What's Going On?

Checking In

Minds on What Did You Expect?

Action! Theoretical Probability

Consolidation Whiteboards

Learning Goal - I will be able to calculate theoretical probabilities for various situations.

There are 3 ways to represent probability:

1. As a fraction
(in lowest terms)

2. As a decimal
(to 3 decimal places)

Take the fraction and divide

3. As a percent
(to 1 decimal place)

Take the decimal and multiply by 100.

Starting with the fractional probability is typically the easiest.

For example: if I roll a dice 20 times and I roll a six, 4 times....

Probability of rolling a 6 $= \frac{4}{20}$

number of times I rolled a 6

total number of rolls (TRIALS)

$\frac{2}{10}$ $\boxed{\frac{1}{5}}$

From here, figuring out the decimal probability and percentage probability is simple!

Decimal Probability = 4 ÷ 20

= 0.2

Percentage Probability = 0.2 X 100

= 20%

Minds on

Yesterday's Experiment

Yesterday you performed probability experiments rolling a dice.
Your results were all over the place!

Minds on

What Happened

The probability of rolling any given number differs wildly from graph to graph.

These probabilities are referred to as

EXPERIMENTAL PROBABILTY

The likelihood of an event occuring based on the results of an experiment (a certain number of trials)

$$\frac{\text{number of successful trials}}{\text{total number of trials}}$$

Minds on

What Did You Expect?

If things worked out perfectly, what do you think would be the probability or rolling any specific number on a dice (for example, the probability of rolling a 2)?

Minds on

The number of 1s, 2s, 3s, 4s, 5s and 6s rolled would even out!

0.166666

P(Rolling 1) = $\frac{1}{6}$ = 0.167 = 16.7%

P(Rolling 2) = $\frac{1}{6}$ = 0.167 = 16.7%

P(Rolling 3) = $\frac{1}{6}$ = 0.167 = 16.7%

P(Rolling 4) = $\frac{1}{6}$ = 0.167 = 16.7%

P(Rolling 5) = $\frac{1}{6}$ = 0.167 = 16.7%

P(Rolling 6) = $\frac{1}{6}$ = 0.167 = 16.7%

Action!

Theoretical Probability

THEORETICAL PROBABILTY
The number of successful outcomes as a fraction of the total number of possible outcomes.

$$P(A)=\frac{n(A)}{n(S)}$$

P(A) - The probability of event A occurring.

n(A) - The number of ways event A can occur.

n(S) - The number of total possible outcomes.

Use this model to write the fractional probability of a female's name in this class today being drawn from a hat.

$$\frac{3}{13}=0.231=23.1\%$$

Action!

Playing Cards

A standard deck of cards (without jokers) has

52 cards

2 colours: red + black

4 suits: ♥ ♦ ♠ ♣

13 cards per suit:

A 2 3 4 5 6 7 8 9 10 J Q K

3 face cards per suit:

J Q K

Action!

Playing Cards

How many total face cards are in a deck of cards?

3 per suit
4 suits

$3 \times 4 = 12$

What is the probability of drawing a face card from a deck of cards? (Fraction, Decimal, %)

$$P(A) = \frac{n(A)}{n(S)}$$

$P(\text{face}) = \frac{12}{52}$

$= 0.231$

$= 23.1\%$

Action!

Playing Cards

What is the probability of drawing a heart

from a standard deck of cards?

$$P(A)=\frac{n(A)}{n(S)}$$

$= 0.25$

25%

$P(\text{heart}) = \frac{13}{52}$

What is the probability of drawing Ace of Clubs

from a standard deck of cards?

$$P(A)=\frac{n(A)}{n(S)}$$

$= 0.019$

$= 1.9\%$

$P(\text{A of clubs}) = \frac{1}{52}$

What is the probability of drawing a two

from a standard deck of cards?

$$P(A)=\frac{n(A)}{n(S)}$$

$= 0.0769$

$P(\text{two}) = \frac{4}{52}$

$= 0.077$

$= 7.7\%$

Action!

Flippin' Out!

Tree diagrams

A tree diagram is a useful tool for calculating probabilities.

For the first trial we have all of the possibilities listed.

Each trial after that "branches" out to allow for all the possibilities on the next trial and so on.

Action!

Tree diagrams

For example.

If we were going to flip a coin several times, we could either flip a head or a tail the first time.

Toss # 1

H

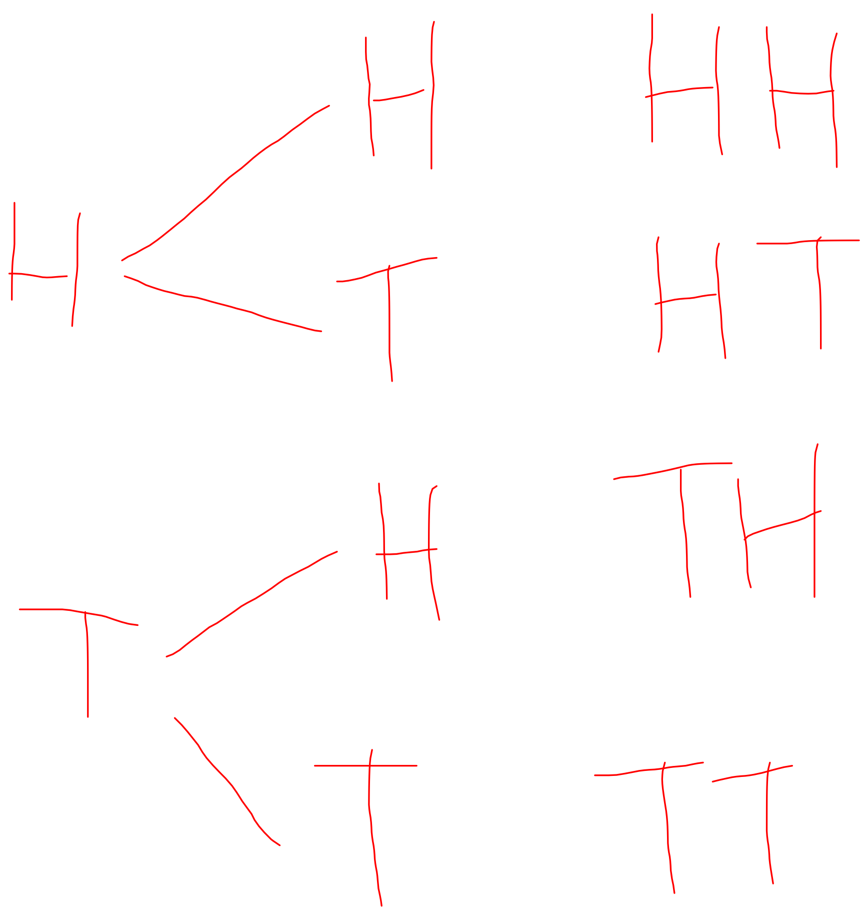
T

Action!

Tree diagrams

Whether we flipped a head or a tail the first time, we can flip a head or a tail the **<u>second time</u>**. Notice that after two tosses, there are 4 different possible outcomes! (HH, HT, TH, TT)

Toss # 1 2

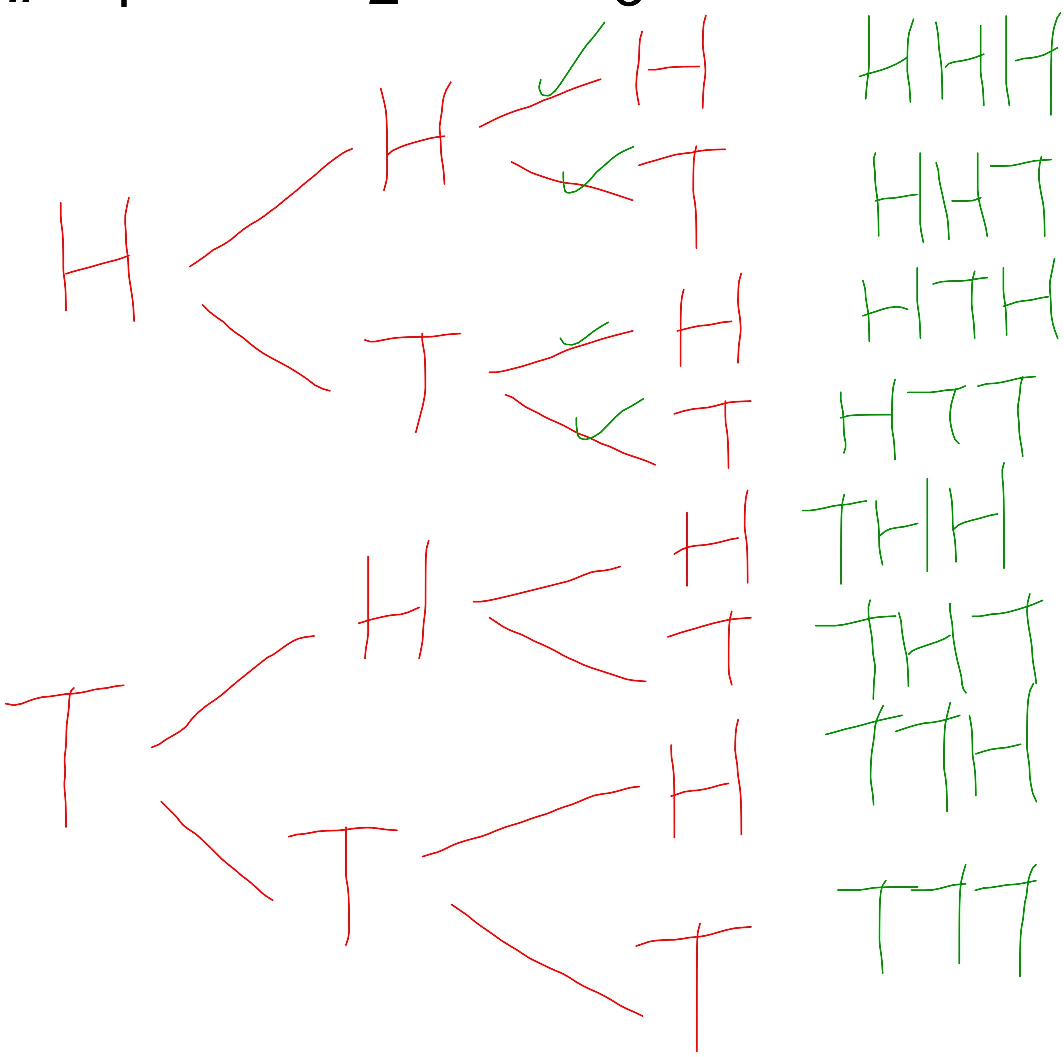


Action!

Tree diagrams

No matter what happened on the first two tosses, we can flip a head or tail on the **third toss**. Notice there are now a total of 8 possible outcomes!

Toss # 1 2 3



Action!

Tree diagrams

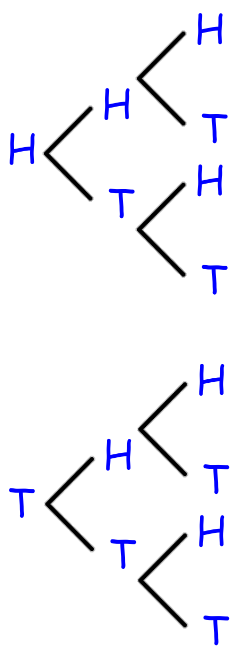
Once you have finished your tree diagram, it is very important to list what happened in EACH outcome.

Toss #	1	2	3	Result

Action!

Flippin' Out!

Tree diagrams



1 2 3	Outcome	# Heads	# Tails
	HHH	3	0
	HHT	2	1
	HTH	2	1
	HTT	1	2
	THH	2	1
	THT	1	2
	TTH	1	2
	TTT	0	3

Total Outcomes: 8

Action!

Flippin' Out!

Use a Tree diagram to answer each question.

1. What is the **theoretical probability** of flipping a tail three times in a row?

$\frac{1}{8} = 0.125 = 12.5\%$

2. What is the **theoretical probability** of flipping two heads and one tail?

$\frac{3}{8} = 0.375 = 37.5\%$

3. What is the **theoretical probability** of flipping a head, **then** a tail, **then** a head?

$\frac{1}{8} = 0.125 = 12.5\%$

Consolidation

Worksheet!

Hand in your work sheet
at the end of class.

You may partner up and work
with someone else!