

8300

GCSE MATHEMATICS

Foundation and Higher tier – Questions by Topic – Mark Scheme

Statistics

Interpreting pie charts

v1.0

Glossary for Mark Schemes

GCSE examinations are marked in such a way as to award positive achievement wherever possible. Thus, for GCSE Mathematics papers, marks are awarded under various categories.

If a student uses a method which is not explicitly covered by the mark scheme the same principles of marking should be applied. Credit should be given to any valid methods. Examiners should seek advice from their senior examiner if in any doubt

M	Method marks are awarded for a correct method which could lead to a correct answer.
A	Accuracy marks are awarded when following on from a correct method. It is not necessary to always see the method. This can be implied
B	Marks awarded independent of method.
ft	Follow through marks. Marks awarded for correct working following a mistake in an earlier step.
SC	Special case. Marks awarded within the scheme for a common misinterpretation which has some mathematical worth.
M dep	A method mark dependent on a previous method mark being awarded.
B dep	A mark that can only be awarded if a previous independent mark has been awarded.
oe	Or equivalent. Accept answers that are equivalent. e.g. accept 0.5 as well as $\frac{1}{2}$
[a, b]	Accept values between a and b inclusive.
3.14...	Allow answers which begin 3.14 e.g. 3.14, 3.142, 3.1416
Use of brackets	It is not necessary to see the bracketed work to award the marks.

Examiners should consistently apply the following principles

Diagrams

Diagrams that have working on them should be treated like normal responses. If a diagram has been written on but the correct response is within the answer space, the work within the answer space should be marked. Working on diagrams that contradicts work within the answer space is not to be considered as choice but as working, and is not, therefore, penalised.

Responses which appear to come from incorrect methods

Whenever there is doubt as to whether a student has used an incorrect method to obtain an answer, as a general principle, the benefit of doubt must be given to the student. In cases where there is no doubt that the answer has come from incorrect working then the student should be penalised.

Questions which ask students to show working

Instructions on marking will be given but usually marks are not awarded to students who show no working.

Questions which do not ask students to show working

As a general principle, a correct response is awarded full marks.

Misread or miscopy

Students often copy values from a question incorrectly. If the examiner thinks that the student has made a genuine misread, then only the accuracy marks (A or B marks), up to a maximum of 2 marks are penalised. The method marks can still be awarded.

Further work

Once the correct answer has been seen, further working may be ignored unless it goes on to contradict the correct answer.

Choice

When a choice of answers and/or methods is given, mark each attempt. If both methods are valid then M marks can be awarded but any incorrect answer or method would result in marks being lost.

Work not replaced

Erased or crossed out work that is still legible should be marked.

Work replaced

Erased or crossed out work that has been replaced is not awarded marks.

Premature approximation

Rounding off too early can lead to inaccuracy in the final answer. This should be penalised by 1 mark unless instructed otherwise.

Q1.

(a) 15

B1

(b) $30 \div 6 (= 5)$ or $30 \div 3$

or

$$(15 -) \frac{15}{3}$$

or

$$15 \div 3 (\times 2)$$

oe

eg $360 \div 30 (= 12)$ and $(180 - 60) \div$ their 12

eg $180 - 60 (= 120)$ and $\frac{\text{their } 120}{360} \times 30$

may be using their (a) for 15 (but not an angle)

M1

10

ft their (a) – 5 or their (a) $\div 3 \times 2$ but must be integer answer for
A1

A1ft

[3]

Q2.

- (a) 1.5 or 1 and a half

*Condone change of units
ie accept 1 hour 30 minutes
or 90 minutes*

B1

- (b) Any one correct fact seen

Cycling is

$\frac{120}{360}$ or 120° or $\frac{2}{3}$ or $\frac{1}{3}$ or 33(...)%

2 hours or $\frac{2}{6}$ or $\frac{1}{3}$ or 33(...)%

or

Swimming or Running is 90° or $\frac{90}{360}$ or $\frac{1}{4}$ or 25%

or

Swimming is 1.5 hours

or

Stretching and Cycling or

Swimming and Running is 180° or $\frac{180}{360}$ or $\frac{3}{6}$ or $\frac{1}{2}$ or 50%

3 hours or $\frac{3}{6}$ or $\frac{1}{2}$ or 50%

May be seen on diagram

Must be linked with correct activity

*Running is 1.5 hours has already been tested in part (a) so M0 if
no other fact seen*

M1

Stretching is $\frac{60}{360}$ or 60 or 1 hour

oe

May be seen on diagram or implied by final answer

A1

$\frac{1}{6}$

SC1 any fraction given with its correct simplest form

or

SC1 Answer $\frac{1}{3}$

A1

[4]

Q3.

(Number of girls =) $\frac{360}{36} \times 5$ or 50
 oe
Check diagram for working

M1

Blue eyed girls = 3×5

$\frac{108}{360} \times 50$
 or 15

M1

(Number of boys =) $2 \times 4^2 (\times \pi)$ or 32

or $\left(\frac{4}{5}\right)^2 \times 50 (\times \pi)$

oe

M1

Blue eyed boys = their $32 \div 4$ or 8

Dependent on 3rd M

M1dep

23

Must see 32 and 50

A1

[5]

Q4.

Fully labelled diagram with angles

Half-Marathon 90°

5K 126°

10K 72°

Marathon 72°

tolerance $\pm 2^\circ$ for drawing

B3 Angles correct but not labelled or wrongly labelled or angles correctly calculated and labelled but wrongly drawn.

Part Marks to maximum of 3

*B1 Half Marathon 90° **and** labelled*

B1 10K and Marathon equal angles or equal angles stated but drawn wrongly and labelled.

B1 5K 126° and labelled

The following only to be awarded if nothing drawn, or if working scores more than the diagram.

B1 Working to show each angle for women = 18° .

B1 all correct numbers of women in each category calculated, ie 5 for HM, 7 for 5K, 4 each for 5K and M.

B4

[4]

Q5.

Alternative method 1

$$360 - 90 - 78 - 48 \quad \text{or} \quad 144$$

oe

may be seen on the diagram

M1

$$120 \times 360 \div 90 \quad \text{or} \quad 480$$

oe eg 120×4

M1

$$\frac{\text{their } 144}{360} \times \text{their } 480$$

oe

dep on M2

M1dep

$$192$$

A1

Alternative method 2

$$360 - 90 - 78 - 48 \quad \text{or} \quad 144$$

oe

may be seen on the diagram

M1

$$120 \div 90 \quad \text{or} \quad \frac{4}{3}$$

or

$$90 \div 120 \quad \text{or} \quad \frac{3}{4}$$

oe

M1

$$\text{their } 144 \times \frac{120}{90}$$

oe eg $144 \div \frac{90}{120} \quad \text{or} \quad 16 \times 12$
dep on M2

M1dep

$$192$$

A1

Alternative method 3

$$360 - 90 - 78 - 48 \quad \text{or} \quad 144$$

oe

may be seen on the diagram

M1

$$\text{their } 144 \div 90 \quad \text{or} \quad \frac{8}{5}$$

or

$$90 \div \text{their } 144 \quad \text{or} \quad \frac{5}{8}$$

oe

M1dep

$$120 \times \frac{144}{90}$$

oe eg $120 \div \frac{90}{144}$

M1dep

192

A1

Additional Guidance

M1 may be awarded for correct work with no answer or incorrect answer, even if this is seen amongst multiple attempts

Allow $\times 1.3(3\dots)$ if seen for method for four thirds

[4]

Q6.

162 or 108 or 36 or 18
 ± 2

B1

$\frac{\text{their } 162}{360} \times 100 (= [44, 46])$
oe

M1

[44, 46] and Yes

A1

Alternative method 1

198 (± 2)

198 (± 2)

B1

$\frac{\text{their } 198}{360} \times 100 (= [54, 56])$
oe $\frac{\text{their } 198}{360} \times 100 (= [54, 56])$

M1

[54, 56] and 60 and Yes

[54, 56] and 45 and Yes

A1

Alternative method 2

162 or 108 or 36 or 18
 ± 2

B1

$0.4 \times 360 (= 144)$

oe

M1

144 and [160, 164] and Yes

A1

Alternative method 3

198

± 2

B1

$0.6 \times 360 (= 216)$

oe

M1

216 and [196, 200] and Yes

A1

Alternative method 4

30% or 10% or 5%

$\pm 1\%$

B1

their 30% + their 10% + their 5%

oe At least one percentage must be in tolerance

M1 dep

[44, 46] and Yes

A1

[3]

Q7.

(a) $\frac{90}{360} (\times 100)$ or $360 \div 90 = 4$ oe

25

M1

A1

(b) Correct comparison of England with one or more countries

Strand (ii)

eg Sales in England were the same as

(total) sales in Northern Ireland, Scotland and Wales

Sales in England were twice sales in Scotland

Sales in England were three times sales in Wales

Q1

(c) (Wales =) 60° or $\frac{1}{6}$

Allow $\pm 2^\circ$

May be implied

or $1^\circ = 500$ or $10^\circ = 5000$

or (NI =) 15 000

Values may be on pie chart

or (Scot =) 45 000

or (Eng =) 90 000

B1

$360 \div \text{their } 60 \times 30\,000$

or

$6 \times 30\,000$

or

$45\,000 \times 4$

oe

or

their 15 000 + their 45 000 + their 90 000 (+ 30 000)

*NI + Scot + Eng with **two** of NI, Scot or Eng correct (condone Wales missing)*

or

$(15\,000 + 30\,000 + 45\,000) (\times 2)$

*(Doubles) (NI + Wales + Scot) with NI **and** Scot correct*

M1

180 000

Accept integer in range [174 194, 186 206] from angle [58, 62]

If 60° used must have 180 000

A1

[6]

Q8.

(a) $\frac{18}{360}$
 $\frac{1}{20}$

M1

A1

(b) $360 - (168 + 54 + 18)$ or 120 seen

M1

$\frac{360}{120} \times 940$ or 3×940
or $\frac{940}{120} \times 360$ oe

M1

2820

A1

[5]

Q9.

Fully correct labelled pie chart

B3 Two or three correct sectors and four sectors labelled correctly

B3 Fully correct but incomplete or no labels

Spain 180°

Portugal 90°

Turkey 30°

B2 All angles calculated

Other 60°

B2 Two or three sectors correct but incomplete or no labels

Tolerance $\pm 2^\circ$

B1 At least one angle calculated in table

B1 One sector drawn and labelled correctly

B4

[4]

Q10.

- (a) $60(^{\circ})$ seen or implied

Accept [58, 62]

May be on the diagram

B1

$$\frac{360}{60}$$

$$\times 3 \text{ oe}$$

Accept these valid statements

20(^{\circ}) seen

9 films = 180(^{\circ})

3 (+) 6 (+) 9

$$\frac{360}{60}$$

$$(= 6)$$

$$\frac{1}{6}$$

$$60 \times 6$$

M1

18

*SC1 Comedy angle $120^{\circ} (\pm 2(^{\circ}))$ used **and** answer 9*

A1

- (b) $[118^{\circ}, 122^{\circ}] \div \text{their } 60 \times 3$

or 6 seen (may be on the diagram in the Romance section)

3 $\times$ 2 or romance is double comedy

M1

3

A1

[5]

Q11.

(a) (i) 20

B1

(ii) As 115 divided by 4 does not give a whole number
oe

B1

(b) (i) 75

B1

(ii) $80 + 115 + 75 (= 270)$

or

$5 + 25 + 40 (= 70)$

$115 - 25 (= 90)$

or $75 - 40 (= 35)$

M1

their 270 – their 70

their 75 + their 90 + their 35

M1 dep

200

SC1 340 or 165 or 125

A1

(c) (i) White or W

B1

(ii) Silver or S or “black or white”

or “white or black” or “B or W”

or “W or B”

B1

(d) Ticks Cannot Tell and explains that they may be in the ‘other’ category

oe

B1

[9]

Q12.

(a) $120 \div 2$

oe $180 \div \left(\frac{360}{120} \right)$

M1

60

SC1 for $\frac{1}{2}$ or 180°

A1

(b) 72 ± 2 (degrees)

or 24 ± 1 people

B1

their 72

$\frac{360}{360} (\times 100)$ oe

M1

[19.4,20.6]

A1

[5]

Q13.

- (a) One correct method eg $0.3 \times 360 (= 108 \text{ degrees})$

M1

All correct angles drawn $\pm 2^\circ$

108, 72, 180

A1 one correct angle calculated or drawn

A2

Structure correct

Strand (iii)

3 sector pie chart with labels in correct order of size

Q1

- (b) $5 + 3 + 2 (= 10 \text{ (cups)})$

1 cup = 8

M1

$80 \div \text{their } 10 \times 5$

oe their 8×5

Award M2 for $80 \div 2$

M1

40

If 40 seen with cola, ignore further work

A1

- (c) (i) Any correct comment

eg orange most in morning

If quantified must be correct

B1

- (ii) Lemonade

B1**[9]****Q14.**

- (a) (i) Leisure and food

B1

(ii) $\frac{1}{4}$

oe

B1

- (b) (i) $240 \div 10 \times 3$ **or** 240×0.3

M1

72

A1

- (ii) 240×0.15

oe eg build up to $24 + 12$

M1

36

A1

- (c) $\frac{120}{360} \times 240$ **or** $240 \div 3 (= 80)$

M1

86 – their 80

M1 Dep

6

A1**[9]**

Q15.

- (a) **B** marked at three parts

0 - - B 1

B1

C marked at 0

B1

- (b) $60(^{\circ})$ or $\frac{1}{6}$ seen
 ± 2 or 60 walk or 50 cycle or 90 bus

B1

$$\frac{360}{\text{their } 60} \times 40$$

oe their 6×40 or $5 \times 40 + 40$

M1

240

Accept integer answer in range [232, 249]

SC2 Non-integer in range [232, 249]

A1 ft

- (c) $\frac{90}{360} (\times 252)$ or $\frac{1}{4} (\times 252)$
 oe

M1

63

A1

Alternative method

$$40 \times \frac{90}{\text{their } 60} + \frac{252 - \text{their } 240}{4}$$

M1

63

A1

[7]

Q16.

- (a) $3\,000\,000 \div 2$ oe

M1

1 500 000

SC1 digits 15

A1

- (b) $800\,000 + \text{their } 1\,500\,000 (= 2\,300\,000)$
 Ignore any working for Dan

M1

$3\,000\,000 \div 3 + 1\,450\,000 (= 2\,450\,000)$ oe

M1

Sally **and** 2 450 000 **and** 2 300 000

Accept 245 if clearly compared with 230

Only ft their part (a)

A1ft

[5]

Q17.

$$360 \div 5 \times 2 \text{ or } 360 \div 15 \times 4$$

M1

144° sector **drawn**

Tolerance 2°

A1

Major sector divided into two sectors with the larger sector labelled 'No' and the smaller sector labelled 'Don't know'

Strand (ii) Logical organised working

Accept any unambiguous representation of No and Don't know, eg N and D

Q1

[3]

Q18.

49 (%) seen or implied

B1

$$\text{their } 3.22 (\times 10^7) \div 51 (= 1\%)$$

$$\text{or their } 3.22 (\times 10^7) \div 51 \times 2 (= 2\%)$$

$$\text{or their } 3.22 (\times 10^7) \times \frac{66}{360}$$

oe

$$[631\,372, 631\,373]$$

$$1\,262\,745$$

$$5\,903\,333$$

M1

$$\text{their } 3.22 (\times 10^7) \div 51 \times 49$$

$$\text{or their } 3.22 (\times 10^7) - \frac{3.22 \times 2}{51}$$

$$\text{or their } 3.22 (\times 10^7) \times \frac{66}{360} \div 51$$

oe

$$[30\,937\,254, 30\,937\,255]$$

$$[115\,751, 115\,752]$$

M1dep

$$\text{their } 3.22 (\times 10^7) \div 51 \times 49 \times \frac{66}{360}$$

$$\text{or } (\text{their } 3.22 - \frac{3.22 \times 2}{51}) \times \frac{66}{360}$$

oe

M1dep

$$5\,671\,830 \text{ or } [5\,500\,000, 5\,700\,000]$$

oe

A1

$$5.67 \times 10^6 \text{ or } 6 \times 10^6$$

$$\text{or } [5.5 \times 10^6, 5.7 \times 10^6]$$

*ft **their** answer which may be rounded and given in standard form*

B1ft

Additional Guidance

$\times 10^7$ not required for method marks

Accept decimals to 2 dp or better

[6]

Q19.

$$\frac{40}{360}$$

→ 2 or 1 student = 20°

Oe

Not 20% = 1 student

M1

$$2 \times 9 \text{ or } 360 \div 20 \text{ or } 18$$

Calculating number failing first time

M1

$$\text{their } 18 \div 40 \times 100 \text{ or } 45$$

$$\text{or } 40\% = \text{their } 18 \text{ or } 20\% = 9$$

M1

$$0.6 \times \text{their } 45$$

$$\text{Or } 18 + 9$$

M1

$$27$$

A1

[5]

Q20.

$$140 - 110$$

$$90 \div 3$$

$$\text{or } 30$$

$$\text{or } 1800 \text{ is } 90^\circ$$

$$\text{or } 1800 \times 4$$

$$\text{or } 7200 \text{ seen}$$

$$\text{or } 1800 \div 90$$

$$\text{or } 7200 \div 360$$

$$\text{or } 20$$

oe

$$90 \div 1800 \text{ or } 0.05^\circ$$

1800 may be in sector D but must see 90

M1

$$1800 \div 90 \times 140 \text{ or } 2800$$

$$\text{or } 1800 \div 90 \times 110 \text{ or } 2200$$

$$\text{or } 1800 \div 90 \times 20 \text{ or } 400$$

$$\text{or } 1800 \div 90 \times 30$$

$$\text{or } 1800 \div 3$$

oe

$$140 \div 0.05 \text{ or } 2800$$

$$\text{or } 110 \div 0.05 \text{ or } 2200$$

$$\text{or } 20 \div 0.05 \text{ or } 400$$

$$\text{or } 30 \div 0.05$$

M1dep

$$600$$

SC1 for 150

A1

Additional Guidance

1800 is $\frac{1}{4}$, 7200 is the whole circle

M1

1800 is $\frac{1}{4}$

M0

[3]

Q21.

(a) **Alternative method 1**

360 – 171 or 189

M1

their 189 ÷ 3 or 63

M1dep

$$\frac{63}{360} \times 800 (= 140)$$

A1

Alternative method 2

$$\frac{171}{360} \times 800 \text{ or } 380$$

M1

(800 – their 380) or 420

M1dep

420 ÷ 3 (= 140)

A1

Alternative method 3

140 + 280 or 420°

M1

$$\frac{\text{their } 420}{800} \times 360 \text{ or } 189$$

oe

M1

360 – 180 = 171

A1

(b) Bar heights 380, 280 and 140

*B1 for one correct bar height
or 280 seen or 380 seen*

B2

Three bars with equal widths, equal gaps
and
correctly labelled vertical axis and bars labelled

B1

Consistent scale, starting at zero with at least two numbers given
Must be using a scale of at least 1 cm per 100 sales

B1

[7]

Q22.

Alternative method 1

360 – 110 or 250

or 360 – 110 – 110 or 140

May be seen on diagram oe

M1

3360 ÷ their 140 or 24

or 2640 (men) or 6000 (women)

Their 140 must be from 360 – 110 – 110 oe

M1dep

8640

SC2 4838 or 4839

A1

Alternative method 2

$$100 - \frac{110}{360} \times 100$$

or $100 - 30.5(\dots)$ or $100 - 30.6$

or $69.4(\dots\%)$ or $69.5(\%)$

$$\text{or } 100 - \frac{110}{360} \times 100 - \frac{110}{360} \times 100$$

or $100 - 30.5(\dots) - 30.5(\dots)$

or $100 - 30.6 - 30.6$

or $38.8(\dots\%)$ or $38.9(\%)$

May be seen on diagram

oe

M1

$3360 \div (\text{their } 69.4 - \text{their } 30.5)$

or $3360 \div \text{their } 38.8(\dots)$

or 86.4

$$\text{Their } 69.4 \text{ must be from } 100 - \frac{110}{360} \times 100$$

$$\text{Their } 30.5 \text{ must be from } \frac{110}{360} \times 100$$

M1dep

8640

SC2 4838 or 4839

A1

Alternative method 3

$$\frac{250}{360}x - \frac{110}{360}x = 3360$$

$$\text{or } m = \frac{110}{360} \times (m + 3360 + m)$$

$$\text{or } w = \frac{250}{360} \times (w + w - 3360)$$

Sets up a correct equation to work out total (x), men (m) or women (w)

oe

M1

$$x = 3360 \div \left(\frac{250 - 110}{360} \right)$$

or $m = 336000 \div 140$ or 2640

or $w = 840000 \div 140$ or 6000

oe

M1dep

8640

SC2 4838 or 4839

A1

Additional Guidance

Condone 8639.9... → answer 8640

M2 A1

2640 or 6000

M2

4838 and 4839 come from 3360 women

SC2

[3]

Q23.

(a) $18 \div 4$

4.5

oe

M1

(b) Valid criticism

eg

*One sector not labelled**Condone angles missing***A1**

(c) Valid comment

eg

*True statement as 9 hours is half the pie chart and BBC is less than half***B1**

(d) $\frac{2}{18} \times 360$ or 40

or states or implies that 18 is a factor of 360

oe

B1

Not correct and 40

or Not correct and 18 is a factor of 360

oe

M1**A1****[6]****Q24.**

90°

B1**[1]****Q25.**

(a) $360 - 72 - 90$ or 198

oe

$100(\%) - 20(\%) - 25(\%)$ or 55(%)

M1

their $198 \div 3 (\times 2)$ or 66 or 132

Correct line drawn implies M1M1

their $55 \div 3 (\times 2)$ or 18(.3...) or 36(.6...) or 37

M1

Correct line drawn within 2° and sections labelled correctly

*L in the section with [130°, 134°]**M in the section with [64°, 68°]***A1****Additional Guidance**

Correct line drawn must be a ruled line for A mark

Angles may be on the diagram

Mark diagram first, if line out of tolerance, check working for method marks

- (b) $16\,200 \div 360$ or 45
 or $360 \div 16\,200$ or 0.022...

$$\begin{array}{r} 72 \\ 360 \overline{) 16\,200} \end{array}$$

 or $16\,200 \times \frac{72}{360}$
 oe

M1

3240

A1

Additional Guidance

Do not ignore further working

$16\,200 - 3240 = 12\,960$

M1A0

$$\begin{array}{r} 3240 \\ 16200 \overline{) 16200} \end{array}$$
 on answer line

M1A0

$16\,200 \div 4 \div 90$

M1

$16\,200 \div 5$

M1

20% of 16 200 without further correct working

M0

[5]

Q26.

- (a) Exactly ten options
 VV VS VC VM
 SS SC SM
 CC CM
 MM

or

exactly sixteen options

VV VS VC VM
 SV SS SC SM
 CV CS CC CM
 MV MS MC MM

may be given as words

B1

any six correct options from the sixteen options

B2

Additional Guidance

Both correct sixteen options listed and correct ten options listed

B2

- (b) **Alternative method 1**

$360 \div 180$ or 2

implied by a correct angle

or

implied by a correctly drawn angle in pie chart $\pm 2^\circ$

M1

Any two of

$45 \times \text{their } 2$ or 90°

$75 \times \text{their } 2$ or 150°

$50 \times \text{their } 2$ or 100°

10 × their 2 or 20°

implied by any two correctly drawn angles in pie chart ± 2°

M1dep

Pie chart with four sectors drawn, two of which are correctly drawn with angles from 90°, 150°, 100° and 20°

± 2°

lines must be ruled

M1dep

Fully correct pie chart and sectors labelled with flavours

± 2°

lines must be ruled

A1

Alternative method 2

$45 \div 180 \times 100$ or 25%

or

$75 \div 180 \times 100$ or $41\frac{2}{3}\%$ or 42%

or

$50 \div 180 \times 100$ or $27\frac{7}{9}\%$ or 28%

or

$10 \div 180 \times 100$ or $5\frac{5}{9}\%$ or 6%

oe

M1

Any two of

$45 \div 180 \times 360$ or 90°

$75 \div 180 \times 360$ or 150°

$50 \div 180 \times 360$ or 100°

$10 \div 180 \times 360$ or 20°

implied by any two correctly drawn angles in pie chart ± 2°

M1dep

Pie chart with four sectors drawn, two of which are correctly drawn with angles from 90°, 150°, 100° and 20°

± 2°

lines must be ruled

M1dep

Fully correct pie chart and sectors labelled with flavours

± 2°

lines must be ruled

A1

Additional Guidance

All four sectors must be correctly labelled with letters or words for the accuracy mark

[6]

Q27.

Alternative method 1

$$\frac{450}{65 - 35} \text{ or } \frac{450}{30} \text{ or } 15$$

oe

M1

(360 – 65 – 35) × their 15
or 260 × their 15

oe

$$M2 \frac{260}{30} \times 450 \text{ or } 8.66(\dots) \times 450$$

or 8.67 × 450

M1dep

3900

A1

Alternative method 2

$$\frac{360}{65 - 35} \times 450 \text{ or } \frac{360}{30} \times 450$$

or 12 × 450 or 5400

oe

M1

$$\frac{360 - 65 - 35}{360} \times \text{their } 5400$$

$$\text{or } \frac{260}{30} \times \text{their } 5400$$

oe eg 0.72(…) × their 5400

M1dep

3900

A1

Additional Guidance

260 ÷ 30 = 8.6 and 8.6 × 450 fully correct working seen

M1M1A0

[3]

Q28.

(a) 360 – 75 – 165 or 120

oe

M1

their 120 ÷ 4 or 30
or their 120 ÷ 4 × 3 or 90

oe

implied by one correctly drawn angle in pie chart ± 2°

M1dep

30° sector labelled Green or G

and

90° sector labelled Red or R

± 2°

line must be ruled

A1

Additional Guidance

Both sectors must be correctly labelled with letters or words for the accuracy mark

(b) $\frac{75}{360}$ or $\frac{360}{75}$ or $\frac{600}{360}$ or $\frac{360}{600}$
 oe
 eg $75 \div 360$
 eg $0.208... \text{ or } 0.21 \text{ or } 4.8$
 or $1.66... \text{ or } 1.67 \text{ or } 0.6$

M1

125

A1

Additional Guidance

125 out of 600

M1A1

$$\frac{125}{600}$$

M1A0

[5]

Q29.

(a) $90 \div 4$

M1

22.5 oe

A1

(b) Valid improvement

eg *Label missing sector*

Add missing angles

B1

(c) Valid comment

Eg *True statement as 45 hours is half the pie chart and 'documentaries' is less than half*

B1

[4]

Q30.

Alternative method 1

$125 + x + x + 175 = 360$ oe

M1

$2x = 360 - 125 - 175$

or $x = 30$

M1

Their $\frac{205}{360} \times 4680$ oe

M1

2665

A1

Alternative method 2

$360 - 125$ or 235

M1

$235 - 175 \div 2$ or 30 oe

M1

Their $205 \div 360 \times 4680$ oe

M1

2665

A1

[4]

Q31.

(a) $360 - 162 - 40 - 90$ or 68

or

$$x + x + 162 + 40 + 90 = 360$$

oe eg $360 - 292$

or

$$2x + 292 = 360$$

M1

34

A1

Additional Guidance

$$68 \div 2$$

M1

68 may be embedded for M1

eg $68 + 162 + 40 + 90 = 360$

M1

eg $162 + 40 + 90 + 30 + 38 = 360$ (because 30 and 38 total 68)

M1

eg $162 + 40 + 90 + 34 + 34 = 360$ (34 needs to be selected to score A1)

M1

34 seen followed by answer 68

M1A0

135

(b) 90 or 1.5

90

or 135 or 0.66(...) or 0.67

or any correct method that would lead to answer 243

eg $\frac{162}{90} \times 135$ or $135 \div \frac{90}{162}$

or $\frac{162}{360} \times 135 \times 4$ or 0.45×540

or $135 \times 4 \div \frac{360}{162}$

or $162 + 162 \div 2$

or $135 + 108$ oe

M1 linking a correct angle with number of people

eg $90 \rightarrow 135$ or $\frac{1}{4} \rightarrow 135$

or $180 \rightarrow 270$ or $72 \rightarrow 108$

or

$135 \times 360 \div 90$ or 135×4 or 540

or

162

90 or 1.8

90

or 162 or 0.55(...) or 0.56

162

or 360 or 0.45 or 45%

360

or 162 or 2.22(...)

M2

243

A1

Additional Guidance

Up to M2 may be awarded for correct work with no answer, or incorrect answer, even if this is seen amongst multiple attempts

M1 may be seen as eg $90 = 135$

If shown on pie chart, just writing 135 in Computer sector is insufficient for

M1 unless 90 or $\frac{1}{4}$ also shown

Allow embedded fraction, even in an incorrect calculation for at least M1

$$\text{eg } \frac{90}{162} \times 135$$

M1

$$\text{eg } \frac{90}{135} \times 162$$

M2

Build-up must be correct or full method must be shown

243 from an incorrect method eg $135 + 40 + 68$

M0A0

[5]

Q32.

80 – 25 or 55

or

360 – 80 – 25 or 255

oe

implied by 1 degree = 2.4 people

or 5 degrees = 12 people

M1

$$\frac{132}{\text{their } 55} \times 360 \text{ or } 864$$

$$\text{or } \frac{132}{\text{their } 55} \times 80 \text{ or } 192$$

$$\text{or } \frac{132}{\text{their } 55} \times 25 \text{ or } 60$$

$$\text{or } \frac{132}{\text{their } 55} \times \text{their } 255$$

$$\text{or } \frac{132}{\text{their } 55} \times (80 + 25) \text{ or } 252$$

$$\text{or their } 255 \div \frac{132}{\text{their } 55}$$

oe

2.4 × their 255 is M2

12 × 51 is M2

2.4 × 105 is M2

M1dep

612

A1

Additional Guidance

Up to M2 may be awarded for correct work, with no answer or incorrect answer, even if this is seen amongst multiple attempts

[3]

Q33.

$$(8 + 9 + 9 + 6 + 9 + 10) \div 6$$

$$\text{or } 51 \div 6$$

$$\text{or } 8.5$$

oe

implied by 34

M1

$$162 \div 360 \times 100$$

$$\text{or } 45$$

oe

M1

$$4 \times \text{their } 8.5 + \text{their } 45$$

$$\text{or } 34 + 45$$

oe

dep on M2

M1dep

$$79$$

SC2 53.5 or 57.5

A1

Additional Guidance

Check table and pie chart for working

$$34 + 45\%$$

M1M1M1

[4]

Q34.

(a) **Alternative method 1**

$$375 + 400 + 1475 \text{ or } 2250$$

59

$$\text{or } 13 \text{ seen or } \frac{59}{90} \text{ seen}$$

$$\text{or } [0.65, 0.66] \text{ seen}$$

oe

for 375 allow 350 or 370 or 380 or 400

for 1475 allow 1450 or 1470 or 1480 or 1500

$$\text{eg } 400 + 400 + 1500$$

any estimated values must be seen eg only seeing 2300 is M0

M1

1475

$$375 + 400 + 1475 \times 29 \ 250$$

$$\text{or } 1475 \times 13$$

$$\text{or } [0.65, 0.66] \times 29 \ 250$$

$$\text{or } [19012.5, 19305]$$

oe

for 375 allow 350 or 370 or 380 or 400

for 1475 allow 1450 or 1470 or 1480 or 1500

for 29 250 allow 29 000 or 29 200 or 29 300 or 29 500 or 30 000

M1dep

$$19 \ 175$$

A1

Alternative method 2

[234, 238]

*may be on the diagram***M1**their [234, 238]360 $\times 29\,250$ or their [234, 238] $\times 81.25$ *oe**for 29 250 allow 29 000 or 29 200 or 29 300 or 29 500 or 30 000***M1dep**

19 175

A1**Additional Guidance** $375 + 400 + 1475 = 2250$

If they subsequently estimate 2250 no further marks can be scored

M1

Answer 19 175 is M1M1A1 unless it comes from rounding or truncating

eg1 Alt 1 $0.65555 \times 29\,250 = 19\,175$ **M1M1A1**eg2 Alt 1 $0.65555 \times 29\,250 = 19\,174.8$ Answer 19 175**M1M1A0**

Alt 2 if their angle is outside the range [234, 238]

M0M0A0

(b) It is lower than the answer to part (a)

B1**[4]****Q35.****Alternative method 1** $64 + x + x + 24 = 360$ *oe***M1** $2x = 360 - 24 - 64$ or $x = 136$ **M1**their $\frac{136}{360} \times 5220$ *oe***M1**

1972

A1

Alternative method 2

360 – 64 or 296

M1

$$\frac{296 - 24}{2}$$

or 136 oe

M1

$$\frac{136}{360}$$

their $\frac{136}{360} \times 5220$ oe**M1**

1972

A1**[4]****Q36.**

360 – 50 or 310(°)

*Allow [86, 86.2](%) or [0.86, 0.862]***M1**

15074 × 13.7 or [206 513, 206 514]

oe

M1

their 310 ÷ 360 × their 206 513. ... or

their 86 ÷ 100 × their 206 513. ...

oe

*dep on second M***M1dep**

[177 571, 178 025]

*May be implied by correct method and 177 000 or 178 000 or 180 000***A1**

180 000

*ft any answer > 2sf correctly rounded***B1ft****Alternative method 1**

360 – 50 or 310(°)

*Allow [86, 86.2](%) or [0.86, 0.862]***M1**

their 310 ÷ 360 × 13.7 or

their 86 ÷ 100 × 13.7 or

[11.78, 11.81]

oe

M1

15074 × their [11.78, 11.81]

oe

*dep on second M***M1dep**

[177 571, 178 025]

*May be implied by correct method and 177 000 or 178 000 or 180 000***A1**

180 000

*ft any answer > 2sf correctly rounded***B1ft**

Alternative method 2

$360 - 50$ or $310(^{\circ})$

Allow $[86, 86.2](\%)$ or $[0.86, 0.862]$

M1

their $310 \div 360 \times 15074$ or

their $86 \div 100 \times 15074$ or

$12980. \dots$ or $[12\,963, 12\,994]$

M1

$13.7 \times$ their $12\,980. \dots$

M1dep

$[177\,571, 178\,025]$

May be implied by correct method and $177\,000$ or $178\,000$ or $180\,000$

A1

$180\,000$

ft any answer $> 2sf$ correctly rounded

B1ft

Alternative method 3

15074×13.7 or $[206\,513, 206\,514]$

M1

$50 \div 360 \times$ their $206\,513. \dots$ or

$28\,682. \dots$ or $[28\,498, 28\,912]$

oe

Condone $[0.138, 0.14]$ for $50 \div 360$

M1

their $206\,513.8 -$ their $28\,682. \dots$

oe

M1dep

$[177\,571, 178\,025]$

May be implied by correct method and $177\,000$ or $178\,000$ or $180\,000$

A1

$180\,000$

ft any answer $> 2sf$ correctly rounded

B1ft

Alternative method 4

15074×13.7 or $[206\,513, 206\,514]$

M1

$50 \div 360 \times 13.7$ or $[1.89, 1.92]$

oe

Condone $[0.138, 0.14]$ for $50 \div 360$

M1

their $206\,513.8 - 15\,074 \times$ their $1.9\dots$

oe

M1dep

$[177\,571, 178\,025]$

May be implied by correct method and $177\,000$ or $178\,000$ or $180\,000$

A1

$180\,000$

ft any answer $> 2sf$ correctly rounded

B1ft

Alternative method 5

15074×13.7 or $[206\,513, 206\,514]$

M1

$50 \div 360 \times 15074$ or

2093. ... or $[2080, 2110.4]$

oe

Condone $[0.138, 0.14]$ for $50 \div 360$

M1

their $206\,513.8 - 13.7 \times$ their 2093. ...

oe

M1dep

$[177\,571, 178\,025]$

*May be implied by correct method and 177 000 or
178 000 or 180 000*

A1

180 000

ft any answer > 2sf correctly rounded

B1ft**[5]**