Write your name here

| Surname | Other names |
|---|---|
| | |

**In the style of:**
**Pearson Edexcel**
**Level 1/Level 2 GCSE (9 - 1)**

| Centre Number | Candidate Number |
|---|---|
| | |

# Mathematics

## Grade 9 type questions

**Higher Tier**

GCSE style questions arranged by topic

Paper Reference
**1MA1/1H**

**You must have:** Ruler graduated in centimetres and millimetres, protractor, pair of compasses, pen, HB pencil, eraser.

Total Marks

### Instructions

- Use **black** ink or ball-point pen.
- **Fill in the boxes** at the top of this page with your name, centre number and candidate number.
- Answer **all** questions.
- Answer the questions in the spaces provided
  – *there may be more space than you need.*
- **Calculators may not be used.**
- Diagrams are **NOT** accurately drawn, unless otherwise indicated.
- You must **show all your working out**.

### Information

- The total mark for this paper is
- The marks for **each** question are shown in brackets
  – *use this as a guide as to how much time to spend on each question.*

### Advice

- Read each question carefully before you start to answer it.
- Keep an eye on the time.
- Try to answer every question.
- Check your answers if you have time at the end.

*Turn over* ▶

**1** Solve the equation $\frac{x}{2} - \frac{2}{x+1} = 1$

.....

**(Total for Question 1 is 4 marks)**

**2** The diagram shows a solid wax cylinder.

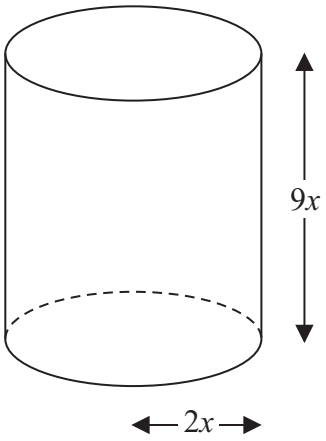



Diagram **NOT** accurately drawn

The cylinder has base radius $2x$ and height $9x$.

The cylinder is melted down and made into a sphere of radius $r$.

Find an expression for $r$ in terms of $x$.

.....

**(Total for Question 2 is 3 marks)**

**3**

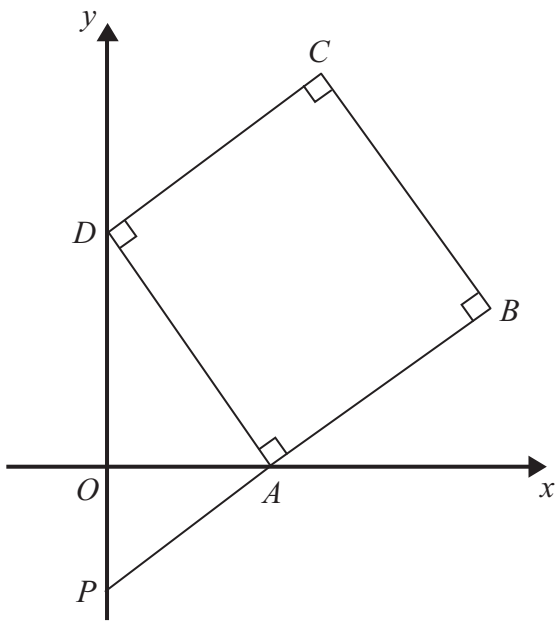



Diagram **NOT** accurately drawn

*ABCD* is a square.
*P* and *D* are points on the *y*-axis.
*A* is a point on the *x*-axis.
*PAB* is a straight line.

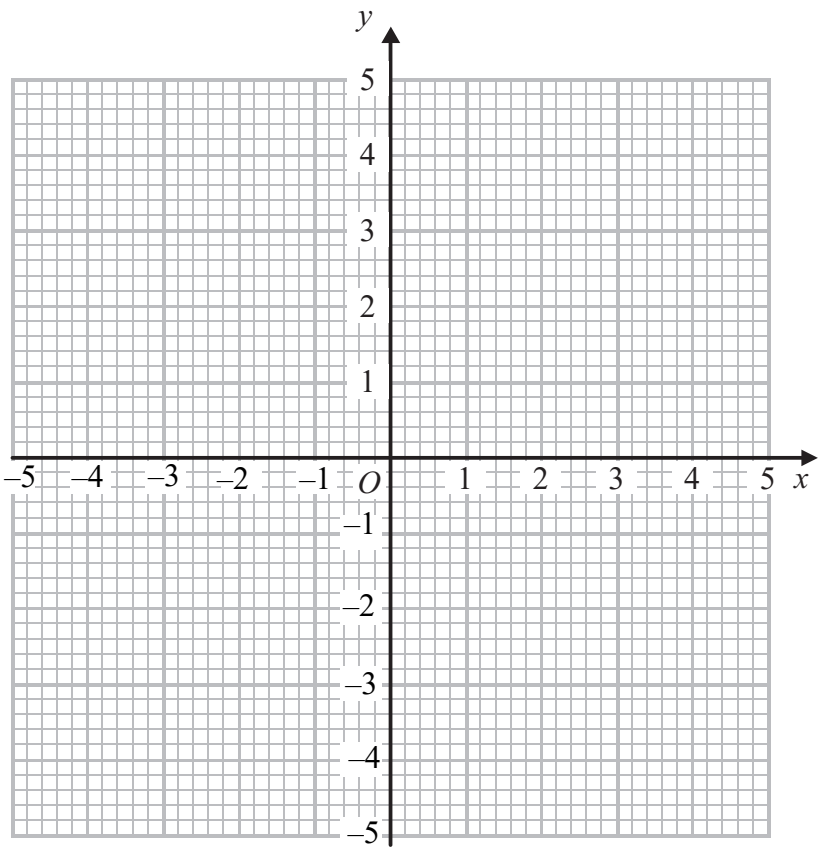
The equation of the line that passes through the points *A* and *D* is $y = -2x + 5$

Find the length of *PD*.

.....

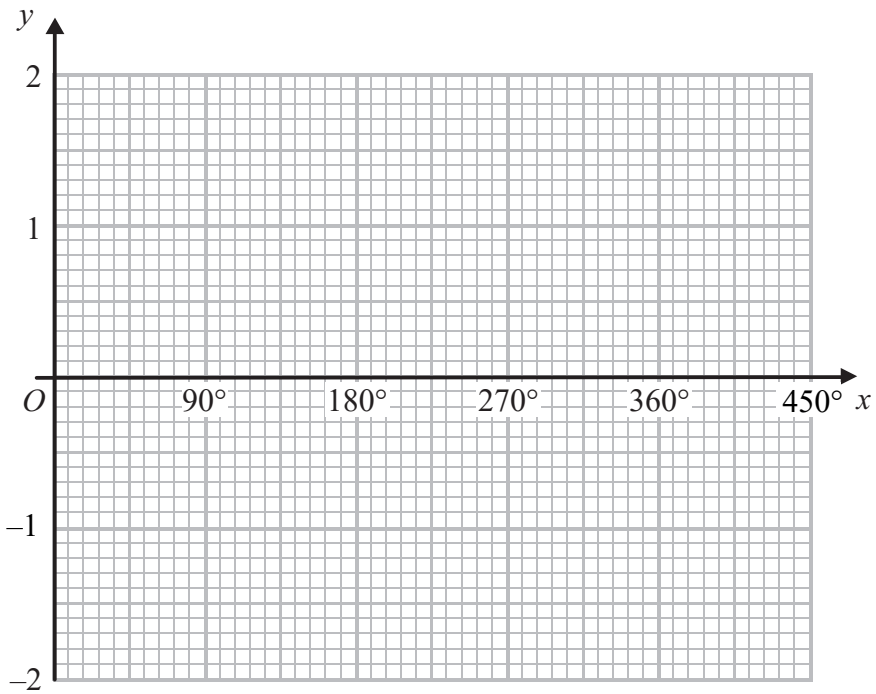
**(Total for Question 3 is 4 marks)**

**4**




(a) On the grid, draw the graph of $x^2 + y^2 = 4$

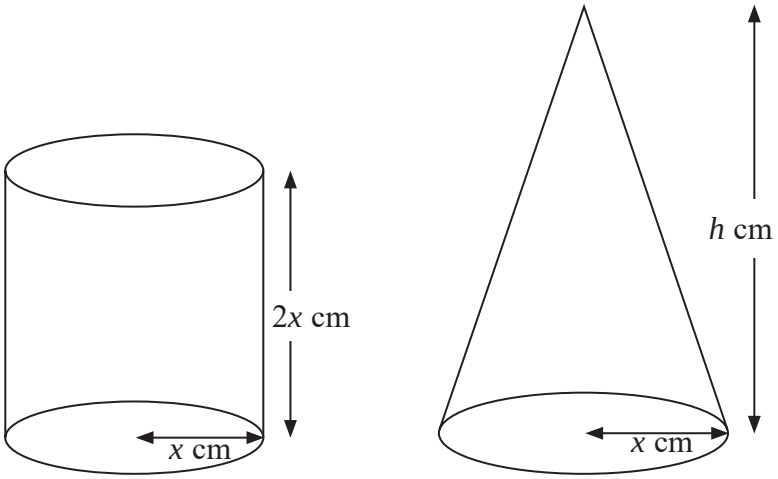
**(2)**




(b) On the grid, sketch the graph of $y = \cos x$ for $0° \leqslant x \leqslant 360°$

**(Total for Question 4 is 4 marks)**

**5**




Diagrams **NOT** accurately drawn

A cylinder has base radius $x$ cm and height $2x$ cm.

A cone has base radius $x$ cm and height $h$ cm.

The volume of the cylinder and the volume of the cone are equal.

Find $h$ in terms of $x$.
Give your answer in its simplest form.

$h =$ .....

**(Total for Question 5 is 3 marks)**

**6**

$$\frac{1}{u} + \frac{1}{v} = \frac{1}{f}$$

$u = 2\frac{1}{2}$, $v = 3\frac{1}{3}$

(a) Find the value of $f$.

.....

(3)

(b) Rearrange $\frac{1}{u} + \frac{1}{v} = \frac{1}{f}$

to make $u$ the subject of the formula.

Give your answer in its simplest form.

.....

(2)

**(Total for Question 6 is 5 marks)**

**7**

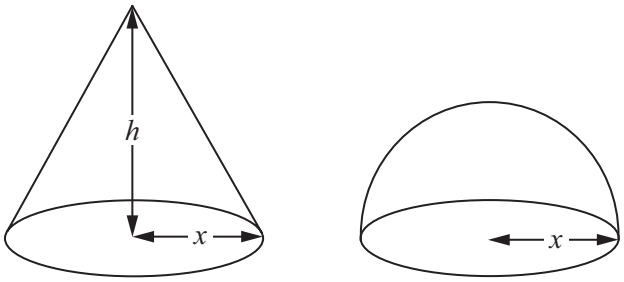



Diagram **NOT** accurately drawn

The diagram shows a solid cone and a solid hemisphere.

The cone has a base of radius $x$ cm and a height of $h$ cm.
The hemisphere has a base of radius $x$ cm.
The surface area of the cone is equal to the surface area of the hemisphere.

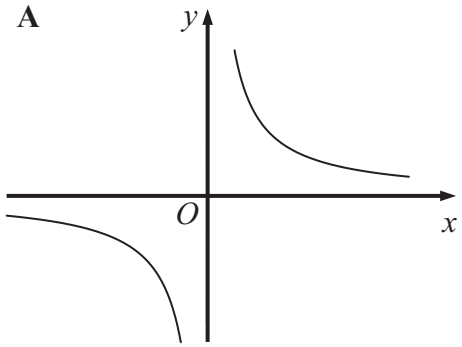
Find an expression for $h$ in terms of $x$.

.....

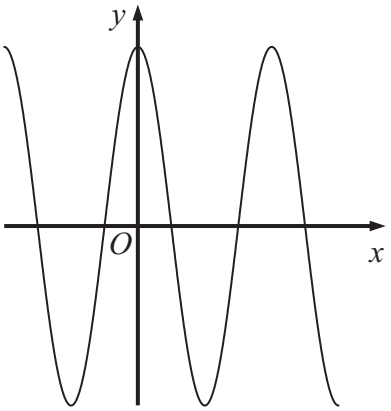
**(Total for Question 7 is 4 marks)**

**8**

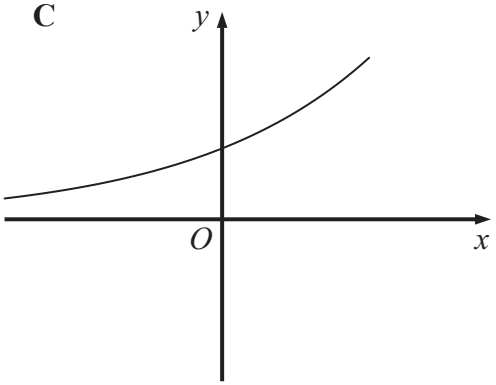
**A**



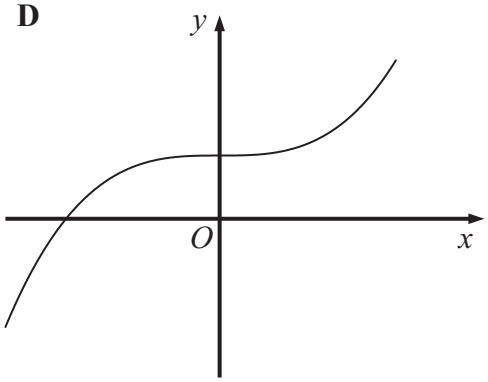

**B**



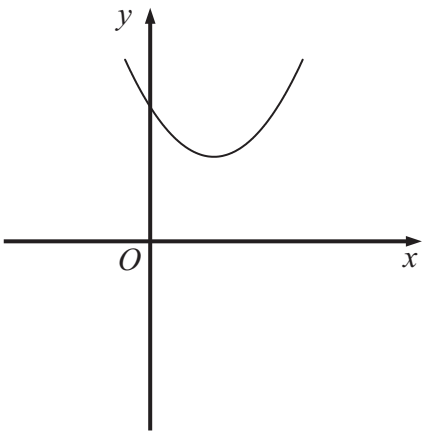

**C**



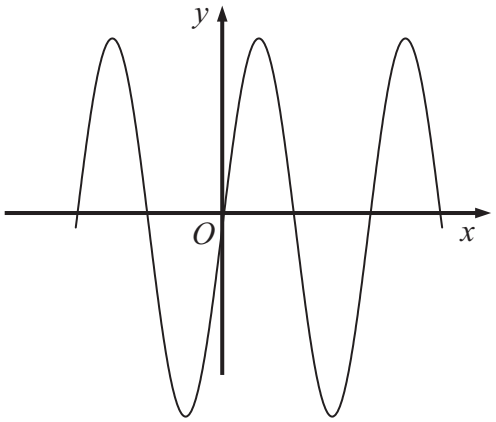

**D**




**E**




**F**




Each equation in the table represents one of the graphs **A** to **F**.

Write the letter of each graph in the correct place in the table.

| Equation | Graph |
|---|---|
| $y = 4 \sin x°$ | |
| $y = 4 \cos x°$ | |
| $y = x^2 - 4x + 5$ | |
| $y = 4 \times 2^x$ | |
| $y = x^3 + 4$ | |
| $y = \frac{4}{x}$ | |



**(Total for Question 8 is 3 marks)**

**9** Here is a shape *ABCDE*.

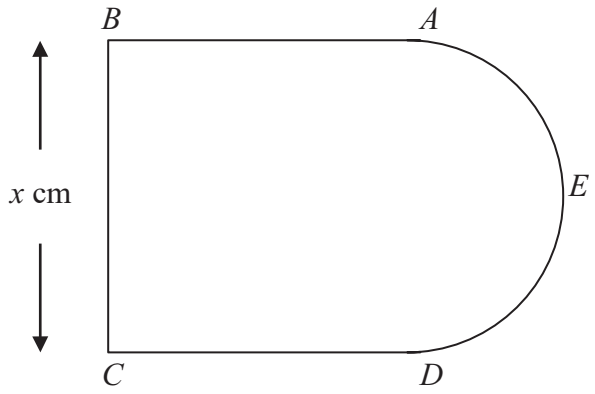



Diagram **NOT** accurately drawn

*AB*, *BC* and *CD* are three sides of a square.
*BC* = *x* cm.
*AED* is a semicircle with diameter *AD*.

The perimeter, *P* cm, of the shape *ABCDE* is given by the formula

$$P = 3x + \frac{\pi x}{2}$$

(a) Rearrange this formula to make *x* the subject.

.....

**(2)**

The area, $A$ cm$^2$, of this shape is given by $A = kx^2$ where $k$ is a constant.

(b) Find the exact value of $k$.
Give your answer in its simplest form.

.....

**(3)**

**(Total for Question 9 is 5 marks)**

**10** Express the recurring decimal $0.2\dot{1}\dot{3}$ as a fraction.

.....

**(Total for Question 10 is 3 marks)**

**11**

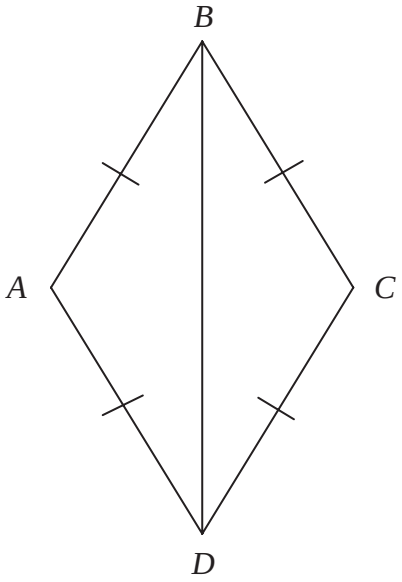



Diagram **NOT** accurately drawn

In the diagram, $AB = BC = CD = DA$.

Prove that triangle $ADB$ is congruent to triangle $CDB$.

**(Total for Question 11 is 3 marks)**

**12** Prove, using algebra, that the sum of two consecutive whole numbers is always an odd number.

**(Total for Question 12 is 3 marks)**

**13** The table shows information about the ages, in years, of 1000 teenagers.

| **Age (years)** | 13 | 14 | 15 | 16 | 17 | 18 | 19 |
|---|---|---|---|---|---|---|---|
| **Number of teenagers** | 158 | 180 | 165 | 141 | 131 | 115 | 110 |

Sophie takes a sample of 50 of these teenagers, stratified by age.

Calculate the number of 14 year olds she should have in her sample.

.....

**(Total for Question 13 is 2 marks)**

---

**14** $P$ is inversely proportional to $V$.

When $V = 8$, $P = 5$

(a) Find a formula for $P$ in terms of $V$.

$P =$ .....

**(3)**

(b) Calculate the value of $P$ when $V = 2$

.....

**(1)**

**(Total for Question 14 is 4 marks)**

**15**

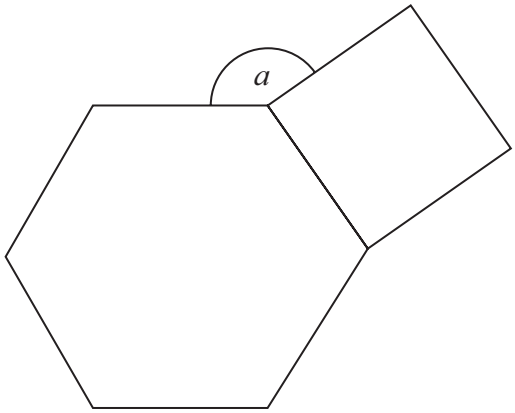



Diagram **NOT** accurately drawn

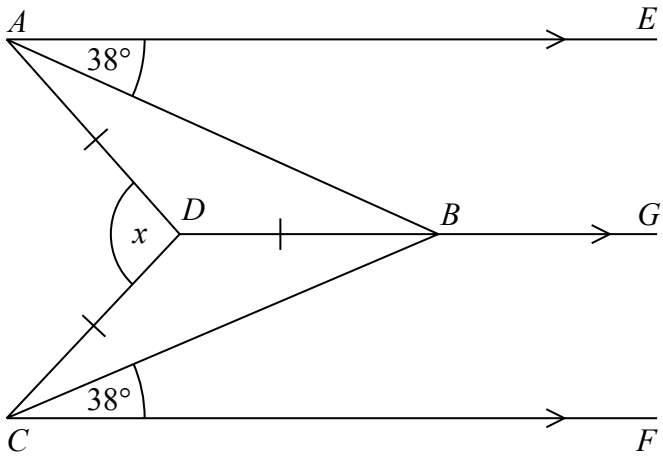
The diagram shows a regular hexagon and a square.

Calculate the size of the angle *a*.

.....°

**(Total for Question 15 is 4 marks)**

**16**




*AE*, *DBG* and *CF* are parallel.
*DA* = *DB* = *DC*.
Angle *EAB* = angle *BCF* = 38°

Work out the size of the angle marked *x*.
You must show your working.

..... °

**(Total for Question 16 is 3 marks)**

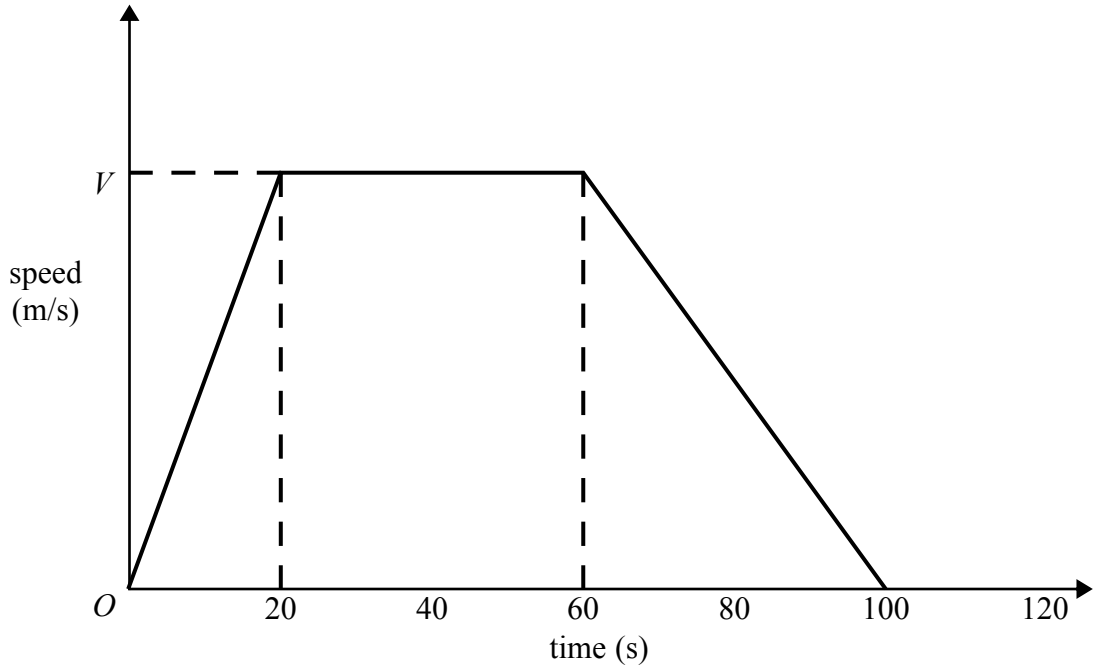
**17** $A(-2, 1)$, $B(6, 5)$ and $C(4, k)$ are the vertices of a right-angled triangle $ABC$.
Angle $ABC$ is the right angle.

Find an equation of the line that passes through $A$ and $C$.
Give your answer in the form $ay + bx = c$ where $a$, $b$ and $c$ are integers.

.....

**(Total for Question 17 is 5 marks)**

**18** Here is a speed-time graph for a car journey.
The journey took 100 seconds.




The car travelled 1.75 km in the 100 seconds.

(a) Work out the value of $V$.

.....

**(3)**

(b) Describe the acceleration of the car for each part of this journey.

.....

.....

.....

.....

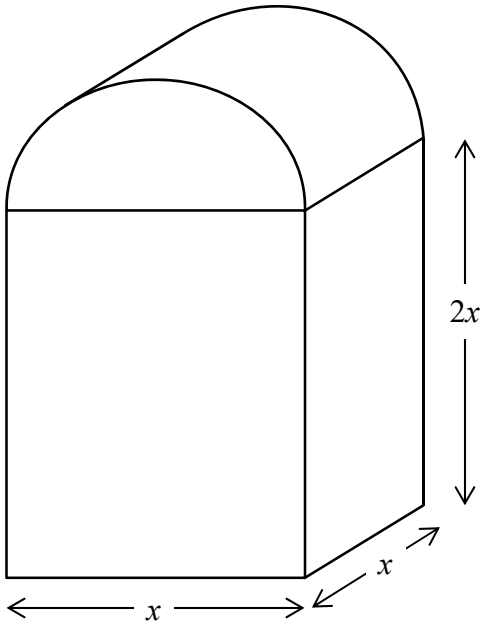
**(2)**

**(Total for Question 18 is 5 marks)**

**19** In this question all dimensions are in centimetres.

A solid has uniform cross section.

The cross section is a rectangle and a semicircle joined together.




Work out an expression, in $cm^3$, for the **total** volume of the solid.

Write your expression in the form $ax^3 + \frac{1}{b}\pi x^3$ where $a$ and $b$ are integers.

..... $cm^3$

**(Total for Question 19 is 4 marks)**

**20** $f(x) = 2x + c$

$g(x) = cx + 5$

$fg(x) = 6x + d$

$c$ and $d$ are constants.

Work out the value of $d$.

.....

**(Total for Question 20 is 3 marks)**

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