

Mark schemes

Q1.

- (a) 0.4 and 0.2

*B1 for $1 - (0.1 + 0.3)$ or 0.6
or total of White and Yellow = 0.6*

B2

Additional Guidance

Mark table but if table blank or scores zero look in script for working or answers
White (W) = 0.4 and Yellow (Y) = 0.2 must be clearly stated to get B2

$1 - (0.1 + 0.3) = 0.4$
White 0.8, Yellow 0.4

B1

No working
White 0.5, Yellow 0.1

B1

White blank, Yellow 0.6

B1

Table blank. W 0.4, Y 0.2 in script

B2

Table blank. W 0.2, Y 0.4 in script

B1

Table blank 0.4 and 0.2 in script

B1

White 0.8, Yellow 0.4

B0

White 0.6, Yellow 0.3

B0

- (b) 200, 150 and 100

B2ft their probabilities in (a) but only for probabilities that total 1

B1 White 200 or Blue 150 or Yellow 100

*B1ft for **one** of
their (a) for white $\times 500$*

or their (a) for yellow $\times 500$

Do not allow B1ft for any probabilities that are greater than 1

B2ft

Additional Guidance

If answer of 200, 150 and 100 given do not check for ft even if table in (a) wrong. 2 marks. They could have started again

In (a) Red 0.1, White 0.2, Blue 0.3, Yellow 0.4
Answers (50) 100, 150 and 200

B2ft

In (a) Red 0.1, White 0.5, Blue 0.3, Yellow 0.1
Answers (50) 250, 150 and 50

B2ft

In (a) Red 0.1, White 0.3, Blue 0.3, Yellow 0.3
Answers (50) 150, 150 and 150

B2ft

In (a) Red 0.1, White 1.2, Blue 0.3, Yellow 0.2
Answers (50) 600, 150 and 100

B1

In (a) Red 0.1, White 0.2, Blue 0.3, Yellow 0.1
Answers (50) 100, 250 and 100

B1ft

In (a) Red 0.1, White 1.2, Blue 0.3, Yellow 0.2
Answers (50) 600, 150 and 200

B1

(c) $\frac{50}{400}$

oe eg $\frac{1}{8}$, 0.125, 12.5%

ft their table in (b)

B2ft for numerator of 50 and denominator from their (b)

B1 for 50 out of 400

B1 for $50 \div 400$

B1ft for 50 out of their 400 from (b)

B0 for any ratio

Ignore any incorrect cancelling or change of form once correct answer seen

B2ft

Additional Guidance

For follow through from their (b) denominator is either 500 – their Yellow **or** 50 + their White + their Blue

$$\frac{50}{300} \text{ oe}$$

B2ft

$$\frac{100}{400}$$

B0

[6]

Q2.

Alternative method 1

$$x + 2x + 2x + 10 \text{ or } 5x + 10$$

$$\text{or } x + 2x + 2x + 10 + 90$$

$$\text{or } 5x + 100$$

oe

M1

$$x + 2x + 2x + 10 = 360 - 90$$

$$\text{or } 5x + 10 = 270$$

$$\text{or } x + 2x + 2x + 10 + 90 = 360$$

$$\text{or } 5x + 100 = 360$$

$$\text{or } 5x = 260$$

oe

M1dep

$$(x =) 52 \text{ or } 2x = 104$$

$$\text{or } 2x + 10 = 114$$

may be on diagram

A1

$$\frac{114}{360} \text{ or } \frac{57}{180} \text{ or } \frac{38}{120} \text{ or } \frac{19}{60}$$

$$\text{or } 0.31(6..) \text{ or } 0.317 \text{ or } 0.32$$

$$\text{or } 31(.6...) \% \text{ or } 31.7 \% \text{ or } 32 \%$$

$$\text{ft } \frac{2 \times \text{their } 52 + 10}{360}$$

$$\text{or } \frac{\text{their angle for C}}{360}$$

B1ft

Alternative method 2

$$\frac{90}{360} + \frac{x}{360} + \frac{2x}{360} + P(C) = 1$$

$$\text{or } \frac{90}{360} + \frac{x}{360} + \frac{2x}{360} + \frac{2x+10}{360}$$

$$\text{or } \frac{2x+10}{5x+100}$$

oe

M1

$$\frac{90}{360} + \frac{x}{360} + \frac{2x}{360} + \frac{2x+10}{360} = 1$$

oe

M1dep

$$(x =) 52 \text{ or } 2x = 104$$

$$\text{or } 2x + 10 = 114$$

may be on diagram

A1

$$\frac{114}{360} \text{ or } \frac{57}{180} \text{ or } \frac{38}{120} \text{ or } \frac{19}{60}$$

or 0.31(6..) or 0.317 or 0.032

or 31(.6...) % or 31.7% or 32%

$$\text{ft } \frac{2 \times \text{their } 52 + 10}{360}$$

or $\frac{\text{their angle for C}}{360}$

B1ft

Additional Guidance

Ignore incorrect simplification or conversion after $\frac{114}{360}$ oe

M1M1A1B1

$$\frac{360 - 10 - 90}{5} \text{ oe}$$

M1M1

$x + 2x + 2x + 10$ followed by $6x + 10 = 270$

M1M0

Do not accept decimal within fraction for final answer if correct fraction not seen

The follow through is not available if A1 awarded

[4]

Q3.

(a) 40 or 50 or 35 or 20 or 25

or 17 (coins)

or $16 + \frac{1}{2} + \frac{1}{2}$ (coins)

May be implied

B1

their 40 + their 50 + their 35 + their 20 + their 25

or their 17×10

or their $16 \times 10 + 5 + 5$

or $200 \div 10$

M1

170

or

20 (coins needed)

A1

Correct conclusion based on their total money raised or on their total coins and their coins needed

Strand (iii)

ft correct conclusion based on their values if B1M1 awarded

Q1ft

Alternative Method

40 or 50 or 35 or 20 or 25

May be implied

B1

Total build up method

eg 10, 20, 30, 40, ..., 170

or 40, 90, 125, 145, 170

Allow one error or omission of one coin

M1

170

A1

Correct conclusion based on their total money raised

Strand (iii)

ft correct conclusion based on their total if B1M1 awarded

Q1ft

- (b) $70 \div 4$ or $7 + 7 + 3.5$ or 0.25×70
 oe

M1

17.50

Strand (i)

17.5 is M1 Q0

Q1

[6]

Q4.

(a) $\frac{2}{17}$

B1

(b) $\frac{1}{17}$

B1

[2]

Q5.

- (a) $3 + 4 = 7$ or $3 : 4 = \text{total } 7$

3 and 4 do not have any common factors (apart from 1)

oe

B1

- (b) $\frac{3}{7}$ and $\frac{4}{7}$ seen
or 2 equivalent fractions

M1

$$\frac{3}{7} \times \frac{3}{7} \text{ or } \frac{4}{7} \times \frac{4}{7} \text{ or } \frac{3}{7} \times \frac{2}{6} \text{ or } \frac{4}{7} \times \frac{3}{6}$$

Maybe on tree diagram with appropriate branches shown
and probability calculation shown for at least one pair of
branches

M1dep

$$\frac{3}{7} \times \frac{3}{7} + \frac{4}{7} \times \frac{4}{7}$$

$$1 - 2 \times \frac{4}{7} \times \frac{3}{7}$$

M1dep

$$\frac{25}{49}$$

ft $\frac{18}{42} \left(= \frac{3}{7} \right)$ if without replacement calculated

$$\text{SC2 } \frac{18}{49} \text{ from } \frac{3}{7} \times \frac{2}{7} + \frac{4}{7} \times \frac{3}{7}$$

A1ft

[5]

Q6.

- (a) $\frac{2}{6}$ or $\frac{1}{3}$ seen
oe

M1

$$\frac{2}{6} \times \frac{1}{5}$$

oe

M1dep

$$\frac{1}{15}$$

oe

A1

- (b) Probability is now bigger

B1

Valid working or statement to support answer
eg

$\frac{1}{3}$ is greater than $\frac{1}{5}$ oe
 $\frac{1}{9}$ is greater than $\frac{1}{15}$ oe

B1

[5]

Q7.

- (a) 20
 or 20 out of 120
 or 20 in 120

$\sqrt{36}$ (oe) is B0

B1

- (b) Yes ticked

If boxes blank, yes may be implied by wording

B1

Valid reason eg

1 should be (about) 20 (but it is much lower)

or 6 should be (about) 20 (but it is higher)

or 6 is much higher than 1

or frequencies should be all (about) the same

oe *Strand (i)*

Only award if Yes ticked or implied

Q1

Additional Guidance

There are 4 ways to score the Q mark

Comparing frequency of 1 to 20

Comparing frequency of 6 to 20

Referring to significant difference between frequency of 1 and 6

Referring to the fact that all frequencies should be the same

Yes ticked and:

B1

6 has above the average which is 20

Q1

6 more, 1 a lot less

Q1

Lands more on 6. It should land on each side about the same number

Q1

The range of results is too large on specific numbers (1,6)

showing there is something making it land on a 6 and not a 1

Q1

The frequency of landing on 6 is over 7 times the frequency

of it landing on 1.

Q1

There is a large range of 33 between the highest and lowest frequency

Q1

Because the frequency is not all the same so it isn't fair

Q1

Frequency should be the same for all numbers

Q1

Lands more on 6

6 has appeared as the mode number whereas 1 is the least amount
 Is heavier on number 6
 Landed on 6 38 times
 All number are about average except 1 and 6
 Answers should be more evenly spaced out
 Each time the number goes up, the frequency goes up

Q0
 Q0
 Q0
 Q0
 Q0
 Q0
 Q0

[3]

Q8.

(a) $\frac{1}{6}$ and $\frac{5}{6}$ on each pair of branches
In correct order

B1

(b) $\frac{1}{36}$

B1

(c) **Alternative method 1**

1 – their $\frac{1}{36}$

M1

$$\frac{35}{36}$$

ft from part (b) provided probabilities < 1

A1ft

Alternative method 2

$$\frac{1}{6} \times \frac{5}{6} \times 2 + \frac{5}{6} \times \frac{5}{6}$$

oe

M1

$$\frac{35}{36}$$

ft from part (a)

A1ft

[4]

Q9.

(a) $\frac{1}{3}$ or $\frac{2}{6}$ or 0.33(...)

or $72 \div 6$ or 12

or $72 \div 6 \times 2$

oe

M1

24

oe

A1

Additional Guidance

24 out of 72

M1A1

$$\frac{24}{72}$$

M1A0

2 out of 6 or 1 out of 3

M0

(b) $250 - 25 - 53 - 62$ or 110

$$(25 + 53 + 62) \div 250 \text{ or } \frac{140}{250} \text{ or } 0.56$$

M1

their $110 \div 2$ or 55

$$1 - \text{their } \frac{140}{250}$$

or $1 - 0.56$ or 0.44

M1dep

$$\frac{55}{250} \text{ or } 0.22 \text{ or } 22\%$$

ignore fw

oe

$$\frac{11}{50}$$

A1

Additional Guidance

$\frac{55}{250}$ followed by error eg = 0.2

M1M1A1

55 in table

M1M1A0

Do not allow misreads for 250

[5]

Q10.

$1 - 0.28$ or 0.72

or

0.28×2 or 0.56

M1

1 - 0.28 - (2 × 0.28)
or their 0.72 - (2 × 0.28)
or 1 - 0.28 - their 0.56 or 0.16

M1

0.08

oe

A1

[3]

Q11.

(a) usually get a different outcome

B1

(b) more trials

B1

(c) 300 × 0.38 or 114

oe

M1

their 114 + 42 or 156

M1dep

0.39 or $\frac{156}{400}$

oe

A1

[5]

Q12.

(a) Square numbers cannot be prime

oe

B1

Additional Guidance

Accept any correct explanation why square numbers cannot be prime, eg prime numbers have exactly 2 factors and square numbers have an odd number of factors

An incorrect statement, even with a correct statement, scores B0 eg prime numbers cannot be square numbers as prime numbers have no factors

B0

(b) $\frac{n}{2} + 1$

B1

[2]

Q13.

(a) $\frac{392}{7} \times 2$

oe

M1

112

SC1 504

A1

- (b) $\frac{8}{11}$ or 0.72... or 0.73
 oe or 72(...)% or 73%

B1

[3]

Q14.

- (a) 0.25×20

M1

5

A1

- (b) 0.32

B1

There have been more trials

oe

SC1 for tending towards 0.3 as trials increase

B1

- (c) Their 0.32×1000

M1

320

ft their (b) if their (b) is between 0 and 1
 Answer must be an integer

A1ft

[6]

Q15.

- (a) $A \cap B'$

B1

- (b) $(A \cup B)'$

B1

[2]

Q16.

- (a) Usually get a different outcome

B1

- (b) More trials

B1

[2]

Q17.

$120 \div 6$ or $\frac{1}{6}$ seen oe

M1

20

SC1 for 100

A1

[2]

Q18.

$300 \div 6 (= 50)$

or

$120 \times 6 (= 720)$

oe $\frac{1}{6}$ oe and $\frac{120}{300} (= \frac{2.4}{6})$

M1

No and 50

or

No and 36 (average of the other numbers)

or

No and 720

No and any sensible comment linking the theoretical probability and experimental outcome with accurate calculation(s)

SC1 States or implies that 120 is too large a proportion

A1

[2]

Q19.

Alternative method 1 of 3

98 in the singles non-intersecting part and 34 in the doubles non-intersecting part

or $98 + x$

or $34 + x$

M1

$98 + x = 2(34 + x)$

oe $\frac{1}{2}(98 + x) = 34 + x$

M1dep

$98 + x = 68 + 2x$

oe $49 + \frac{1}{2}x = 34 + x$

M1dep

30

A1

Alternative method 2 of 3

98 in the singles non-intersecting part and 34 in the doubles non-intersecting part

M1

34×2 or 68
or $98 \div 2$ or 49
or $98 - 34$ or 64

second M1 implies M1M1

M1

98 – their 68
or $2 \times (\text{their } 49 - 34)$
or their $64 - 34$
or $2 \times \text{their } 64 - 98$

third M1 implies M1M1M1

M1

30

A1

Alternative method 3 of 3

One complete trial correctly evaluated
eg $98 + 10 = 108$ and $34 + 10 = 44$
and
 $108 \div 2 = 54$ or $44 \times 2 = 88$
(and No)

oe

$108 \div 2 = 54$ or $44 \times 2 = 88$ is not required if a second trial is done

M1

Second complete trial correctly evaluated
eg $98 + 20 = 118$ and $34 + 20 = 54$
and
 $118 \div 2 = 59$ or $54 \times 2 = 108$
(and No)

oe

$118 \div 2 = 59$ or $54 \times 2 = 108$ is not required if a third trial is done

M1

Correct trial with both numbers and correctly evaluated
 $98 + 30 = 128$ and $34 + 30 = 64$

M1

30

A1

Additional Guidance

Working may be shown on Venn diagram

30 shown in intersection in Venn diagram unless contradicted by final answer

M1M1M1A1

$2 \times 98 - 2 \times 34 - 98$ oe

M1M1M1

98 and 34 correctly positioned in Venn diagram may be replaced by working or have additional working

eg 34 in Venn diagram replaced by or with 68

M1M1

eg 98 in Venn diagram replaced by or with 49

M1M1

98 and 34 incorrectly positioned in Venn diagram may be recovered by working

[4]

Q20.

(a) $\frac{1}{6}$

$$\frac{5}{6}$$

On every pair of branches

oe

Allow 0.16... or 0.17

Allow 0.83...

B1

(b) $\frac{1}{6} \times \frac{1}{6}$

or $\frac{1}{6} \times$ their $\frac{1}{6}$

oe

Allow 0.16... or 0.17

fit their $\frac{1}{6}$ provided $[0, 1]$

M1

$$\frac{1}{36}$$

oe

Allow 0.027...

Allow 0.03 if working shown

Ignore fw if attempting to convert

$\frac{1}{36}$ to a decimal, otherwise, do not ignore fw,

eg $\frac{1}{36} \times 2$

A1ft

[3]

Q21.

(a) $\sqrt{0.36} = 0.6$ or $0.6 \times 0.6 (= 0.36)$

oe

B1

(b) $(1 - 0.6) \times (1 - 0.6)$ or 0.4×0.4
oe

M1

0.16

oe

A1

(c) $1 - 0.36$

oe $0.6 \times (1 - 0.6) \times 2 + (1 - 0.6) \times (1 - 0.6)$
or $0.6 \times (1 - 0.6) \times 2 +$ their 0.16 or $0.4 + 0.6 \times 0.4$

M1

0.64

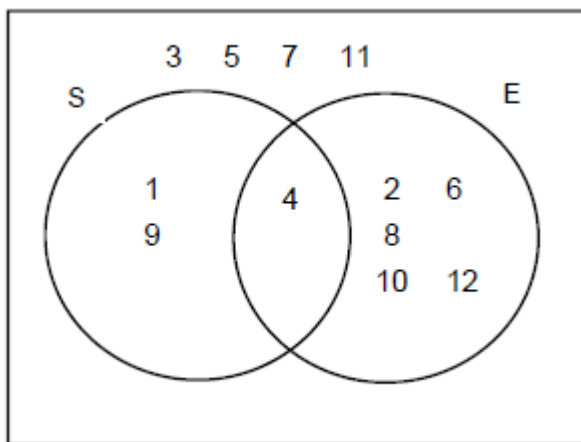
oe

A1

[5]

Q22.

(a)



B2 Any 2 or 3 of the 4 sections correct
B1 Any 1 of the 4 sections correct

B3

(b) $\frac{1}{12}$

oe
ft their Venn diagram

B1ft

[4]

Q23.

(a) Two of $\frac{6}{50}$ $\frac{28}{100}$ $\frac{34}{150}$

oe fraction, decimal, percentage

B1 One of $\frac{6}{50}$ $\frac{28}{100}$ $\frac{34}{150}$

with at most one incorrect answer

B2

- (b) Chooses their probability from the larger number of trials and reason given that more trials are involved

Must have two probabilities in (a)

B1ft

[3]