Cambridge IGCSE

Cambridge Assessment International Education
Cambridge International General Certificate of Secondary Education

CANDIDATE NAME	

CENTER NUMBER						CANDIDATE NUMBER				

MATHEMATICS (US)

Paper 3 (Core)

0444/31

May/June 2019

2 hours

Candidates answer on the Question Paper.

Additional Materials: Geometrical instruments
                          Electronic calculator

READ THESE INSTRUCTIONS FIRST

Write your center number, candidate number and name on all the work you hand in.
Write in dark blue or black pen.
You may use an HB pencil for any diagrams or graphs.
Do not use staples, paper clips, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

Answer **all** questions.
If work is needed for any question it must be shown in the space provided.
Electronic calculators should be used.
If the degree of accuracy is not specified in the question, and if the answer is not exact, give the answer to three significant digits.
Give answers in degrees to one decimal place.
For π, use either your calculator value or 3.142.

The number of points is given in parentheses [ ] at the end of each question or part question.
The total of the points for this paper is 104.

Write your calculator model in the box below.

This document consists of **16** printed pages.

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[Turn over

Formula List

Area, A, of triangle, base b, height h. $\qquad$ $A = \frac{1}{2}bh$

Area, A, of circle, radius r. $\qquad$ $A = \pi r^2$

Circumference, C, of circle, radius r. $\qquad$ $C = 2\pi r$

Lateral surface area, A, of cylinder of radius r, height h. $\qquad$ $A = 2\pi rh$

Surface area, A, of sphere of radius r. $\qquad$ $A = 4\pi r^2$

Volume, V, of prism, cross-sectional area A, length l. $\qquad$ $V = Al$

Volume, V, of cylinder of radius r, height h. $\qquad$ $V = \pi r^2 h$

Volume, V, of sphere of radius r. $\qquad$ $V = \frac{4}{3}\pi r^3$

1 **(a)** Write the following in order, starting with the smallest.

$$\frac{3}{4} \qquad 0.749 \qquad 76\% \qquad \frac{11}{15}$$

.... < .... < .... < .... [2]
smallest

(b) Write down the smallest prime number.

.... [1]

(c) Write down all the factors of 18.

.... [2]

(d) Write down a common factor of 16 and 72 that is greater than 2.

.... [1]

(e) Write $\frac{28}{140}$ as a fraction in its simplest form.

.... [1]

(f) Jeff and his friends win a prize.
Jeff's share is \$160 which is $\frac{5}{11}$ of the prize.

Work out the value of the prize.

\$ .... [2]

0444/31/M/J/19 **[Turn over**

2 Here is part of the menu for Jamie's café.

Menu	
	Price ($)
Tea	2.35
Coffee	3.40
Lemonade	1.80
Cake	4.45
Cookie	0.85

(a) Sue has one tea and one cake.

Calculate how much she pays.

$ .... [1]

(b) Derrick has one coffee and two cookies.

How much change does he receive from a $10 note?

$ .... [2]

(c) Harriet works at the café for 34 hours each week.
She is paid $8.25 for each hour.

(i) Work out the amount she is paid each week.

$ .... [1]

(ii) One week she works 8 hours extra.
The extra hours are paid at 1.5 times her usual rate of $8.25 for each hour.

Work out the total amount she is paid for that week.

$ .... [2]

(d) Peter works these hours each week at the café.

Day	Time
Monday	08 30 to 16 00
Tuesday	10 00 to 17 00
Thursday	08 30 to 16 30
Saturday	08 00 to 18 30

Work out the number of hours he works in one week.

.... hours [2]

(e) Jamie buys a clock for the café from Japan for 9395 yen.
The exchange rate is $1 = 110.27$ yen.

Work out the cost of the clock in dollars, correct to the nearest cent.

$ .... [3]

(f) Jamie invests $12 000 at a rate of 5% per year compound interest.

Calculate the value of his investment at the end of 3 years.

$ .... [3]

3 **(a)** On Monday, Main Street station sells 40 tickets.
There are four types of ticket: infant, child, adult, and senior.
The bar chart shows the number of infant, child, and adult tickets sold.
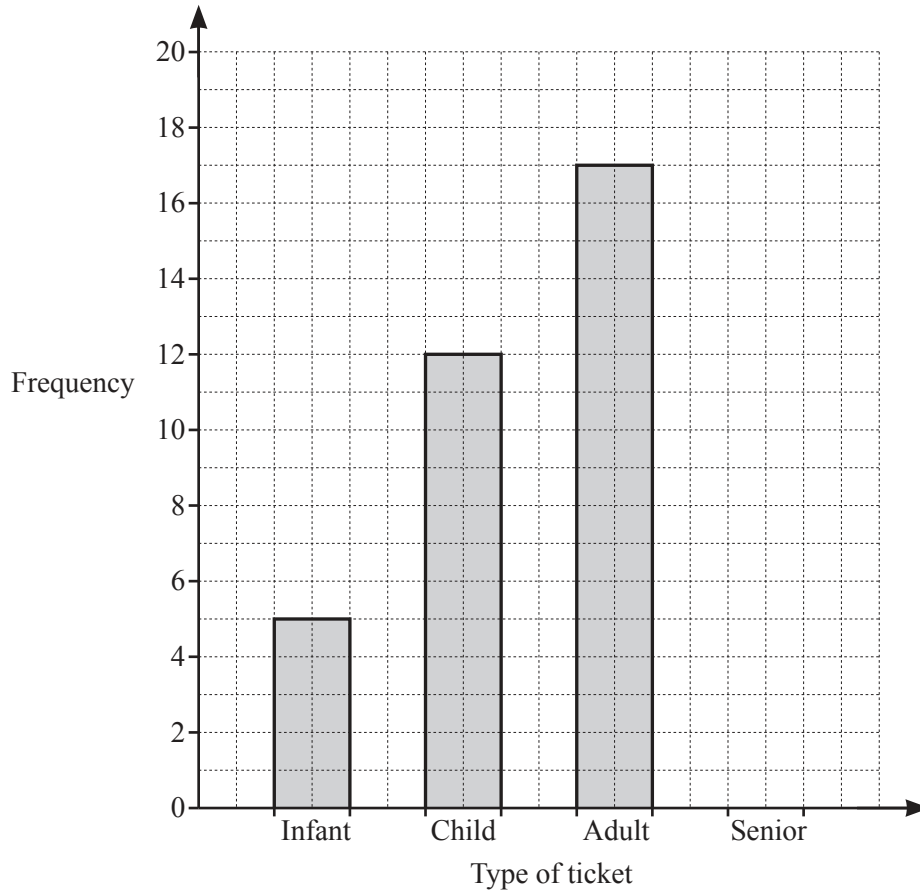
(i) Complete the bar chart. [3]

(ii) Find how many more adult tickets were sold than child tickets.

.... [1]

(iii) One of these 40 people is chosen at random.

Find the probability that this person is a child.

.... [1]

(b) At Donville station the number of tickets sold each day is recorded for seven days.

104	18	72	31	27	45	60

Find

(i) the range,

.... [1]

(ii) the median,

.... [2]

(iii) the mean.

.... [2]

(c) The ticket machine at North Street station developed a fault.
Some tickets were incorrectly printed.
The frequency table shows information about these tickets.

Type of ticket incorrectly printed	Frequency
Infant	3
Child	5
Adult	4
Senior	2

Complete the diagram to show a dot plot for Infant, Child and Adult tickets.

Type of ticket incorrectly printed
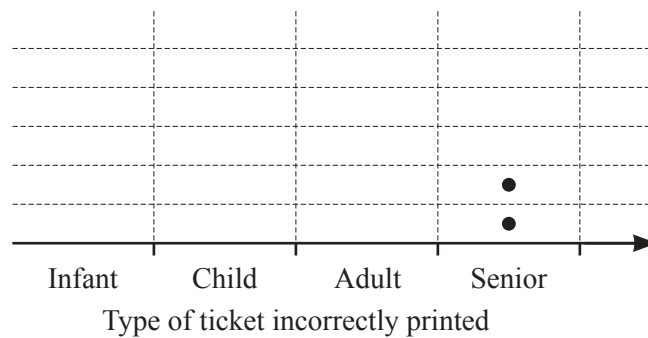
[1]

(d) An officer at West Park station measures the length of time each train is early or late.
These times are an example of **continuous** data.

Explain what is meant by continuous data.

....

.... [1]

4   **(a)**

NOT TO
SCALE
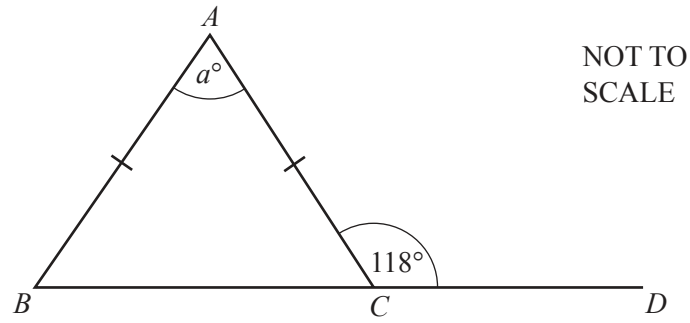
ABC is an isosceles triangle.
BCD is a straight line.

Find the value of *a*.

a = ... [2]

(b) Find the size of one interior angle of a regular 10-sided polygon.

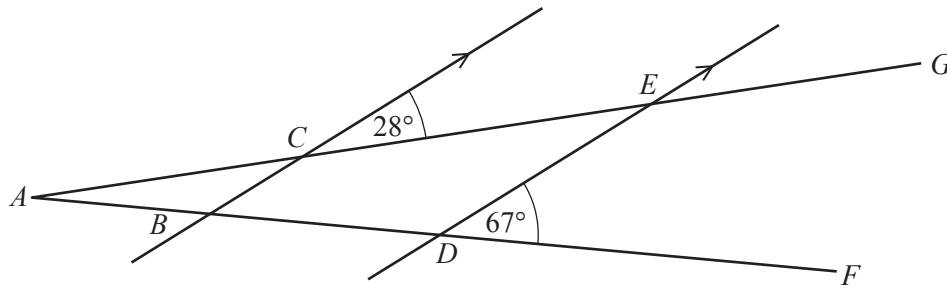... [3]

(c)
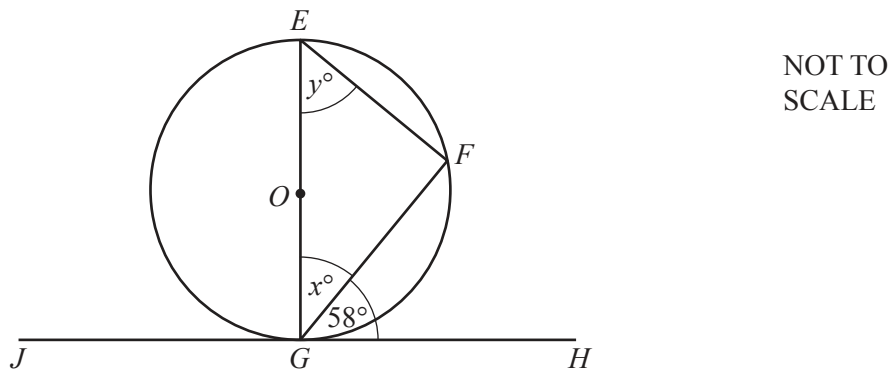
NOT TO
SCALE

The points *E*, *F*, and *G* lie on the circumference of a circle, center *O*.
JGH is a tangent to the circle.

Find the value of *x* and the value of *y*.

x = ...

y = ... [2]

(d)

NOT TO SCALE

In the diagram *AG* and *AF* are straight lines.
Lines *BC* and *DE* are parallel.

Find angle *CED* and give a reason for your answer.

Angle *CED* = ... because .... [2]

(e) (i)
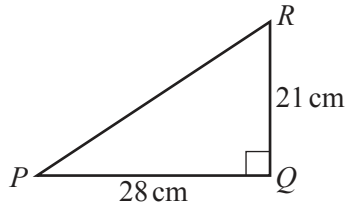
NOT TO SCALE

Calculate *PR*.

PR = ... cm [2]

(ii)
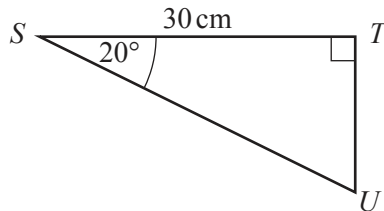
NOT TO SCALE

Calculate *SU*.

SU = ... cm [3]

5 **(a)** The diagram shows a rectangle with length $7a$ and width $2a$.

$7a$

NOT TO
SCALE

$2a$
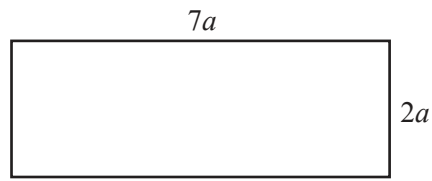
Write an expression, in its simplest form, for

(i) the perimeter,

.... [2]

(ii) the area.

.... [2]

(b) The nth term of a sequence is $n^2 + 5$.

Find the first three terms of this sequence.

.... , ... , ... [2]

(c) **(i)** Complete the table of values for $y = \dfrac{12}{x}$, $x \neq 0$.

x	-6	-4	-3	-2	-1		1	2	3	4	6
y	-2	-3					12				2

[3]

(ii) On the grid, draw the graph of $y = \dfrac{12}{x}$ for $-6 \leqslant x \leqslant -1$ and $1 \leqslant x \leqslant 6$.
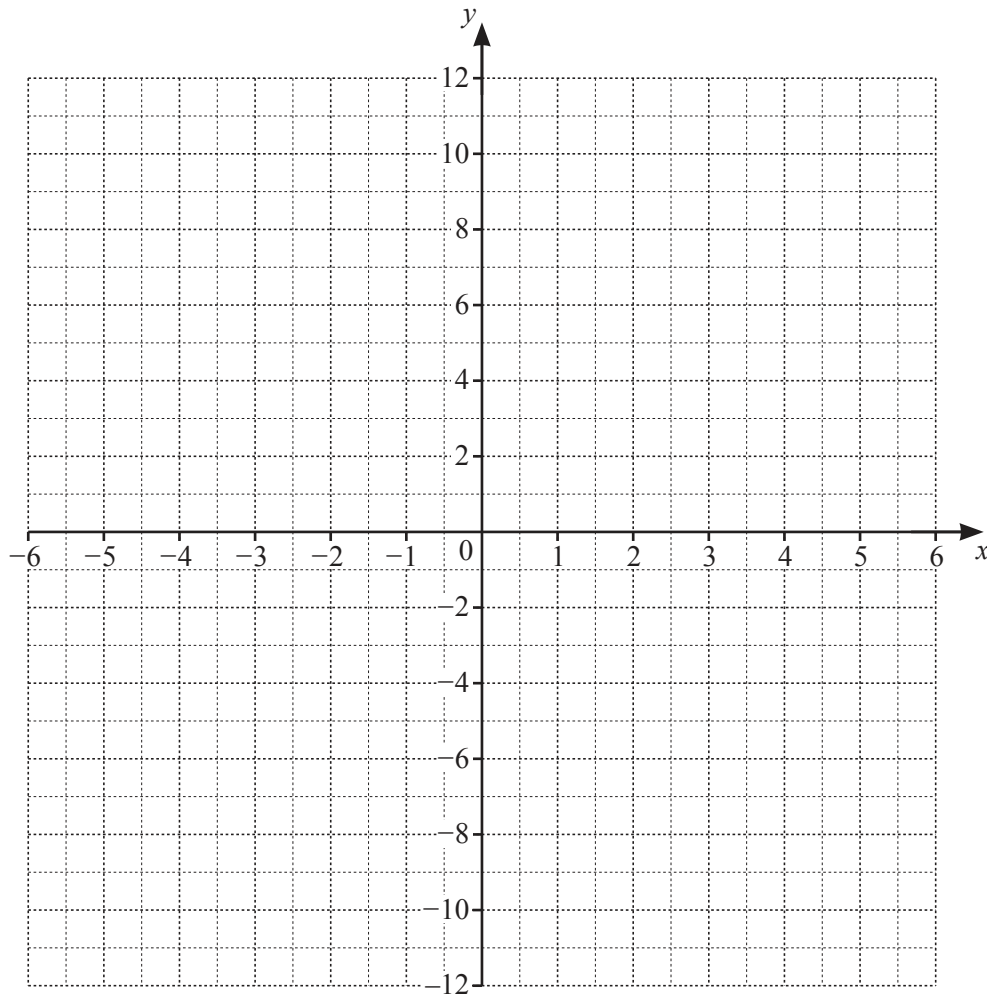
[4]

(iii) On the grid, draw the line $y = 8$. [1]

(iv) Use your graph to solve $\dfrac{12}{x} = 8$.

$x = $ .... [1]

6 Fourteen students each take two tests in French, a speaking test and a written test.
The table shows the scores.

Speaking test	10	13	48	30	35	18	41	40	22	28	20	44	37	46
Written test	24	44	51	39	45	29	56	20	39	49	33	52	44	52

(a) Complete the scatter diagram.
The first ten points have been plotted for you.
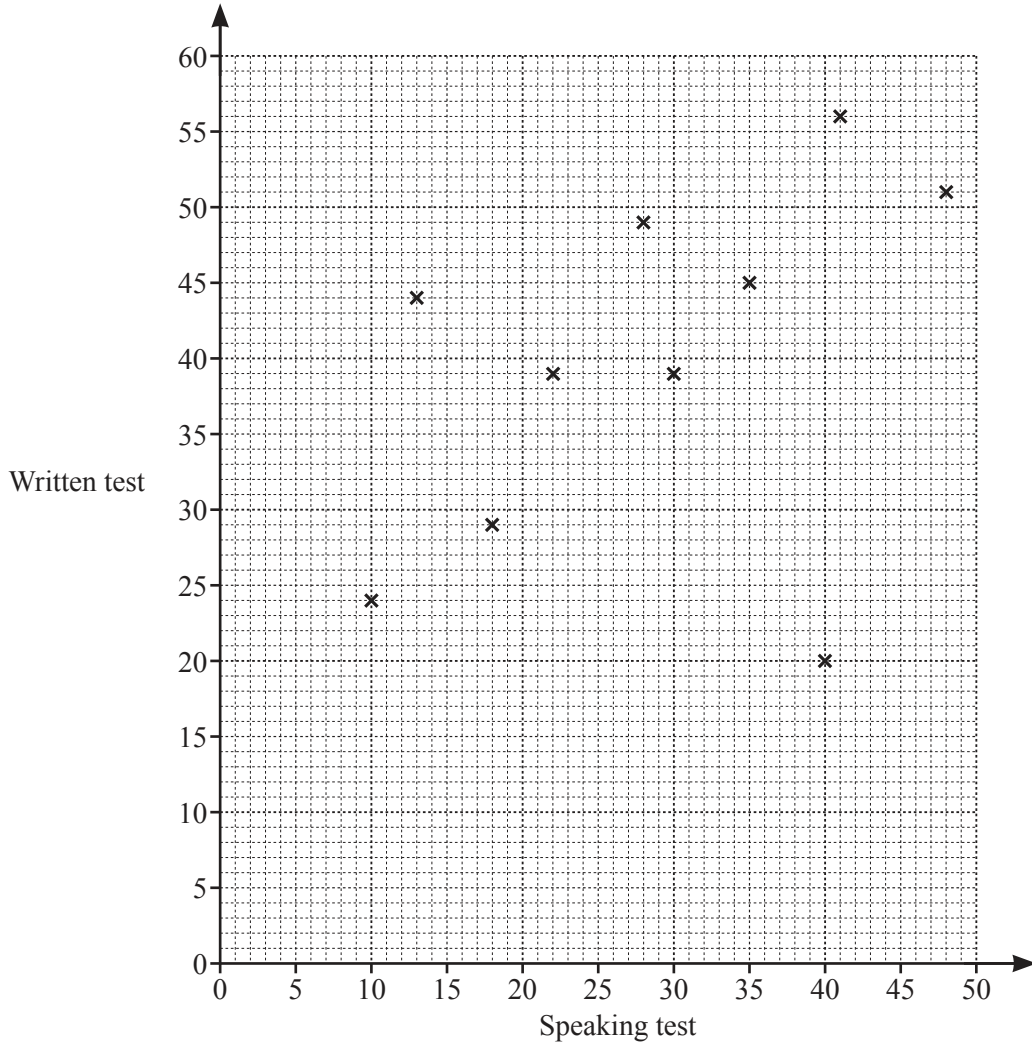
[2]

(b) What type of correlation is shown in this scatter diagram?

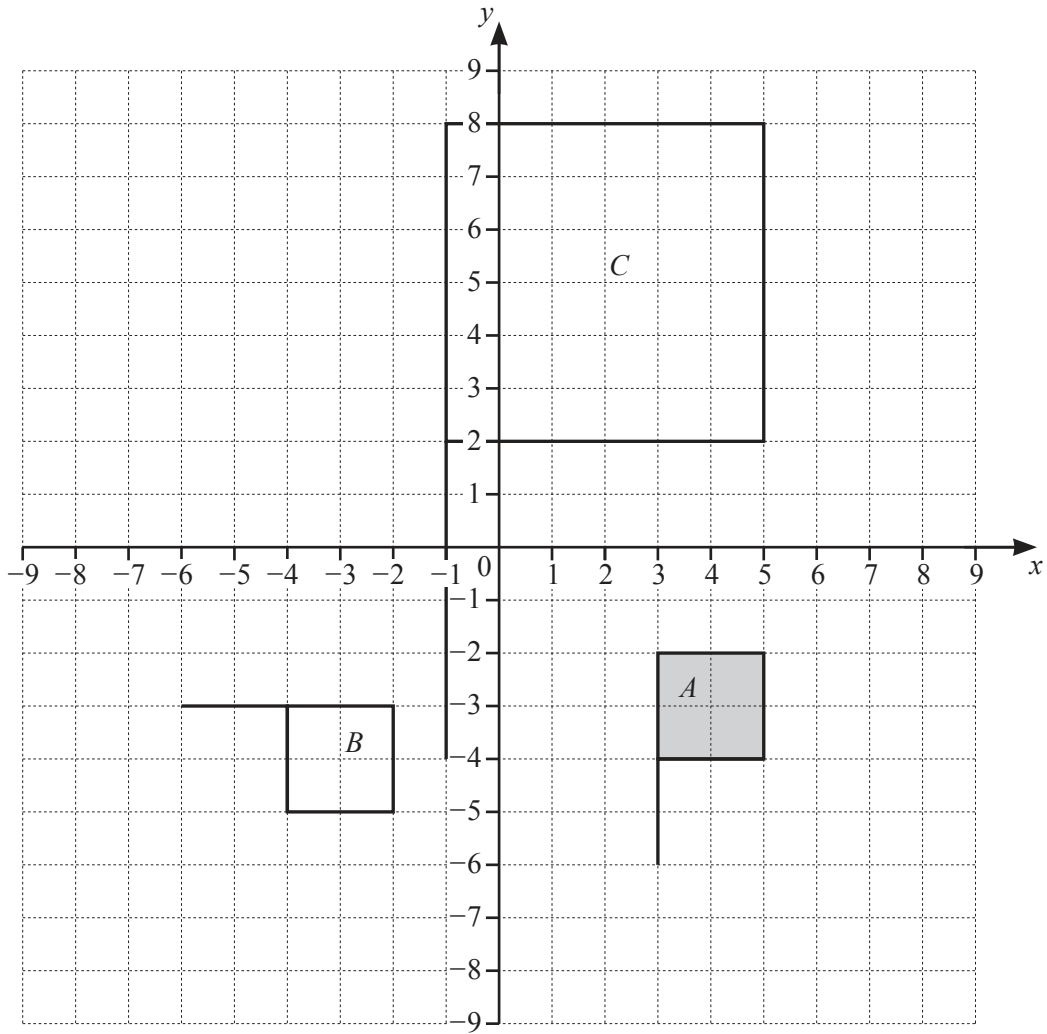.. [1]

(c) One student has a high score in the speaking test and a low score in the written test.

On the scatter diagram, put a ring around this point. [1]

(d) On the scatter diagram, draw a line of best fit. [1]

(e) Use your line of best fit to estimate a score in the written test for a student who scored 25 in the speaking test.

.... [1]

7

(a) Describe fully the **single** transformation that maps shape *A* onto shape *B*.

....

.... [3]

(b) Describe fully the **single** transformation that maps shape *A* onto shape *C*.

....

.... [3]

(c) On the grid, draw the image of shape *A* after a translation by the vector $\begin{pmatrix} 3 \\ 1 \end{pmatrix}$. [2]

(d) On the grid, draw the image of **shape *B*** after a reflection in the line $y = 1$. [2]

 [Turn over

8 (a) A cylinder has a radius of 6 cm and a height of 17 cm.

Show that the volume of this cylinder is 1923 cm³, correct to 4 significant figures.

[2]

(b)
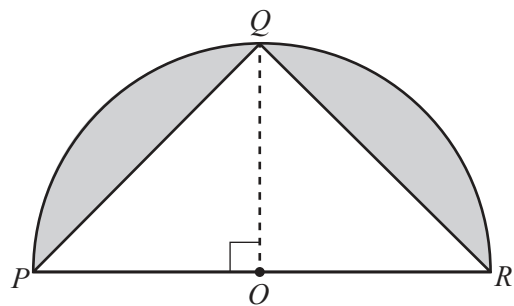
Points P, Q, and R are on the circumference of a semicircle, center O and radius 8 cm.
Angle $POQ = 90°$.

Calculate the shaded area.

....cm² [5]

9 **(a)** Simplify $8a + 3b - 2a + b$.

.... [2]

(b) Calculate the value of $4x^2 + xy$ when $x = 3$ and $y = -2$.

.... [2]

(c) Solve these equations.

(i) $\frac{x}{4} = 20$

$x = $ .... [1]

(ii) $3x - 5 = 16$

$x = $ .... [2]

(iii) $5(2x + 1) = 27$

$x = $ .... [3]

(d) Solve for r.
$$p = 3r - 5$$

$r = $ .... [2]

Question 10 is printed on the next page.

10 The scale drawing shows a field, *ABCD*.
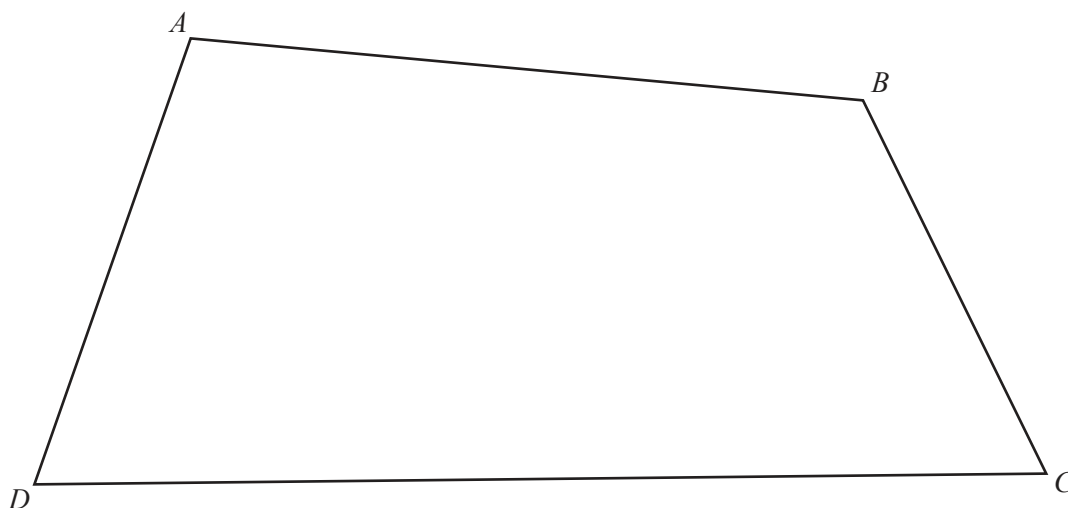
Treasure is buried at the point *X* where the perpendicular bisector of *AB* and the bisector of angle *ADC* intersect.

(a) **Using a straight edge and compass only and showing all your construction arcs**, construct

•   the perpendicular bisector of *AB*

and

•   the bisector of angle *ADC*.   [4]

(b) Measure angle *DXC*.

.... [1]