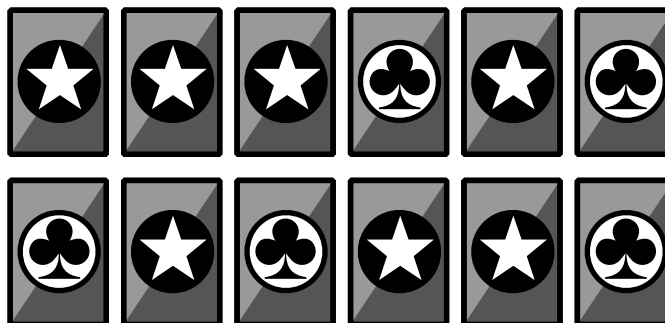


9.1 Tree Diagrams

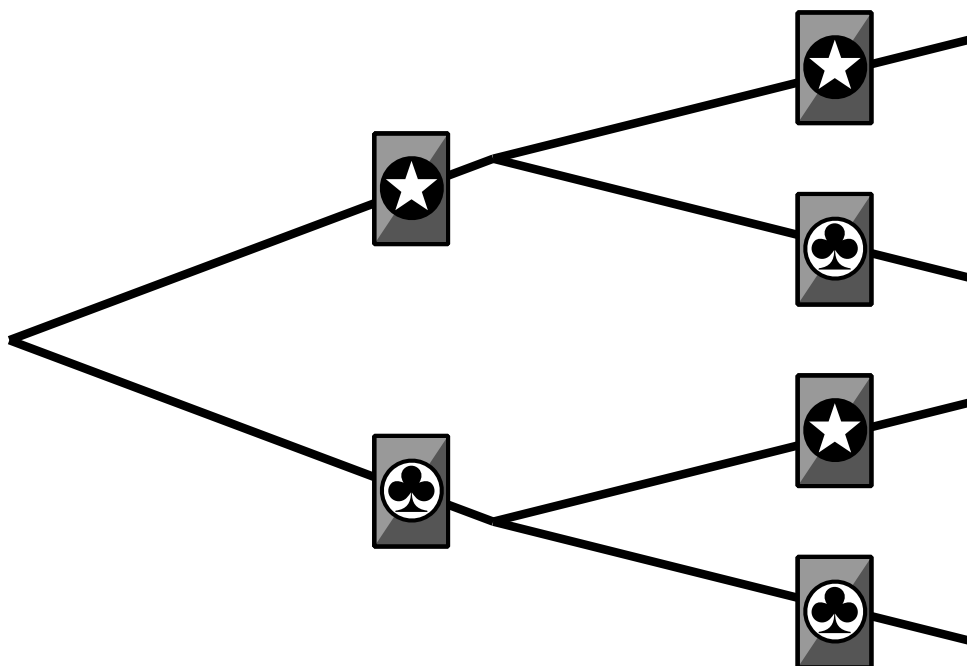
Example

A children's pack of *snap* playing cards is shown below;



The cards are shuffled. Then, first one is placed face up on the table, then a second.

- (i) Complete this tree diagram by marking each branch with a probability to show all possible outcomes.



- (ii) Use your tree diagram to determine the probability of a *snap*.
- (iii) What is the probability of **NOT** obtaining a *snap* ?

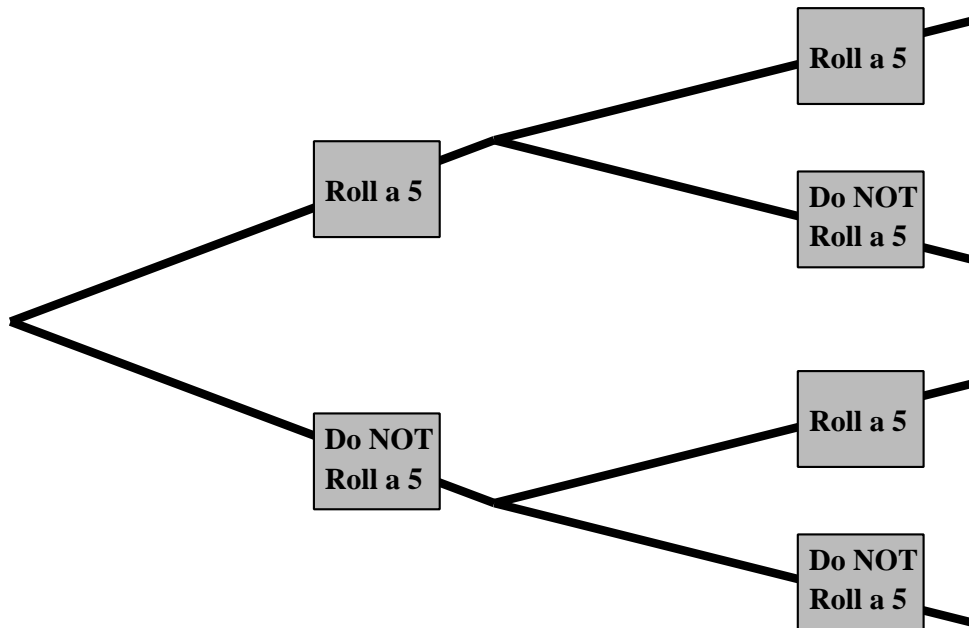
9.2 Exercise

Question 1

Five is my lucky number.

I roll an ordinary six sided dice once, then roll it again.

(a) Complete the probability tree diagram.



(b) Calculate the probability that I will roll my lucky number

(i) Twice

(ii) Exactly once

(c) Richard's lucky number is 4.

He's going to roll the dice thrice.

What is the probability that he will roll his lucky number exactly once ?

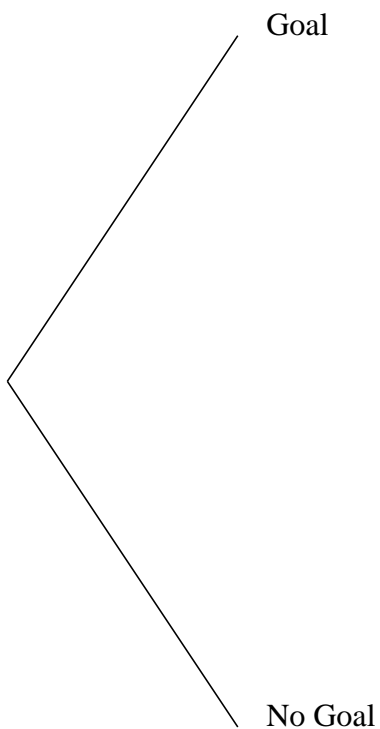
Question 2

Each time Astrid takes a shot at goal, the probability that she will score is $\frac{1}{3}$.
Astrid takes two shots.

(a) Complete the probability tree diagram.

First shot

Second shot



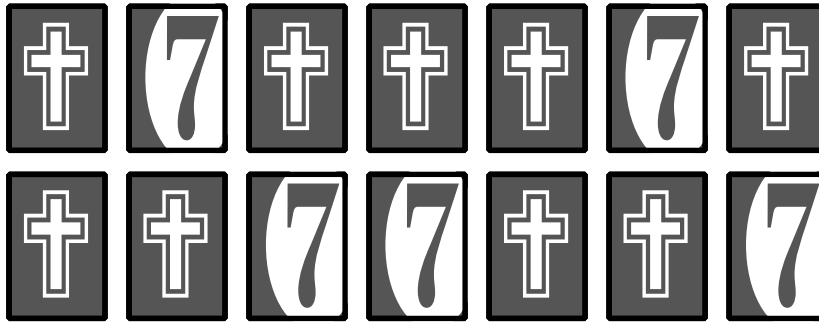
[3 marks]

(b) Calculate the probability that Astrid scores at least 1 goal.

[3 marks]

Question 3

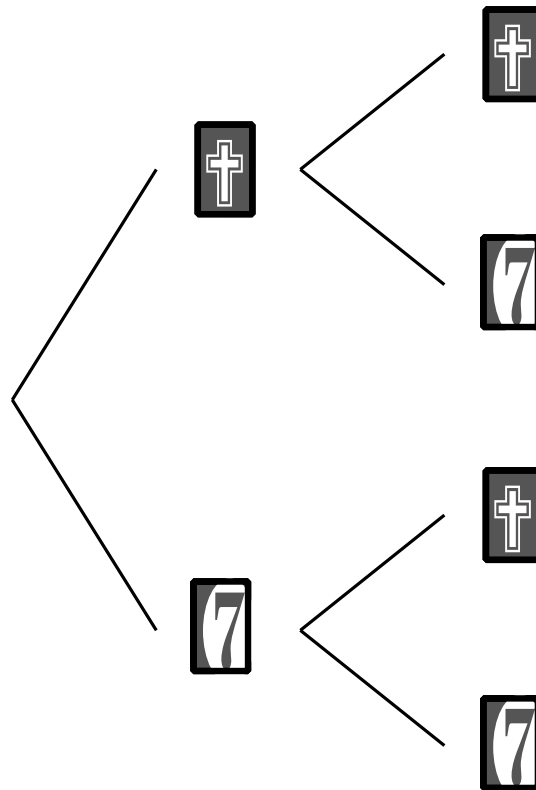
A pack of children's *snap* playing cards is shown below.



The cards are shuffled.

Then a first, followed by a second are placed face up on the table.

(i) Complete this tree diagram to show all possible outcomes.



(ii) Use your tree diagram to determine the probability of a *snap*.

(iii) What is the probability of **NOT** obtaining a *snap* ?

Question 4

GCSE Examination Question from 6th November 2008, paper 3H, Q15.

This question does not tell you to draw a tree diagram but please do.

Notice the words "without replacement".

It's Question 15 so it's an A grade question and worth 4%.

There are 9 counters in a bag.

7 of the counters are red and 2 of the counters are white.

Ajit takes at random two counters from the bag without replacement.

(a) Calculate the probability that the two counters are red.

[2 marks]

(b) Calculate the probability that the two counters have different colours.

[2 marks]

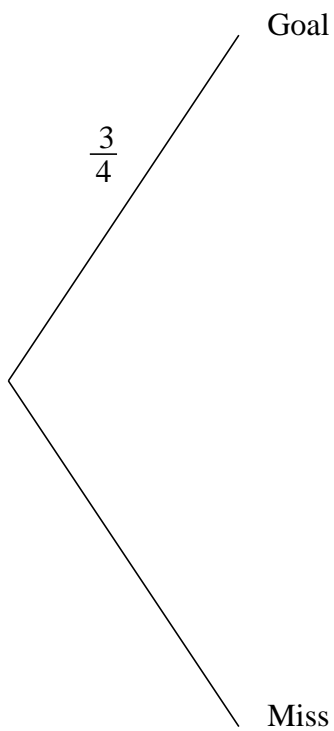
Question 5

Each time Nikos has a shot at goal, the probability that he will score a goal is $\frac{3}{4}$
Nikos takes two shots.

(a) Complete the probability tree diagram.

First shot

Second shot



[2 marks]

- (b) Calculate the probability that Nikos will score
(i) two goals

[2 marks]

- (ii) exactly one goal

[3 marks]

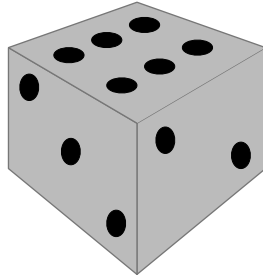
Nikos now takes another three shots.

- (c) Calculate the probability that he will score exactly 1 goal or exactly 2 goals.

[3 marks]

Question 6

Here is a fair dice.



It has faces numbered 1, 2, 3, 4, 5 and 6

The dice shows a score of 6

Hari throws the dice three times.

(a) Work out the probability that the sum of the scores is 3

[2 marks]

(b) Work out the probability that the dice shows a score of 1 on exactly one of the three throws

[3 marks]

Question 7

A pack of PENGUIN biscuits contains wrappers coloured as follows:

- * 4 *red*
- * 3 *blue*
- * 2 *green*
- * 2 *purple*

A biscuit is chosen at random then replaced. (I didn't like the wrapper colour !)
A second biscuit is then chosen at random.

What is the probability that the following are chosen:

(i) First *red*, and then *purple*.

(ii) First *purple*, and then *red*.

(iii) *Purple* and *red*.

(iv) *Green* and *blue*.

(v) The same colour, twice.

Question 8

I've decided to use a coin to walk randomly along a corridor.

If I spin Heads I walk ten steps forward.

If I spin Tails I walk ten steps back.

What is the probability that after **three** spins I've walked from my starting position:

(i) Thirty steps forward.

(ii) Twenty steps forward.

(iii) Ten steps forward.

Question 9

I start facing North.

I walk forward ten paces then spin a coin to decide if I should turn 90° to the right or 90° to the left.

I do this four times.

What is the probability that I am back where I started, facing North ?

Question 10

I've decided to keep spinning a coin until it lands Heads.

What is the probability that I'll spin it:

- (i) Once only.
- (ii) More than once.
- (iii) Twice exactly.
- (iv) More than twice. (Be careful !)
- (v) Thrice exactly.
- (vi) More than thrice.

Toby argues that as a HEAD must eventually be spun:

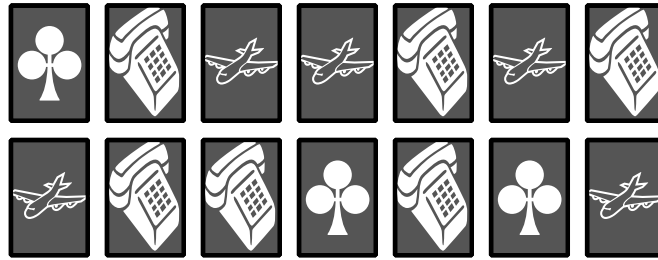
$$p(H) + p(T,H) + p(T,T,H) + p(T,T,T,H) + \dots = 1$$

Write out this with $p(H)$, $p(T,H)$, $p(T,T,H)$... replaced with numbers.

This is an example of an infinite series that has a finite sum.

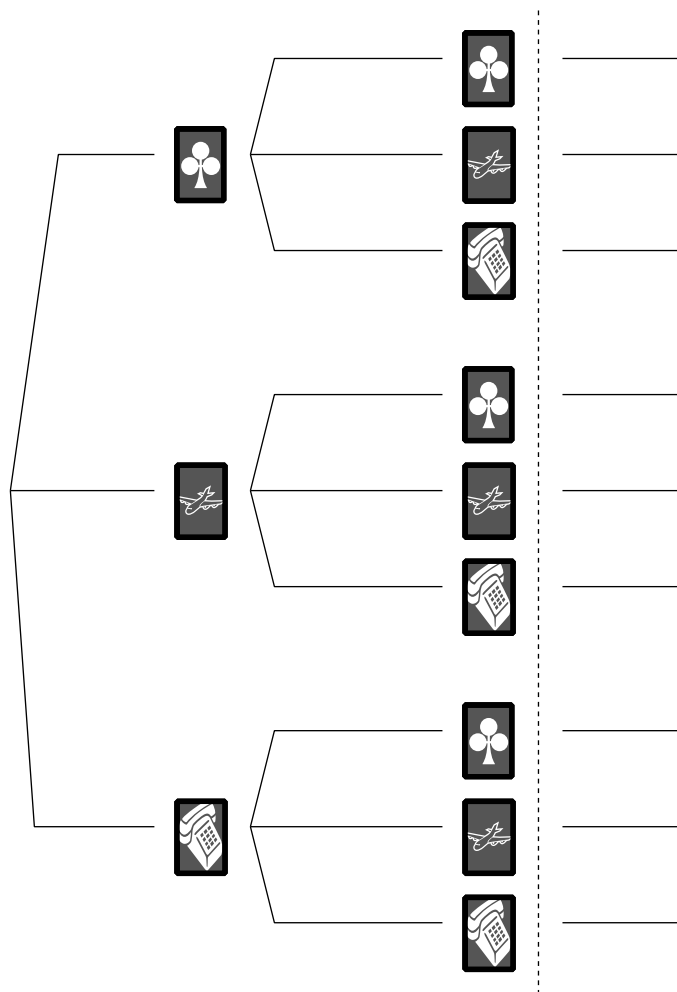
Question 11

A children's pack of "snap" playing cards is shown below;



The cards are shuffled and then first one is placed face up on the table, then a second.

(i) Complete this tree diagram to show all possible outcomes.



(ii) Use your tree diagram to determine the probability of a "snap".

Question 12

A number is chosen at random from the following list;

13, 25, 46, 81, 12.

It is replaced and a second number is chosen from the list.

Find the probability that;

- (i) An ODD number is chosen twice.

- (ii) A SQUARE number is chosen first, and a PRIME number second.

- (iii) The number 46 is not chosen.

Question 13

First one and then a second letter is chosen at random from this sentence.

What is the probability that it is a vowel both times ?