

MORE THEORETICAL PROBABILITY

Theoretical Probability Formula:

$$P(\text{event}) = \frac{\# \text{ successful outcomes}}{\text{Total } \# \text{ possible outcomes}}$$

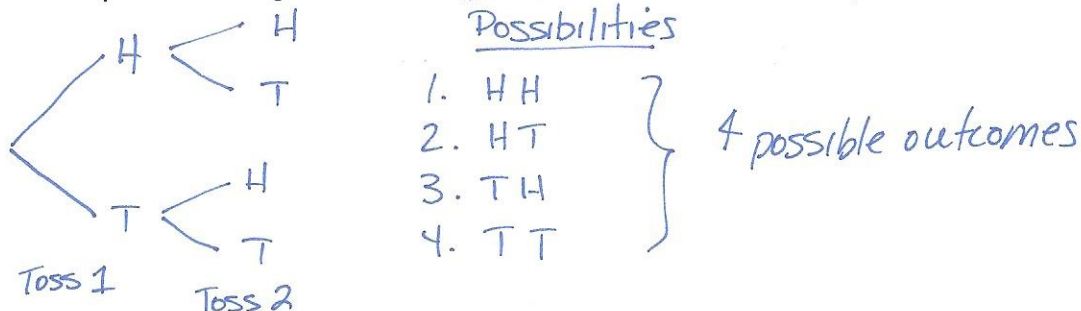
To calculate the theoretical probability, all outcomes must be EQUALLY LIKELY. What does this mean?

Each event has the same chance of occurring because conditions are fair.

WAYS TO REPRESENT PROBABILITY OUTCOMES

TREE DIAGRAMS are one way of representing possible probability outcomes.

Draw a quick tree diagram for tossing a coin twice. What are the possible outcomes?



Another way to represent possible outcomes is to use a TABLE

EXAMPLE 1 ¹

Marc, Jenny, and Otto have each won a t-shirt from West49 at a store Grand Opening event. Each shirt will be randomly assigned to the three winners; one is red, one is black, and one is green. What is the probability that Marc will receive the black t-shirt?

Use R, B, and G to represent the colours of the t-shirts.

In the table, record all the different possible ways the t-shirts can be given to the three people.

Marc	Jenny	Otto
B	G	R
B	R	G
G	B	R
R	B	G
G	R	B
R	G	B

a) In how many different ways can the three t-shirts be distributed? 6

b) In how many of these arrangements does Marc receive the black t-shirt? 2

c) What is the probability that Marc will receive the black t-shirt?

$$P(\text{black}) = \frac{2}{6} = \frac{1}{3} \text{ or } 33\%$$

¹Adapted from McGraw-Hill Ryerson Foundations for College Mathematics 11

²Adapted from OAME Support Resources for MBF3C – Probability

EXAMPLE 2¹

What is the probability of rolling DOUBLES with a PAIR of dice? Complete the table below showing all possible outcomes.

		# on First Die					
		1	2	3	4	5	6
# on Second Die	1	1, 1	2, 1	3, 1	4, 1	5, 1	6, 1
	2	1, 2	2, 2	3, 2	4, 2	5, 2	6, 2
	3	1, 3	2, 3	3, 3	4, 3	5, 3	6, 3
	4	1, 4	2, 4	3, 4	4, 4	5, 4	6, 4
	5	1, 5	2, 5	3, 5	4, 5	5, 5	6, 5
	6	1, 6	2, 6	3, 6	4, 6	5, 6	6, 6

a) In how many ways can the two dice be rolled (how many possible outcomes)?

36

b) In how many ways can doubles be rolled?

6

c) What is the probability of rolling doubles?

$$P(\text{doubles}) = \frac{\# \text{ successes}}{\# \text{ possibilities}} = \frac{6}{36} = \frac{1}{6} \text{ or } 17\%$$

EXAMPLE 3²

Complete the table below showing all possible outcomes for the SUM of two dice.

		# on First Die					
		1	2	3	4	5	6
# on Second Die	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

a) How many possible outcomes are there?

36

b) In how many ways can the sum of the two dice add to SEVEN?

6

c) What is the probability of rolling SEVENS with a pair of dice?

$$P(\text{sevens}) = \frac{\# \text{ successes}}{\# \text{ possibilities}} = \frac{6}{36} = \frac{1}{6} \text{ or } 17\%$$

d) What is the probability of rolling ODDS?

ODD include
3, 5, 7, 9, 11

$$P(3, 5, 7, 9, 11) = \frac{\# \text{ successes}}{\# \text{ possibilities}} = \frac{18}{36} = \frac{1}{2} \text{ or } 50\%$$

¹Adapted from McGraw-Hill Ryerson Foundations for College Mathematics 11

²Adapted from OAME Support Resources for MBF3C – Probability