Name ANSWERS	Class

MATHS TEACHER HUB

www.MathsTeacherHub.com

Probability

(9 – 1) Topic booklet

Foundation

These questions have been collated from previous years GCSE Mathematics papers.

You must have: Ruler graduated in centimetres and millimetres, protractor, pair of compasses, pen, HB pencil, eraser.	Total Marks

Instructions

- Use **black** ink or ball-point pen.
- **Fill in the boxes** at the top of this page with your name, centre number and candidate number.
- Answer **all** questions.
- Answer the questions in the spaces provided
  – *there may be more space than you need.*
- Diagrams are NOT accurately drawn, unless otherwise indicated.
- You must **show all your working out.**
- If the question is a **1F** question you are not allowed to use a calculator.
- If the question is a **2F** or a **3F** question, you may use a calculator to help you answer.

Information

- The marks for **each** question are shown in brackets
  – *use this as a guide as to how much time to spend on each question.*

Advice

- Read each question carefully before you start to answer it.
- Keep an eye on the time.
- Try to answer every question.
- Check your answers if you have time at the end.

Answer ALL questions
Write your answers in the space provided.
You must write down all the stages in your working.

5 There are some boys and girls in a classroom.

The probability of picking at random a boy is $\frac{1}{3}$

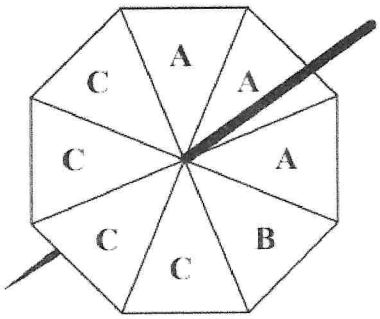
What is the probability of picking a girl?

$\frac{2}{3}$

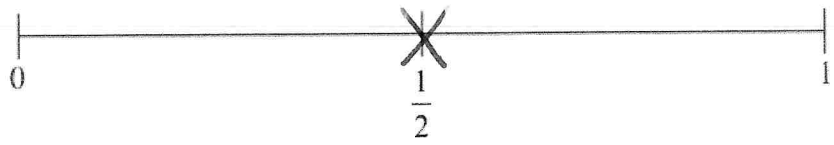
Sample 1 – Paper 2F

(Total for Question 5 is 1 mark)

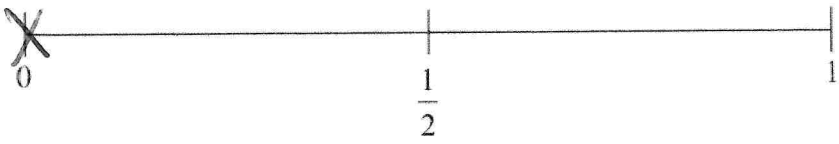
6 Gita spins a fair 8-sided spinner.



(a) On the probability scale, mark with a cross (×) the probability that the spinner will land on **C**.



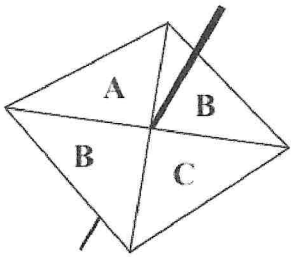
(b) On the probability scale, mark with a cross (×) the probability that the spinner will land on **D**.



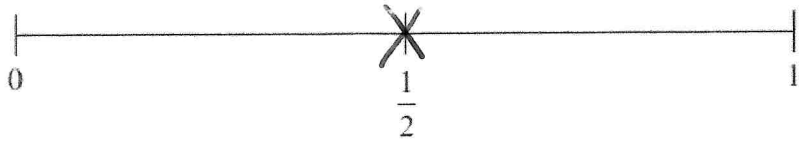
May 2020 – Paper 1F

(Total for Question 6 is 2 marks)

6 Sammy spins a fair 4-sided spinner.

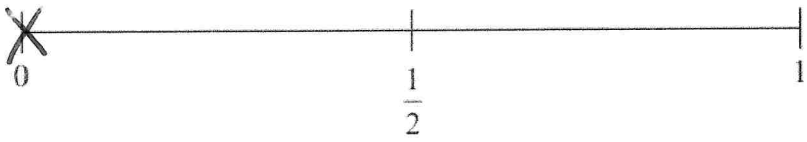


(i) On the probability scale, mark with a cross (×) the probability that the spinner will land on **B**.



(1)

(ii) On the probability scale, mark with a cross (×) the probability that the spinner will land on **F**.

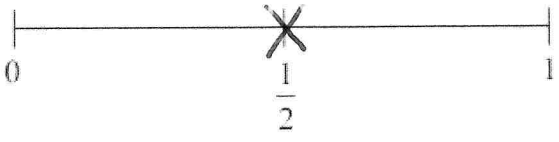


(1)

June 2017 – Paper 1F **(Total for Question 6 is 2 marks)**

6 An ordinary fair dice is thrown once.

(a) On the probability scale below, mark with a cross (×) the probability that the dice lands on an odd number.



(1)

(b) Write down the probability that the dice lands on a number greater than 4

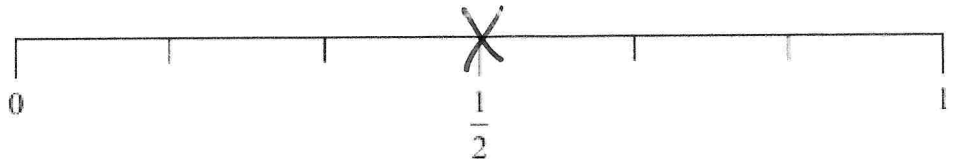
$\frac{2}{6} = \frac{1}{3}$

(1)

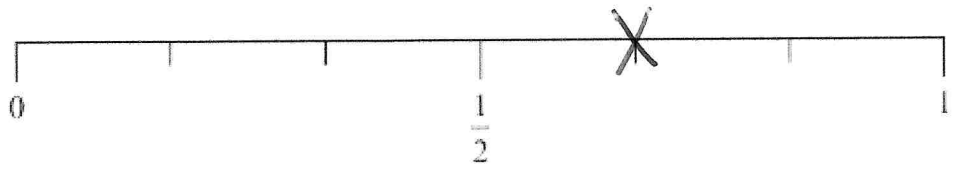
November 2018 – Paper 3F **(Total for Question 6 is 2 marks)**

6 Greg rolls a fair ordinary dice once.

(i) On the probability scale, mark with a cross (×) the probability that the dice will land on an odd number.



(ii) On the probability scale, mark with a cross (×) the probability that the dice will land on a number less than 5

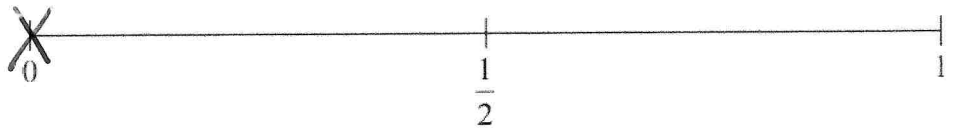


Sample 1 – Paper 1F **(Total for Question 6 is 2 marks)**

6 Shari has a fair ordinary dice.

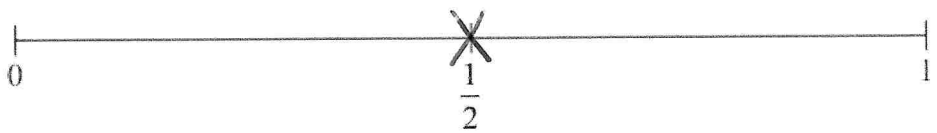
She rolls the dice once.

(a) On the probability scale, mark with a cross (×) the probability that Shari gets the number 7



(1)

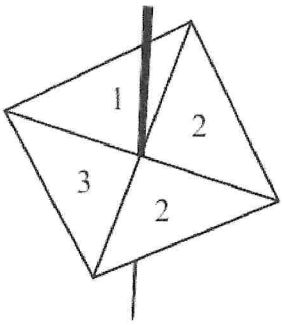
(b) On the probability scale, mark with a cross (×) the probability that Shari gets an even number.



(1)

June 2023 – Paper 2F **(Total for Question 6 is 2 marks)**

7 Here is a 4-sided spinner.



Samina spins the spinner once.

(a) Choose the word that best describes the probability that the spinner lands on 2

impossible	unlikely	evens	likely	certain

Evens

(1)

(b) Choose the word that best describes the probability that the spinner lands on a number less than 4

impossible	unlikely	evens	likely	certain

Certain

(1)

Ralph rolls a biased dice once.
The probability that he gets the number 5 is 0.4

(c) Work out the probability that Ralph does **not** get the number 5

0.6

(1)

(Total for Question 7 is 3 marks)

7 Here is a list of 8 letters.

B C A A A A B A

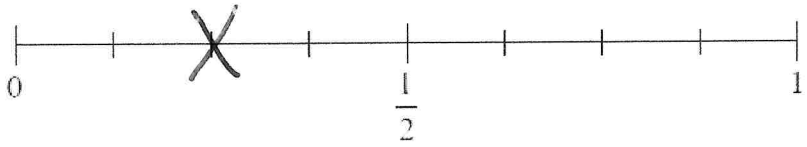
(a) Write down the mode.

A

(1)

One of the 8 letters is going to be picked at random.

(b) (i) On the probability scale, mark with a cross (×) the probability that this letter will be B.



(1)

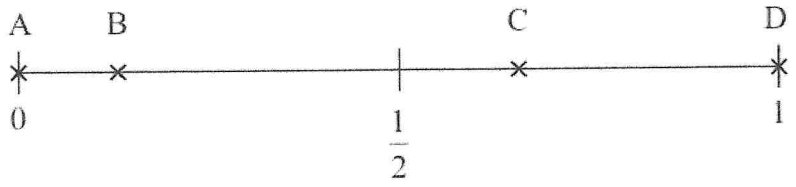
(ii) Find the probability that this letter will be C.

$\frac{1}{8}$

(1)

(Total for Question 7 is 3 marks)

7 Here is a probability scale.
It shows the probability of each of the events A, B, C and D.



(a) Write down the letter of the event that is certain.

D

(1)

(b) Write down the letter of the event that is unlikely.

B

(1)

There are 12 counters in a bag.

3 of the counters are red.
1 of the counters is blue.
2 of the counters are yellow.
The rest of the counters are green. 6 green

Caitlin takes at random a counter from the bag.

(c) Show that the probability that this counter is yellow or green is $\frac{2}{3}$

Yellow Green

$2 + 6 = 8$

$\frac{8}{12} = \frac{4}{6} = \frac{2}{3}$

(3)

(Total for Question 7 is 5 marks)

7 The probability that a new fridge has a fault is 0.015

What is the probability that a new fridge does **not** have a fault?

0·985

June 2017 – Paper 2F **(Total for Question 7 is 1 mark)**

7 In a box there are three types of chocolates.

There are 6 plain chocolates,
8 milk chocolates
and 10 white chocolates.

Ben takes at random a chocolate from the box.

(a) Write down the probability that Ben takes a plain chocolate.

$\frac{6}{24} = \frac{1}{4}$

Deon takes 2 chocolates from the box.

(b) Write down all the possible combinations of types of chocolates that Deon can take.

plain + plain
plain + milk
plain + white
milk + milk.
milk + white
white + white

Specimen 2 – Paper 1F **(Total for Question 7 is 4 marks)**

9 Selina has a bag of 22 counters.

5 of the counters are blue.
9 of the counters are red.
8 of the counters are pink.

Selina takes at random a counter from the bag.

Write down the probability that Selina

(i) takes a red counter.

$\frac{9}{22}$

(1)

(ii) does **not** take a pink counter.

$\frac{14}{22} = \frac{7}{11}$

(1)

(iii) takes a white counter.

$\frac{0}{22} = 0$

(1)

(Total for Question 9 is 3 marks)

9 There are 3 red beads and 1 blue bead in a jar.
A bead is taken at random from the jar.

What is the probability that the bead is blue?

$\frac{1}{4}$

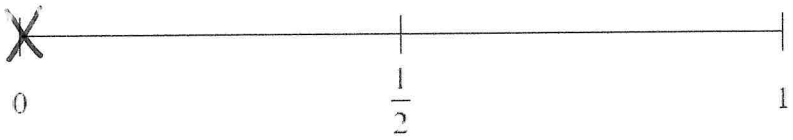
Sample 1 – Paper 1F **(Total for Question 9 is 1 mark)**

10 Here is a list of 8 numbers.

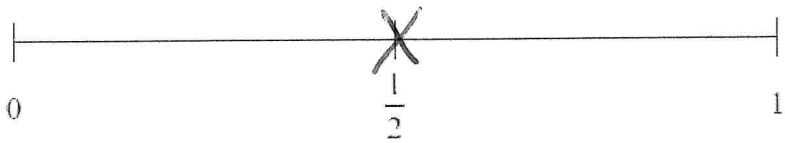
2 2 3 5 6 6 8 9

Kim picks at random one of these numbers.

(a) On the probability scale below, mark with a cross (×) the probability that Kim picks a number 7



(b) On the probability scale below, mark with a cross (×) the probability that Kim picks a number greater than 5

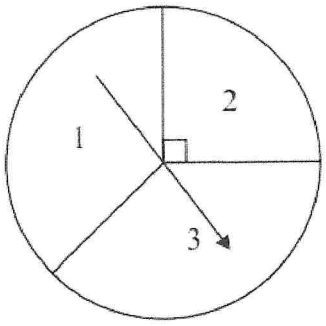


(c) Find the probability that Kim picks an even number.

$\frac{5}{8}$

June 2022 – Paper 3F **(Total for Question 10 is 4 marks)**

11 Majid has a spinner.



Majid is going to spin the arrow.
The arrow can land on 1 or on 2 or on 3

Majid says,

> "The probability that the arrow will land on 2 is $\frac{1}{3}$ because the spinner has three sections."

Is Majid correct?
You must give a reason for your answer.

90° = 1/4

(Total for Question 11 is 1 mark)

May 2024 – Paper 2F

11 Rima is going to roll a fair 6-sided dice.

(a) Choose the word that best describes the probability that the dice will land on the number 3

impossible	unlikely	evens	likely	certain

Unlikely

(1)

(b) Choose the word that best describes the probability that the dice will land on an odd number.

impossible	unlikely	evens	likely	certain

Evens

(1)

November 2023 – Paper 2F

(Total for Question 11 is 2 marks)

12 There are 49 counters in a bag.

20 of the counters are red.
The rest of the counters are blue. 29

One of the counters is taken at random.

Find the probability that the counter is blue.

$\frac{29}{49}$

November 2018 – Paper 2F **(Total for Question 12 is 2 marks)**

12 There are only 7 blue pens, 4 green pens and 6 red pens in a box.

One pen is taken at random from the box.

Write down the probability that this pen is blue.

$\frac{7}{17}$

June 2017 – Paper 1F **(Total for Question 12 is 2 marks)**

13 A scout group has a raffle to raise money for charity.
There is 1 prize to be won in the raffle.

Laura buys 12 raffle tickets.
A total of 350 raffle tickets are sold.

Find the probability that Laura does **not** win the prize.

win $\frac{12}{350}$ not win $\frac{338}{350}$

$\frac{338}{350} = \frac{169}{175}$

May 2018 – Paper 2F **(Total for Question 13 is 2 marks)**

13 There are only £10 notes and £20 notes in a wallet.

Ali takes at random a note from the wallet.

(a) Write down the probability that Ali takes a note with a value of more than £5

1 or 100%

(1)

There are only 1p coins and 2p coins in a bag.
The total value of the coins in the bag is 40p

The total value of the 1p coins is the same as the total value of the 2p coins.

Simon takes at random a coin from the bag.

(b) Find the probability that Simon takes a 1p coin.

20p of 1p's 20 coins 20p of 2p's 10 coins

$\frac{20}{30} = \frac{2}{3}$

(2)

May 2024 – Paper 1F **(Total for Question 13 is 3 marks)**

13 There are 15 sweets in a jar.
4 of the sweets are red.

Jill takes at random a sweet from the jar.

(a) Write down the probability that the sweet is red.

$\frac{4}{15}$

(1)

There are only green counters and blue counters in a bag.

A counter is taken at random from the bag.
The probability that the counter is green is 0.3

(b) Find the probability that the counter is blue.

0.7

(1)

(Total for Question 13 is 2 marks)

14 Victoria throws an ordinary fair 6-sided dice once.

She says,

"The probability of getting a 3 is half the probability of getting a 6"

(a) Is Victoria correct?
You must explain your answer.

She is wrong, they are both $\frac{1}{6}$

(1)

Andy throws the dice twice.
He says,

"The probability of getting a 6 on both throws is $\frac{2}{6}$"

(b) Is Andy correct?
You must explain your answer.

Andy is wrong $\frac{1}{6} \times \frac{1}{6} = \frac{1}{36}$

(1)

Indre throws the dice once.
She also throws a coin to get Heads or Tails.

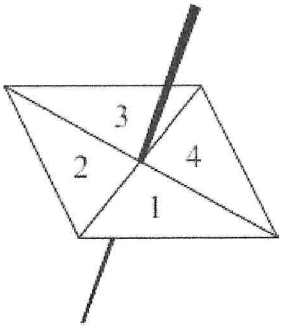
(c) List all the possible outcomes she can get.

1+H, 2+H, 3+H, 4+H, 5+H, 6+H
1+T, 2+T, 3+T, 4+T, 5+T, 6+T

(2)

(Total for Question 14 is 4 marks)

14 Here is a 4-sided spinner.



The table shows the probabilities that when the spinner is spun it will land on 1, on 3 and on 4

Number	1	2	3	4
Probability	0.2	0.3	0.4	0.1

20% 40% 10% = 100%

The spinner is spun once.

(a) Work out the probability that the spinner will land on 2

0.3

(1)

(b) Which number is the spinner least likely to land on?

4

(1)

Jake is going to spin the spinner 60 times.

(c) Work out an estimate for the number of times the spinner will land on 1

20% of 60 = 12

12

(2)

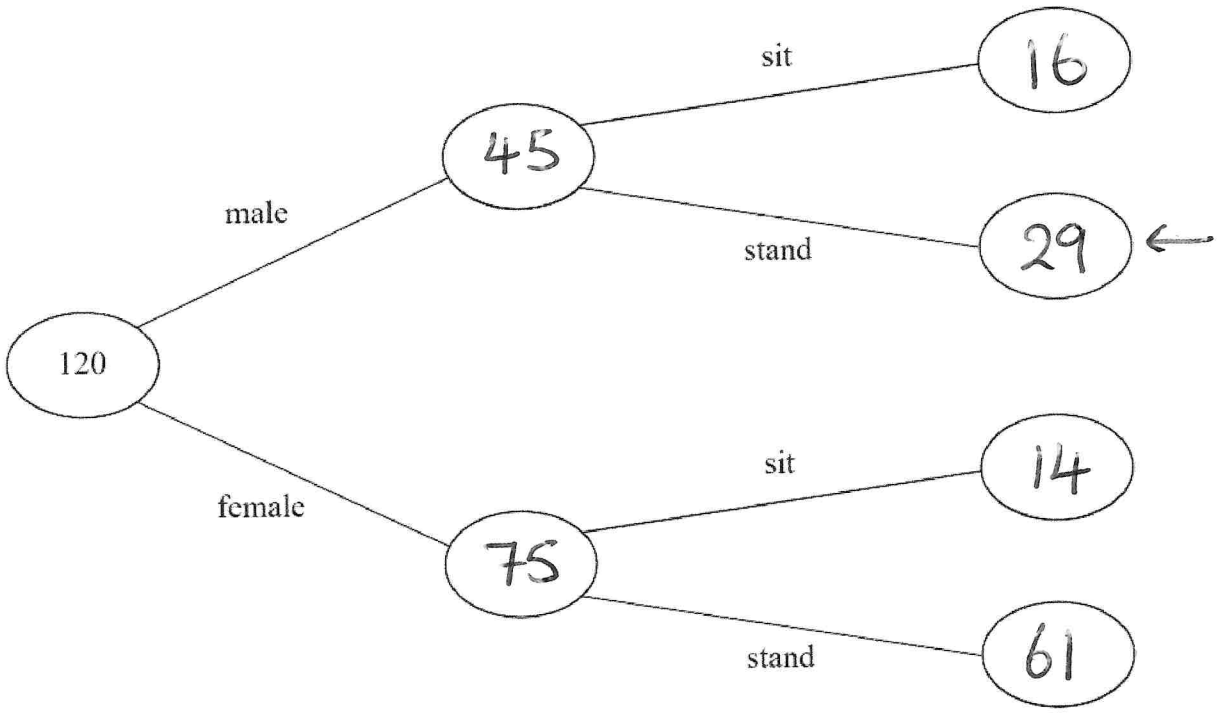
(Total for Question 14 is 4 marks)

15 120 people were at a hockey match.

Each person was asked if they wanted to stand or to sit to watch the match.

75 of the people were female
29 of the males wanted to stand
30 of the people wanted to sit

(a) Use this information to complete the frequency tree.



(3)

One of the 120 people is chosen at random.

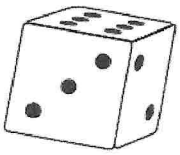
(b) Write down the probability that this person is a male who wanted to stand.

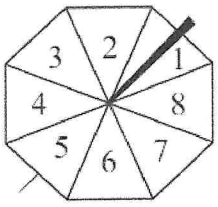
$\frac{29}{120}$

(1)

(Total for Question 15 is 4 marks)

15 Here is a fair ordinary dice and a fair 8 sided spinner.





Charlie throws the dice once and spins the spinner once.

Is Charlie more likely to get

a number less than 3 on the dice
or a number greater than 5 on the spinner?

You must show all your working.

Dice
less than 3

$= \frac{2}{6} = \frac{1}{3} = 33.3\%$

Spinner
greater than 5

$\frac{3}{8} = 37.5\%$

More likely to get a number greater than 5 on the spinner.

June 2023 – Paper 2F

(Total for Question 15 is 3 marks)

15 There are 25 boys and 32 girls in a club.

$\frac{2}{5}$ of the boys and $\frac{1}{2}$ of the girls walk to the club.

The club leader picks at random a child from the children who walk to the club.

Work out the probability that this child is a boy.

$\frac{2}{5}$ of 25 = 10

$\frac{1}{2}$ of 32 = 16

Walk = 26

$\frac{10}{26} = \frac{5}{13}$

Sample 1 – Paper 3F

(Total for Question 15 is 3 marks)

16 There are only 5 blue cards, 2 green cards and 4 red cards in a pack.

Isabella is going to take at random one card from the pack.

(a) Write down the probability that Isabella will take a blue card.

$\frac{5}{11}$

(2)

Ken is going to throw a biased dice once.
The probability that the dice will land on six is 0.3

(b) What is the probability that the dice will **not** land on six?

0.7

(1)

May 2020 – Paper 3F

(Total for Question 16 is 3 marks)

16 In a bag there are only red counters, blue counters, green counters and yellow counters.
A counter is taken at random from the bag.

The table shows the probabilities of getting a red counter or a yellow counter.

Colour	red	blue	green	yellow
Probability	0.4	0.15	0.2	0.25

40% 25% = 100%

the number of blue counters : the number of green counters = 3 : 4

Complete the table.

35% → 3 : 4

15 : 20

(Total for Question 16 is 4 marks)

16 Four biased coins, A, B, C and D are thrown.

The probability that each coin will land on Heads is shown in the table.

Coin	Probability
A	0.33
B	0.033
C	$\frac{1}{3}$
D	30%

(a) (i) Which coin is least likely to land on Heads?

B

(1)

(ii) Which coin is most likely to land on Heads?

C

(1)

Julie says,

"The probability that coin C will land on Heads is the same as the probability that coin C will land on Tails."

(b) Is she correct?
Give a reason for your answer.

No, if heads = $\frac{1}{3}$ then tails = $\frac{2}{3}$

(1)

Coin B is going to be thrown 4000 times.

(c) Work out an estimate for the number of times coin B will land on Heads.

0.033×4000

132

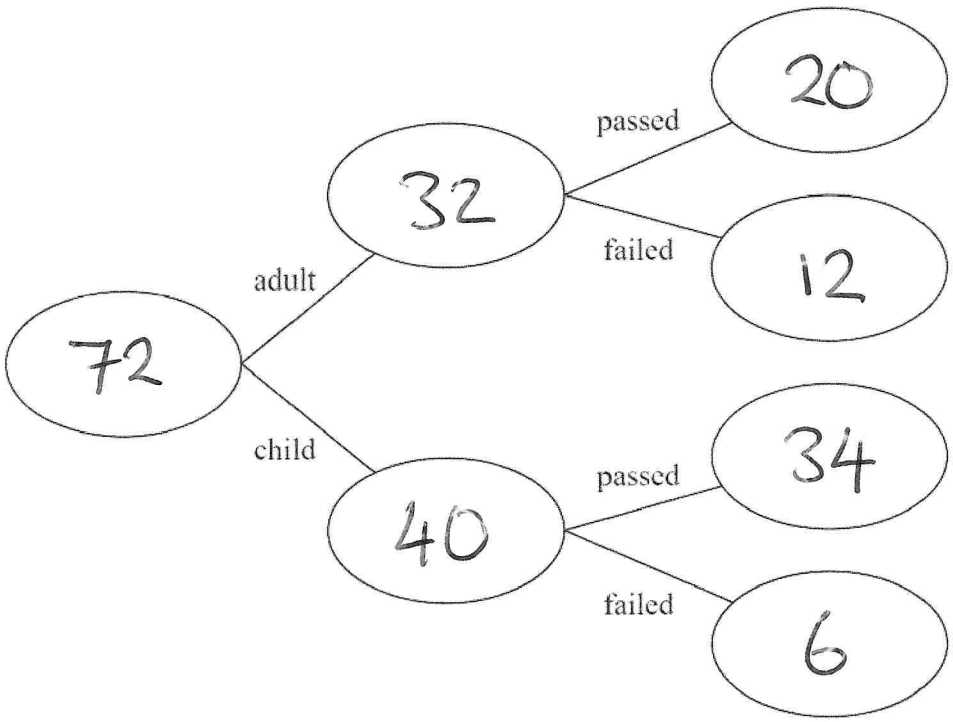
(2)

(Total for Question 16 is 5 marks)

17 72 people did a test.

20 of the 32 adults who did the test passed.
6 of the children who did the test failed.

(a) Use this information to complete the frequency tree.



One of these people is picked at random.

(b) Find the probability that this person is an adult who failed the test.

$\frac{12}{72} = \frac{6}{36} = \frac{1}{6}$

(3)

(Total for Question 17 is 5 marks)

17 There are only blue counters, green counters, red counters and yellow counters in a bag.

The table shows the number of blue counters in the bag.

Colour	blue	green	red	yellow
Number of counters	30			

There is a total of 100 counters in the bag.

Ashin takes at random a counter from the bag.

(a) Find the probability that the counter is **not** blue.

$\frac{70}{100} = \frac{7}{10}$

(2)

The ratio of the number of blue counters to the number of green counters is 2 : 3

(b) Work out the number of green counters in the bag.

B : G
2 : 3
×15 ↘ 30 : 45

45

(2)

Bradley says,

"The number of red counters in the bag is the same as the number of yellow counters in the bag."

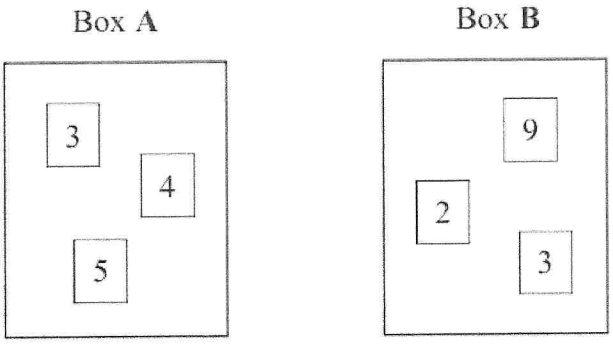
(c) Can Bradley be correct?
Give a reason for your answer.

No as there is 25 counters left which cannot be split in half.

(1)

(Total for Question 17 is 5 marks)

17 There are 3 cards in Box **A** and 3 cards in Box **B**.
There is a number on each card.



Ryan takes at random a card from Box **A** and a card from Box **B**.
He adds together the numbers on the two cards to get a total score.

Work out the probability that the total score is an odd number.

odd

3 + 2 = 5

4 + 9 = 13

4 + 3 = 7

5 + 2 = 7

Even

3 + 9 = 12

3 + 3 = 6

4 + 2 = 6

5 + 9 = 14

5 + 3 = 8

$\frac{4}{9}$

(Total for Question 17 is 2 marks)

17 The table shows the probabilities that a biased dice will land on 2, on 3, on 4, on 5 and on 6

Number on dice	1	2	3	4	5	6
Probability		0.17	0.18	0.09	0.15	0.1

17% 18% 9% 15% 10% = 100%

Neymar rolls the biased dice 200 times.

Work out an estimate for the total number of times the dice will land on 1 or on 3

1 = 0·31

1 or 3

0·31 + 0·18

= 0·49

0·49 × 200 = 98

98

(Total for Question 17 is 3 marks)

19 There are only blue cubes, yellow cubes and green cubes in a bag.

There are

twice as many blue cubes as yellow cubes
and four times as many green cubes as blue cubes.

Hannah takes at random a cube from the bag.

Work out the probability that Hannah takes a yellow cube.

B Y G

$2x \quad x \quad 8x$

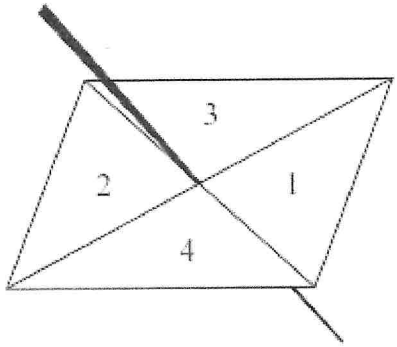
$2 : 1 : 8 = 11$

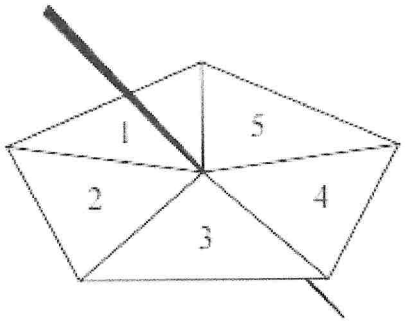
$\frac{1}{11}$

(Total for Question 19 is 3 marks)

19 Here are a 4-sided spinner and a 5-sided spinner.

The spinners are fair.





Jeff is going to spin each spinner once.
Each spinner will land on a number.
Jeff will get his score by adding these two numbers together.

(a) Complete the possibility space diagram for each possible score.

5-sided spinner

4-sided spinner	**1**	**2**	**3**	**4**	**5**
1	2	3	4	5	6
2	3	4	5	6	7
3	4	5	6	7	8
4	5	6	7	8	9

(1)

Jeff spins each spinner once.

(b) Find the probability that Jeff gets

(i) a score of 3

$\frac{2}{20} = \frac{1}{10}$

(ii) a score of 5 or more.

$\frac{12}{20} = \frac{3}{5}$

(2)

(Total for Question 19 is 3 marks)

19 There are only blue counters, green counters, red counters and yellow counters in a bag. George is going to take at random a counter from the bag.

The table shows each of the probabilities that George will take a blue counter or a green counter or a yellow counter.

Colour	blue	green	red	yellow
Probability	0.5	0.2	0.05	0.25

50% 20% 25% = 100%

(a) Work out the probability that George will take a red counter.

0.05

There are 120 counters in the bag.

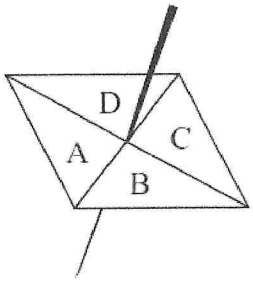
(b) Work out the number of green counters in the bag.

20% of 120 = 24

24

(Total for Question 19 is 3 marks)

21 Here is a biased spinner.



The table shows the probabilities that when the spinner is spun it will land on A, on B, on C and on D.

Letter	A	B	C	D
Probability	0.4	0.21	0.32	0.07

Luka will spin the spinner 200 times.

Work out an estimate for the number of times the spinner will land on A.

$0.4 \times 200 = 80$

80

(Total for Question 21 is 2 marks)

21 Malik is going to throw a fair coin 50 times.

(a) Write down an estimate for the number of times the coin will land on heads.

25

(1)

Paula and Simon are trying to find out if a different coin is biased.

Paula throws this coin 10 times.
She records the number of times the coin lands on heads.

Simon throws the same coin 100 times.
He records the number of times the coin lands on heads.

(b) Whose results will be more useful in deciding if the coin is biased?
Give a reason for your answer.

Simons results will be more accurate as he threw the coin more times

(1)

(Total for Question 21 is 2 marks)

21 David has designed a game.
He uses a fair 6-sided dice and a fair 5-sided spinner.
The dice is numbered 1 to 6
The spinner is numbered 1 to 5

Each player rolls the dice once and spins the spinner once.
A player can win £5 or win £2

Win £5	**Win £2**
roll a 5 **and** spin a 5	roll a 1 **or** spin a 1 **or** both

David expects 30 people will play his game.
Each person will pay David £1 to play the game.

(a) Work out how much profit David can expect to make.

Dice \ Spinner	1	2	3	4	5
1	£2	£2	£2	£2	£2
2	£2				
3	£2				
4	£2				
5	£2				£5
6	£2				

£30 - £5 - £20
= £5

$\frac{1}{30}$ = £5 $\frac{10}{30}$ = £2 £ 5

1 × £5 = £5 10 × £2 = £20

(b) Give a reason why David's actual profit may be different to the profit he expects to make.

In the real world, anything can happen.

(Total for Question 21 is 5 marks)

22 There are only blue cubes, red cubes and yellow cubes in a box.

The table shows the probability of taking at random a blue cube from the box.

Colour	blue	red	yellow
Probability	0.2	0·4	0·4

20%

The number of red cubes in the box is the same as the number of yellow cubes in the box.

(a) Complete the table.

(2)

There are 12 blue cubes in the box.

(b) Work out the total number of cubes in the box.

20% = 12

10% = 6

100% = 60

60

(2)

(Total for Question 22 is 4 marks)

22 There are only red counters, blue counters, green counters and yellow counters in a bag.

The table shows the probabilities of picking at random a red counter and picking at random a yellow counter.

Colour	red	blue	green	yellow
Probability	0.24	0·22	0·22	0.32

24% 32% = 100%

The probability of picking a blue counter is the same as the probability of picking a green counter.

Complete the table.

Specimen 1 – Paper 1F **(Total for Question 22 is 2 marks)**

23 There are only red discs, blue discs and yellow discs in a bag.
There are 24 yellow discs in the bag.

Mel is going to take at random a disc from the bag.

The probability that the disc will be yellow is 0.16

the number of red discs : the number of blue discs = 5 : 4

Work out the number of red discs in the bag.

150
R B Y
24

126
R : B
5 : 4
70 : 56

24 = 16%) ÷4
6 = 4%) ×25
150 = 100%

70

June 2024 – Paper 2F **(Total for Question 23 is 4 marks)**

24 There are some counters in a bag.
The counters are red or white or blue or yellow.

Bob is going to take at random a counter from the bag.

The table shows each of the probabilities that the counter will be blue or will be yellow.

Colour	red	white	blue	yellow
Probability			0.45	0.25

18 10

There are 18 blue counters in the bag.

The probability that the counter Bob takes will be red is twice the probability that the counter will be white.

(a) Work out the number of red counters in the bag.

÷9 → 45% = 18
5% = 2
50% = 20
100% = 40

12
R : W
2x : x
8 : 4

8

(4)

A marble is going to be taken at random from a box of marbles.
The probability that the marble will be silver is 0.5

There must be an even number of marbles in the box.

(b) Explain why.

An odd number divided by 2 is not a whole number, you cant have half of a marble.

(1)

(Total for Question 24 is 5 marks)

26 In a bag there are only red counters, blue counters, green counters and pink counters.
A counter is going to be taken at random from the bag.

The table shows the probabilities of taking a red counter or a blue counter.

Colour	red	blue	green	pink
Probability	0.05	0.15	0.5	0.3

5% 15%

The probability of taking a green counter is 0.2 more than the probability of taking a pink counter.

(a) Complete the table.

$x + 20 + x = 80$

$2x + 20 = 80$

$2x = 60$

$x = 30$

(2)

There are 18 blue counters in the bag.

(b) Work out the total number of counters in the bag.

15% = 18

5% = 6

50% = 60

100% = 120

120

(2)

(Total for Question 26 is 4 marks)

26 When a drawing pin is dropped it can land point down or point up.

Lucy, Mel and Tom each dropped the drawing pin a number of times.

The table shows the number of times the drawing pin landed point down and the number of times the drawing pin landed point up for each person.

	Lucy	Mel	Tom	
point down	31	53	16	= 100
point up	14	27	9	= 50
	45	80	25	

Rachael is going to drop the drawing pin once.

(a) Whose results will give the best estimate for the probability that the drawing pin will land point up?
Give a reason for your answer.

Mel, as she has dropped the pin more times so her results are more accurate.

(1)

Stuart is going to drop the drawing pin twice.

(b) Use all the results in the table to work out an estimate for the probability that the drawing pin will land point up the first time and point down the second time.

$$\frac{50}{150} \times \frac{100}{150} = \frac{2}{9}$$

$\frac{2}{9}$

(2)

(Total for Question 26 is 3 marks)