

GRADE 12 ESSENTIAL
UNIT I - PROBABILITY WORKBOOK

Name: _____

Date: _____

All answers to be expressed as simplified fractions and as percentage to nearest 0.01%

Lesson 8 Probability

You draw one of the cards shown at the right without looking. You would like to know your *chance* or **probability** of getting a card that says *win*.

Each card (possible result) is called an **outcome**. There are 10 cards. There are 10 possible outcomes. Since you have the same chance of drawing any of the cards, the outcomes are **equally likely**.

number of outcomes
that say *win*

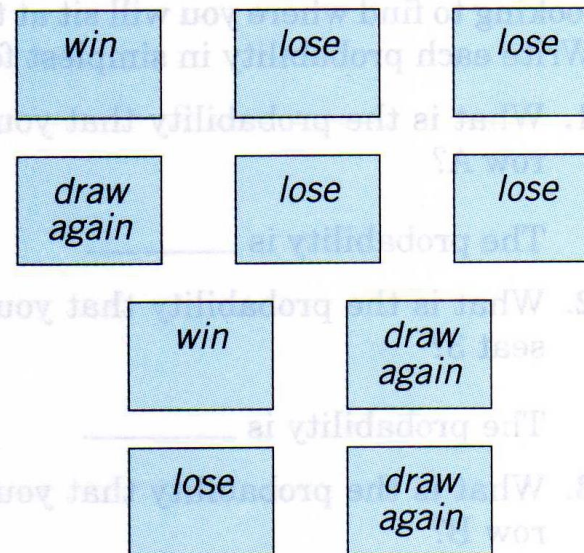
$$\frac{2}{10} \text{ or } \frac{1}{5}$$

Write the probability
in simplest form.

number of
possible outcomes

or 0.2 or 20%

The probability of drawing a card that says *win* is $\frac{1}{5}$.

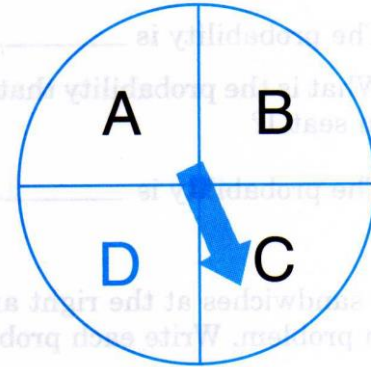


All probability answers as reduced fraction and as percentage to nearest 0.01%

Mr F

You spin the spinner shown at the right. Find the probability of the spinner stopping on

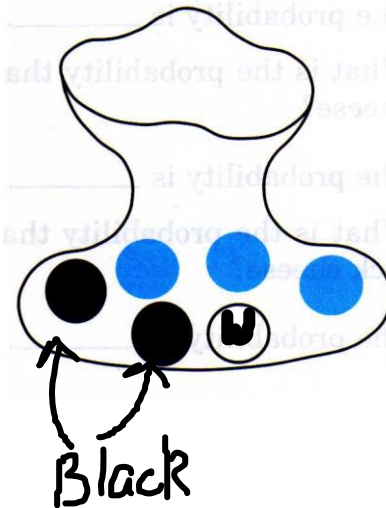
as % and fraction
% to nearest 0.01%



1. a blue letter _____
2. the letter A _____
3. a black letter _____
4. the letter C _____
5. a black letter B _____
6. the letter D or B _____

You pick a marble without looking. In simplest form, what is the probability of picking

7. white _____
 8. black _____
 9. blue _____
 10. a marble that is **not** white _____
- ie: $P(\text{white}) =$ _____
 $P(\text{black}) =$ _____
 $P(\text{blue}) =$ _____
 $P(\overline{\text{white}})$



MrF

To decide which committee you will be on, you are to draw one of the slips shown at the right without looking. These are the only committees you can be on. Write each probability in simplest terms.

1. How many slips are there? _____ slips
2. What is the probability of being on the cleanup committee? _____
3. What is the probability of being on the invitation committee? _____
4. What is the probability of being on the decorations committee? _____
5. What is the probability of **not** being on the decorations committee? _____
6. What is the sum (total) of the probabilities in problems 4 and 5? _____
7. What is the probability of being on the refreshments committee? _____
8. When you add the probability that an outcome **will** happen and the probability that it **will not** happen, the answer is _____.

refreshments

cleanup

refreshments

cleanup

refreshments

cleanup

decorations

cleanup

All probability answers as reduced fraction and as percentage to nearest 0.01%

MrF All answers as fraction and ⁴

Lesson 9 Problem Solving

Solve each problem. Write each probability in simplest form. *and a percentage to 0.01%*

1. You are taking a multiple-choice test. Each item has four choices. You have no idea which is the correct answer. What is the probability that you will guess the correct answer?

The probability is _____.

2. Suppose that each item on the test in problem 1 had five choices. You still have no idea which is the correct answer. What is the probability that you will guess the correct answer?

The probability is _____.

3. You draw one marble from a bag containing six marbles. There are four white marbles and two black marbles. What is the probability that you will draw a red marble?

The probability is _____.

Test	Name _____
In the blank at the left, write the answer that best completes the statement.	
_____	1. Zelda ran away on a. Monday b. Tuesday c. Wednesday d. Thursday

% to nearest 0.01%

All probability answers as reduced fraction and as percentage to nearest 0.01%

MrF

4. You pick one of the letter cards shown at the right without looking. What is the probability that you will pick a vowel (a, e, i, o, u)?

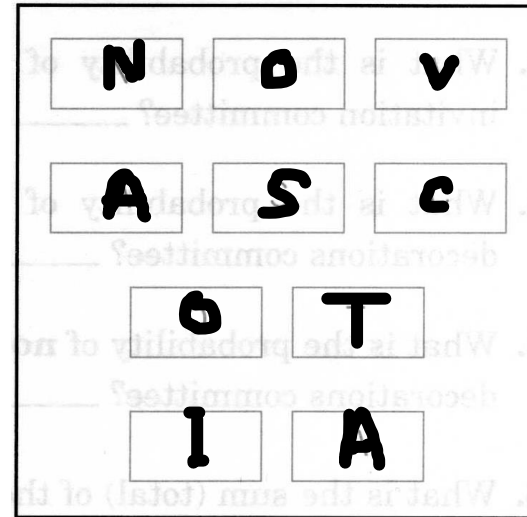
The probability is _____.

5. You pick one of the letter cards shown at the right without looking. What is the probability that the letter on the card is in the words *NOVA SCOTIA*?

The probability is _____.

6. You pick one of the letter cards shown at the right without looking. What is the probability that the letter on the card is **not** in the words *NOVA SCOTIA*?

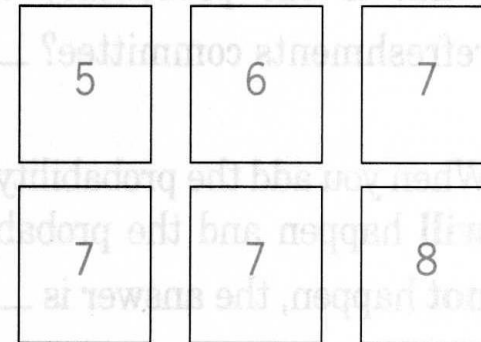
The probability is _____.



7. You pick one of the number cards shown at the right without looking. What is the probability that you will pick a number greater than 4?

The probability is _____.

$P(\text{number} > 4)$



Lesson 10 Sample Spaces

Suppose you have a choice of jewellery. You can have a bracelet, a necklace, or a pin. The jewellery can be gold, silver, or platinum.

You can show all the different outcomes in a table like the one shown at the right.

A list or a table of all the possible outcomes is called a **sample space**.

		Jewellery Piece		
		<i>bracelet</i> (B)	<i>necklace</i> (N)	<i>pin</i> (P)
Colour	gold (g)	Bg	Ng	Pg
	silver (s)	Bs	Ns	Ps
	platinum (p)	Bp	Np	Pp

Use the sample space above to answer each question.

1. How many possible outcomes are there?

2. Suppose your jeweller chooses a combination for you at random.

What is the probability of getting a gold

necklace? _____

Try this

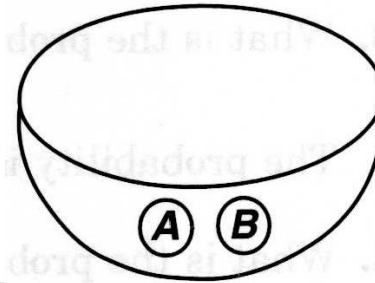
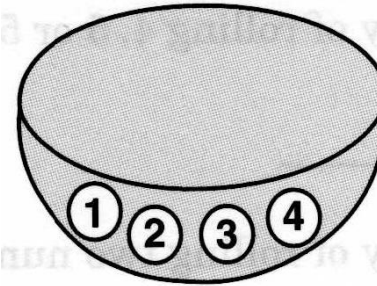
$$P(\text{gold}) \cdot P(\text{necklace})$$

$$=$$

MrF

Without looking, you pick marbles from two bowls shown at the right. Complete the sample space to show the outcomes. Then use the table to answer each question. Write each probability in simplest form. and % to nearest 0.01%

		Blue Bowl			
		1	2	3	4
White Bowl	A	1A	2A		
	B	1B			



3. How many outcomes are there? _____
4. What is the probability of drawing a 2 and an A? _____
5. What is the probability of drawing a B and an even number? _____
6. What is the probability of drawing any number and a B? _____

Try:
 $\text{Prob}(2 \text{ AND } A) = \text{Prob}(2) \cdot \text{Prob}(A)$
 Try $\text{Prob}(B \text{ AND } \text{Even}) = P(B) \cdot P(\text{Even})$

All probability answers as reduced fraction and as percentage to nearest 0.01%

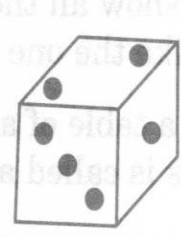
MrF

EXPRESS ALL ANSWERS
this workbook as fraction and % to
nearest 0.01%

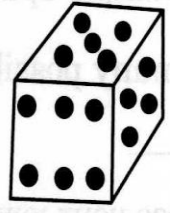
Lesson 10 Problem Solving

Complete the sample space below to show all the possible outcomes of rolling a blue number cube and a black number cube. Then use the sample space to solve each problem. Write each probability in simplest form.

		Blue Number Cube					
		1	2	3	4	5	6
Black Number Cube	1	1, 1	2, 1	3, 1	4, 1		
	2	1, 2	2, 2	3, 2			
	3	1, 3					
	4	1, 4					
	5						
	6						



Blue



Black

All probability answers as reduced fraction and as percentage to nearest 0.01%

1. What is the probability of rolling a 1 and a 3?

The probability is _____.

2. What is the probability of rolling 4s on both number cubes?

The probability is _____.

3. What is the probability of rolling 4, 5 or 5, 4?

The probability is _____.

4. What is the probability of rolling two number cubes that total 10?

The probability is _____.

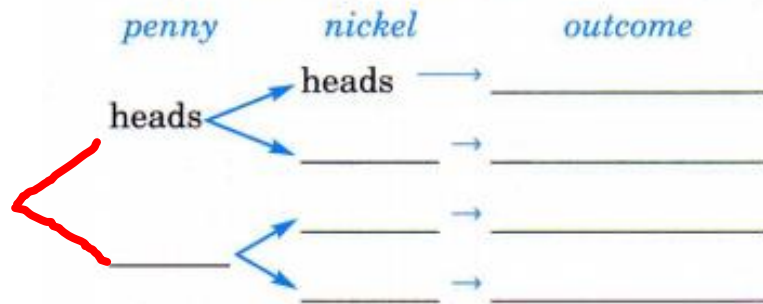
5. What is the probability of rolling two number cubes that total 20?

The probability is _____.

6. What is the probability of rolling two number cubes that total less than 13?

The probability is _____.

6. Complete the sample space for tossing a penny and a nickel.



All probability answers as reduced fraction and as percentage to nearest 0.01%

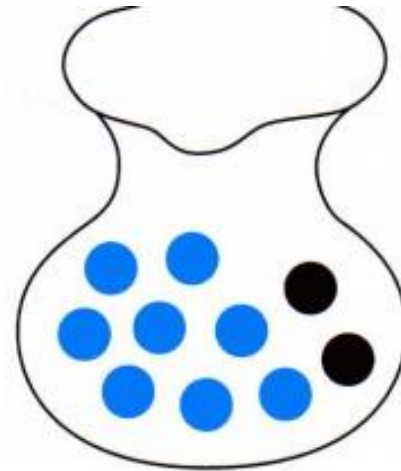
Solve each problem. Write each probability as a percent.

7. You draw one of the marbles without looking. What is the probability of drawing a blue marble?

The probability is _____.

8. A company knows that 1% of the bolts they make are defective. If they produce 250 000 bolts, how many will be defective?

_____ bolts will be defective.



9. You spin the spinner at the right. What is the probability that the spinner will stop on 6?

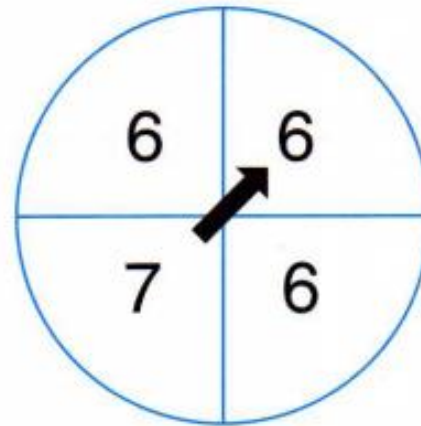
The probability is _____.

10. You spin the spinner at the right 20 times. Predict how many times the spinner will stop on 6.

The spinner will stop on 6 _____ times.

11. You spin the spinner at the right 200 times. Predict how many times the spinner will stop on 6.

The spinner will stop on 6 _____ times.



A game has a board like the one shown below. Use the board to answer each question. Write each probability in simplest form.

6. Are the outcomes equally likely? _____

Draw lines to make all of the rectangles the same size. Remember to label each section.

7. Now how many rectangles say *win*? _____

8. Now how many rectangles say *lose*? _____

9. You throw one dart. What is the probability of hitting a rectangle that says *win*?

The probability is _____.

10. You throw one dart. What is the probability of **not** hitting a rectangle that says *win*?

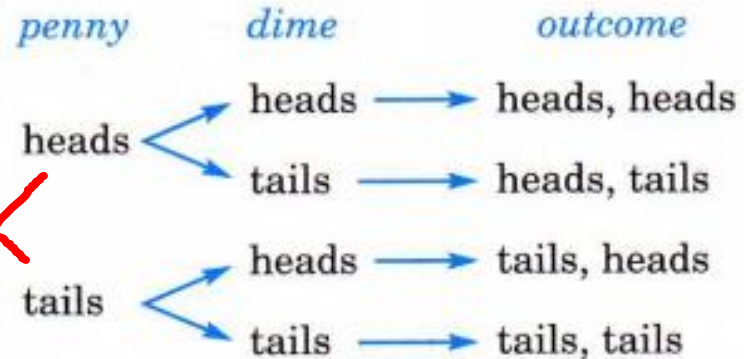
The probability is _____.

DART THROW		
win	lose	win
lose		lose
	win	
win	lose	win
lose		lose
	win	

Lesson 3 Sample Spaces

Suppose you flip a penny and a dime. You can show all the possible outcomes in a table or in a tree diagram.

		dime	
		heads	tails
penny	heads	h, h	h, t
	tails	t, h	t, t



A list or a table of all the possible outcomes is called a **sample space**.

Use the sample spaces above to answer each question.

1. How many possible outcomes are there? _____
2. What is the probability that both coins will land with heads up? _____
3. What is the probability that one coin will land with heads up and the other will land with tails up? _____

All probability answers as reduced fraction and as percentage to nearest 0.01%

Complete the sample space below to show all the possible outcomes of rolling a blue number cube and a black number cube. Then use the sample space to solve each problem. Write each probability in simplest form.

Blue Number Cube

		1	2	3	4	5	6
Black Number Cube	1	1,1	2,1	3,1	4,1		
	2	1,2	2,2	3,2			
	3	1,3					
	4	1,4					
	5						
	6						

- What is the probability of rolling two 5s?
The probability is _____.
- What is the probability of rolling the same number on both number cubes?
The probability is _____.
- What is the probability of rolling 4,5 or 5,4?
The probability is _____.
- What is the probability of rolling two number cubes that total 10?
The probability is _____.
- What is the probability of rolling two number cubes that total 20?
The probability is _____.
- What is the probability of rolling two number cubes that total less than 13?
The probability is _____.
- What is the probability of rolling two number cubes that total 7?
The probability is _____.
- What is the probability of rolling two different numbers?
The probability is _____.

All probability answers as reduced fraction and as percentage to nearest 0.01%

Lesson 4 Probability Experiments

Try this experiment.

Use tally marks (/) to record the results.

Flip a coin 10 times.

How many times did you get heads? _____

heads	
tails	

Flip a coin 10 more times.

Out of the 20 flips, did you
get heads exactly 10 times? _____

Mathematical probability (what you have found in previous lessons) tells what is likely to happen. It does not tell what will actually happen. **Experimental probability** tells what happened during a particular experiment.

→ "Theoretical"

Lesson 4 Problem Solving

Try each experiment. Record your results. Use your results to answer each question.

1. Make paper cards like those shown at the right. Be sure the cards are all the same size. Draw one card without looking, record the result, and put the card back. Repeat the experiment 100 times. (You could work with a friend and each person make 50 draws.)

Red	
Blue	
White	
Black	

Red	Blue
Red	Blue
Red	Blue
Red	Black
White	Black

OR
use
Suits
of cards

OR
some
"App"

2. Based on your experiment, what is the probability of picking a card that says *Red*? _____
3. What is the ^{theoretical} mathematical probability of picking a card that says *Red*? _____
4. Based on your experiment, what is the probability of picking a card that says *Blue*? _____
5. What is the mathematical probability of picking a card that says *Blue*? _____

If the theoretical and experimental are not close then:
a) need more trials; or
b) something is wrong with the theory, or experiment is

1. Make paper cards like those shown. Be sure the cards are all the same size. Draw one card without looking, record the result, and put the card back. Repeat the experiment 20 times.

Red	
Blue	
White	
Black	

2. Based on your experiment, what is the probability of picking a card that says *Red*? _____
3. What is the mathematical probability of picking a card that says *Red*? _____

Red Blue

White Blue

White Blue

Black Black

Black Black

or use
marbles

or
card
suits
etc

4. Based on your experiment, what is the probability of picking a card that says *Blue*? _____
5. What is the mathematical probability of picking a card that says *Blue*? _____
6. Based on your experiment, what is the probability of picking a card that says *White*? _____
7. What is the mathematical probability of picking a card that says *White*? _____

8. Based on your experiment, what is the probability of picking a card that says *Black*? _____
9. What is the mathematical probability of picking a card that says *Black*? _____
10. What is the experimental probability of picking a card that does **not** say *Black*? _____
11. What is the mathematical probability of picking a card that does **not** say *Black*? _____

All probability answers as reduced fraction and as percentage to nearest 0.01%

Lesson 6 Predicting with Probability

You roll a number cube once. What is the possibility of getting a 5?

Suppose you roll a number cube 60 times. You can predict how many times you would expect to get a 5 as follows:

probability of getting a 5 \times number of rolls = number of times you would expect to get a 5

$$\frac{1}{6} \times 60 = 10$$

A company finds that 2% of their calculators are defective. Predict how many calculators will be defective if they make 5000 calculators.

$$\begin{array}{r} 5000 \\ \times 0.02 \\ \hline 100.00 \end{array}$$

The company can expect 100 defective calculators.

Solve each problem. Write each probability as a fraction in simplest terms or as a percent.

- You flip a coin once. What is the probability of getting heads?
The probability is _____.
- Suppose you flip a coin 200 times. Predict how many times you would expect to get tails.
You should get tails about _____ times.
- A company knows that $\frac{1}{2}\%$ of the batteries they make are defective. If they produce 100 000 batteries, how many will be defective?
_____ batteries will be defective.

1-2.

$$\text{If } \text{prob} = \frac{n(\text{favoured})}{n \text{ total}}$$

$$\text{then } n(\text{favoured}) = \text{prob} \cdot n \text{ total}$$

3.

4. You spin the spinner at the right. What is the probability that the spinner will stop on *radio*?

The probability is _____.

5. You spin the spinner at the right 20 times. Predict how many times the spinner will stop on *radio*.

The spinner will stop on *radio* _____ times.

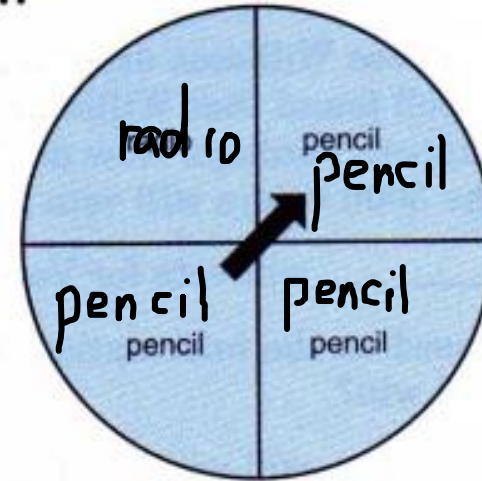
6. You spin the spinner at the right. What is the probability that the spinner will stop on *pencil*?

The probability is _____.

7. You spin the spinner at the right 60 times. Predict how many times the spinner will stop on *pencil*.

The spinner will stop on *pencil* _____ times.

4-7.



Lesson 6 Problem Solving

One hundred people were polled to see whom they preferred for union representative. The results are shown below. Use the results to solve each problem.

Candidate	Erickson	Nunez	Verdugo	Williams
Number of votes	34	27	25	14

1. What percent of those polled prefer Erickson?

_____ % prefer Erickson.

2. If 3000 people vote for union representative, predict how many will vote for Erickson.

_____ will vote for Erickson.

3. What percent of those polled prefer Williams?

_____ % prefer Williams.

4. If 3000 people vote for union representative, predict how many will vote for Williams.

_____ will vote for Williams.

1-2.

3-4.

5. If 3000 people vote for union representative, predict how many will vote for Nunez.
_____ will vote for Nunez.
6. If 3000 people vote for union representative, predict how many will vote for Verdugo.
_____ will vote for Verdugo.
7. Suppose Williams drops out of the election. A poll found that Williams's supporters now support Verdugo. Now predict how many of the 3000 voters will vote for Verdugo.
_____ will vote for Verdugo.
8. Based on the information in problem 7, who will win?
_____ will win the election.
9. How many more votes will the winner get than Nunez will get?
The winner will get _____ more votes than Nunez.

5.

6.

7.

8-9.

Solve each problem. Write each probability as a percent.

4. You spin the spinner at the right once. What is the probability that the spinner will stop on 4?

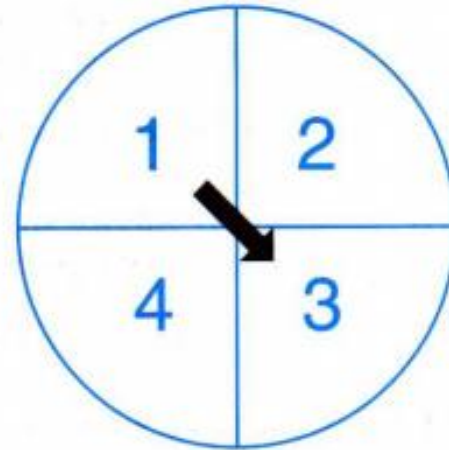
The probability is _____.

5. You spin the spinner 80 times. Predict how many times the spinner will stop on 4.

The spinner will stop on 4 _____ times.

6. A company knows that 2% of their computer disks are defective. The company produced 400 000 computer disks. How many of those disks will be defective?

_____ computer disks will be defective.



Complete this experiment. Flip a coin. Record the results. Repeat the experiment 19 more times. Write each probability as a percent.

7. Based on 20 flips, what is the probability that the coin landed *heads up*?

The probability is _____.

8. Based on 20 flips, what is the probability that the coin landed *tails up*?

The probability is _____.

9. What is the mathematical probability that a coin will land *heads up*?

The probability is _____.

All probability answers as reduced fraction and as percentage to nearest 0.01%