### 8A - Basic Probability

#### Vocabulary, Formulas, Theories:

- Outcome: the possible result of a situation or experiment.
- · Event: a single or a group outcome.
- Sample Space: the set of all possible outcomes.
- Probability: the numerical value from 0 to 1 that measures the likelihood of an event.

You can write the probability of an event as a ratio, decimal, or percent.

equally likely to occur
impossible or not occur certain

or less likely 0.5 more likely 1

• Experimental Probability: measures the likelihood that the event occurs based on the actual results of an experiment.

 $P(\text{event}) = \frac{\text{number of favorable outcomes}}{\text{number of possible outcomes}}$ 

- Theoretical Probability: describes the likelihood of an event based on mathematical reasoning.
- Independent events: events that have no effect on the outcome of each other. If two events, A and B, are said to be independent, they follow this formula:

$$P(A \text{ and } B) = P(A) \cdot P(B)$$

• Dependent Events: events that affect the outcome of each other.

Watch the following video to understand the basic vocabulary of probability. It reviews the definition of a sample space, elements (or sample points), and outcomes.

# Video #1 - "Probability - Sample Space, Sample Points, Events" - Don't Memorise (1:45)

EX1) Identify the sample space and list the outcomes of that sample space.

- a) Flip a coin
- b) Pick a shirt out of a drawer that has 2 blue shirts, 1 red shirt, and 4 green shirts.
- c) Pick a card out of a standard deck of cards. (See extra resources on the back)

Possible outcomes: Iteads, Tails

# Video #2 - "Theoretical and Experimental Probability" - Derek Ganz (7:11)

EX2) Considering a standard six sided number cube is used, find the theoretical probability of each outcome:

- a) P(rolling a 5) = 1/c
- b) P(rolling a 6) = 1/6

Sample Spore = { 1, 2, 3, 4, 5, 6}

- c) P(rolling an even number) = 3/6 = 1/2
- d) P(rolling a multiple of 3) =  $\frac{2}{6} = \frac{7}{3}$
- c) Even #5: 2,4,6 d) Multipus of 3: 3,6

EX3) You roll a standard six sided number cube 10 times. The results are 6, 4, 6, 1, 5, 2, 4, 2, 6, 6. Find the experimental probability of each outcome: Sample space

- (smu 5 occurs once) a) P(rolling a 5) =  $\frac{1}{100}$
- b) P(rolling a 6) = 1/10 = 12/5 (sine 6 occurs 4 times)
- c) P(rolling an even number) = 8/10 = 4/5 (sine there are eight even #5)
- d) P(rolling a 3) = 10=[0] (they were no 3s relied)
- e) For 50 rolls of the number cube, predict the number of rolls that will result in an odd number based on the experimental probability.

To predict for To rolls,  $\frac{1}{5} \times \frac{x}{50} \Rightarrow 50=5x \Rightarrow x=10$ , so we can

EX4) Are the outcomes of each trial independent or dependent events?

- a) Choose a number tile from 12 tiles. Then spin a spinner.
- b) Pick one card from a set of 15 sequentially numbered cards. Then, without replacing the card, pick another card.
- a) Independent (do you see why?)
- b) Dependent

EX5) A factory foreman determines that on any given day there is a 15% change that Machine A will malfunction, a 45% chance that Machine B will malfunction, and a 6.75% chance that both machines will malfunction. Are the events "Machine A malfunctions" and "Machine B malfunctions" independent events? Explain. P(A) - ?(B) = P(A n B)

0.150 0.45 = 0.0675 0.0675 = 0.0675, Yes So the two events are independent events.

## Extra Resources:

