THEORETICAL PROBABILITY

Learning Goal
- calculate theoretical probability

$$Theoretical = \frac{\text{\# of "desired" outcomes}}{\text{total \# of possible outcomes}}$$
$$Probability$$

Recall:
- The probability of an event is between 0 and 1 ✳
- Each outcome much be equally likely (fair conditions)

Flipping a <u>coin</u>.

P_T (heads) = $\dfrac{1}{2}$

↑ theoretical

Rolling a <u>dice</u>.

a) P_T (five) = $\dfrac{1}{6}$

b) P_T (even #) = $\dfrac{3}{6} = \dfrac{1}{2}$

diamonds

spades

hearts

clubs

Jokers are not considered for probabilities.

Playing <u>cards</u>.

a) P_T (heart) $= \dfrac{13}{52} = \dfrac{1}{4}$

b) P_T (ace) $= \dfrac{4}{52} = \dfrac{1}{13}$

c) P_T (face card) $= \dfrac{12}{52} = \dfrac{3}{13}$

<u>Spinner</u>

P(blue) $= \dfrac{1}{4}$

P(red) $= \dfrac{1}{4}$

P (green or orange) $= \dfrac{2}{4} = \dfrac{1}{2}$
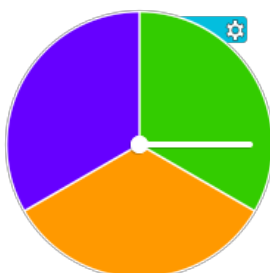
P(blue) $= \dfrac{1}{3}$

P(green and blue) $= \dfrac{0}{3} = 0$

Tree Diagram

A tree diagram is an easy way of finding all the combinations of outcomes.

Make a tree diagram to show the outcomes for flipping a coin 3 times.

① ② ③

H H H
H H T ✳
H T H ✳
H T T ✓
T H H ✳
T H T ✓
T T H ✓
T T T

$$P(3H) = \frac{1}{8}$$

$$P(2H) = \frac{3}{8}$$

Recall the example from last day...flipping 3 coins

	Experiment	Theory
P (zero tails)	$\frac{10}{50}$	$\frac{1}{8}$
P (1 tail)	$\frac{15}{50}$	$\frac{3}{8}$
P (2 tails)	$\frac{15}{50}$	$\frac{3}{8}$
P (3 tails)	$\frac{10}{50}$	$\frac{1}{8}$

If we do an experiment __many__ of times, the experimental probability will __equal__ the theoretical probability.

A bag contains tiles of 3 different shapes.
(squares, circles, and triangles)
Each shape can be four different colours.
(red, blue, green, yellow)

On the Boards...

a) Draw a tree diagram to represent the different possible outcomes of pulling 1 tile from the bag.

R
B
G
Y
○
□
△
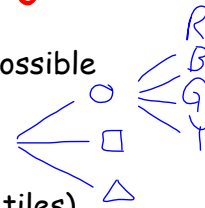
b) How many different possible outcomes (different tiles) are there?

12

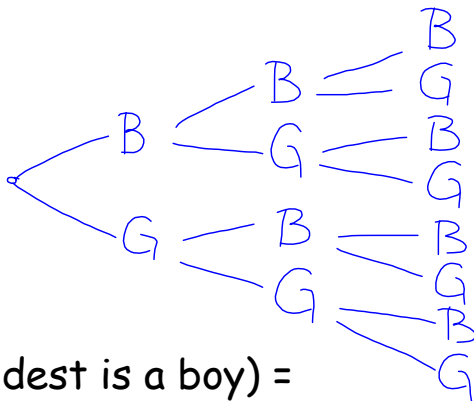**c)** What is the probability of choosing a circle?

P_T (circle) = $\dfrac{4}{12} = \dfrac{1}{3}$

d) What is the probability of choosing a green or blue tile?

P_T (green or blue) = $\dfrac{6}{12} = \dfrac{1}{2}$

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ex. Make a tree diagram to show the different possibilities for a family of 3 kids.

B
B
G
B
G
B
G
G
B
G
B
G
B
G
B
G

P(oldest is a boy) = $\dfrac{4}{8} = \dfrac{1}{2}$

P(2 boys and a girl) = $\dfrac{3}{8}$

P(2 oldest are boys) = $\dfrac{2}{8} = \dfrac{1}{4}$

P(girls only) = $\dfrac{1}{8}$

1. A card is randomly selected from a standard deck of cards. Write the theoretical probability of each event as a fraction in lowest terms.

a) a spade $\dfrac{13}{52} = \dfrac{1}{4}$

b) a face card (jack, queen, or king) $\dfrac{12}{52} = \dfrac{3}{13}$

c. a heart, a club, or a jack

d. a heart, a club, a spade, or a diamond

1

$13 + 13 + J_{spade} + J_{\diamond}$

$\dfrac{28}{52} = \dfrac{7}{13}$

3. Britt rolls a regular six-sided die. Find the theoretical probability of each event. Express your answer as a fraction in lowest terms.

a) rolling a 6 $\dfrac{1}{6}$

b) rolling a number greater than 3 $\dfrac{3}{6} = \dfrac{1}{2}$

c) rolling an 8 0

d) rolling an even number $\dfrac{3}{6} = \dfrac{1}{2}$

5. Suppose you roll two six-sided dice. Find the theoretical probability of rolling each sum. Express each answer as a fraction in lowest terms.

a) 2

$$\frac{1}{36}$$

b) 11

$$\frac{2}{36}$$

c) a sum greater than 5

$$\frac{26}{36} = \frac{13}{18}$$

36

different possibilities

Homework

Handout +

pg. 73 # 1, 3, 5, 9, 11