IB Math Studies 1 BELL WORK

Chapter 9

Probability

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

Syllabus reference: 3.5, 3.6, 3.7

B SAMPLE SPACE

A **sample space** U is the set of all possible outcomes of an experiment. It is also referred to as the **universal set** U.

LISTING OUTCOMES

List the sample space of possible outcomes for:

a tossing a coin

{H, T}

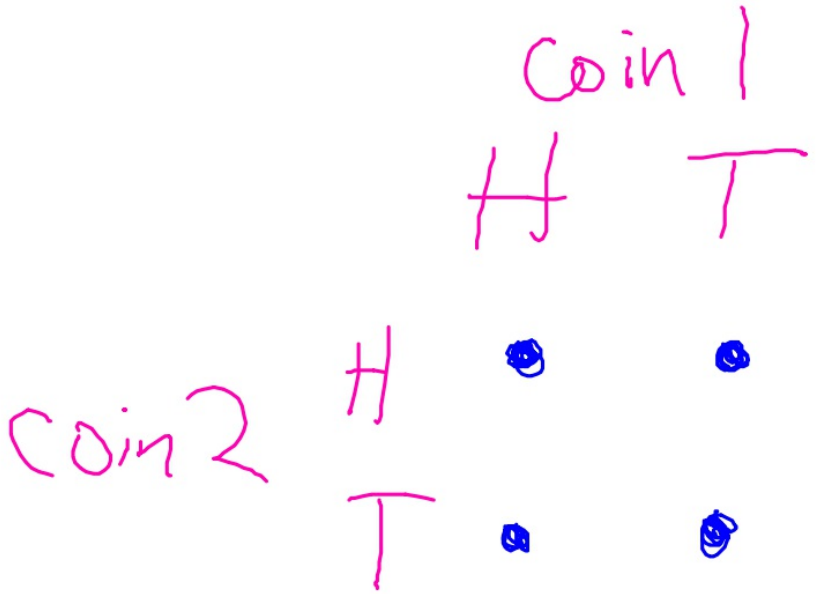
b rolling a die.

{1, 2, 3, 4, 5, 6}

2-DIMENSIONAL GRIDS

When an experiment involves more than one operation we can still use listing to illustrate the sample space. However, a grid is often more efficient. Each point on the grid represents one of the outcomes.

Using a 2-dimensional grid, illustrate the possible outcomes when 2 coins are tossed.

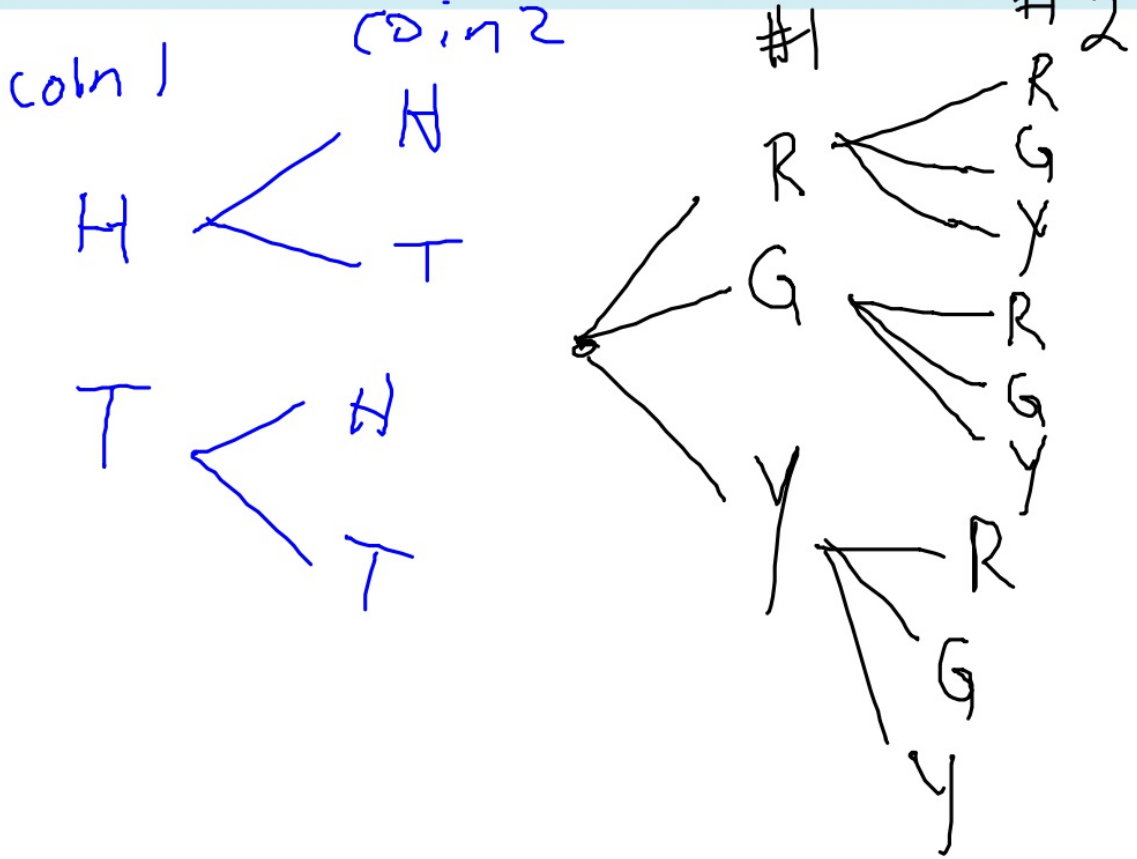


TREE DIAGRAMS

Illustrate, using a tree diagram, the possible outcomes for:

a tossing two coins

b drawing two marbles from a bag containing many red, green, and yellow marbles.



C THEORETICAL PROBABILITY

mathematical or **theoretical** probability
is based on what we theoretically expect to occur.

It is the chance of that event occurring in any trial of the experiment.

In general, for an event A containing **equally likely** possible results, the probability of A occurring is

$$\mathbf{P}(A) = \frac{\textbf{the number of members of the event } A}{\textbf{the total number of possible outcomes}} = \frac{n(A)}{n(U)}.$$

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A ticket is *randomly selected* from a basket containing 3 green, 4 yellow, and 5 blue tickets. Determine the probability of getting:

a a green ticket $\frac{3}{12} = \frac{1}{4}$

b a green or yellow ticket $\frac{7}{12}$

c an orange ticket 0

d a green, yellow, or blue ticket. 1

An ordinary 6-sided die is rolled once. Determine the chance of:

a getting a 6

$\frac{1}{6}$

b not getting a 6

$\frac{5}{6}$

c getting a 1 or 2

$\frac{2}{6} = \frac{1}{3}$

d not getting a 1 or 2

$\frac{4}{6} = \frac{2}{3}$

COMPLEMENTARY EVENTS

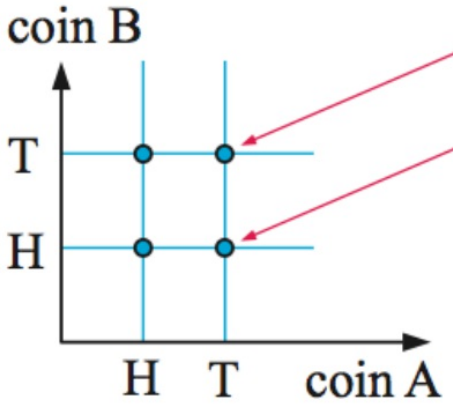
Two events are **complementary** if exactly one of the events *must* occur. If A is an event, then A' is the complementary event of A, or 'not A'.

$$\mathbf{P}(A) + \mathbf{P}(A') = 1$$

$0.4 + 0.6 = 1$

USING GRIDS TO FIND PROBABILITIES

Two-dimensional grids can give us excellent visual displays of sample spaces.



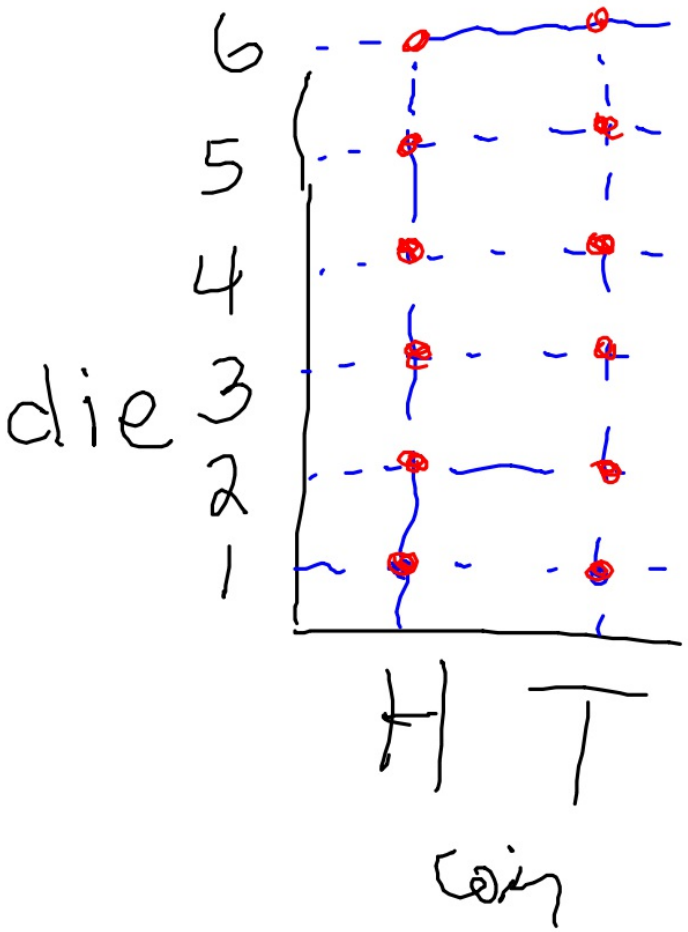
This point represents 'a tail from coin A' and 'a tail from coin B'.

This point represents 'a tail from coin A' and 'a head from coin B'.

There are four members of the sample space.

Use a two-dimensional grid to illustrate the sample space for tossing a coin and rolling a die simultaneously. From this grid determine the probability of:

a tossing a head $\frac{1}{2}$ **b** getting a tail and a 5 $\frac{1}{12}$ **c** getting a tail or a 5. $\frac{7}{12}$



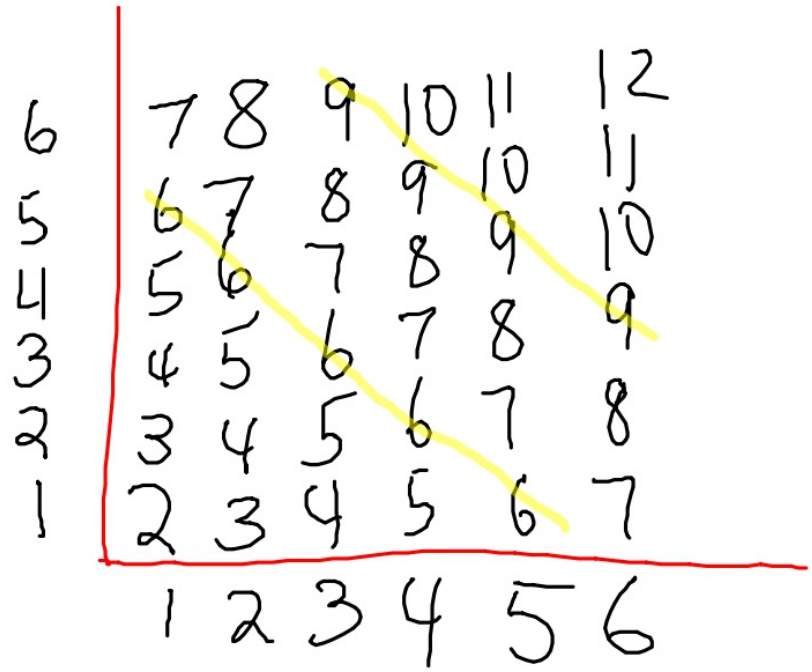
$\cap$

$\cup$

TABLES OF OUTCOMES

Draw a table of outcomes to display the possible results when two dice are rolled and the scores are added together.

Hence, determine the probability that the sum of the dice is 7.



$$\frac{6}{36} = \frac{1}{6}$$

Assignment:

Exercises 9 B all
C.1 # 1, 3, 4
C.2 # 1, 3
C.3 # 3