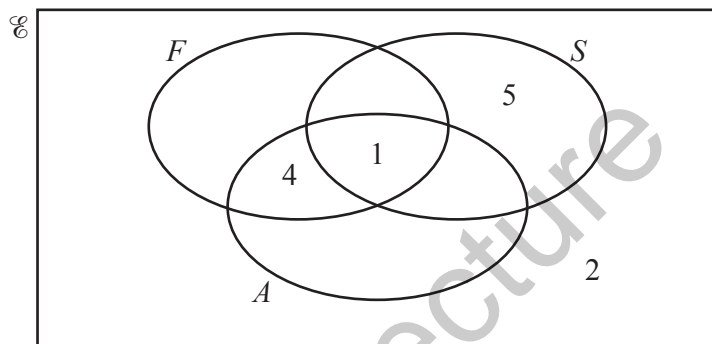# Probability Worksheet

1 In a college, students can study French (*F*), Spanish (*S*) and Arabic (*A*).
A group of 25 students are asked which languages they study.
Some of the results are shown in the Venn diagram.

(i) All students who study both Arabic and Spanish also study French.
7 students study French only.
8 students study Arabic.

Use this information to complete the Venn diagram.

[2]

(ii) Two of the 25 students are selected at random.

Find the probability that they both study Spanish only.

.... [2]

(iii) Three of the students are selected at random from those who study French.

Find the probability that only one of them also studies Arabic.

.... [3]

2   Azra has a spinner.
The sections are coloured red, blue, yellow or green.
The relative frequency of the spinner landing on red, blue or yellow is shown in the table.

Colour on spinner	Red	Blue	Yellow	Green
Relative frequency	0.15	0.3	0.2	

(a) Find the relative frequency of the spinner landing on green.

.... [2]

(b) Azra spins the spinner 150 times.

How many times would she expect the spinner to land on blue?

.... [1]

3 A 5-sided spinner is numbered 1, 2, 3, 4 and 5.
The table shows the results from spinning the spinner 200 times.

Number	Frequency
1	51
2	19
3	28
4	35
5	67

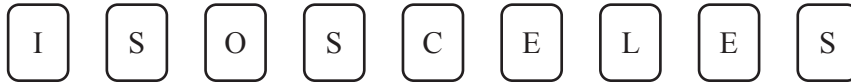**(a)** Use the results to estimate the probability that the spinner lands on 3.

.... [1]

(b) Use the results to estimate the probability that the spinner lands on a number that is a factor of 30.

.... [2]

(c) The spinner is spun 3000 times.

Estimate the number of times it lands on an even number.

.... [2]

4 A bag contains these 9 letter tiles.

| I | S | O | S | C | E | L | E | S |

(a) Nur takes one tile from the bag at random.
She notes the letter and then puts the tile back in the bag.

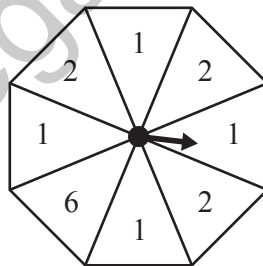Find the probability that she does **not** take a letter E.

.... [1]

(b) Nur now takes two of the 9 letter tiles at random without replacement.

Find the probability that both tiles show the same letter.

.... [3]

5 **(a)**

Asma has this fair 8-sided spinner.

(i) She spins the spinner once.

Find the probability that the score is

(a) 6,

.... [1]

(b) not 2.

.... [1]

(ii) Asma spins the spinner twice.

Find the probability that she scores two 2s.

.... [2]

(b) Leon has 7 red counters, 6 green counters and 3 white counters.
He takes two counters at random, without replacement.

Find the probability that the two counters are the same colour.

.... [3]

6 Two bags contain beads.

The first bag contains 7 beads, of which 3 are red and 4 are white.
The second bag contains 5 beads, of which 2 are red and 3 are blue.

One bead is taken, at random, from each bag.
The tree diagram is shown below.

First bag   Second bag

Find the probability that

(a) both beads are red,

.... [1]

(b) both beads are white,

.... [1]

(c) **exactly** one bead is red.
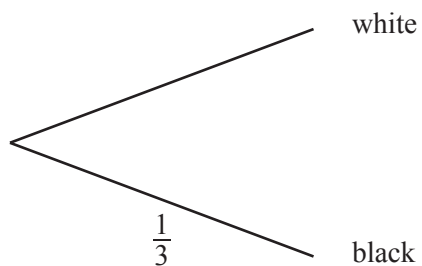
.... [2]

7 A bag contains two white beads and one black bead only.
Two beads are taken, at random, without replacement from the bag.
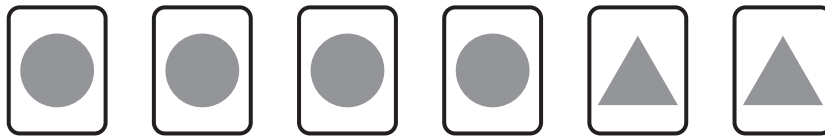
(a) Complete the tree diagram.

First bead   Second bead

white

$\frac{1}{3}$ black

[2]

(b) Write down the probability that two black beads are taken.

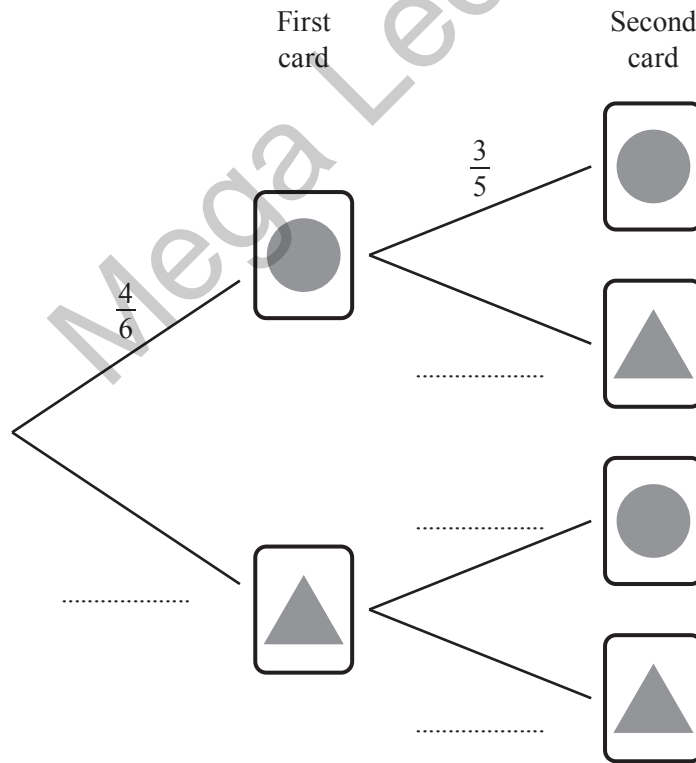.. [1]

8

Nima has these six cards. Each card has a shape on it.
She takes two cards at random without replacement.

(a) Complete the tree diagram.
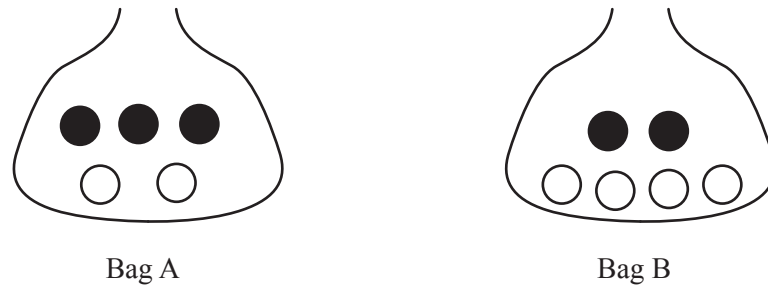

First card   Second card

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

....

....

....

[2]

(b) Find the probability that the shapes on Nima's two cards are the same.
Give your answer as a fraction.

.... [2]

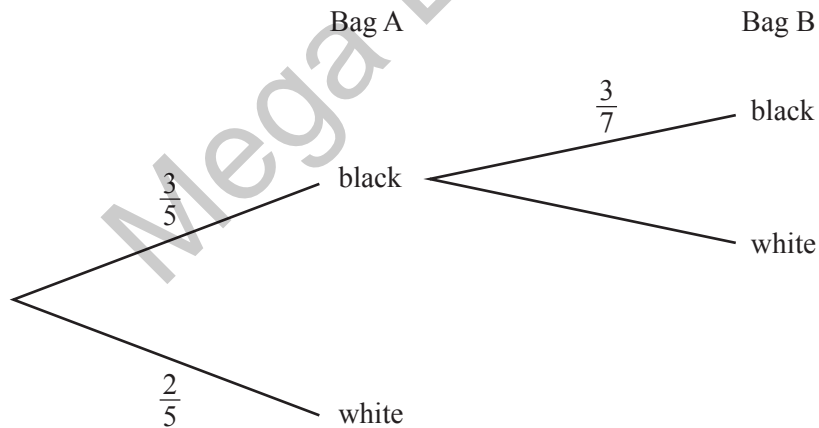**9**

Bag A   Bag B

Bag A contains 3 black and 2 white beads.
Bag B contains 2 black and 4 white beads.

A bead is chosen, at random, from Bag A and placed in Bag B.
A bead is then chosen, at random, from Bag B.

(a) Complete the tree diagram.

[2]

(b) Find the probability that a black bead is taken from Bag B.

Answer   .... [2]

10   Jenny also asked which type of movie each of the 60 people preferred.

The table summarises her results.

Type of movie	Action	Comedy	Drama	Horror
Frequency	24	15	9	12

(i)   One of the 60 people is chosen at random.

Find the probability that this person preferred drama or horror movies.
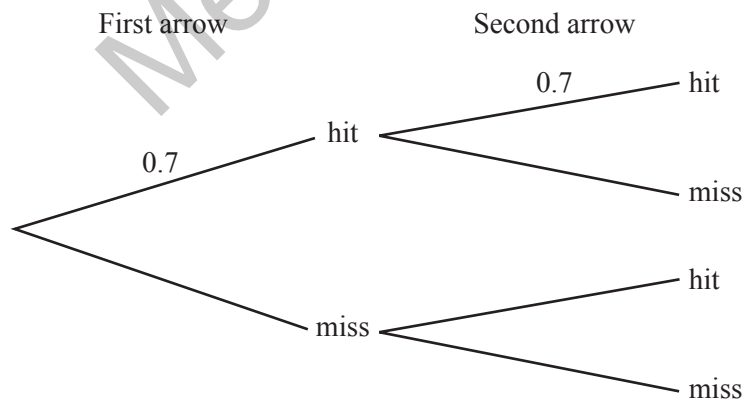
Answer .... [1]

(ii)   Two of the 60 people are chosen at random.

Calculate the probability that they both preferred comedy movies.

Answer .... [2]

11 Each time an archer fires an arrow, the probability that she hits the target is 0.7 .
She fires two arrows.

(a) Complete the tree diagram.

First arrow   Second arrow

```
                                      0.7        hit
                              hit
             0.7                               miss


                                               hit
                              miss
                                               miss
```

[1]

(b) Find the probability that

    (i)   she hits the target twice,

Answer .... [1]

(ii) she hits the target exactly once.

12 A bag contains n balls.
3 of the balls are white.
Two balls are taken from the bag, at random, without replacement.

(a) Complete the tree diagram.

First ball   Second ball

[2]

(b) The probability that both balls are white is $\frac{1}{15}$.

Show that $n^2 - n - 90 = 0$.

[2]

(c) Find the value of *n*.

Answer .... [2]

13 A bag contains 10 counters of which 8 are blue and 2 are white.
Two counters are taken from the bag at random without replacement.

(a) Complete the tree diagram to show the possible outcomes and their probabilities.

First counter   Second counter

$\frac{7}{9}$ Blue

Blue

$\frac{8}{10}$

.... White

.... Blue
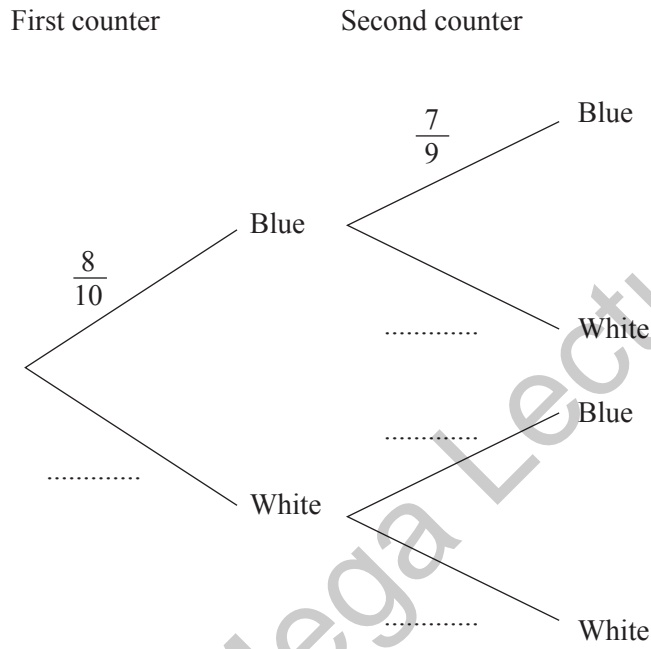
.... White

White

.... White

[1]

(b) Find, as a fraction, the probability that

(i) both counters are blue,

Answer .... [1]

(ii) one counter is blue and the other is white.

Answer .... [2]

14 A group of 160 adults each completed the same task.
The table shows the number of errors made by each of these adults.

Number of errors	0	1	2	3	4	5
Frequency	24	30	50	32	16	8

(i) Calculate the mean.

.... [2]

(ii) One of the adults is selected at random.

Find the probability that this adult made more than 3 errors.

.... [1]

(iii) Two of the adults are selected at random.

Find the probability that they each made exactly one error.

15 Ateeq has a set of 16 cards numbered from 1 to 16.

(i) He takes a card from the set at random.

Find the probability that the card shows an odd square number.

.... [1]

(ii) Ateeq takes two cards at random from the set of 16 cards.

Find the probability that both cards show even numbers that are factors of 100.

.... [2]

16 The probability that Anna arrives at work on time or early on any given day is $\frac{5}{8}$.

Calculate the probability that she is **late** on both Monday and Tuesday.
Give your answer as a fraction.

.... [2]

17 $\mathcal{E} = \{x : x \text{ is an integer and } 10 \leqslant x \leqslant 20\}$

     $A = \{x : x \text{ is an odd number}\}$
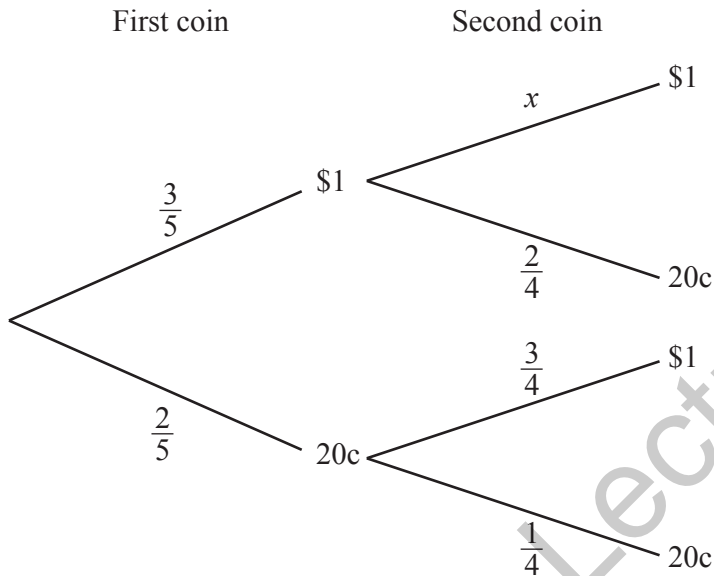
     $B = \{x : x \text{ is a multiple of 5}\}$

     A number, r, is chosen at random from $\mathcal{E}$.

     Find the probability that $r \in A \cup B$.

Answer   .... [1]

18 Amira has three $1 coins and two 20c coins in her purse.
She picks out coins at random, one after the other.
The coins are not replaced.

The tree diagram shows the possible outcomes and their probabilities when picking out two coins.

First coin   Second coin

(i) Find x.

Answer .... [1]

(ii) Find the probability that the total value of the two coins picked out is 40 cents.

Answer .... [1]

(iii) Find the probability that the total value of the two coins picked out is $1.20 .

Answer .... [2]
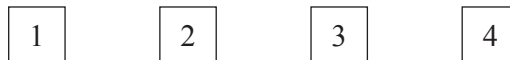
(iv) At a car park, the charge is $1.40 .
Amira picks out three coins, one after the other.

Find the probability that the total value of the three coins is $1.40 .

Answer .... [2]

19

| 1 | | 2 | | 3 | | 4 |

Four cards are marked with the numbers 1, 2, 3 and 4.
One card is chosen at random.
A second card is then chosen, at random, from the remaining three cards.
The sum of the numbers on the two chosen cards is calculated.

(a) Complete the table to show the possible outcomes.

		First card			
		1	**2**	**3**	**4**
Second card	**1**	▨			
	2		▨		
	3			▨	
	4				▨

[1]

(b) What is the probability that the sum is less than 2?

Answer .... [1]

(c) What is the probability that the sum is greater than 5?

Answer .... [1]

20 A fair 4-sided spinner is numbered 1, 2, 3 and 4.

(a) Anil spins it once.
He gets his score by doubling the number obtained.

Complete the table to show the probabilities of his scores.

Score	2	4	6	8
Probability				

[1]

(b) Billie spins it twice. She gets her score by adding the numbers obtained.

(i) Complete the possibility diagram.

First spin

+	1	2	3	4
1	2	3	4	5
2	3	4	5	6
3	4	5	6	7
4				

Second spin

[1]

(ii) Complete the table showing the probabilities for some of Billie's scores.

Score	> 2	> 4	> 6	> 8
Probability	$\frac{15}{16}$			

[1]

(c) Find the probability that Billie scores more than Anil.

Answer .... [2]

21 The length of time taken by 80 drivers to complete a particular journey is summarised in the table below.

Time (t minutes)	$60 < t \leqslant 80$	$80 < t \leqslant 90$	$90 < t \leqslant 95$	$95 < t \leqslant 100$	$100 < t \leqslant 110$	$110 < t \leqslant 130$
Number of drivers	4	10	14	20	24	8

(a) One driver is chosen at random.

Calculate the probability that this driver took 95 minutes or less for the journey.

Answer .... [1]

(b) Two of the 80 drivers are chosen at random.

(i) Calculate the probability that both took more than 100 minutes for the journey.

Answer .... [2]

(ii) Calculate the probability that one took 80 minutes or less and the other took more than 110 minutes.

Answer .... [2]

22 100 adults in a town were surveyed about the number of emails they each received one day.
The table shows the results.

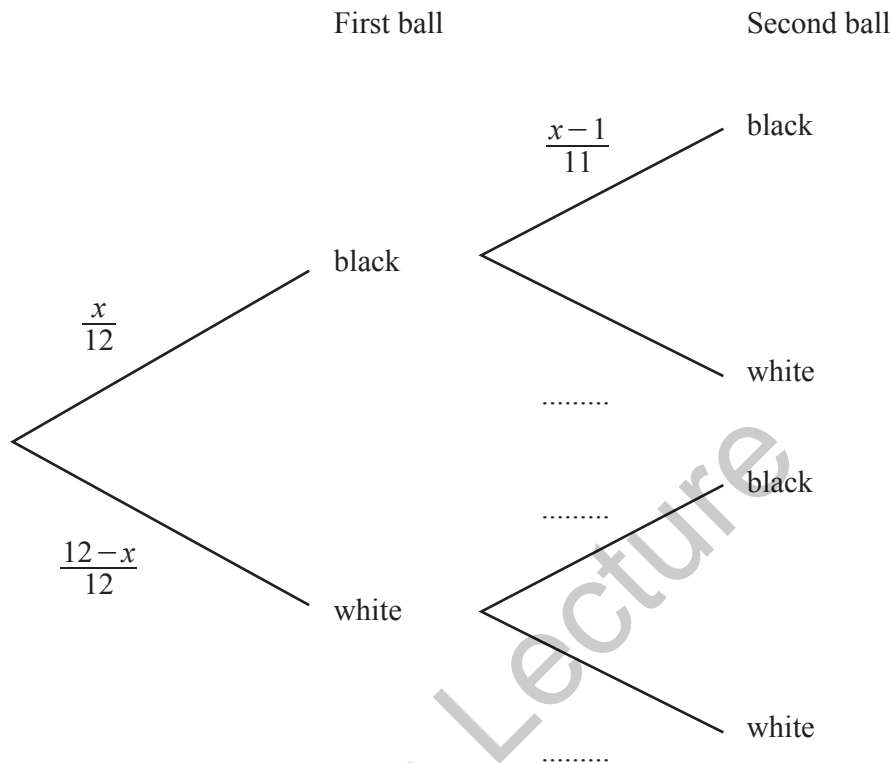| Number of emails	1	2	3	4	5	6	7	8
Number of adults	8	10	22	28	15	9	5	3

One of these adults is chosen at random.

Find the probability that they received **fewer than** 4 emails that day.
Give your answer as a fraction in its simplest form.

.... [2]

23 A bag contains 12 balls.
There are x black balls in the bag and the other balls are white.

Two balls are taken at random from the bag without replacement.

(a) Complete the tree diagram.

First ball   Second ball

$$\frac{x-1}{11} \quad \text{black}$$

black

$$\frac{x}{12}$$

white

....

black

....

$$\frac{12-x}{12}$$

white

white

....

[2]

(b) Find an expression for the probability of taking one ball of each colour.
Write your answer as a single fraction in terms of x.

.... [3]

(c) The probability that both balls are black is $\frac{14}{33}$.

Form an equation in x and solve it to find the number of black balls in the bag.
Show your working.

.... [4]

24 A bag contains coloured counters.
A counter is taken from the bag at random.
The table shows the probabilities of taking a counter of each colour.

Colour	Red	Green	Blue	Yellow
Probability	0.15	0.3		0.42

Complete the table. [2]

25 (a)

| 5 | 2 | 4 | 6 | 3 |

Two of these cards are chosen at random.
They are placed next to each other to give a two-digit number.

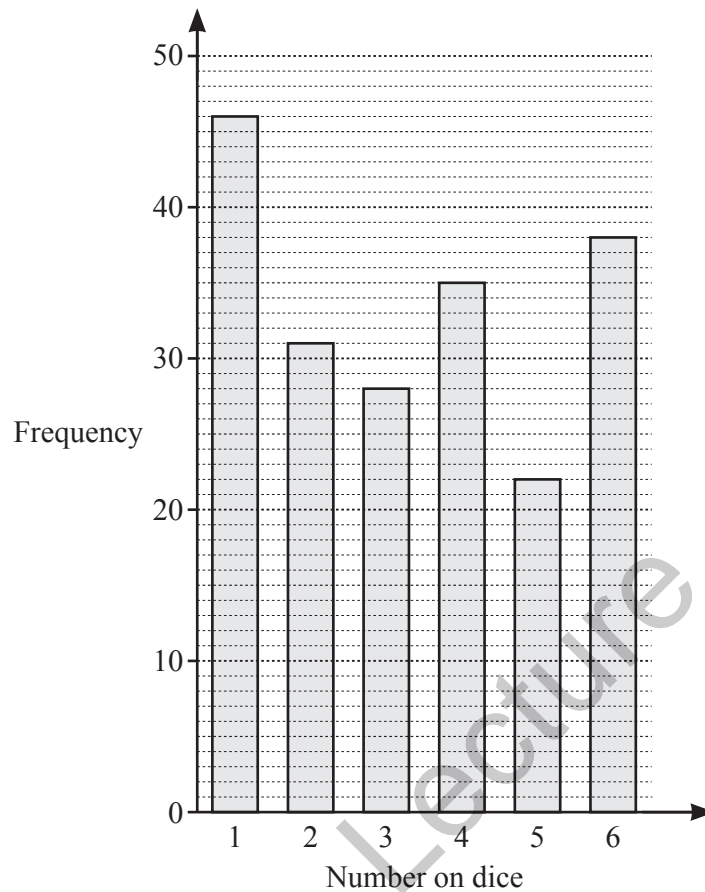(i) Find the probability that the two-digit number is less than 30.

.... [1]

(ii) List all the possible two-digit numbers that are prime.

.... [2]

(iii) Find the probability that the two-digit number is a multiple of 4.

.... [2]

(b) Rowan throws a dice 200 times.
The bar chart shows his results.

(i) Use the bar chart to complete the table of results.

Number on dice	1	2	3	4	5	6
Frequency	46	31	28			

[1]

(ii) Using Rowan's results, find the relative frequency that he threw a number less than 3.

.... [2]

(iii) Rowan says that the dice he has thrown is not a fair dice.

Make two comments to explain why the dice may not be fair.

....

.... [2]