

8300

GCSE MATHEMATICS

Foundation and Higher tier – Questions by Topic – Mark Scheme

Ratio, proportion and rates of change

Sharing amounts in a given ratio (non-calculator)

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) $30 \div (7 + 3)$ or 3
oe

21

M1

A1

(b) $12 \div 3$ or 4

M1

4×7 or 28

M1dep

40

SC1 50

A1

[5]

Q2.

$3 + 7$ or 10

implied by 10 symbols or 6.2

M1

$62 \div \text{their } 10 \times 3$

or 6.2×3 or 18.6

or

$62 \div \text{their } 10 \times 7$

or 6.2×7 or 43.4

oe full method to work out either number

M1dep

18.6 or $\frac{93}{5}$ or $18\frac{3}{5}$

and

43.4 or $\frac{217}{5}$ or $43\frac{2}{5}$

*oe decimals, fractions or mixed numbers
either order*

A1

Additional Guidance

18.6 and 43.4 in working, but truncated or rounded to 18 or 19 and 43 on the answer line

M1M1A1

$62 = 10x$

M1

$\frac{x}{62} = \frac{3}{10}$ or $\frac{y}{62} = \frac{7}{10}$

M1

[3]

Q3.

Alternative method 1 – using the given scale

(O) $20 \div 5$ or (A) $8 \div 2$ or 4

or (O) $5 \div 20$ or (A) $2 \div 8$ or $\frac{1}{4}$
oe

M1

their 4×3 or $3 \div$ their $\frac{1}{4}$

or

their $4 \times$ their $(5 + 3 + 2) - 20 - 8$

or 12

*20 – 8 implies M2
may be on diagram*

M1dep

Correct width bar, in the correct position, drawn to height of 12

mark intention, ignore any shading

A1**Alternative method 2 – using squares**

(O) $10 \div 5$

or (A) $4 \div 2$

or 2 (squares)

M1

their 2×3

or 6 (squares)

*10 – 4 implies M2
may be on diagram*

M1dep

Correct width bar, in the correct position, drawn to height of 12

mark intention, ignore any shading

A1**Additional Guidance**

$(20 + 8) \div (5 + 2)$

M1

$(10 + 4) \div (5 + 2)$

M1**[3]****Q4.**

Alternative method 1

$2400 \div (3 + 5)$

$\text{or } 2400 \div 8$

$\text{or } 300$

$\text{oe accept } \frac{1}{8} \text{ of } 2400$

M1

$5 \times \text{their } 300 \text{ or } 1500$

 or

$3 \times \text{their } 300 \text{ or } 900$

 or

$\text{their } 300 \div 6 \text{ or } 50$

 oe **M1dep**

$5 \times \text{their } 300 \div 6$

 oe or

$(2400 - 3 \times \text{their } 300) \div 6$

 or

$1500 \div 6$

M1dep

250

A1**Alternative method 2**

$2400 \div 6 \text{ or } 400$

 oe **M1**

$\text{their } 400 \div (3 + 5) \text{ or } 50$

 $\text{oe } 2400 \div 48 \text{ scores } M1M1$ **M1dep**

$5 \times \text{their } 50$

$\text{or } 400 - (3 \times \text{their } 50)$

 oe **M1dep**

250

A1**Additional Guidance**

Answer 400 with 1500 or 900 in working

M1M1M0A0

Answer 400 with 250 in working

M1M1M1A0

Condone incorrect representation of a division if recovered

$\text{eg } 8 \div 2400 = 300$

M1**[4]****Q5.**

Alternative method 1 - Finding the value of one part first

$35 \div (6 + 1) \text{ or } 5$

oe

M1

$6 \times \text{their } 5 \text{ or } 30$

or

$(6 - 1) \times \text{their } 5$

oe

M1dep

25

A1**Alternative method 2 - Finding the difference in the number of parts first**

$6 - 1 \text{ or } 5$

oe

M1

$\frac{\text{their } 5}{6+1} \times 35 \text{ or } \frac{5}{7} \times 35$

oe

M1dep

25

A1**Additional Guidance**

Allow a maximum of one error overall in build-up methods

[3]**Q6.**

$405 \div (4 + 11) \text{ or } 405 \div 15 \text{ or } 27$

or build up in 15s to 405

*Clear intention to divide**Do not accept $15 \div 405$ unless clearly recovered***M1**

their 27×4 or 108

or

their 27×11 or 297

M1dep

108 and 297

A1**Additional Guidance**

297 and 108

M1M1A0

Answer 108 : 297

M1M1A1

Partial build up using ratios from 4 : 11 (eg 104 : 286) is 0 marks unless correct answer achieved

M0M0A0If 405 is divided by 10 and then divided by 5 this is M0 unless $405 \div 15$ was clearly seen first, then it is M1M0A0**[3]****Q7.**

Alternative method 1

150 ÷ (5 – 2) or 150 ÷ 3 or 50

M1

their 50 × 7

or their 50 × 5 or 250

and their 50 × 2 or 100

M1dep

350

SC1 210

A1**Alternative method 2**

$$\frac{5}{2} = \frac{x+150}{x}$$

oe $5x = 2(x + 150)$

M1

(x =) 100 and (x + 150 =) 250

M1

350

SC1 210

A1**Additional Guidance**

250 and 100 is at least M1M1

[3]**Q8.**

270 ÷ (3 + 2 + 1)

M1

45

No wrong working seen

A1

135, 90, 45

ft their 45 if all values correctly evaluated

Values must be written in order

Correct answer only full marks

Incorrect answer only with 45 as a part ratio is not M1, A1

NB *Build up method must be fully correct*

A1ft**Additional Guidance**

Be careful of correct answers from wrong work.

$$\text{eg } 270 \div 3 = 90, 270 \div 2 = 135, 270 \div 1 = 270 \quad 135 : 90 : 270$$

M0

$$\text{eg } 270 \div 3 = 90, 270 \div 2 = 135, 90 \div 2 = 45, \quad 135 : 90 : 45$$

M0

$$270 \div 6 = 35$$

$$105 : 70 : 35$$

M1, A0

A1ft

$$270 \div 6 = 45$$

$$145 : 90 : 45$$

M1, A1

A0

$$270 \div 6 = 45$$

$$45 : 135 : 90$$

M1, A1

A0

$$270 \div 6 = 41.2$$

$$123.2 : 82.4 : 41.2$$

M1, A0

A0ft

$$270 \div 6 = 41.2$$

$$123.6 : 82.4 : 41.2$$

$$124 : 82 : 41$$

Ignore rounding after correct ft

M1, A0

A1ft

$$270 \div 6 = 41.2$$

$$124 : 82 : 41$$

Answer do not ft.

No intermediate values

M1, A0

A0ft

$$135 : 45 : 90$$

No working, not in order

M0

$$145 : 90 : 45$$

No working, not correct

M0

$$3 + 2 + 1 = 5$$

$$270 \div 5 = 54$$

$$162 : 108 : 54$$

No working, not in order

M1, A0

A1ft

$$270 \div 5 = 54$$

$$162 : 108 : 54$$

M0

[3]

Q9.

$$\left(\frac{1}{2}\right) \times \pi \times 6 \times 6$$

oe

M1

$$\left(\frac{1}{2}\right) \times \pi \times 6 \times 6 \div 4$$

oe

M1dep

$$4.5\pi$$

oe

A1

[3]

Q10.

Alternative method 1

$$8 \times 2 \text{ or } 16$$

Implied by 8 : 16

M1

$$\text{their } 16 + 8 \text{ or } 24$$

$$8 \times 3$$

M1dep

$$48$$

A1

Alternative method 2

$$(1 + 2 = 3)$$

$$3 + 3 \text{ or } 6$$

M1

$$\text{their } 6 \times 8$$

Their 6 must be from 3 + 3

M1dep

$$48$$

A1

Additional Guidance

Beware 24 coming from incorrect working

e.g. Misread of 8 girls who do not sing in the show, leading to answer of 24

M1M1A0

[3]

Q11.

(a) Valid reason

eg there might be 20 sheep

or

the number of sheep could be any multiple of 10

or

the ratio may have been simplified

or

the numbers in the ratio do not have to be the actual numbers

B1

Additional Guidance

Ignore irrelevant statements but do not ignore contradictory statements

It doesn't mean 10 sheep it's just their ratio

B1

The total number of animals is unknown

Could be 50 sheep	B1
Could be 20 : 6	B1
There are 10 sheep for every 3 cows we just don't know the exact number (of sheep/cows or total)	B1
Could be 50 sheep and 18 cows (error seen)	B0
Could be $50 : 15 = 10 : 3 = 2 : 1$ (error seen)	B0
It's only a ratio	B0
There are 10 sheep for every 3 cows	B0
There could be more than 10 sheep and more than 3 cows	B0
There might be more than 10 sheep / might be more than 3 cows	B0
(b) Yes and valid working <i>eg Yes and $(4 \times 3 =) 12$ oe</i> <i>or</i> <i>Yes and 4×3 is less than 13 oe</i> <i>or</i> <i>Yes and $(13 \div 4 =) 3.25$ oe</i> <i>or</i> <i>Yes and $13 \div 4$ is more than 3 oe</i> <i>or</i> <i>Yes and $(13 \div 3 =) 4.3...$ oe</i> <i>or</i> <i>Yes and $13 \div 3$ is more than 4 oe</i>	B1
Additional Guidance	
'No' or 'Cannot tell' ticked	B0
Ignore irrelevant statements but do not ignore contradictory statements Allow correct reference to remainders or shortfalls in working eg Yes and $13 \div 4 = 3$ with one (goat) left over	B1
eg Yes and $13 \div 4 = 3$ r1	B1
eg Yes and $13 \div 4 = 3.1$	B0
Any evaluation must be fully correct or reference a remainder or shortfall eg Yes and $13 \div 4 = 3.2$	B0
Any comparative statement must be true eg Yes and $13 \div 4$ is less than 3	B0

[2]

Q12.

Alternative method 1: total amount of each colour (judgement accepted that ratio is not 4 : 3)

$60 \div (2 + 1)$ or 20 or 40

M1

80 + their 20 or 100

M1dep

$28 + 2 \times$ their 20 or 68

dep on first M1 only

M1dep

100 and 68 and No

A1

Alternative method 2: total of red and how much white should have been added or how much there should have been originally or how much there should be now

$60 \div (2 + 1)$ or 20 or 40

M1

80 + their 20 or 100

M1dep

their $100 \div 4 \times 3$ or 75

dep on M2

M1dep

$(75 - 2 \times 20 =)$ 35 and No

or

40 and $(75 - 28 =)$ 47 and No

or

75 and 68 and No

comparing 35 to 28

A1

Alternative method 3: total of white and how much red should have been added or how much there should have been originally or how much there should be now

$60 \div (2 + 1)$ or 20 or 40

M1

$28 + 2 \times$ their 20 or 68

M1dep

their $68 \div 3 \times 4$ or $90 \frac{2}{3}$ or $\frac{272}{3}$

dep on M2

M1dep

$(90 \frac{2}{3} - 20 =)$ $70 \frac{2}{3}$ and No

or 20 and $(90 \frac{2}{3} - 80 =)$ $10 \frac{2}{3}$ and No

or $90 \frac{2}{3}$ and 100 and No

comparing $70 \frac{2}{3}$ to 80

A1

Alternative method 4: total of red and what it should be for total amount of

paint

$60 \div (2 + 1)$ or 20 or 40

M1

80 + their 20 or 100

M1dep

$(60 + 80 + 28) \div (4 + 3) \times 4$ or 96

M1

100 and 96 and No

A1

Alternative method 5: total of white and what it should be for total amount of paint

$60 \div (2 + 1)$ or 20 or 40

M1

$28 + 2 \times$ their 20 or 68

M1dep

$(60 + 80 + 28) \div (4 + 3) \times 3$ or 72

M1

68 and 72 and No

A1

Additional Guidance

20 from $80 \div 4$ is incorrect

With no incorrect working, 'He should have added 76 red and 32 white' implies full marks

M1M1M1A1

'No' can be implied, eg on alt 1 accept 100 and 68 and 'He needs 7 more white'

M1M1M1A1

Condone dubious notation eg $20 : 40 + 80 : 28 = 100 : 68$, so No

M1M1M1A1

Ignore further work if 100 and 68 and No are seen

M1M1M1A1

Only works out the amounts of red and white there should be for the total amount of paint, eg, $168 \div 7 \times 4 = 96$ and $168 \div 7 \times 3 = 72$

M0M0M1A0

[4]

Q13.

90 ÷ 5 or 18

M1

2 × their 18 or 36

$$M2 \frac{2}{5} \times 90$$

M1dep

180 – 90 – their 36

oe eg 90 – their 36

M1dep

90

36

54

any order

A1

Additional Guidance

Beware of incorrect methods, eg dividing 180 by 5

$$180 \div 5 = 36$$

$$180 \div 2 = 90$$

$$180 - 90 - 36 = 54$$

Answer 90, 36, 54

MOMOM0A0

Beware of 18 coming from wrong working

$$90 \div 2 = 45$$

$$90 \div 5 = 18$$

$$90 \div 7 = \dots$$

However, it is not incorrect to work with $180 \div 10$

MOMOM0A0

Trial and Improvement scores 0 or 4

[4]

Q14.

$$240 \div (1 + 3) \quad \text{or} \quad 240 \div 4$$

or 60

oe

M1

180

A1

Additional Guidance

$240 \div 4$ and $240 \div 3$ is choice unless the answer comes from $240 \div 4$

60 : 180 or 180 : 60 with no answer chosen

M1A0

[2]

Q15.

$$7x = 2x + 20$$

or

$$\frac{x-20}{x} = \frac{2}{7}$$

or

$$\frac{x+20}{x} = \frac{7}{2}$$

or

$$20 \div (7 - 2) \text{ or } 20 \div 5 \text{ or } 4$$

oe

any letter

M1

$$7 \times 20 \div (7 - 2) \text{ or } 28$$

oe hours for History

or

$$2 \times 20 \div (7 - 2) \text{ or } 8$$

hours for French

or

$$(7 + 2) \times 20 \div (7 - 2)$$

total hours

M1dep

$$36$$

A1

[3]

Q16.

$$600 \div (9 + 6 + 5) (= 30)$$

M1

$$\text{their } 30 \times 9 \text{ or their } 30 \times 6$$

$$\text{or their } 30 \times 5$$

M1 dep

$$270 : 180 : 150$$

In any order

A1

[3]

Q17.

$$2 \text{ parts} = 10 \text{ marks}$$

M1

$$A (= 5 \text{ parts} =) 25 \text{ and } B (= 3 \text{ parts} =) 15$$

A1

$$A = 25, B = 15, C = 32$$

A1

Alternative method 1

Attempt to write equivalent ratios eg $10 : 6$, $15 : 9$

oe

eg writing consecutive multiples

5, 10, 15, ... and 3, 6, 9, ...

M1

$$(A)25 : 15(B)$$

25 : 15 selected

A1

$$A = 25, B = 15, C = 32$$

A1

Alternative method 2

$$\frac{m+10}{m} = \frac{5}{3}$$

oe eg $5m = 3(m+10)$

M1

$m = 15$, hence $m + 10 = 25$

A1

A = 25, B = 15, C = 32

A1

[3]

Q18.

Alternative method 1

$330 \div (7 + 4)$ or 30

oe

M1

7 × their 30 or 210

and

4 × their 30 or 120

oe

M1dep

45

A1

Alternative method 2

$330 \div (7 + 4)$ or 30

oe

M1

$(7 - 4) \times$ their 30 or 90

oe

M1dep

45

A1

Alternative method 3

$330 \div (7 + 4)$ or 30

oe

M1

7 × their 30 or 210

or 4 × their 30 or 120

and

$330 \div 2$ or 165

oe

M1dep

45

A1

Alternative method 4

$330 \div (7 + 4)$ or 30 oe

M1

their 30 × 1.5

oe

M1dep

45

A1

[3]

Q19.

$$21000 \div 7 \text{ or } 3000$$

oe

M1

$$5 \times 3000 \text{ or } 2 \times 3000$$

$$\text{or } 15000 \text{ or } 6000$$

M1

$$15000 \times 30 \text{ or } 450000$$

$$\text{or } 6000 \times 10 \text{ or } 60000$$

M1

$$(\pounds) 510000$$

A1

[4]

Q20.

Alternative method 1

$$1 \text{ part} = 6 \text{ bricks}$$

oe

M1

$$36 \text{ (yellow, blue and green)}$$

A1

$$12 \text{ (red)}$$

B1

$$36 + 12 = 48$$

B1

Alternative method 2

$$12 \text{ (red)}$$

B1

$$36 \div 6 \text{ or } 6$$

M1

$$\text{their } 6 \times 2$$

M1dep

$$12 \text{ (yellow)}$$

A1

Alternative method 3

$$6 \text{ parts} = 75\%$$

M1

$$8 \text{ parts} = 100\%$$

A1

$$1 \text{ part} = 6 \text{ bricks}$$

B1

$$8 \times 6 = 48$$

B1

[4]

Q21.

210 ÷ 7 or 30
or 7 ÷ 2 or 3.5
or 80 ÷ 2 or 40

M1

their 30 × 2
or 210 ÷ 3.5 or 60
or 9 × their 30
or their 40 × 7 or 280

M1dep

270 ml

SC1 for 360

A1

[3]

Q22.

1 (+) 2 (+) 6 (= 9)

oe eg a (+) 2a (+) 6a (= 9a)

M1

180 ÷ their 9 (= 20)

oe a = 180 ÷ 9 (= 20)

M1

6 × their 20

M1

120

A1

120 and Yes

Strand (iii)

M3 awarded and a correct decision based on their 120

SC3 30, 60 and 90 with 90 and No

SC2 30, 60 and 90

Q1

Alternative method using T & I

ratio 1:2:6 seen or implied in any order

M1

Correctly evaluated trial

eg 10 + 20 + 60 = 90

M1

2nd trial in ratio 1:2:6 correctly evaluated

eg 15 + 30 + 90 = 135

M1

120

A1

120 and Yes

Strand (iii)

M3 awarded and a correct decision based on their 120

SC3 30, 60 and 90 with 90 and No

SC2 30, 60 and 90

Q1

[5]

Q23.

(19, 9)

$$\frac{15+23}{2} = 19 \text{ or } \frac{6+12}{2} = 9$$

B1

(31 – their 19) $\times \frac{2}{3}$ or 8
or

(their 9 – 3) $\times \frac{2}{3}$ or 4

M1

their 19 – 8 or 11
or
their 9 + 4 or 13

M1

(11, 13)

A1

[4]

Q24.

2476 $\div$ (3 + 1) or 619
oe

M1

their 619 $\times$ (3 – 1) or their 619 $\times$ 2
or
2476 $\div$ (3 – 1) or 2476 $\div$ 2
or
their 619 $\times$ 3 – their 619
or
(2476 – their 619) – their 619
or
1857 – 619

oe

M1

1238

A1

Alternative method

(3 + 1) $\div$ (3 – 1) or 4 $\div$ 2
or
(3 – 1) $\div$ (3 + 1) or 2 $\div$ 4
oe

M1

2476 $\div$ their 2

or 2476 $\times$ their $\frac{1}{2}$
oe

M1

1238

A1

[3]

Q25.

$$12 \div 4 \quad \text{or} \quad 3$$

oe
may be on the diagram
may be seen in a ratio

M1

$$\pi \times \text{their } 3 \times \text{their } 3 \quad \text{or} \quad 9\pi$$

or [28.2, 28.3]

oe

M1dep

$$\pi \times 12 \times 12 \quad \text{or} \quad 144\pi$$

or [452.1, 452.45]

oe

M1

$$135\pi$$

SC2 135

A1

Additional Guidance

Condone eg $\pi 9$ for 9π

22

Condone use of 7 or 3.1 or better for π up to M3

Answer 135 with 135π in working

M1M1M1A0

Answer 135 without 135π in working

SC2

Answer [423.8, 424.3]

M1M1M1A0

[4]

Q26.

(a) $21 \div 7 \times 2 (= 6)$

or

$$21 \div 3 = 7 \text{ and } 6 \div 3 = 2$$

or

$$21 \div 7 = 3 \text{ and } 6 \div 2 = 3$$

or

$$7 \times 3 = 21 \text{ and } 2 \times 3 = 6$$

oe eg $6 \div 2 = 3$ and $7 \times 3 = 21$

B1

Additional Guidance

$3 \times 2 (= 6)$	B0
$7 : 2 (=) 21 : 6$ with no other working	B0
$7 : 2 (=) 21 : 6$ with multiplication by 3 shown by arrow(s)	B1
$7 : 2 (=) 14 : 4 (=) 21 : 6$	B1
Do not condone incorrect representation of a division eg $7 \div 21 = 3$	B0
Do not condone incorrect mathematical representation eg $21 \div 7 = 3 \times 2 = 6$	B0
$21 \div 6 = 3.5, 3.5 \times 2 = 7$	B1
$21 \times 2 = 42, 42 \div 7 = 6$	B1
(b) Alternative method 1	
$2 \times \pi \times 21$ or $\pi \times 42$ or 42π or $[131.88, 132]$ oe condone $[3.14, 3.142]$ for π	M1
$2 \times \pi \times 6 \div 4$ or $\pi \times 12 \div 4$ or 3π or $[9.4, 9.43]$ oe arc length of quarter circle condone $[3.14, 3.142]$ for π	M1
$2 \times \pi \times 6 \div 4 + 2 \times 6$ or $3\pi + 12$ or $[21.4, 21.43]$ oe dep on 2nd M1 this does not imply M1M1M1	M1dep
$45\pi + 12$	A1

Alternative method 2

$2 \times \pi \times 21$ or $\pi \times 42$
 or 42π
 or $[131.88, 132]$
 oe
 condone $[3.14, 3.142]$ for π

M1

$2 \times \pi \times 21$ and $2 \times \pi \times 6 \div 4$
 or 42π and 3π
 or
 $2 \times \pi \times 21 + 2 \times 6$ or $42\pi + 12$
 or $[143.88, 144]$
 oe eg 42π and $[9.4, 9.43]$
 or $[131.88, 132]$ and 3π

M1dep

$2 \times \pi \times 21 + 2 \times \pi \times 6 \div 4$
 or $42\pi + 3\pi$ or 45π
 or $[141, 141.43]$ or $[153, 153.43]$
 oe
 eg $42\pi + [9.4, 9.43]$
 or $[131.88, 132] + 3\pi$

M1dep

$45\pi + 12$

A1

Additional Guidance

Condone $3(15\pi + 4)$

M1M1M1A1

Condone, for example, $\pi 42$ for up to M1M1M1
 $21\pi + 3\pi + 12$

M0M1M1A0 on alt 1

$441\pi + 3\pi + 12$

M0M1M1A0 on alt 1

$42\pi + 36\pi + 12$

M1M1M0A0 on alt 2

$441\pi + 36\pi + 12$

M0M0M0A0

Using πr^2 instead of $2\pi r$ throughout

M0M0M0A0

$45\pi + 12$ in working with incorrect further work, eg $45\pi + 12 = 57\pi$

M1M1M1A0

[5]

Q27.

$\left(\frac{1}{2}\right) \times \pi \times 4 \times 4$ oe

M1

$\left(\frac{1}{2}\right) \times \pi \times 4 \times 4 \div 4$
 oe

M1dep

2π oe

A1

[3]

Q28.

Alternative method 1

$180 \div (5 + 7)$ or $180 \div 12$ or 15
oe

M1

$5 \times$ their 15
or $180 - 7 \times$ their 15 or 75
oe

M1dep

$180 -$ their 75 $- 20$
or $180 - 95$
oe

M1dep

85

A1**Alternative method 2**

$$x + \frac{7x}{5} = 180$$

$$\text{or } \frac{5y}{7} + y = 180 \text{ or } y = 105$$

oe correct elimination of a variable from equations $x + y = 180$
and $7x = 5y$

M1

$$(x=) 180 \times \frac{5}{12} \text{ or } (x=) 75$$

oe

M1dep

$180 -$ their 75 $- 20$
or $180 - 95$
oe

M1dep

85

A1**[4]****Q29.**

Alternative method 1

$$\frac{180}{9+3} \text{ or } 15$$

$$\text{oe eg } 180 \times \frac{1}{3+1} \text{ or } 180 \div 4$$

or

$$3 \times \frac{180}{9+3} \text{ or } 45$$

size of angle c

or

$$9 \times \frac{180}{9+3} \text{ or } 135$$

*size of angle a***M1**

$$5 \times \frac{180}{9+3} \text{ or } 5 \times 15 \text{ or } 75$$

or

$$7 \times \frac{180}{9+3}$$

or

$$(3+5+9) \times \frac{180}{9+3} \text{ or } 255$$

*oe**size of angle b***M1dep**

105

A1**Alternative method 2**

$$a:b:c:d=9:5:3:7$$

or

$$b:d=5:7$$

*oe**implied by d = 7***M1**

$$\frac{7}{9+5+3+7} \times 360 \text{ or } \frac{7}{24} \times 360$$

or

$$\frac{7}{5+7} \times 180 \text{ or } \frac{7}{12} \times 180$$

or

$$7 \times 15$$

*oe**allow numerator to be 5***M1dep**

105

A1**[3]**