

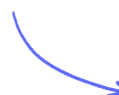
Exam Questions

Introduction to Probability

Basic Probability / Sample Space Diagrams / Relative & Expected Frequency

Easy (16 questions)	/48
Medium (14 questions)	/49
Hard (18 questions)	/69
Total Marks	/166

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Easy Questions

- 1 The probability that a biased dice will land on a five is 0.3

Megan is going to roll the dice 400 times.

Work out an estimate for the number of times the dice will land on a five.

(2 marks)

- 2 (a) Jane has a packet of seeds.

The probability that a seed will grow is 0.75

What is the probability that a seed will **not** grow?

(1 mark)

- (b) Jane plants 200 of these seeds.

Estimate the number of the seeds that will grow.

(2 marks)

- 3 (a)** There are some green counters, some yellow counters, some blue counters and some red counters in a bag.

The table shows the probabilities that a counter taken at random from the bag will be green or yellow or red.

Colour	Green	Yellow	Blue	Red
Probability	0.16	0.4		0.24

Mary takes at random a counter from the bag.
Work out the probability that the counter will be blue.

(2 marks)

- (b)** Mary puts the counter back into the bag.
There are 125 counters in the bag.

Work out the number of green counters in the bag.

(2 marks)

- 4 (a)** There are some black pens, some blue pens, some red pens and some green pens in a box.

The table shows the probabilities that a pen taken at random from the box will be black or will be blue or will be red.

colour	black	blue	red	green
probability	0.3	0.2	0.4	

There are 200 pens in the box.

Work out the number of black pens in the box.

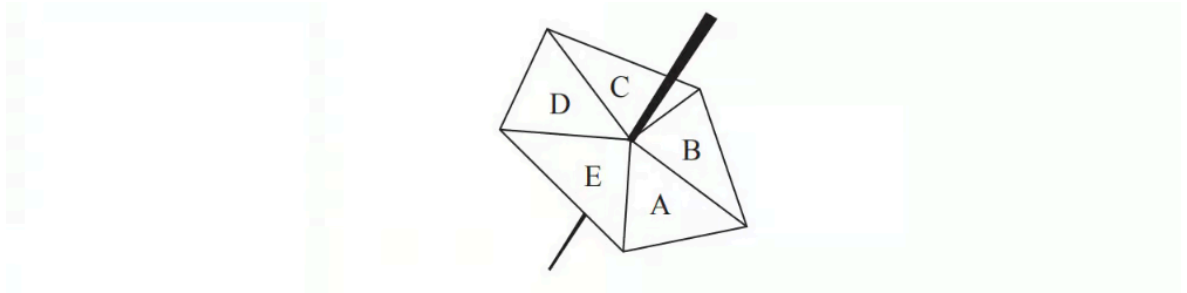
(2 marks)

- (b)** A pen is taken at random from the box.

Work out the probability that the pen will be green.

(2 marks)

5 (a) Here is a five-sided spinner.



The table shows the probabilities that the spinner will land on A or on B or on C or on D.

Letter	A	B	C	D	E
Probability	0.25	0.10	0.20	0.15	

Kirsty spins the spinner once.

Work out the probability that the spinner will land on E.

(2 marks)

(b) Chris is going to spin the spinner 60 times.

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

(3 marks)

- 6** Each time John plays a game, the probability that he wins the game is 0.65

John is going to play the game 300 times.

Work out an estimate for the number of games that John wins.

(2 marks)

- 7 (a)** A tin contains tea bags with a choice of four different flavours of tea.
The four flavours of tea are Assam or Darjeeling or Nilgiri or Rize.

Sara takes at random a tea bag from the tin.

The table shows each of the probabilities that the flavour of the tea Sara takes is Assam or Darjeeling or Rize.

Flavour of tea	Assam	Darjeeling	Nilgiri	Rize
Probability	0.38	0.24		0.16

Work out the probability that the flavour of the tea Sara takes is Nilgiri.

(2 marks)

- (b)** Work out the probability that the flavour of the tea Sara takes is either Darjeeling or Rize.

(2 marks)

- 8** The probability that a spinner will land on blue is 0.4

Rayyan is going to spin the spinner 280 times.

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

(2 marks)

9 There are some ice lollies in a freezer.

The flavour of each ice lolly is banana or strawberry or mint or chocolate.

Julius takes at random an ice lolly from the freezer.

The table shows the probabilities that the flavour of the ice lolly that Julius takes is banana or strawberry or chocolate.

Flavour	banana	strawberry	mint	chocolate
Probability	0.35	0.32		0.12

Work out the probability that the flavour of the ice lolly that Julius takes is either strawberry or mint.

(3 marks)

10 A biased coin is thrown 250 times.

The relative frequency of Heads is worked out after every 50 throws.

Total number of throws	50	100	150	200	250
Relative frequency	0.4	0.29	0.4	0.32	0.3

Choose the best estimate of the probability of Heads.

- A.** 0.3
- B.** 0.32
- C.** 0.342
- D.** 0.4

(1 mark)

11 The probability of Heads when a biased coin is thrown is 0.6

The coin is thrown 500 times.

Choose the expected number of Tails.

- A.** 20
- B.** 200
- C.** 250
- D.** 300

(1 mark)

12 (a) Dora has the following number cards.



She takes a card at random, replaces the card and then takes a second card.
She adds the numbers on the two cards she has taken and records the total.

Complete the following table to show all of her possible totals.

Total		First card				
		2	2	3	5	6
Second card	2	4	4	5	7	8
	2	4	4	5		8
	3	5	5		8	9
	5	7		8	10	11
	6	8	8	9	11	12

(1 mark)

(b) Find the probability that her total is

i) an even number,

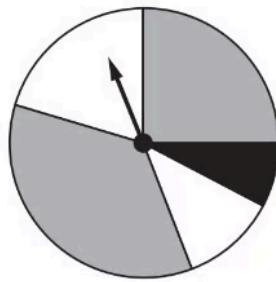
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ii) a multiple of 3 or 4.

[2]

(4 marks)

- 13 This spinner has two grey sections, two white sections and one black section.



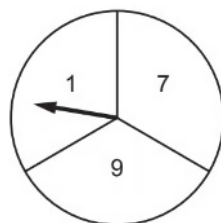
Vlad says

The probability of the spinner landing on black is $\frac{1}{5}$.

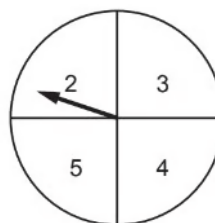
Explain why Vlad is not correct.

(1 mark)

- 14 (a) Geoff has two fair spinners.



Spinner A



Spinner B

He spins both spinners and **multiplies** the numbers on each spinner.

Complete the table.

×		Spinner A		
		1	7	9
Spinner B	2	2	14	18
	3	3	21	27
	4	4	28	
	5	5	35	

(1 mark)

- (b) Geoff wants to work out the probability that the outcome of the multiplication is an even number or a prime number.
Here is his working.

The probability the outcome is an even number is $\frac{6}{12}$

The probability the outcome is a prime number is $\frac{3}{12}$

The probability the outcome is an even number or a prime number is

$$\frac{6}{12} + \frac{3}{12} = \frac{9}{12}$$

Geoff is wrong.

Explain his error and give the correct answer.

(2 marks)

- 15 (a)** Jeat is growing carrots from seed in his garden.
He plants 28 carrot seeds but only 12 grow.

Jeat says

The probability of one of my carrot seeds growing is $\frac{3}{7}$.

Use Jeat's result to show that he is correct.

(1 mark)

- (b)** A farmer uses this probability to calculate how many carrot seeds he should plant to grow 10000 carrots.

(i) How many seeds should he plant?

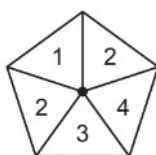
..... seeds [2]

(ii) Explain why it may not be sensible for the farmer to use Jeat's experimental probability to calculate the number of seeds he should plant.

[1]

(3 marks)

- 16** This is a fair 5-sided spinner.



Ciara spins the spinner twice and records the product of the two scores.

i) Complete the table.

×		First spin				
		1	2	2	3	4
Second spin	1	1				
	2			4		
	2					
	3					
	4				12	

[2]

ii) Find the probability that the product is a multiple of 3.

[2]

(4 marks)

Medium Questions

- 1 One of the teachers at a school is chosen at random.

The probability that this teacher is female is $\frac{3}{5}$

There are 36 **male** teachers at the school.

Work out the total number of teachers at the school.

(3 marks)

- 2 (a) There are only red counters, blue counters, white counters and black counters in a bag.

The table shows the probability that a counter taken at random from the bag will be red or blue.

Colour	red	blue	white	black
Probability	0.2	0.5		

The number of white counters in the bag is the same as the number of black counters in the bag.

Tania takes at random a counter from the bag.

Work out the probability that Tania takes a white counter.

(2 marks)

(b) There are 240 counters in the bag.

Work out the number of red counters in the bag.

(2 marks)

3 Rhiana plays a game.

The probability that she will lose the game is 0.32

The probability that she will draw the game is 0.05

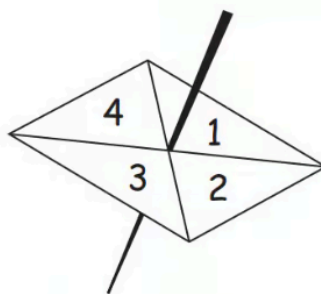
Rhiana is going to play the game 200 times.

Work out an estimate for the number of times Rhiana will win the game.

(3 marks)

4 (a) Here is a four sided spinner.

The spinner is biased.



The table shows the probabilities that the spinner will land on 1 or on 3

Number	1	2	3	4
Probability	0.2		0.1	

The probability that the spinner will land on 2 is the same as the probability that the spinner will land on 4

Work out the probability that the spinner will land on 4.

(3 marks)

(b) Shunya is going to spin the spinner 200 times.

Work out an estimate for the number of times the spinner will land on 3.

(2 marks)

5 Carol spins a spinner 80 times.

The table shows information about her results.

Outcome	Frequency
J	39
K	25
L	16

Dan spins this spinner 300 times.

Work out an estimate for the number of times that Dan will get an L.

(3 marks)

6 (a) Lorna carries out a survey about the number of times customers go to a shop.

She asks at random 100 customers how many times they went to the shop last month.

The table shows Lorna's results.

Number of times	0	1	2	3	4	5	6	more than 6
Frequency	4	12	13	17	25	13	11	5

One of the 100 customers is chosen at random.

What is the probability that this customer went to the shop 5 or more times?

(2 marks)

(b) Last month the shop had a total of 1500 customers.

Work out an estimate for the number of customers who went to the shop exactly 2 times last month.

(2 marks)

- (c) The owner of a different shop is carrying out a survey on the ages of his customers. He records the ages of the first 10 customers in his shop after 9 am one morning.

This may **not** be a suitable sample.

Give **two** reasons why.

(2 marks)

- 7 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

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.

(3 marks)

- 8 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			0.32

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

Complete the table.

(2 marks)

9 (a) 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
point up	14	27	9

Rachael is going to drop the drawing pin once.

Whose results will give the best estimate for the probability that the drawing pin will land point up?

Give a reason for your answer.

(1 mark)

(b) Stuart is going to drop the drawing pin twice.

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.

(2 marks)

10 (a) 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		

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

Complete the table.

(2 marks)

(b) There are 12 blue cubes in the box.

Work out the total number of cubes in the box.

(2 marks)

11 The table gives information about the amounts of money, in euros, that 70 of Anjali's friends spent last Saturday.

Money spent (S euros)	Frequency
$0 < S \leq 8$	6
$8 < S \leq 16$	14
$16 < S \leq 24$	19
$24 < S \leq 32$	25
$32 < S \leq 40$	6

One of Anjali's 70 friends is going to be chosen at random.
Find the probability that this friend spent more than 24 euros last Saturday.

(1 mark)

- 12** Toy cars are made in a factory.
The toy cars are made for 15 hours each day.
5 toy cars are made every 12 seconds.

For the toy cars made each day, the probability of a toy car being faulty is 0.002

Work out an estimate of the number of faulty toy cars that are made each day.

(4 marks)

- 13 (a)** In a bag there are only red bricks, blue bricks, green bricks and orange bricks.
The number of green bricks in the bag is the same as the number of orange bricks.

Jiao takes at random a brick from the bag.

The table gives the probability that Jiao takes a red brick and the probability that he takes a blue brick.

Colour	red	blue	green	orange
Probability	0.26	0.3		

Work out the probability that Jiao takes an orange brick.

(3 marks)

(b) Jiao puts the brick back into the bag.

There are 91 red bricks in the bag.

Jiao is going to build a tower using all the red bricks and all the blue bricks but no other bricks.

The tower will be in the shape of a cuboid.

There will be 4 bricks in each layer of the tower.

Work out how many layers the tower will have.

(3 marks)

14 Antonio rolls two fair six-sided dice and calculates the **difference** between the scores.

For example, if the two scores are 2 and 5 or 5 and 2 then the difference is 3.

Complete the sample space diagram to show the possible outcomes from Antonio's dice.

Difference		Dice 2					
		1	2	3	4	5	6
Dice 1	1	0					
	2					3	
	3		1				
	4						
	5		3				
	6						

(2 marks)

Hard Questions

1 Bill has some counters in a bag.

3 of the counters are red.

7 of the counters are blue.

The rest of the counters are yellow.

Bill takes at random a counter from the bag.

The probability that he takes a yellow counter is $\frac{2}{7}$

How many yellow counters are in the bag before Bill takes a counter?

(2 marks)

2 (a) Karl wants to raise money for charity.
He designs a game for people to play.

Karl uses a fair 10-sided dice for the game.

The dice is numbered from 1 to 10

Each person will roll the dice once.

A person wins the game if the dice lands on a multiple of 4

Ali plays the game once.

Work out the probability that Ali will win the game.

(2 marks)

- (b) Each person pays 30p to play the game once.
The prize for a win is £1

Karl thinks that the game will be played 100 times.

Work out an estimate for how much money Karl will raise for charity.

(3 marks)

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

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

The table shows the probability that Olga will take a blue counter and the probability that she will take a yellow counter.

Colour	blue	green	red	yellow
Probability	0.4			0.15

The number of red counters in the bag is 4 times the number of green counters in the bag.

Complete the table.

(3 marks)

- 4 There are 5 girls, 6 boys and some adults in a room.
Jenny selects at random one of these people.

The probability that Jenny selects a girl is $\frac{1}{3}$

Work out the probability that Jenny selects an adult.

(3 marks)

5 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.

(3 marks)

6 (a) There are only blue counters, yellow counters, green counters and red counters in a bag. A counter is taken at random from the bag.

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

Colour	blue	yellow	green	red
Probability	0.2	0.35	0.4	

Work out the probability of getting a red counter.

(1 mark)

- (b)** What is the least possible number of counters in the bag?
You must give a reason for your answer.

(2 marks)

- 7 (a)** 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

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.

Work out the number of red counters in the bag.

(4 marks)

- (b)** 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.

Explain why.

(1 mark)

- 8** There are only red counters, blue counters and purple counters in a bag.
The ratio of the number of red counters to the number of blue counters is 3 : 17

Sam takes at random a counter from the bag.
The probability that the counter is purple is 0.2

Work out the probability that Sam takes a red counter.

(3 marks)

- 9 (a)** Four friends each throw a biased coin a number of times.
The table shows the number of heads and the number of tails each friend got.

	Ben	Helen	Paul	Sharif
heads	34	66	80	120
tails	8	12	40	40

The coin is to be thrown one more time.

Which of the four friends' results will give the best estimate for the probability that the coin will land heads?
Justify your answer.

(1 mark)

- (b)** Paul says,

"With this coin you are twice as likely to get heads as to get tails."

Is Paul correct?
Justify your answer.

(2 marks)

(c) The coin is to be thrown twice.

Use all the results in the table to work out an estimate for the probability that the coin will land heads both times.

(2 marks)

- 10 (a)** There are 54 fish in a tank.
Some of the fish are white and the rest of the fish are red.

Jeevan takes at random a fish from the tank.

The probability that he takes a white fish is $\frac{4}{9}$

Work out the number of white fish originally in the tank.

(2 marks)

- (b)** Jeevan puts the fish he took out, back into the tank.
He puts some more white fish into the tank.
Jeevan takes at random a fish from the tank.

The probability that he takes a white fish is now $\frac{1}{2}$

Work out the number of white fish Jeevan put into the tank.

(2 marks)

- 11** There are 90 counters in a bag.
Each counter in the bag is either red or blue so that

the number of red counters : the number of blue counters = 2 : 13

Li is going to put some more red counters in the bag so that

the probability of taking at random a red counter from the bag is $\frac{1}{3}$

Work out the number of red counters that Li is going to put in the bag.

(4 marks)

- 12 Becky has a biased 6-sided dice.

The table gives information about the probability that, when the dice is thrown, it will land on each number.

Number	1	2	3	4	5	6
Probability	$2x$	0.18	$2x$	$3x$	0.26	x

Becky is going to throw the dice 200 times.

Work out an estimate for the number of times that the dice will land on an even number.

(4 marks)

- 13 A bag contains only pink sweets, white sweets, green sweets and red sweets.

The table gives each of the probabilities that, when a sweet is taken at random from the bag, the sweet will be green or the sweet will be red.

Sweet	pink	white	green	red
Probability			0.2	0.35

The ratio

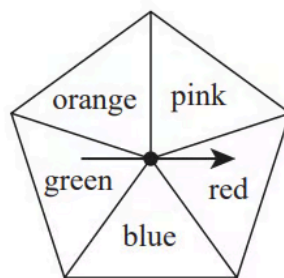
number of pink sweets : number of white sweets = 2 : 1

There are 28 red sweets in the bag.

Work out the number of white sweets in the bag.

(5 marks)

14 (a) Grace has a biased 5-sided spinner.



Grace is going to spin the arrow on the spinner once.

The table below gives the probabilities that the spinner will land on red or on blue or on green.

Colour	Red	Blue	Green	Orange	Pink
Probability	0.20	0.12	0.08		

The probability that the spinner will land on orange is 3 times the probability that the spinner will land on pink.

Work out the probability that the spinner will land on orange.

(3 marks)

- (b) Grace spins the arrow on the spinner 150 times.
Work out an estimate for the number of times the spinner lands on blue.

(2 marks)

- 15 A bag contains only red beads, blue beads, green beads and yellow beads.
The table gives the probabilities that, when a bead is taken at random from the bag, the bead will be blue or the bead will be yellow.

Colour	red	blue	green	yellow
Probability		0.24		0.31

The probability that the bead will be green is twice the probability that the bead will be red.

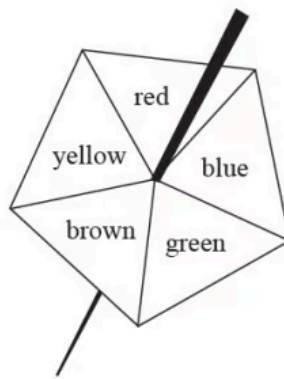
Sofia takes at random a bead from the bag.

She writes down the colour of the bead and puts the bead back into the bag. She does this 180 times.

Work out an estimate for the number of times she takes a red bead from the bag.

(4 marks)

16 Here is a biased 5-sided spinner.



When the spinner is spun, it can land on red, blue, green, brown or yellow.

The table gives the probabilities that the spinner lands on red or on blue or on green.

Colour	red	blue	green	brown	yellow
Probability	0.15	0.26	0.33		

When the spinner is spun once, the probability that the spinner lands on brown is **0.06** more than the spinner lands on yellow.

Jennie spins the spinner **150** times.

Work out an estimate for the number of times the spinner lands on yellow.

(4 marks)

17 In a bag there are blue discs, green discs and white discs.

There are four times as many blue discs as green discs.

number of blue discs : number of white discs = 3 : 5

One disc is selected at random.

Work out the probability that the disc is either blue or white.

(3 marks)

18 A bag contains some counters.

- There are 300 counters in the bag.
- There are only red, white and blue counters in the bag.
- The probability of picking a blue counter is $\frac{23}{50}$
- The ratio of red counters to white counters is 2 : 1.

Calculate the number of red counters in the bag.

(4 marks)