UNIT 7

STUDENT BOOK

6

LESSON

Theoretical Probability

Quick Review

At Home At School

➤ This table shows the possible outcomes when 2 dice are rolled and the numbers are added.

+	1	2	3	4	5	6
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

From the table:

- There are 36 possible outcomes.
- 18 outcomes are odd sums.
- 18 outcomes are even sums.

We say: The **probability** of getting an odd sum is 18 out of 36.
We write the probability of an odd sum as a fraction: $\frac{18}{36}$

This probability is a **theoretical probability**.

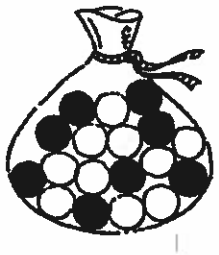
Theoretical probability = $\frac{\text{Number of favourable outcomes}}{\text{Number of possible outcomes}}$

The probability of an odd sum is $\frac{18}{36}$. The probability of an even sum is $\frac{18}{36}$.

Since $\frac{18}{36} = \frac{18}{36}$, the probability of getting an odd sum or an even sum is equally likely.

Try These

1. A bag contains 10 white marbles and 8 black marbles.
A marble is picked at random.
What is the probability
that a black marble is picked? _____



2. 16 girls and 13 boys put their names in a bag.
One name is drawn from the bag. What is the probability
that a boys name will be drawn? _____

Practice

1. A box contains 8 red apples, 10 green apples, and 12 yellow apples. Without looking, you pick an apple from the box.

a) What are the possible outcomes?

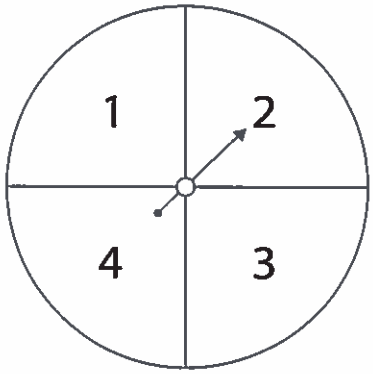
_____

b) How many apples are in the box? _____

c) What is the theoretical probability that the apple is:

i) red? _____ **ii)** green? _____ **iii)** yellow? _____

2. Suppose you spin the pointer on this spinner. What is the probability of each outcome?



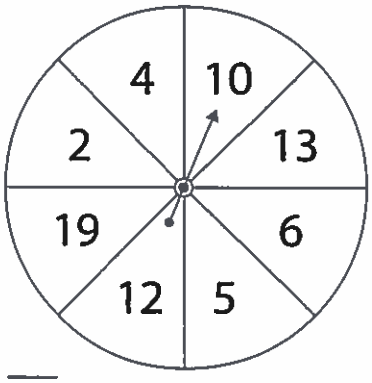
a) The pointer lands on 1. _____

b) The pointer lands on 2. _____

c) The pointer lands on 3 or 4. _____

d) The pointer does not land on 3. _____

3. Rafik spins the pointer on this spinner.



a) List the possible outcomes. _____

b) What is the probability of each outcome?

i) The pointer lands on a prime number? _____

ii) The pointer lands on a composite number? ___

iii) The pointer lands on a number greater than 10? ___

Stretch Your Thinking

Draw and colour marbles in the bag so that the probability of picking a green marble is greater than the probability of picking a red marble, but less than the probability of picking an orange marble.

UNIT 7

STUDENT BOOK 7 LESSON

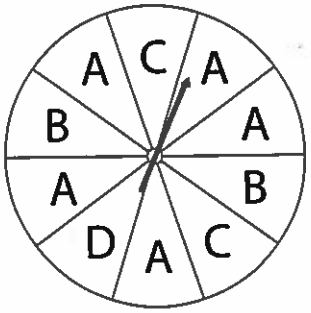
Experimental Probability

Quick Review

At Home / At School

➤ Saul spun the pointer on this spinner 10 times.
The theoretical probability of landing on the letter A is $\frac{5}{10}$, or $\frac{1}{2}$.
Here are Saul's results.

Letter	A	B	C	D
Number of Times	6	1	2	1



The **experimental probability** is the likelihood that something occurs based on the results of an experiment.

$$\text{Experimental probability} = \frac{\text{Number of times an outcome occurs}}{\text{Number of times the experiment is conducted}}$$

The experimental probability of landing on the letter A is $\frac{6}{10}$, or $\frac{3}{5}$.
This is different from the theoretical probability.

➤ Saul combined the results from 10 experiments.

Letter	A	B	C	D
Number of Times	51	19	8	22

The experimental probability of landing on the letter A is $\frac{51}{100}$.
The experimental probability is close to the theoretical probability.
The more trials we conduct, the closer the experimental probability may come to the theoretical probability.

Try These

1. Look at the table of Saul's individual results.
What is the experimental probability of landing on:

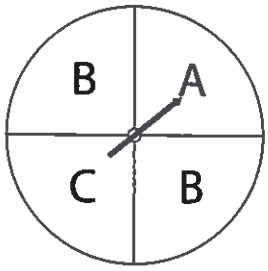
i) B? ____ **ii)** C? ____ **iii)** D? ____ **iv)** B or C? ____ **v)** A or D? ____

2. Look at the table of Saul's combined results.
What is the experimental probability of landing on:

i) B? ____ **ii)** C? ____ **iii)** D? ____ **iv)** B or D? ____

Practice

1. Tatiana spins the pointer on this spinner several times.
Here are her results.



A	B	C
𝍸 𝍸 ||	𝍸 𝍸 𝍸 𝍸	𝍸 |||

a) How many times did Tatiana spin the pointer? _____

b) What fraction of the spins were A? _____ B? _____ C? _____

2. A coin is tossed 100 times.
Heads showed 43 times and tails showed 57 times.

a) What are the possible outcomes? _____

b) What is the experimental probability of the tosses showing:

i) heads? _____ **ii)** tails? _____

c) What is the theoretical probability of the tosses showing:

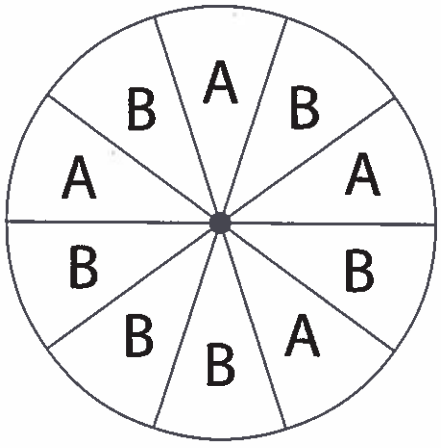
i) heads? _____ **ii)** tails? _____

Stretch Your Thinking

a) What is the theoretical probability of the pointer landing on:

i) A? _____ **ii)** B? _____

b) Use an opened paper clip as a pointer.
Spin it 100 times. Record the results.



A	B

c) What is the experimental probability of the pointer landing on:

i) A? _____ **ii)** B? _____

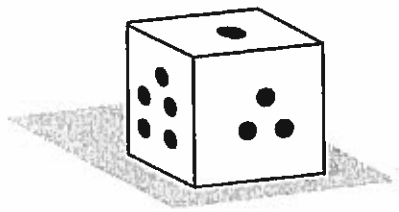
Probability

Name _____

Determine the probability of each event.

When rolling a standard six-sided die, what is the probability of getting...?

1. a 3 _____
2. a 2 _____
3. a 4 or a 5 _____
4. an odd number _____
5. an even number _____
6. a 7 _____

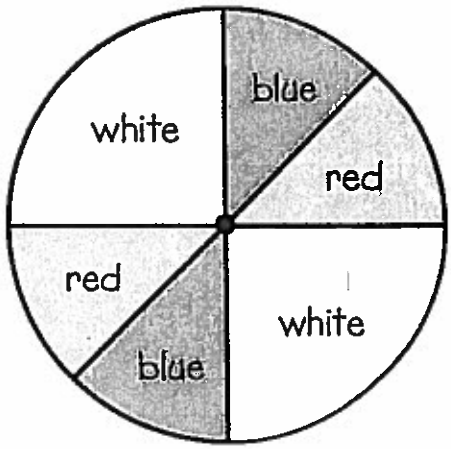


When flipping a coin, what is the probability of getting...?

7. heads _____
8. tails _____

When spinning this spinner, what is the probability of getting...?

9. white _____
10. red _____
11. brown _____
12. red, white, or blue _____

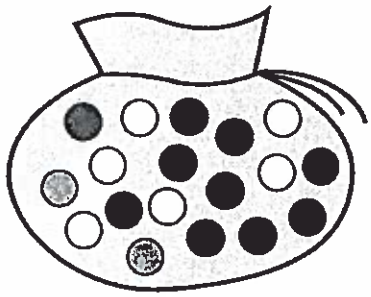


Compute theoretical probabilities for simple chance events

Bags of Probability

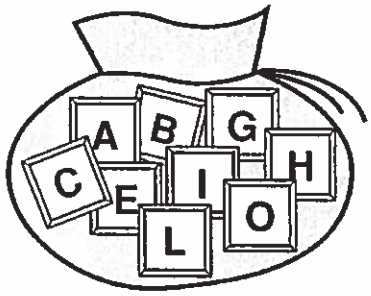
Name _____

There is a bag with 18 colored marbles inside. There are 6 white marbles, 2 green marbles, 1 red marble, and 9 blue marbles inside the bag. If one marble is selected at random, what is the probability that it will be...?



1. green _____
2. white _____
3. blue _____
4. red _____

There is a bag with 9 tiles. The tiles have the following letters, one letter on each tile: A, B, C, E, G, H, I, L, and O. If one tile is selected at random, what is the probability that it will be...?



5. the letter B _____
6. the letter H _____
7. a vowel _____
8. a consonant _____

There is a bag with 8 colored tiles. The tiles include 2 red, 3 orange, 2 blue, and 1 green. If one colored tile is selected at random, what is the probability that it will be...?

9. green _____
10. red or blue _____
11. purple _____
12. orange, blue, green, or red _____

Compute theoretical probabilities for simple chance events

Riddle

Name ______________________

What time is it when an elephant sits on your car?

Look at each of the figures below and compute the requested probability. Look for that value at the bottom of the page and write the corresponding letter on the line above the value. The letters will spell out the solution to the riddle.

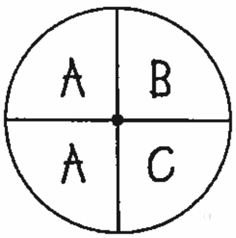
On this spinner,

E *P* (A)

M *P* (A or B)

A *P* (B)

T *P* (D)



On a standard six-sided die,

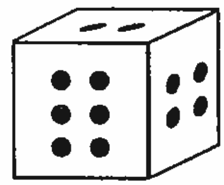
N *P* (one)

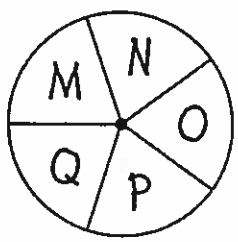
O *P* (number less than seven)

I *P* (three or four)

R *P* (one, two, three, or five)

C *P* (anything but 1)





On this spinner,

W *P* (vowel)

G *P* (M, N, or Q)

___	___	___	___	___	___	___	___	___
0	$\frac{1}{3}$	$\frac{3}{4}$	$\frac{1}{2}$	0	1.0	$\frac{3}{5}$	$\frac{2}{4}$	0

___	___	___	___	___	___	___
$\frac{1}{4}$	$\frac{1}{6}$	0.5	0.2	$\frac{5}{6}$	0.25	$\frac{2}{3}$

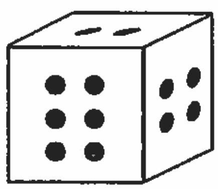
Compute theoretical probabilities for simple chance events

Riddle

Name ______________________

What is the difference between a bus driver and a cold?

To solve the riddle, look at each of the figures below and compute the requested probability. Look for that value at the bottom of the page and write the corresponding letter on the line above the value. The letters will spell out the answer to the riddle.



On a standard six-sided die,

W P (one or two)

E P (number less than six)

N P (three)

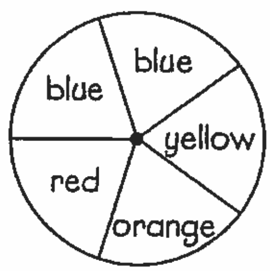
S P (two, three, four, or five)

When flipping a coin,

H P (heads)

P P (heads or tails)

O P (ears)



On this spinner,

T P (red)

K P (blue)

R P (primary color)

___ ___ ___   ___ ___ ___ ___ ___   ___ ___ ___

0 $\frac{1}{6}$ $\frac{5}{6}$ $\frac{2}{5}$ $\frac{1}{6}$ 0 $\frac{1}{3}$ $\frac{2}{3}$ 0.2 $\frac{1}{2}$ $\frac{5}{6}$

___ ___ ___ ___ ___ ;   ___ ___ ___

$\frac{2}{3}$ $\frac{1}{5}$ $\frac{0}{2}$ 1.0 $\frac{4}{6}$; 0.2 0.5 $\frac{5}{6}$

___ ___ ___ ___ ___   ___ ___ ___ ___ ___

0 $\frac{1}{5}$ $\frac{1}{2}$ $\frac{5}{6}$ $\frac{4}{5}$ $\frac{4}{6}$ $\frac{1}{5}$ $\frac{0}{2}$ 1 $\frac{2}{3}$

___ ___ ___   ___ ___ ___ ___

0.2 $\frac{1}{2}$ $\frac{5}{6}$ $\frac{1}{6}$ 0 $\frac{4}{6}$ $\frac{5}{6}$

Compute theoretical probabilities for simple chance events

M&Ms:

Estimate of how many M&Ms are in the bag:_____

M&M Colour	Prediction of the # of M&Ms in the Bag:	Actual # of M&Ms in the Bag:
Red		
Yellow		
Green		
Brown		
Orange		
Blue		

Group M&M Results:

Red: Fraction - Percent - Decimal -

Yellow: Fraction - Percent - Decimal -

Green: Fraction - Percent - Decimal -

Brown: Fraction - Percent - Decimal -

Orange: Fraction - Percent - Decimal -

Blue: Fraction - Percent - Decimal -

The company that makes M&Ms strives to put the following amount of M&Ms in each bag: Blue 10%, Green 10%, Orange 10%, Yellow 20%, Brown 30%, and Red 20%. Did your groups bag contain the desired outcome?

Class Results:

Red: Percent -

Yellow: Percent -

Green: Percent -

Brown: Percent -

Orange: Percent -

Blue: Percent -

Do the results better match the company's desired outcome? Why?