FULL MODEL ANSWERS

Q1. NON-CALCULATOR

Stuart throws a biased coin 10 times. He gets 7 Tails.

Maxine throws the same coin 50 times. She gets 30 Tails.

Prasha is going to throw the coin once.

(i) Whose results will give the better estimate for the probability that she will get Tails, Stuart's or Maxine's? You must give a reason for your answer. Ignore the number of Tails!

Maxine's results will give a better estimate for the probability of getting Tails, as she conducted more trials.

(1)

(ii) Use Stuart's and Maxine's results to work out an estimate for the probability that Prasha will get Tails.

$P(\text{Tails}) = \frac{\text{Total number of tails}}{\text{Total number of trials}}$ (fraction, decimal or %)

$= \frac{7+30}{10+50}$

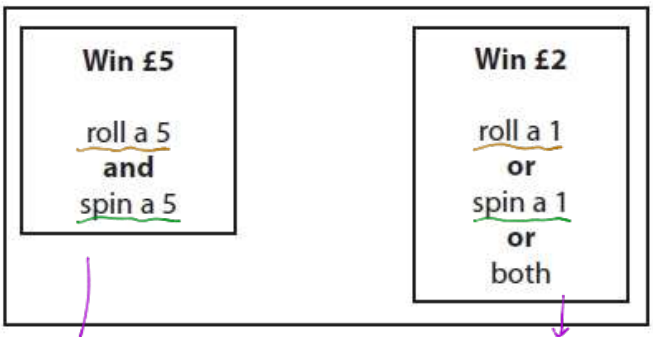
$\frac{37}{60}$

(1)

(Total for question = 2 marks)

Q2. NON-CALCULATOR

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

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.

$P(\text{win}) = \frac{1}{6} \times \frac{1}{5}$

$= \frac{1}{30}$

Expect 1 person out of 30 to win £5

$P(\text{win}) = \frac{1}{6} \times \frac{4}{5} + \frac{1}{5} \times \frac{5}{6} + \frac{1}{6} \times \frac{1}{5}$

$= \frac{4}{30} + \frac{5}{30} + \frac{1}{30}$

$= \frac{10}{30}$

Expect 10 people to win £2

Income: $30 \times 1 = £30$

Outgoings: $(1 \times 5) + (10 \times 2) = £25$

$30 - 25$

£ 5

(4)

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

This is the theoretical probability. With only 30 people, the actual results may be different.

(1)

(Total for question = 5 marks)

Q3. CALCULATOR ALLOWED

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		0.25

Sum of probability of mutually exclusive outcomes is 1.

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

$P(\text{red}) = 1 - P(\text{blue}) - P(\text{green}) - P(\text{yellow})$

$= 1 - 0.5 - 0.2 - 0.25$

0.05

(1)

There are 120 counters in the bag.

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

Number of green counters = P(green) × Total number of counters

$= 0.2 \times 120$

24

(2)

(Total for question = 3 marks)

Q4. CALCULATOR ALLOWED

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	0.31	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

First find P(one)

$P(\text{one}) = 1 - 0.17 - 0.18 - 0.09 - 0.15 - 0.1$

$= 0.31$

$P(\text{one or three}) = 0.31 + 0.18$

$= 0.49$

Number of times to land on one or three = P(one or three) × Number of rolls

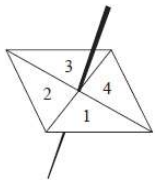
$= 0.49 \times 200$

98

(Total for question = 3 marks)

Q5. CALCULATOR ALLOWED

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		0.4	0.1

The spinner is spun once.

Sum of probabilities of all mutually exclusive outcomes is 1.

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

$P(\text{two}) = 1 - 0.2 - 0.4 - 0.1$

0.3

.....

(1)

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

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

Number of times spinner will land on 1 = $P(1)$ × Number of spins

$= 0.2 \times 60$

12

.....

(2)

(Total for question = 4 marks)

Q6. CALCULATOR ALLOWED

Coin	Probability
A	0.33
B	0.033
C	$\frac{1}{3}$ $0.\dot{3}$
D	30% 0.3

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

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

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

Smallest probability

B

.....

(1)

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

biggest probability

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.

As P(heads) and P(tails) are the only possible outcomes and are mutually exclusive, they must sum to 1. However $\frac{1}{3} + \frac{1}{3} = \frac{2}{3}$ so Julie is wrong.

(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.

Number of times coin will land on Heads = P(Heads) × Number of throws

= 0.033 × 4000

132

(2)

(Total for question = 5 marks)

Q7. CALCULATOR ALLOWED

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

number of red counters : number of blue counters : number of green counters = 1 : 3 : 7

A counter is going to be taken at random from the bag.

Total parts = 1 + 3 + 7 = 11

(a) Complete the table below to show each of the probabilities that the counter will be red or blue or green.

Colour	red	blue	green
Probability	$\frac{1}{11}$	$\frac{3}{11}$	$\frac{7}{11}$

(2)

Jamie takes at random a counter from the bag and records the colour of the counter.
He then puts the counter back in the bag.

Jamie does this a number of times.
He records a total of 68 blue counters.

(b) Work out an estimate for the total number of times Jamie takes a counter from the bag.

Number of times gets a blue = P(blue) × Number of attempts

$68 = \frac{3}{11} \times$ Number of attempts

$68 \div \frac{3}{11}$ = Number of attempts

(nearest integer)

249

(2)

(Total for question = 4 marks)

Q8. CALCULATOR ALLOWED

There are 300 seeds in a packet of flower seeds. Each seed will grow into a white flower or a yellow flower or a red flower.

The probability of a seed growing into a white flower is 0.62
45 of the seeds are expected to grow into yellow flowers.

One of the seeds is chosen at random from the packet. What is the probability that this seed will grow into a red flower?

Colour	White	Yellow	Red
Probability	0.62	$45 \div 300 = 0.15$	?

Sum of probabilities of all mutually exclusive outcomes is 1.

$1 - 0.62 - 0.15$

0.23

(Total for question = 3 marks)

Q9. CALCULATOR ALLOWED

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	0.05

(a) Work out the probability of getting a red counter.

Sum of probabilities of all mutually exclusive outcomes is 1.

$1 - 0.2 - 0.35 - 0.4 = 0.05$

(1)

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

Assume smallest probability equals 1 counter

$0.05 = \frac{1}{20}$ 20 counters is the least possible number of counters.

(2)

(Total for question = 3 marks)