**WEEK 1 CHEAT SHEET**

When talking about random variables, an OUTCOME is a particular result (such as 3 in a dice roll). An EVENT is a set of outcomes (such as the event E of rolling 3 or less – E = {1,2,3}).

Mutually exclusive events are events that have no intersection in their outcome sets. For example, event A = {1,2} and event B = {4,5}. Alternatively, if A = {1,2,4} and B = {4,5}, they would not be mutually exclusive events.

Permutations and combinations are ways of counting r elements from a set of size n. Permutations count different orderings of elements, while combinations only count unique groupings of elements.

**Question 1)**

What is probability? When all outcomes are equiprobable, the probability of an event E is

EXAMPLE – What is the probability of spinning >= 4 on the spinner?

Step 1 – find total outcomes, or the Sample Space of the variable

Step 2 – find the successful outcomes of event E spinning >= 4

Taking the sizes of these sets -

EXTRA Q – What is the probability of spinning a number >= 4 OR divisible by 2?

Note -

**Question 2)**

How do we find the probability of spinning >= 4 twice? Since one spin cannot impact the next, these are independent variables. The probability of BOTH events is defined to be

Hint – how is a random number/letter different to the spinner? Are they different? Count the sample space, then the successful outcomes

**Question 3)**

Since we are now dealing directly with probabilities, we no longer count the successful and total cases. We now use just the rules

– if A and B independent

– if A and B mutually exclusive

– if A and B not mutually exclusive

We know the probability of Arya taking x route, and the probability of x route being trapped. What is

?

Can we reformulate p(Arya getting caught on any route) in terms of the above formula?

b) The probability of an event NOT happening, or the complimentary probability of an event A…

**Question 4)**

THINK – in which part is drawing from the urn repeatedly INDEPENDENT or DEPENDENT?

a)

Step 1 – write the probabilities you know. How likely are you to draw a red once?

Step 2 – find all outcomes where 3 marbles are drawn AND no more than 1 red marble is in those three. Using step 1, find and sum their probabilities

b)

WITHOUT replacement – every draw of a marble changes the distribution of marbles in the urn. Reframe as a counting problem (hint use combinations)

How many ways can you choose 3 marbles from an urn of 10? How many ways can you choose 3 marbles, less than 2 of which are red?

**Question 5)**

Up to you ☺