

8300

GCSE MATHEMATICS

Foundation and Higher tier – Questions by Topic – Mark Scheme

Geometry

Nets of 3D shapes, plans and elevations

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.

29

*B2 answer 27, 28, 30 or 31
B1 answer 25, 26, 32 or 33
or $4 \times 4 \times 3$ or 48 (total cubes)
or $2 \times 3 \times 4$ or 24 (missing cuboid)
or 19 seen (cubes in original shape)*

B3

Additional Guidance

Beware of 29 or close to 29 arising from (clear) adding of the squares in the original diagrams. This alone is B0, however B1 can still be scored for either 48, 24 or 19 (or the appropriate products leading to 48 or 24)

[3]

Q2.

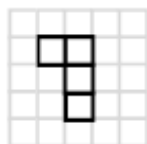
C

B1

[1]

Q3.

A



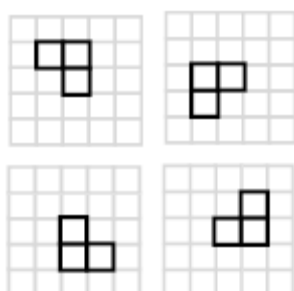
*Only outline needed. Can be anywhere on grid
Internal lines not necessary (may be dashed)
Shape may be shaded (even in chequer-board fashion)*

B1

*Only outline needed. Can be anywhere on grid
Internal lines not necessary (may be dashed)
Shape may be shaded (even in chequer-board fashion)*

B1

C

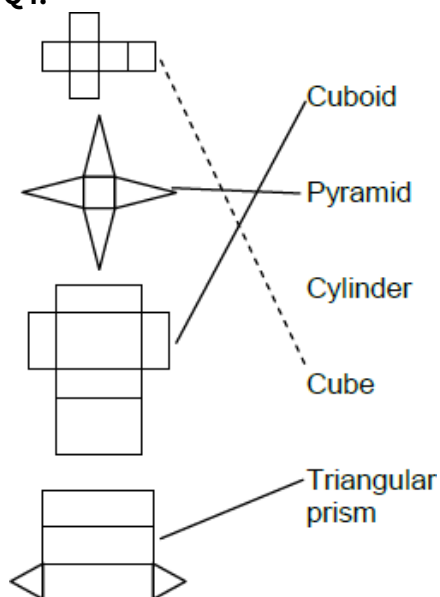


*Any orientation (as shown)
Only outline needed. Can be anywhere on grid
Internal lines not necessary (may be dashed)
Shape may be shaded (even in chequer-board fashion)*

B1

[3]

Q4.



B2 any two correct
B1 any one correct

B3

[3]

Q5.

Any product seen or implied of 2 numbers that make 12 or 15 or 20

M1

All three of 3, 4 and 5 stated or marked on diagram

M1dep

60

Answer only of 60 with no product seen is 3 marks

A1

$3 \times 4 \times 5$ or correctly evaluated product of their 3 sides, 2 of which must be correct

Strand (ii)

Product must be seen

Q1

Alternative method

Any one of 3, 4 or 5 seen on diagram (correctly for the net) or any sides of cuboid

M1

Side found and corresponding cross-section identified

M1dep

60

Answer only of 60 with no product seen is 3 marks

A1

Correct side and cross-section multiplied, ie 5×12 or 4×15 or 3×20

Strand (ii)

Product must be seen

Q1

Additional Guidance

Beware of 60 from incorrect work.

No incorrect work and answer of 60 is 3 marks

1 side correct maximum 1 mark

2 sides correct maximum 2 marks

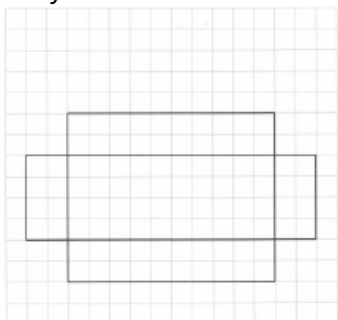
Use positive marking.

[4]

Q6.	6 correct faces	<i>B2 for 4 or 5 correct faces B1 for 2 or 3 correct faces</i>	B3	
				[3]
Q7.	Cuboid	<i>Do not accept: Cube</i>	B1	
	(Square based) Pyramid		B1	
	(Triangular) Prism		B1	
				[3]
Q8.	Fully correct sketch any orientation using grid	<i>B1 for at least 1 correct face</i>	B2	
				[2]
Q9.	Please note, actual measurements may have changed slightly on export/printing.			
	(a) Vertical line with height [6.9, 7.1] cm marked Point marked [2.4, 2.6] cm on base line from RHS (or from base of wall) Correct ladder drawn	<i>B1 for first or second criterion met</i>	B2	
	(b) [7.2, 7.7]	<i>ft with a tolerance of ± 2.5 mm (0.25 cm)</i>	B1ft	
				[3]
Q10.	(a) Yes Yes No Yes	<i>B1 For each correct answer</i>	B4	
	(b) 90 and 60 in either order	<i>Accept [90, 95] or [60, 65] B2 For one correct B1 Any size that will take all 4 parcels (i.e. > 95 and > 65)</i>	B3	
				[7]
Q11.	Correct net – all 6 faces	<i>Accept outline of net Ignore tabs B2 for 5 correct faces B1 for four 4×2 rectangles in a correct position or two 2×2 squares in a correct position</i>	B3	
				[3]

Q12.

Fully correct



*B2 adding a 10 by 4 rectangle and two 4 by 2 rectangles in correct positions
or
adding a 10 by 4 rectangle and 4 by 2 rectangle and 10 by 2 rectangle in correct positions*

B1 adding a 10 by 4 rectangle in correct position

SC2 Fully correct follow through net for 10 by x by 2 cuboid with

$$x \neq 4$$

B3

[3]

Q13.

cylinder

B1

[1]

Q14.

6 seen

May be on diagram

B1

$$\tan 70 = \frac{h}{(their 6) \div 2}$$

oe, x being an equal side of isosceles triangle

$$\sin 20 = \frac{3}{x}$$

$$\cos 70 = \frac{3}{x}$$

$$\frac{6}{\sin 40} = \frac{x}{\sin 70}$$

M1

$(h =) [8.2, 8.3]$

$[8.7, 8.8]$ eg 8.77

A1ft

$$\frac{1}{2} \times their 6 \times their h$$

M1

$$\frac{1}{2} \times their 6 \times their 8.77 \times \sin 70$$

$$or \frac{1}{2} \times their 8.77^2 \times \sin 40$$

$[24.3, 24.9]$

A1ft

[5]

Q15.

- (a)
- $(AB =) [9.8, 10.2]$
- (cm)
- or**

(1 cm represents)

 $[24.5, 25.5102041]$ (metres)*oe eg [3.9, 4.1] inches**May be seen on diagram***M1** $(AC =) 175 \div 250 \times \text{their } [9.8, 10.2]$ $(= [6.86, 7.14])$ (cm))*oe eg $175 \div \text{their } [24.5, 25.5102041]$* *(= [6.86, 7.14] (cm))**May be seen on diagram***M1**AC drawn with C on North line through B with $AC = [6.86, 7.14]$ *SC3 AC drawn with C on North line through B within tolerance shown on the overlay***A1**

- (b) Two arcs centre P with equal radii intersecting PQ and PS

*oe eg single arc intersecting PQ and PS**Allow intersection at Q***M1**Two intersecting arcs with equal radii **and** line from P to point of intersection*SC1 M0 but line within tolerance***A1**

[5]

Q16.

- (a) 16

*B1 Diagram showing 6 or 7 tables in a row with evidence of counting edges or people on the diagram**or**Calculation leading to 16 eg $7 + 7 + 2$* *or**(4) (6) (8) 10 12 14 (16)***B2**

- (b) Arrangement with exactly 12 tables in rows that will seat exactly 30 that has exactly one row of four tables and no single table. Eg
-
- One row of 6 and one row of 4 and one row of 2
-
- One row of 5 and one row of 4 and one row of 3

*B2 Arrangement with exactly 12 tables in rows that will seat [28, 32] that has exactly one row of four tables and no single table. Eg**One row of 4 and two rows of 3 and one row of 2 (32 people)**or**Arrangement with exactly 12 tables in rows that will seat exactly 30 people that does **not** have exactly one row of four tables or no single tables.**Eg**Two rows of 5 and one row of 2*

Three rows of 4

or

Arrangement with exactly 12 tables some not in rows that will seat exactly 30 people that has exactly one row of four tables and no single table
One 2 by 2 square, one row of 4 and two rows of 2

B1 Arrangement with [11, 13] tables that will seat [26, 34] people

that may or may **not** have exactly one row of four tables or no single table. Eg
One row of 4 and two rows of 3 and two single tables

Four rows of 3

One row of 4 and three rows of 3

One row of 4 and three rows of 2 and one single tables

B3

[5]

Q17.

(a) Hexagon → 6 sides

B1

Quadrilateral → 4 sides

B1

Pentagon → 5 sides

B1

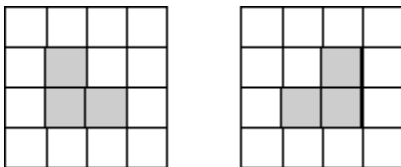
(b) C or (square based) pyramid

B1

[4]

Q18.

(a)



Drawings can be anywhere on the grids

B1 for shapes reversed

or B1 for one correct

B2

(b) $6 \times 2 + 3$

or $4 + 7 + 4$

or $2 + 2 + 2 + 2 + 7$

or 28

or 13

M1

15

SC1 for 17

A1

[4]

Q19.

- (a) Cube

B1

Additional Guidance

Cuboid

B0

- (b) Sphere

B1

Additional Guidance

Accept misspelling as long as intention to indicate sphere

B1

Spherical

B0

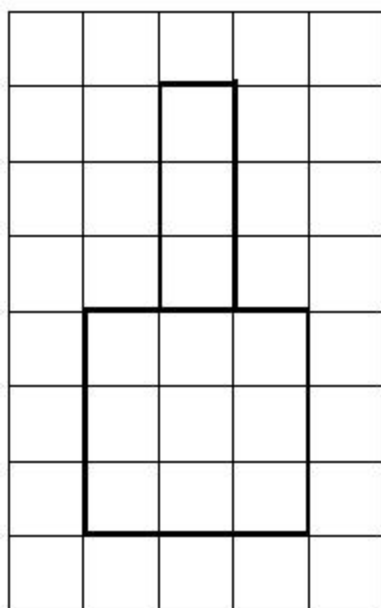
Ball

B0

[2]

Q20.

- (a)



Mark intention

3 cm by 3 cm square with 1 cm by 3 cm

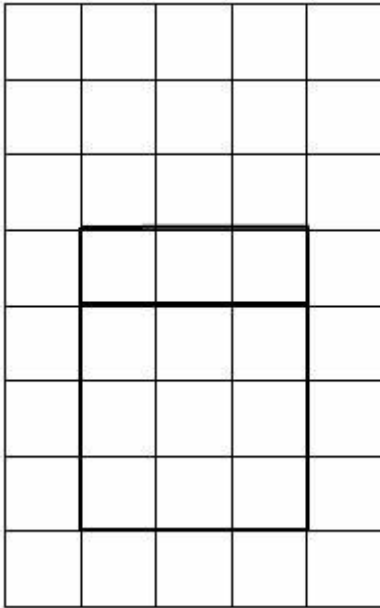
rectangle positioned centrally above

Must be correct size and orientation but

can be anywhere on the grid

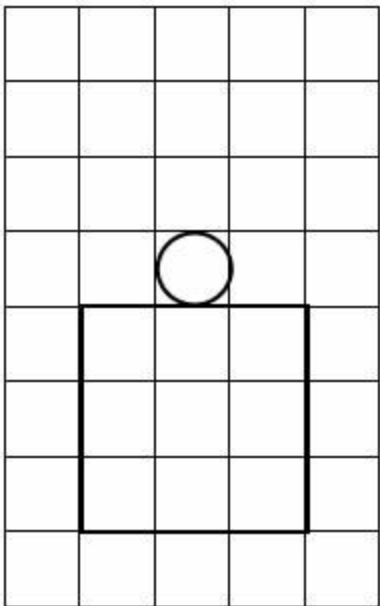
B1

(b)



Mark intention
3 cm by 3 cm square with 3 cm by 1 cm
rectangle above
Must be correct size and orientation but
can be anywhere on the grid
Elevations may be on either grid

B1



Mark intention
3 cm by 3 cm square with circle diameter
1 cm positioned centrally above
Must be correct size and orientation but
can be anywhere on the grid
Elevations may be on either grid

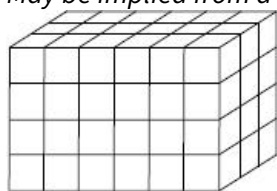
B1

[3]

Q21.

3, 4 and 6 chosen

May be implied from a diagram



72

M1

A1

[2]

Q22.

Rectangle with height 3 and width 2

any position on the grid

B1 rectangle with height 3 or width 2

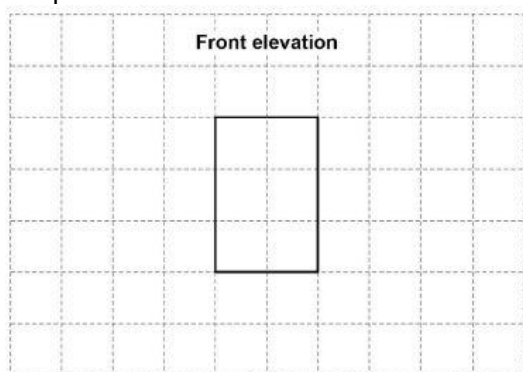
or rectangle with height 2 and width 3

or cuboid with rectangular front face height 3 and width 2

B2

Additional Guidance

Accept unruled lines



B2

[2]

Q23.

(a) Rectangle with horizontal sides 3 cm and vertical sides 2 cm

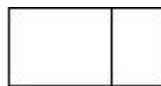
accept internal vertical line 1 cm from the right, but no other internal lines

B1

Additional Guidance



or



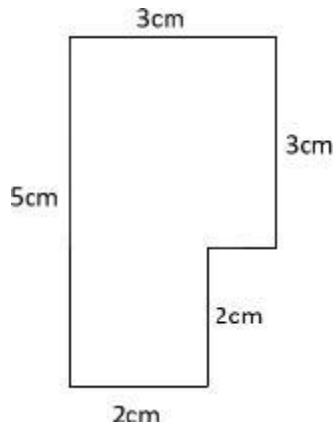
with dimensions 3 cm and 2 cm

B1

Do not accept other internal lines

Mark intention

(b)



any orientation

B1

Additional Guidance

Do not accept internal lines

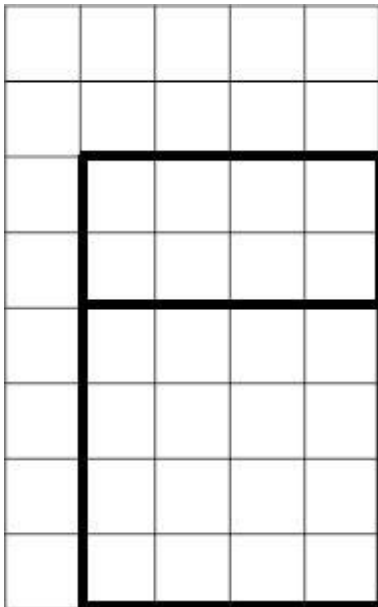
Do not accept a reflection

Mark intention

[2]

Q24.

(a)



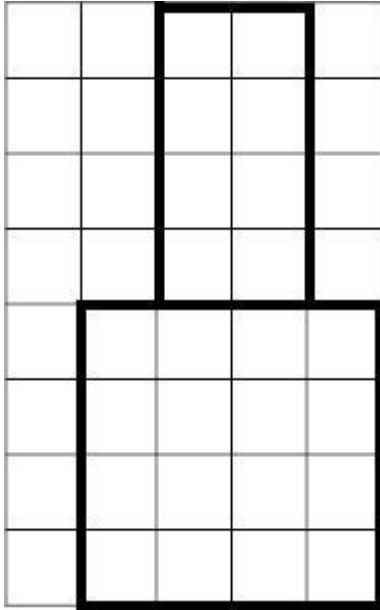
Mark intention

4 cm by 4 cm square with 4 cm by 2 cm rectangle positioned centrally above

Must be correct size and orientation but can be anywhere on the grid

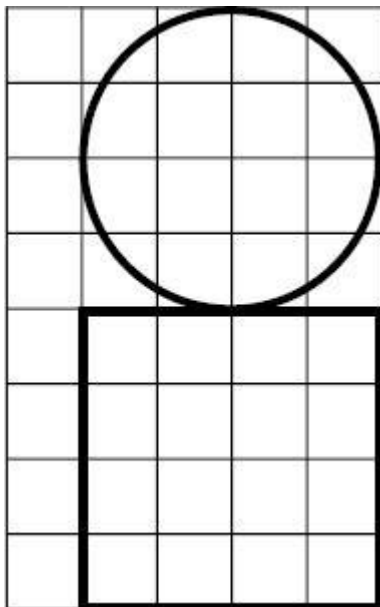
B1

(b)



Mark intention
4 cm by 4 cm square with 2 cm by 4 cm rectangle above.
Must be correct size and orientation but can be anywhere on the grid.
Elevations may be on either grid.

B1



Mark intention
4 cm by 4 cm square with circle diameter
4 cm positioned centrally above.
Must be correct size and orientation but can be anywhere on the grid.
Elevations may be on either grid.

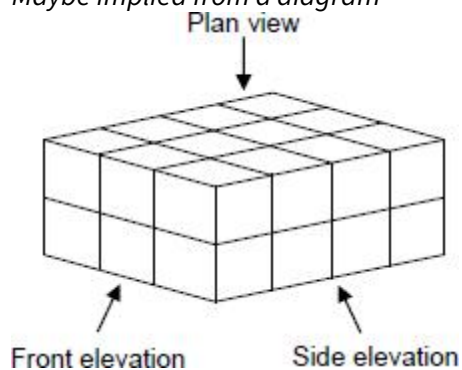
B1

[3]

Q25.

2, 3 and 4 chosen

Maybe implied from a diagram



M1

24

A1

[2]

Q26.

Please note, actual measurements may have changed slightly on export/printing.

(a) Circle with diameter 4 cm

diameter ± 5 mm

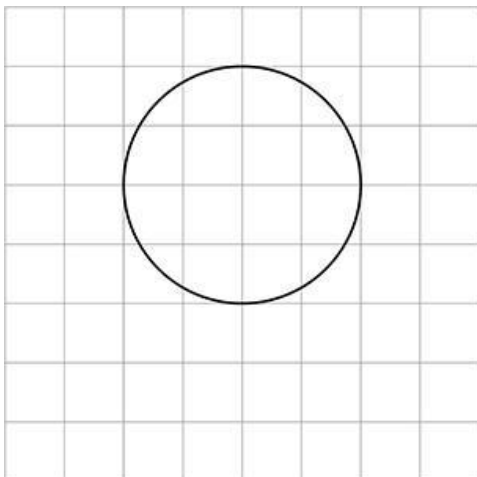
B1 for any circle

or $40 \div 10$ or 4

or (radius =) 2

B2

Additional Guidance



Can be anywhere on the grid

B2

Mark intention

Check stem and part (b) for evidence of 4 or 2

4 or 2 cannot be implied from a diagram for B1

(b) Rectangle with horizontal sides

4 cm and vertical sides 5.5 cm

± 2 mm

B1 for any rectangle or

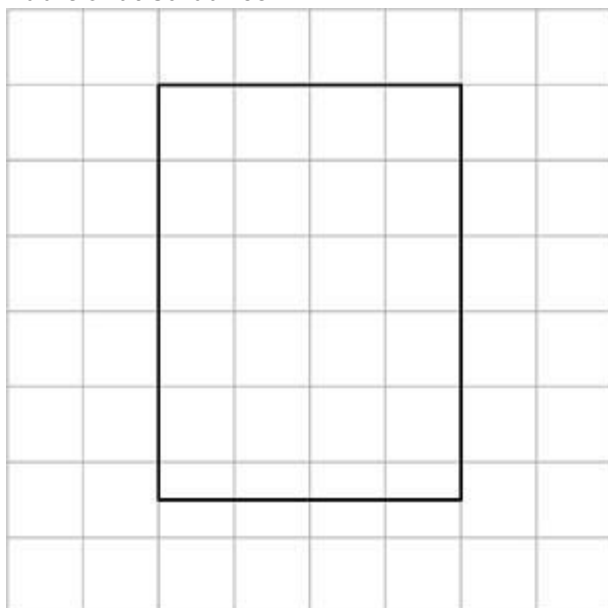
*$40 \div 10$ or 4 **and** $55 \div 10$ or 5.5*

SC2 for correct answers in (a) and (b) reversed (award 0 in (a)

and 2 in (b))

B2

Additional Guidance



Can be anywhere on the grid

B2

Mark intention

Do not accept curved corners on any rectangle

Check stem and part (a) for evidence of 4 and 5.5

4 and 5.5 cannot be implied from a diagram for B1

[4]

Q27.

72 (-) 6 or 66

or 63 (-) 6 or 57

large rectangle subtract missing rectangle, implied by volumes of 864 and 72

or

45 (+) 21 or 66

or 36 (+) 21 or 57

splits side elevation vertically, implied by volumes of 540 and 252

or

56 (+) 10 or 66

or 49 (+) 8 or 57

splits side elevation horizontally, implied by volumes of 672 and 120

oe

may be on diagram

M1

792 or 165

A1

Maximum 792 and Minimum 165

A1

[3]

Q28.

$$42 \div (2 \times 3) \quad \text{or} \quad 7$$

or

rectangle with height 2 cm

oe

implied by rectangle with one side 7 cm

M1

Rectangle with height 2 cm and width 7 cm

any position on the grid

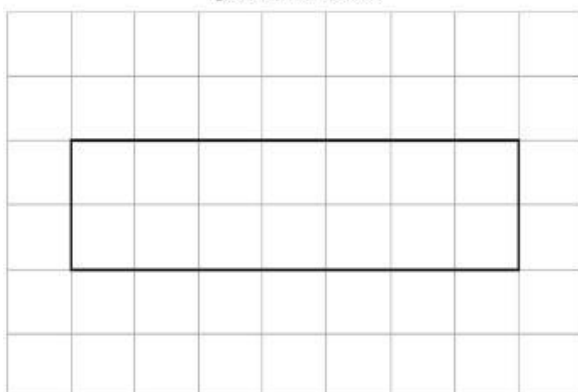
A1

Additional Guidance

Mark intention, condone interior lines

Accept unruled lines

Side elevation



M1A1

Cuboid with rectangle height 2 cm and / or width 7 cm

M1A0

[2]

Q29.

(a) $2 \times 1.9 \times \pi$ or 3.8π

or $[11.9, 11.94]$

oe

M1

$2 \times 1.9 \times \pi \times 10.2$

or

$3.8\pi \times 10.2$

or

their $[11.9, 11.94] \times 10.2$

oe

M1dep

$[121, 122]$

SC1 [115, 116]

A1

Additional Guidance

SC1 [115, 116] is from using the area of the circle

(b) It is equal to the area of the rectangle

accept any indication

B1

(c) It is more than the perimeter of the rectangle

accept any indication

B1

[5]

Q30.

Correct method or evaluation of the area of any face

or

correct method or evaluation of the volume of any relevant cuboid of length 6 cm

*eg 5×6 or 30**or 2×6 or 12**or 3×6 or 18**or 4×6 or 24**or $2 \times 5 + 2 \times 2$ or $10 + 4$ or 14**or* *$2 \times 5 \times 6$ or 60**or $2 \times 2 \times 6$ or 24**or $2 \times 3 \times 6$ or 36**or $4 \times 2 \times 6$ or 48**or $5 \times 4 \times 6$ or 120***M1**

Correct method for volume of prism

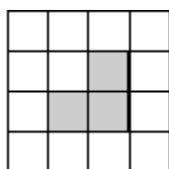
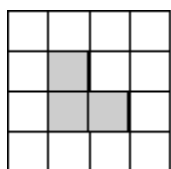
eg $2 \times 5 \times 6 + 2 \times 2 \times 6$ or $60 + 24$ *or 14×6* **M1dep**

84

A1**Additional Guidance**

The first M1 may be awarded even if this is seen amongst multiple attempts

[3]

Q31.*Drawings can be anywhere on the grids**B1 for shapes reversed**or B1 for one correct***B2***or**Drawings can be anywhere on the grid**May be upside down***B1**

[3]

