

3.1 Probability

What is probability?

Measure of the likelihood that a specific event will occur. Always a value between 0 and 1. WHY?

Experimental Probability: the probability that a certain outcome will occur, as determined through an experiment

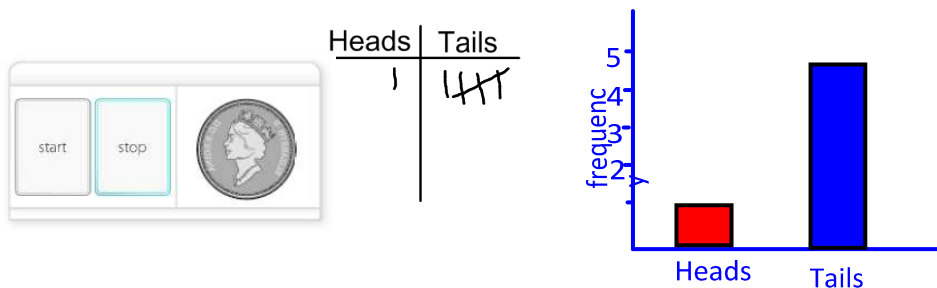
Theoretical Probability: the probability that a certain outcome will occur, as determined through measurement or calculation

Outcome: A possible result of an experiment

Trial: One round of a probability experiment

Example 1

Make a tally chart for 6 tosses and answer the questions:



a) How many heads were rolled? 1 How many tails were rolled? 5

b) What fraction of rolls were tails? $\frac{5}{6}$

c) What percent of rolls were heads? $\frac{1}{6} = 0.1666... \sim 17\%$

d) What is the experimental probability of rolling a head? 17%

e) What is the theoretical probability of rolling a head? $\frac{1}{2} \sim 50\%$

Example 2:

In a free throw practice, Darren attempted 80 shots and made 52 baskets.

a) What percent of shots did he sink?

$$\frac{52}{80} = 0.65 \quad \Rightarrow \quad 65\%$$



b) If he attempts 50 shots in the next practice, how many would you expect him to get in?

$$50 \times 0.65 \\ = 32.5$$

Theoretical Probability:

- calculated value of what "should" happen (in theory!!)
- conditions must remain the same for the outcome to be "*equally likely*"
i.e. you can't remove a few cards from the deck or weight the die

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

Example 3

What is the **theoretical** probability of:

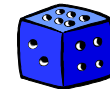
- tossing a head with a coin

$$P(\text{a head}) = \frac{1}{2}$$



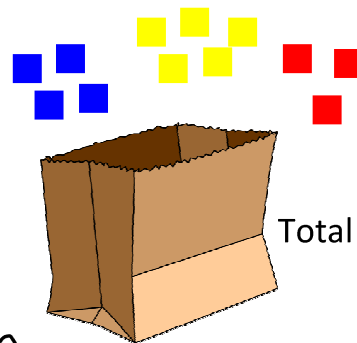
- rolling a 4 with on a standard die

$$P(\text{a 4}) = \frac{1}{6}$$



Example 4

There are 4 blue, 5 yellow and 3 red tiles in a bag.



Total tiles:

1. What are the possible outcomes?

3 (B, Y, R)

2. If we pull one tile what colour do you think it will be?

Why? Yellow, there are more of them

3. What is **Theoretical Probability** of each outcome?

$$B = \frac{4}{12} \quad R = \frac{3}{12} \quad Y = \frac{5}{12}$$

4. Let's try... (Be sure to return the tiles after each draw)

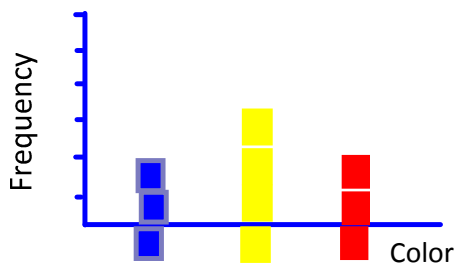
a) What are the results from our actual experiment?

'Experimental Probability'

yellow: 3

red: 2

blue: 2



Trial #	Color
1	R
2	Y
3	Y
4	Y
5	B
6	B
7	B

b) How does this compare to the **theoretical probability**?

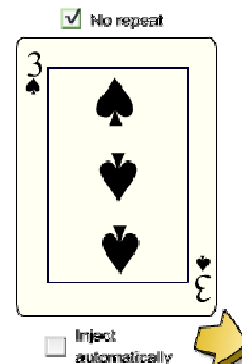
Yes, we saw more yellow, but percentages were off

c) When would experimental match theoretical probability?

Do many more trials

Example 4

How many cards in a deck? 52



a) What is the probability of each event:

a heart

$$\frac{13}{52}$$

$$= \frac{1}{4}$$

a jack

$$\frac{4}{52}$$

$$= \frac{1}{13}$$

b) a heart, a club, or a jack

~~P(Heart, club, or jack)~~

J J JJ

$$\frac{13+13+2}{52} = \frac{28}{52}$$

$$\rightarrow \frac{7}{13}$$

$$\frac{13+13+2}{52}$$

$$= \frac{28}{52}$$

$$= \frac{7}{13}$$

Be careful not to count the jacks twice, two already included in the hearts and clubs

c) a black diamond

$$\frac{0}{52}$$

P(black diamond)

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

P(a heart, a club, a spade or diamond)

$$\frac{52}{52}$$

$$= \frac{52}{52}$$

$$= 1$$

$$= 100\%$$



Homework:
pg 66 # 1,2,6,7
pg 73 - 75 #1-4,6-9,13