Math 30-2: U3L1 Teacher Notes

Exploring Probability

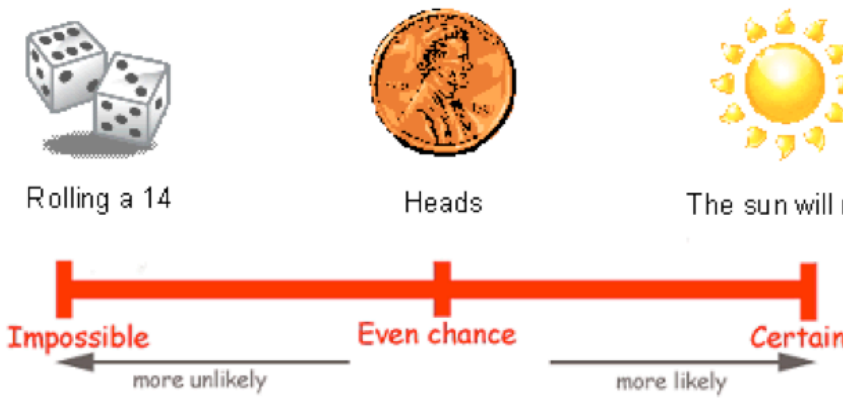
Key Math Learnings:

By the end of this lesson, you will learn the following concepts:

- **Represent and solve counting problems, using a graphic organizer.**
- Generalize the Fundamental Counting Principle, using inductive reasoning.
- Identify and explain assumptions made in solving a counting problem.
- Solve a contextual counting problem, using the Fundamental Counting Principle, and explain the reasoning.

What is Probability?

Probability is the measure of how likely an event is.



Click here to watch a Youtube video on Probability and Sample Space

Experimental Probability Vs. Theoretical

An **experiment** is a situation involving chance or probability that leads to results called outcomes. An **event** is one or more outcomes of an experiment. An **outcome** is the result of a single trial of an experiment.

A Fair Game is a game in which all the players are equally likely to win.

For Example:

Let's look at tossing a fair coin to make a decision.

The experiment is tossing the coin. The events of tossing of coin is either tossing a head or tossing a tail. The outcome of the tossing a coin is what happens if you toss it. Either you will toss a head or a tail.

And tossing a coin to get heads or tails is a fair game.

One way to find the probability of an event is to conduct an **Experiment.** We can find the experimental probability of the event by using the formula below.

Experimental Probability	
Experimental probability = $\frac{\text{Number of event occurrences}}{\text{Total number of trials}}$	$P(A) = \frac{n(A)}{n(T)}$ *A* is the favorable event *n(A)* is the number of times it occurs *n(T)* is the total number of trials in the experiment

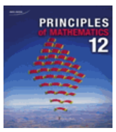
The following video illustrates how the results of the experimental probability may approach the theoretical probability.

Click the icon to watch a Youtube video on Experimental Probability.

Conducting experiments every time is a bit tedious and time consuming so we use theoretical probability to solve most probability problems.

Theoretical Probability	
Theoretical probability=$\frac{\text{Number of favorable outcomes}}{\text{Total number of outcomes}}$	$$P(A) = \frac{n(A)}{n(S)}$$ *A* is the favorable event *n(A)* is the number of times it occurs *n(S)* is the total number of outcomes in the sample space

Probability ranges from 0 which means that event is NEVER going to occur to 1 which means that is CERTAIN to occur.

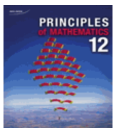


Practice Problem:

Complete “Check your Understanding” question 1 on page 141 of your textbook.

Solution:

Reverse the rules for Players 1 and 2 on each turn.



Practice Problem:

Complete “Check your Understanding” question 2 on page 141 of your textbook.

Solution:

2. a) Outcome Table:

MATT

P		H	T
A	H	HH	HT
T	T	HT	TT

$P(\text{Matt wins}) = \frac{2}{4}$ $\qquad$ $P(\text{Pat wins}) = \frac{2}{4}$

$P(\text{Matt wins}) = \frac{1}{2}$ $\qquad$ $P(\text{Pat wins}) = \frac{1}{2}$

Each player has an equal chance of winning, so the game is fair.

b) Sample Space:

H	H	H
H	H	T
H	T	H
H	T	T

T	H	H
T	H	T
T	T	H
T	T	T

$P(\text{Treena wins}) = \frac{1}{8}$ $P(\text{Leena wins}) = \frac{1}{8}$ $P(\text{Gina wins}) = \frac{6}{8}$

This game is not fair. Gina has a 6 in 8 chance of winning.

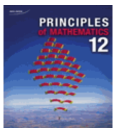
c) Outcome Table:

Die 2 \ Die 1	**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

$P(\text{Ann wins}) = \frac{15}{36}$ $P(\text{Dan wins}) = \frac{15}{36}$

$P(\text{Ann wins}) = \frac{5}{12}$ $P(\text{Dan wins}) = \frac{5}{12}$

Each player has an equal chance of winning, so the game is fair.



Practice Problem:

Complete “Check your Understanding” question 3 on page 141 of your textbook.

Solution:

No. e.g., A certain chance is 100%. 120% > 100%.