junior hockey league goalie has made 225 saves out of 250 shots after 10 games.

a) Determine his save percentage (SPCT). Recall that the save percentage is written as a decimal to 3 places.

b) If the goalie plays 80 games this season, how many goals do you expect him to let in?

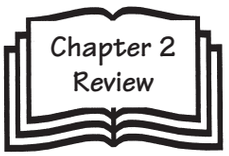
5. According to a recent census, about $\frac{1}{5}$ of Canadians consider French their native language. About $\frac{1}{25}$ of these French-speaking Canadians live in New Brunswick.

a) In a survey of 1000 randomly selected Canadians, how many would you expect to consider French as their native language and live in New Brunswick?

b) About $\frac{3}{5}$ of Canadians consider English their native language. In a survey of 1000 randomly selected Canadians, how many would you expect to consider neither English nor French their native language?

Date: _____

Chapter 2 Review



2.1 Probability Experiments, textbook pages 60–67

1. Over a period of 7 days, 250 homeowners were surveyed to determine if cosmetic pesticides should be banned. Of those surveyed, 140 were in favour of banning cosmetic pesticides while 110 were not. Determine the experimental probability that the next person surveyed will not be in favour of banning cosmetic pesticides

a) as a fraction in lowest terms

b) as a percent

c) as a decimal

2. In a class of 30 students, 12 are randomly chosen to answer a question. Find the experimental probability of a student not being chosen to answer a question. Express your answer as a fraction in lowest terms.

2.2 Theoretical Probability, textbook pages 68–75

3. Two dice are rolled. Find the probability that the product of the numbers is

a) 12 **b)** 3 **c)** 8, 10, or 30

d) an odd number **e)** greater than 6 **f)** not 6

4. For Tuesday's special in the cafeteria, students can choose lasagna or salad for a main course, cookies or chips on the side, and white milk, chocolate milk, or water to drink.

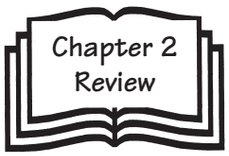
a) Draw a tree diagram showing all the possible choices for a three item Tuesday special.

b) Find the probability that a student selects at random a meal with

i) lasagna **ii)** salad and water

iii) cookies and chocolate milk **iv)** not chips

Date: _____



2.3 Compare Experimental and Theoretical Probabilities, textbook pages 76–85

5. The aces and face cards have been removed from a standard deck of playing cards. A card is drawn, the number is recorded, and the card is replaced. Suggest a method of simulating this probability experiment using

a) the **randInt(** command on a graphing calculator

b) the **rand** command on a graphing calculator

c) a spinner

6. A card is randomly drawn from a standard deck of playing cards. In 90 trials, a red card was drawn 40 times and a spade was drawn 28 times.

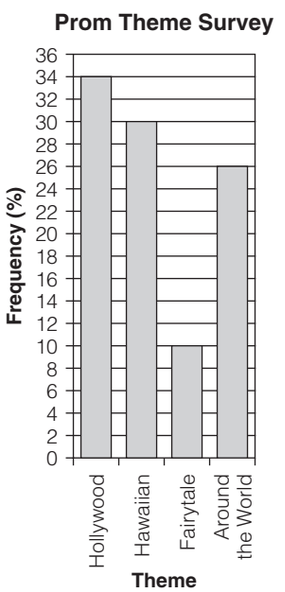
a) Determine the experimental probability of drawing a club.

b) If 12% of the black cards drawn were face cards, how many black face cards were drawn? What was the experimental probability of drawing a black face card?

c) What is the theoretical probability of drawing a black face card? How does this compare to your answer in part b)?

2.4 Interpret Information Involving Probability, textbook pages 86–93

7. A survey was conducted by a high school's prom planning committee to determine the theme of this year's prom. The results are shown in the graph.



a) If 20 students chose "Fairytale", how many students in total were surveyed?

b) The theme "Fairytale" was eliminated as an option, so those who chose it were asked to vote for another theme instead. Ten voted for "Around the World" and ten voted for "Hawaiian". What is the new percent of students who voted for "Around the World"?