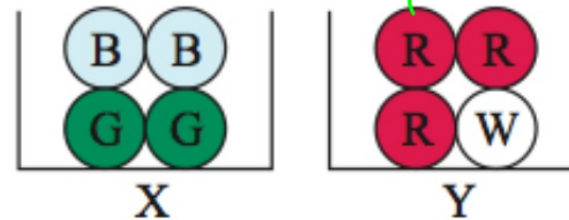
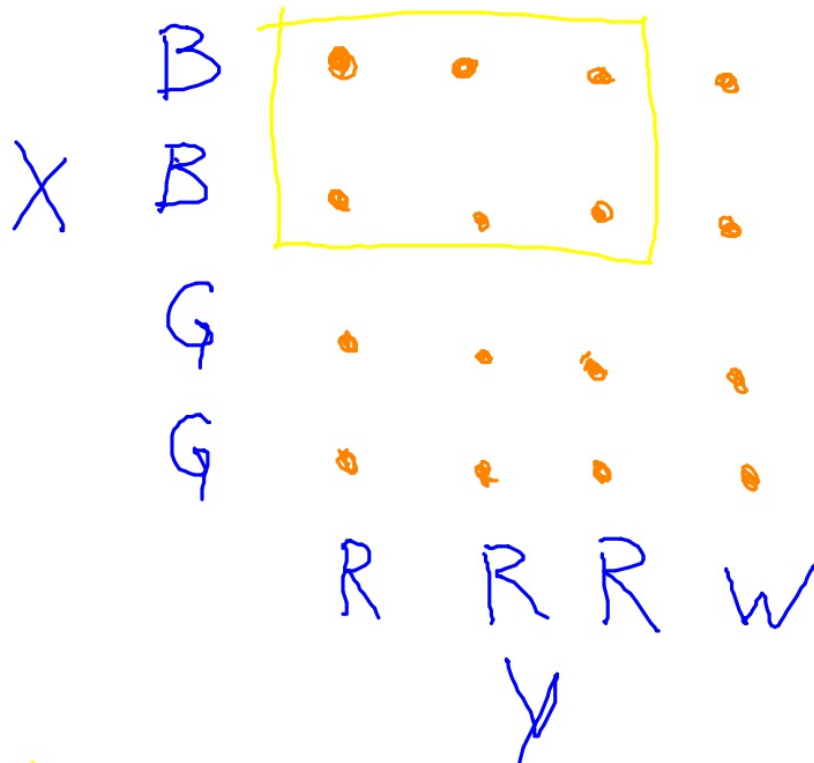


IB Math Studies 1

BELL WORK

Box X contains 2 blue and 2 green balls. Box Y contains 1 white and 3 red balls. A ball is randomly selected from each of the boxes. Determine the probability of getting “a blue ball from X and a red ball from Y”.

$$\frac{1}{2} \times \frac{3}{4} = \frac{3}{8}$$



$$\frac{6}{16} = \frac{3}{8}$$

Chapter

9

Probability

Syllabus reference: 3.5, 3.6, 3.7

- A** Experimental probability
- B** Sample space
- C** Theoretical probability
- D** Compound events
- E** Tree diagrams
- F** Sampling with and without repl
- G** Expectation
- H** Probabilities from Venn diagram
- I** Laws of probability
- J** Conditional probability
- K** Independent events

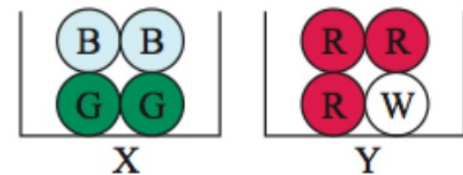
D

COMPOUND EVENTS

INDEPENDENT EVENTS

Events are **independent** if the occurrence of either of them does not affect the probability that the others occur.

Consider again the example on the previous page. Suppose we happen to choose a blue ball from box X. This does not affect the outcome when we choose a ball from box Y. So, the two events “a blue ball from X” and “a red ball from Y” are independent.



If A and B are **independent events** then $P(A \text{ and } B) = P(A) \times P(B)$.

This rule can be extended for any number of independent events.

If A , B , and C are all **independent events**, then
 $P(A \text{ and } B \text{ and } C) = P(A) \times P(B) \times P(C)$.

DEPENDENT EVENTS

Suppose a hat contains 5 red and 3 blue tickets. One ticket is randomly chosen, its colour is noted, and it is then put aside. A second ticket is then randomly selected. What is the chance that it is red?

$$P(\text{blue then red}) = P(\text{blue}) \times P(\text{red} | \text{blue})$$
$$\frac{3}{8} \times \frac{5}{7}$$

Two or more events are **dependent** if they are **not independent**.

Dependent events are events for which the occurrence of one of the events *does affect* the occurrence of the other event.

If A and B are dependent events then

$$P(A \text{ then } B) = P(A) \times P(B \text{ given that } A \text{ has occurred}).$$

A box contains 4 red and 2 yellow tickets. Two tickets are randomly selected from the box one by one *without* replacement. Find the probability that:

a both are red

b the first is red and the second is yellow.

$$\frac{4}{6} \times \frac{3}{5}$$

$$\frac{4}{6} \times \frac{2}{5} = \frac{8}{30}$$

$$\frac{12}{30} = \frac{2}{5}$$

$$= \frac{4}{15}$$

Design an experiment:

Design a probability experiment using at least two manipulatives (coins, cards, dice, colored marbles).

- 1) Describe the experiment you will run.
- 2) Calculate the theoretical probability of two different outcomes of your experiment.
- 3) Run the experiment at least 20 times, recording all results. Calculate the experimental probability of the same outcomes used in #2.