



7th  
Basic

8th  
Advanced

# Helping With Math

USA  
GRADES

## Probability Models

*Suitable for students  
aged 11-13*



This pack is suitable for learners aged 11-13 years old or 7th to 8th graders (USA). The content covers fact files and relevant basic and advanced activities involving probability models.



### Probability

Probability refers with the likelihood of an event to occur. The probability of an event is measured by the ratio of favorable outcomes to all possible outcomes.

### Probability Model

- This is a mathematical representation of different events.
- This also shows all possible outcomes of an event and the probability of each outcome.



# PROBABILITY MODEL

## What is a probability model?

A model that is made up of a sample space, which is the set of all possible experiment results, and a set of probabilities for each part of the sample space.



## SAMPLE SPACE



Sample space is the set of all possible outcomes in an experiment.

Example:

Two coins are tossed at the same time.



List	HH	TT	TH	HT
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### Tree Diagram

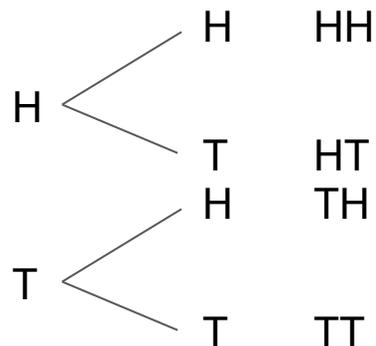


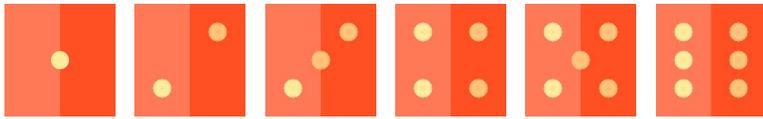
Table	H	T
H	HH	TH
T	HT	TT



## EXAMPLE

Give a probability model for the chance process of rolling a die.

Sample Space



Each of these outcomes has a probability of  $\frac{1}{6}$ .

Outcome	1	2	3	4	5	6
Probability	$\frac{1}{6}$	$\frac{1}{6}$	$\frac{1}{6}$	$\frac{1}{6}$	$\frac{1}{6}$	$\frac{1}{6}$

Give a probability model for the chance process of tossing a coin.

Sample Space = {heads, tails}



Outcome	Heads	Tails
Probability	$\frac{1}{2}$	$\frac{1}{2}$

Summer rolled a die six times. She got: 1, 2, 3, 4, 4, & 5. Find the probability:  $P(4)$

$$P(4) = \frac{2}{6} = \frac{1}{3}$$



# TABLE OF ACTIVITIES

Ages 11-12 (Basic)		7th Grade
1	Christmas Party	
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9	Rock, Paper, Scissors	
10	Christmas Wish	



# CHRISTMAS PARTY

G7  
Basic

A christmas party in Simon's village is starting today. To be able to enter the party, people should answer the questions at the entrance gate by identifying which of the statements are correct by writing true and replacing the underlined word/s if false.

1. Probability means possibility.

2. The probability of the sample space is 1.

3. Any probability is a number from -1 to 1.

4. The probability model is made up of a sample space.

5. The probability of different outcomes must have a sum of 2.

6. A probability of 1 means that an event is uncertain to happen.



# GIFT GIVING

G7  
Basic

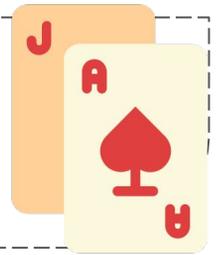
Before the party starts, Simon's family decided to have the exchanging of gifts first. As they start, they need to answer the questions below and whoever gets the lowest point will be the first person to give a gift.

Give the sample space of each event.

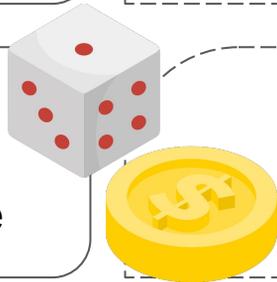
1. Tossing three coins at the same time



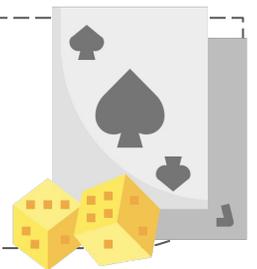
2. Drawing a face card



3. Tossing a coin and rolling a die



4. Drawing a black ace card and rolling a die

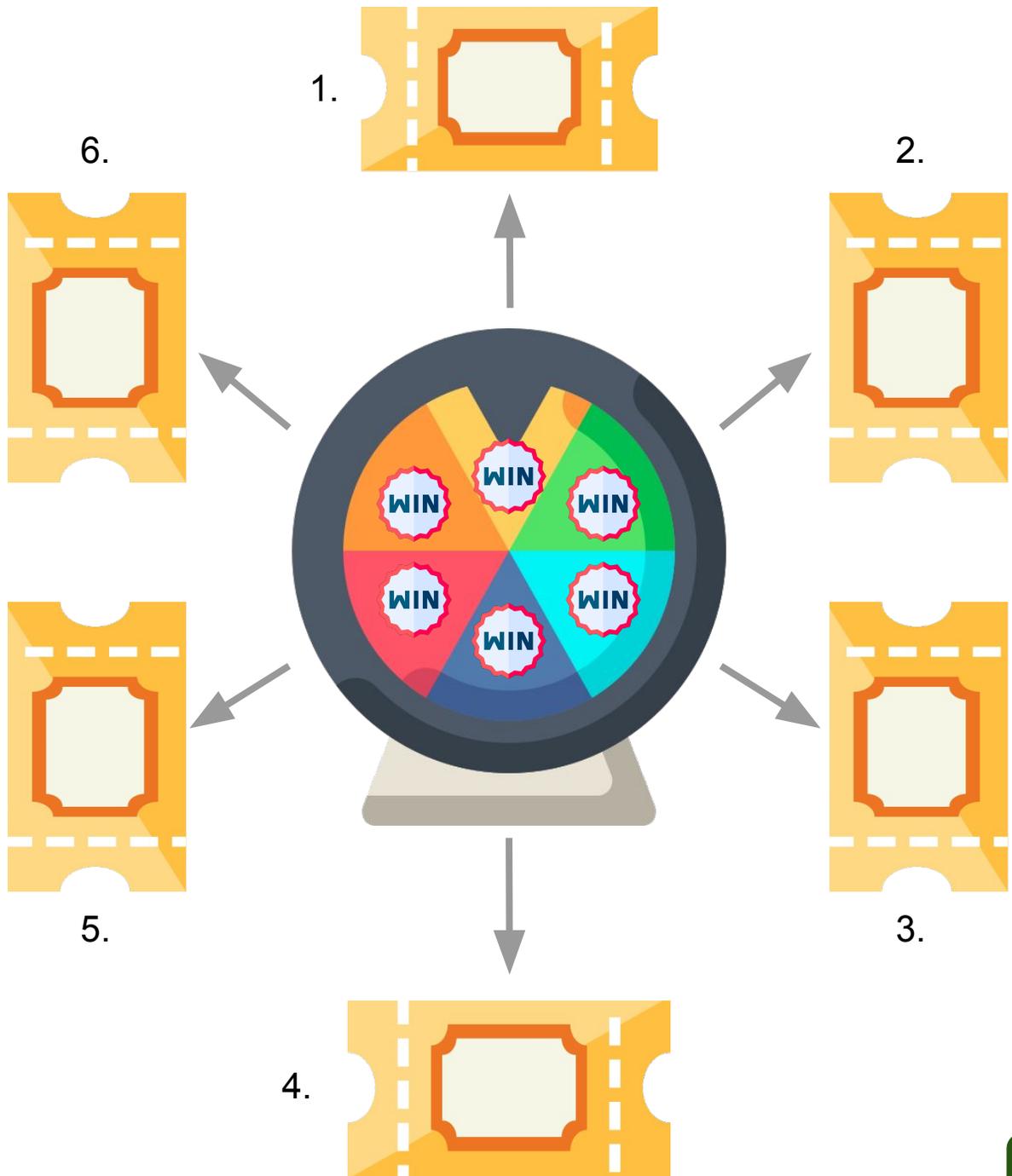


# PARTY POINTS

G7  
Basic

To trade points for a prize at the party, the players should spin the wheel. Each color or letter corresponds to a prize. Simon will trade his points. Help him get the probability of getting any prize.

What is the probability of each color on the color wheel?

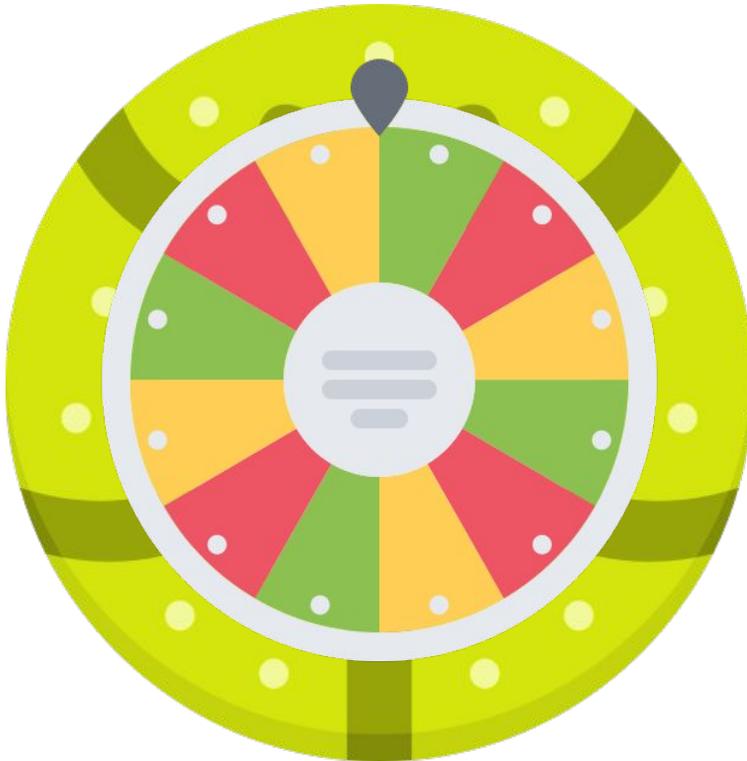


# THE COLOR WHEEL

G7  
Basic

One of the games in the christmas party is the color wheel. A player will insert a coin and bet on a color (red, green or yellow). Find the probability of each of the colors.

What is the probability of each color on the color wheel?



1. Red

2. Green

3. Yellow

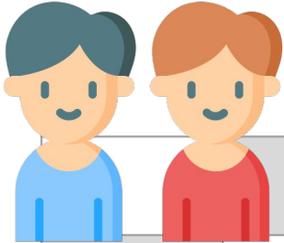
4. What is the sum of the probabilities you got above? Explain why it is the value you got.



# A PAIR OF DICE

G7  
Basic

Simon and his friend decided to play a one-on-one game using a pair of dice. Before they start, they have to identify first the sample space of rolling a pair of dice.



Identify each of the outcomes of rolling two dice by filling in the table.

	1	2	3	4	5	6
1						
2						
3						
4						
5						
6						

List the outcomes that give a sum of 6 or 8 and find the probability.



# SANTA HAT

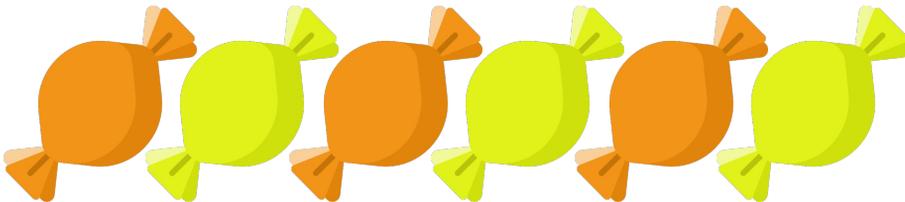
G8  
Basic

Simon's father prepared giveaway candies for the children who attended the Christmas party. He placed it inside a Santa hat. Before they receive the candies, they need to answer first the problem below.



Inside Santa's hat, there are 5 orange candies, 3 blue candies, 6 yellow candies, 7 green candies, and 9 pink candies Using the information answer the questions below.

1. What is the probability of getting an orange or a green candy?



2. If you draw 1 candy 10 times (replacing the candy each time), how many times would you expect to get a candy that is not green or blue?



# DINNER'S DESSERT

G8  
Basic

After having the games, it's time for the dinner. On the table, there are fruits, chocolate marbles, and gummy bears. Based on the information given below, answer the question that follows.

1. Mr. Thompson has a basket of fruits. Each of the 15 visitors picks one fruit from the basket without looking and puts it back. Based on the results shown below, what can we conclude about the probability of selecting a mango?

Mango - 7	Apple - 4	Orange - 15
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- A. There are no oranges in the basket.  
B. It is more likely to pick a mango than apple.  
C. It is equally likely that a visitor will pick a mango.  
D. There is about a 100% chance that a visitor picks a mango.
2. Simon told the kids that the container has 300 chocolate balls. Based on the table of the colors of the chocolate balls, about how many red chocolate balls are in the container?

Red - 37	Blue - 23	Pink - 3	Green - 24
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- A. 185      B. 120      C. 115      D. 37
3. There are colorful gummy bears in the jar. Each of the visitors picks one gummy bear without looking. Based on the results, which of the following predictions is most likely possible?

Orange - 7	Yellow - 8	White - 3	Purple - 4
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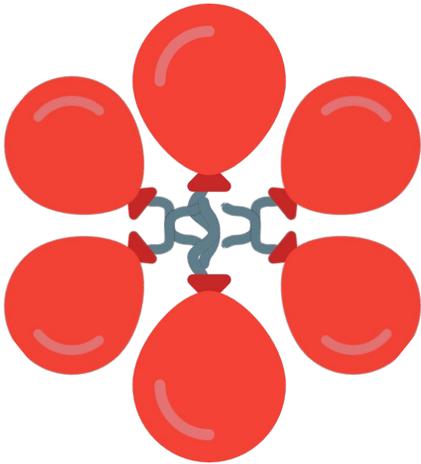
- A. There are probably less orange balls than white.  
B. There are probably more white balls than purple.  
C. There are probably less purple balls than yellow.  
D. There are probably more purple balls than orange.



# CHRISTMAS DECORATIONS

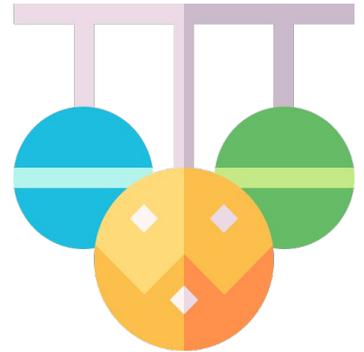
G8  
Basic

Mr. Thompson is fixing the party decorations. He asks Simon's friends about some probability by matching the word problems to their corresponding answer. Write the letter on the left box. Try it!



1. There are 50 balloons at the party. 18 of the balloons are red. What is the probability that a randomly selected balloon will be red?

2. There are 24 christmas balls. 12 are green and 10 are blue. What is the probability that a randomly selected ball will not be green or blue?



3. There are 10 candy canes displayed. 6 are pink and 2 are yellow. What is the probability that a randomly selected candy will be pink or yellow?

A.  $\frac{1}{12}$

B.  $\frac{4}{5}$

C.  $\frac{9}{25}$



# ROCK, PAPER, SCISSORS

G8  
Basic

Simon and her younger sibling Peter are playing rock, paper, and scissors while waiting for 12 midnight. Give the answers to the questions below.

1. Make a table showing all the outcomes or sample space.



2. How many possible outcomes are there in the sample space?

3. What is the probability of at least 1 paper coming up?

4. What is the probability of at least 2 rocks coming up?

5. Both Simon and Peter show the same sign. What is the probability of a tie?



# CHRISTMAS WISH

G8  
Basic

It's been a long night for everyone. Before they go home, each visitor tells his/her christmas wish and receives a giveaway treat from Mr. Thompson's family if they answered the question below. Help them!

1. What are uniform models in probability? Give an example.



2. What are uniform models in probability? Give an example.



# ANSWER GUIDE

## Activity 1

- |          |            |             |
|----------|------------|-------------|
| 1.) True | 3.) 0 to 1 | 5.) 1       |
| 2.) True | 4.) True   | 6.) certain |

## Activity 2

1. HHH, HTH, HTT, HHT, TTT, THT, THH, TTH
2. King of hearts, king of diamonds, king of spades, king of clubs  
Queen of hearts, queen of diamonds, queen of spades, queen of clubs  
Jack of hearts, jack of diamonds, jack of spades, jack of clubs
3. H-1, H-2, H-3, H-4, H-5, H-6, T-1, T-2, T-3, T-4, T-5, T-6
4. Ace of spades – 1, ace of spades – 2, ace of spades – 3, ace of spades – 4, ace of spades – 5, ace of spades – 6  
Ace of clubs – 1, ace of clubs – 2, ace of clubs – 3, ace of clubs – 4, ace of clubs – 5, ace of clubs – 6

## Activity 3

- |                   |                   |                   |                   |                   |                   |
|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|
| 1.) $\frac{1}{6}$ | 2.) $\frac{1}{6}$ | 3.) $\frac{1}{6}$ | 4.) $\frac{1}{6}$ | 5.) $\frac{1}{6}$ | 6.) $\frac{1}{6}$ |
|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|

## Activity 4

- |                   |                   |                   |
|-------------------|-------------------|-------------------|
| 1.) $\frac{1}{3}$ | 2.) $\frac{1}{3}$ | 3.) $\frac{1}{3}$ |
|-------------------|-------------------|-------------------|
- 4.) Sum is 1, explanation may vary.



# ANSWER GUIDE

## Activity 5

	1	2	3	4	5	6
1	1, 1	1, 2	1, 3	1, 4	1, 5	1, 6
2	2, 1	2, 2	2, 3	2, 4	2, 5	2, 6
3	3, 1	3, 2	3, 3	3, 4	3, 5	3, 6
4	4, 1	4, 2	4, 3	4, 4	4, 5	4, 6
5	5, 1	5, 2	5, 3	5, 4	5, 5	5, 6
6	6, 1	6, 2	6, 3	6, 4	6, 5	6, 6

(1, 5), (2, 4), (2, 6), (3, 3), (3, 5),  
(4, 2), (4, 4), (5, 1), (5, 3), (6, 2)

$$\text{Probability} = \frac{5}{18}$$

## Activity 6

1.)  $\frac{2}{5}$                       2.) 6.67

## Activity 7

1.) B                      2.) A                      3.) C

## Activity 8

1.) C                      2.) A                      3.) B



# ANSWER GUIDE

## Activity 9

1.)

	Simon		
Peter	Rock	Paper	Scissors
Rock	RR	RP	RS
Paper	PR	PP	PS
Scissors	SR	SP	SS

2.) 9

3.)  $\frac{5}{9}$

4.)  $\frac{1}{9}$

5.)  $\frac{1}{3}$

## Activity 10

1. Answers may vary.

2. Answers may vary.



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