Cambridge International Examinations
Cambridge International General Certificate of Secondary Education

CANDIDATE NAME

CENTRE NUMBER

CANDIDATE NUMBER

CAMBRIDGE INTERNATIONAL MATHEMATICS **0607/41**

Paper 4 (Extended) **October/November 2018**

2 hours 15 minutes

Candidates answer on the Question Paper.

Additional Materials: Geometrical Instruments
Graphics Calculator

READ THESE INSTRUCTIONS FIRST

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

Answer **all** the questions.
Unless instructed otherwise, give your answers exactly or correct to three significant figures as appropriate.
Answers in degrees should be given to one decimal place.
For π, use your calculator value.
You must show all the relevant working to gain full marks and you will be given marks for correct methods, including sketches, even if your answer is incorrect.
The number of marks is given in brackets [ ] at the end of each question or part question.
The total number of marks for this paper is 120.

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

DC (NF/CT) 156327/3

CAMBRIDGE International Examinations

[Turn over

Formula List

For the equation $ax^2 + bx + c = 0$ $x = \dfrac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

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

Curved surface area, A, of cone of radius r, sloping edge l. $A = \pi rl$

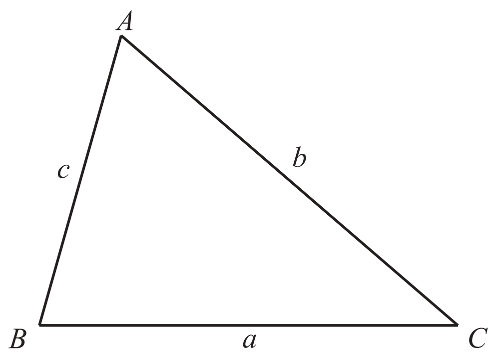
Curved surface area, A, of sphere of radius r. $A = 4\pi r^2$

Volume, V, of pyramid, base area A, height h. $V = \frac{1}{3}Ah$

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

Volume, V, of cone of radius r, height h. $V = \frac{1}{3}\pi r^2 h$

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



$$\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$$

$$a^2 = b^2 + c^2 - 2bc\cos A$$

$$\text{Area} = \frac{1}{2}bc\sin A$$

Answer **all** the questions.

1 **(a)** Solve the following equations.

(i) $12 - x = 4$

$x =$ .... [1]

(ii) $9x - 4 = 6x + 8$

$x =$ .... [2]

(iii) $\frac{12}{x} + 5 = 9$

$x =$ .... [2]

(b) **(i)** Solve $6x^2 - 5x + 1 = 0$.

$x =$ .... or $x =$ .... [3]

(ii) Use your answer to **part (b)(i)** to solve

$$6\sin^2 x - 5\sin x + 1 = 0 \quad \text{for} \quad 0° \leqslant x \leqslant 90°.$$

$x =$ .... or $x =$ .... [3]

2 The table shows the marks for 75 students in a test.

Mark	0	1	2	3	4	5, 6 or 7	8
Number of students	6	18	16	8	15	5	7

(a) Write down the mode.

.... [1]

(b) Find the range.

.... [1]

(c) Find the median.

.... [1]

(d) Find the inter-quartile range.

.... [2]

(e) Calculate an estimate of the mean.

.... [2]

(f) Give a reason why your answer to **part (e)** is an estimate.

....

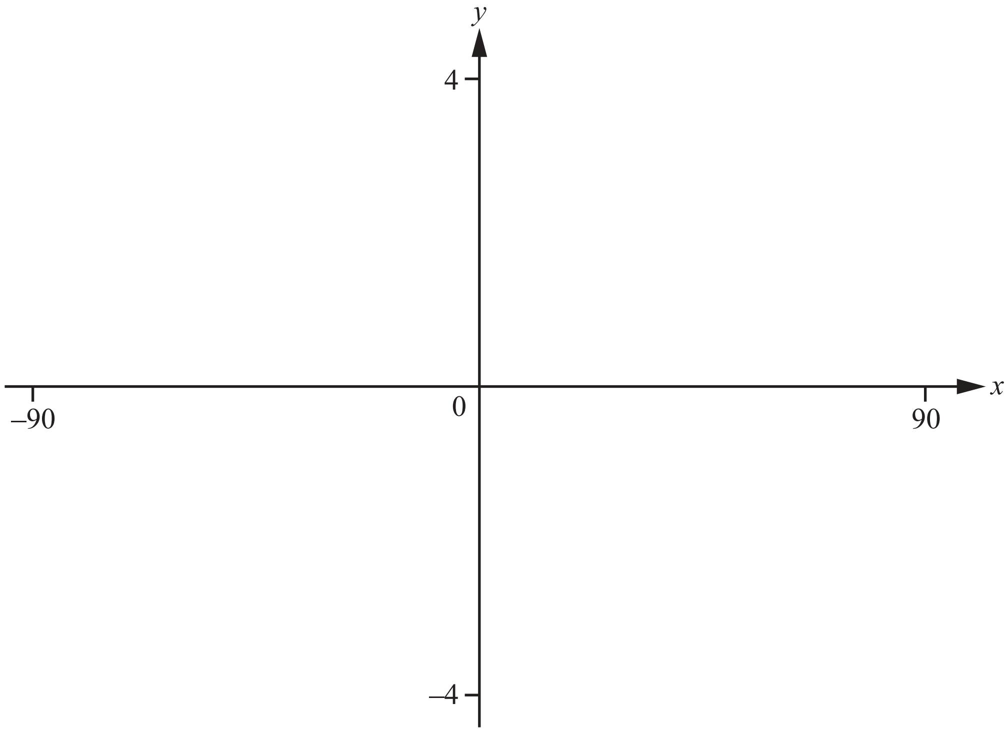
.... [1]

(g) Two of these students are chosen at random.

Find the probability that the highest mark of these students is 2.

.... [3]

3



$f(x) = 1 - 2\sin(2x - 10)^{\circ}$

(a) On the diagram sketch the graph of $y = f(x)$, for $-90 \leqslant x \leqslant 90$.

[3]

(b) Write down the co-ordinates of the x-intercepts.

(................ , ...)

(................ , ...) [2]

(c) Write down the co-ordinates of the local maximum.

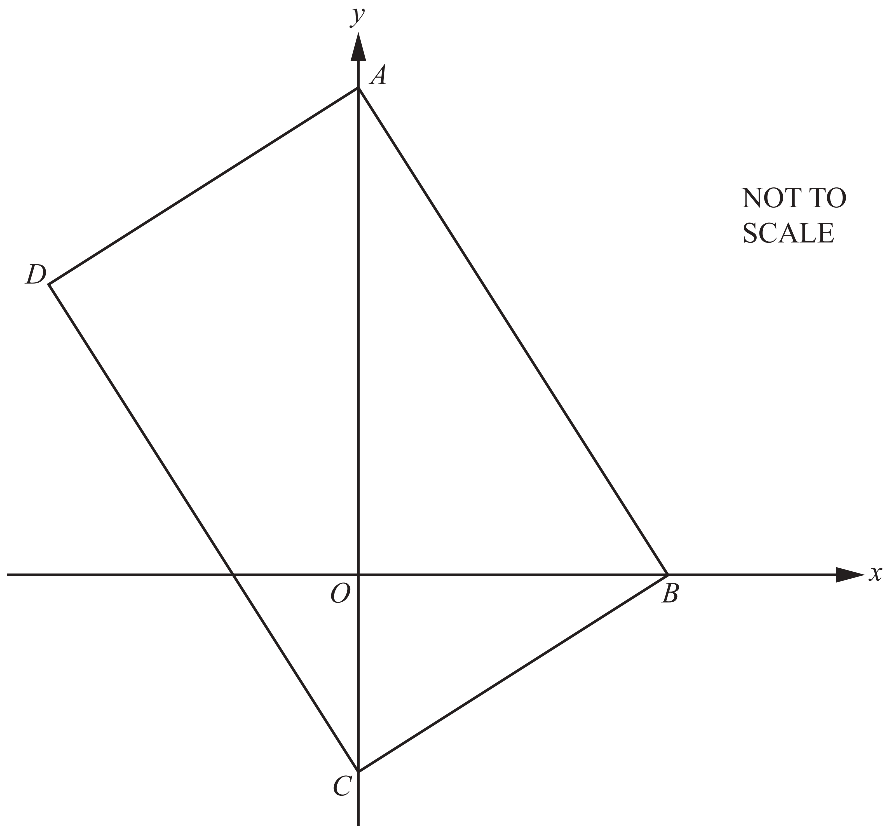
(................ , ...) [1]

(d) The graph of $y = -\frac{x}{60}$ intersects the graph of $y = 1 - 2\sin(2x - 10)^{\circ}$ three times.

Find the value of the x co-ordinate at each point of intersection.

$x =$ .... or $x =$ .... or $x =$ .... [3]

4



ABCD is a rectangle.

The equation of the line *AB* is $4x+3y=24$.

(a) Find the co-ordinates of

(i) point *A*,

(................ , ...) [1]

(ii) point *B*,

(................ , ...) [1]

(iii) the midpoint of *AB*.

(................ , ...) [2]

(b) Rearrange the equation $4x+3y=24$ to make y the subject.

$y =$ .... [2]

(c) Find the equation of the line BC.
Give your answer in the form $y = mx + c$.

$y =$ .... [3]

(d) Find the co-ordinates of

(i) point C,

(................ , ...) [1]

(ii) point D.

(................ , ...) [3]

5 The number of fish in a lake decreases by 4% each year.
In January 2018 there are 30 000 fish in the lake.

(a) Calculate the number of fish in the lake in

(i) January 2019,

.... [2]

(ii) January 2029,

.... [3]

(iii) January 2017.

.... [3]

(b) Find the last year in which there were at least 50 000 fish in the lake.

.... [4]

(c) Philip runs a fishing business and he works 50 weeks every year.
In 2018, he catches 800 kg of fish in each of these weeks.
He sells all the fish he catches at a price of \$3.50 for each kilogram.

(i) Calculate the total amount he receives in 2018.

\$ .... [3]

(ii) For each of the 50 weeks, Philip's business costs \$2240 to run.

Calculate his profit as a percentage of \$2240.

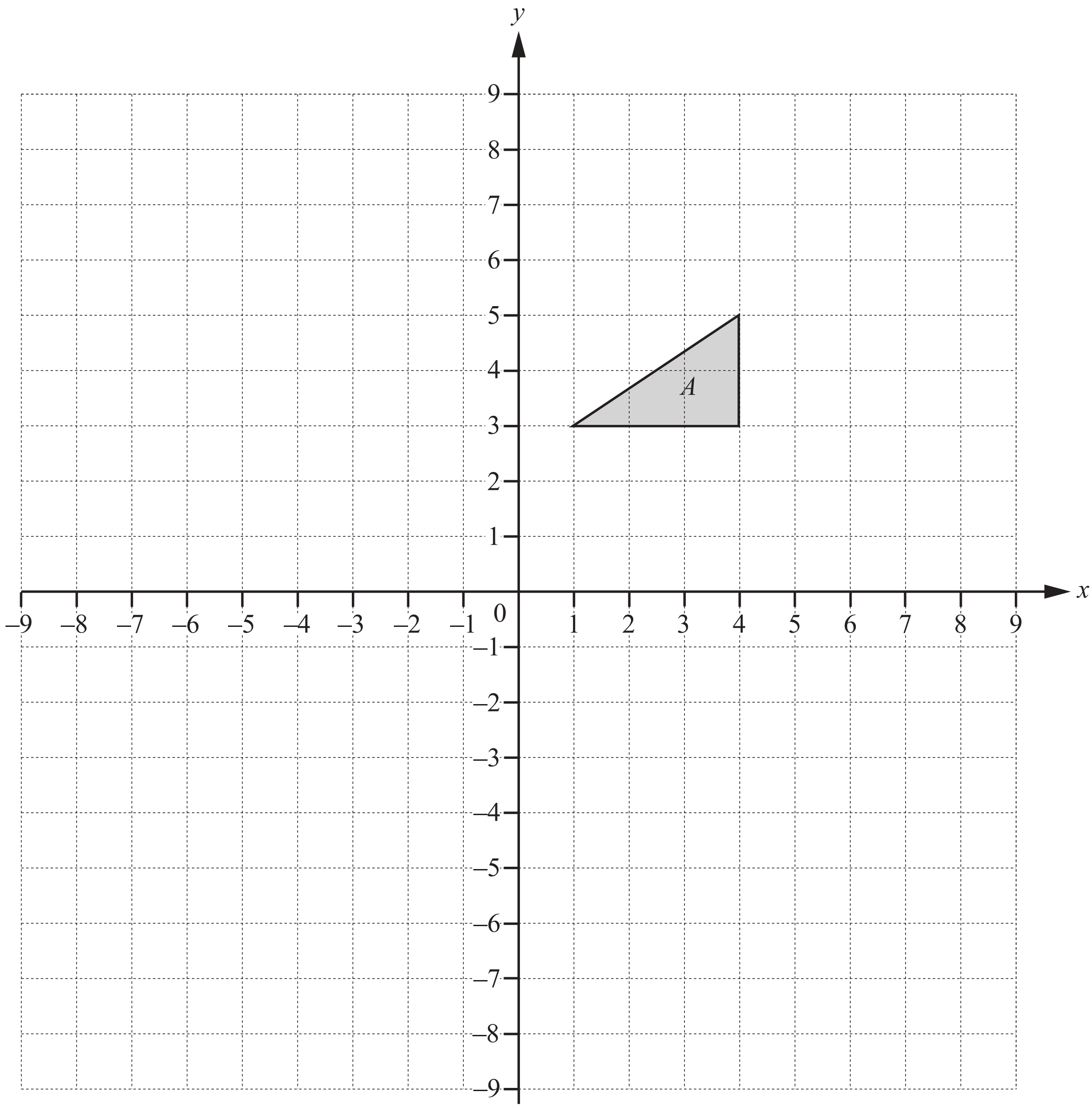
....% [3]

(d) In 2019, Philip's business costs 8% more to run than in 2018.
The selling price of fish decreases by 10%.

Find the amount of fish, in kilograms, Philip will need to catch each week to keep the percentage profit found in **part (c)(ii)** the same.

.... kg [4]

6



(a) Reflect triangle *A* in the line $x = -2$. Label the image *B*. [2]

(b) Rotate triangle *A* through 180° about (−2, −1). Label the image *C*. [2]

(c) Describe fully the **single** transformation that maps triangle *C* onto triangle *B*.

....

.... [2]

(d) Enlarge triangle *A* with centre of enlargement (1, 2) and scale factor 2. Label the image *D*. [2]

7 **(a)** Find an expression for the nth term for each of these sequences.

(i) 80, 77, 74, 71, …

.... [2]

(ii) 128, 64, 32, 16, …

.... [2]

(b) The nth term of a sequence is $n^2 - 1$.

Find the first four terms of this sequence.

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

(c) The nth term of a sequence is $|n-3|$.

Find the first four terms of this sequence.

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

(d) The nth term of a sequence is $n^2 + n + 41$.

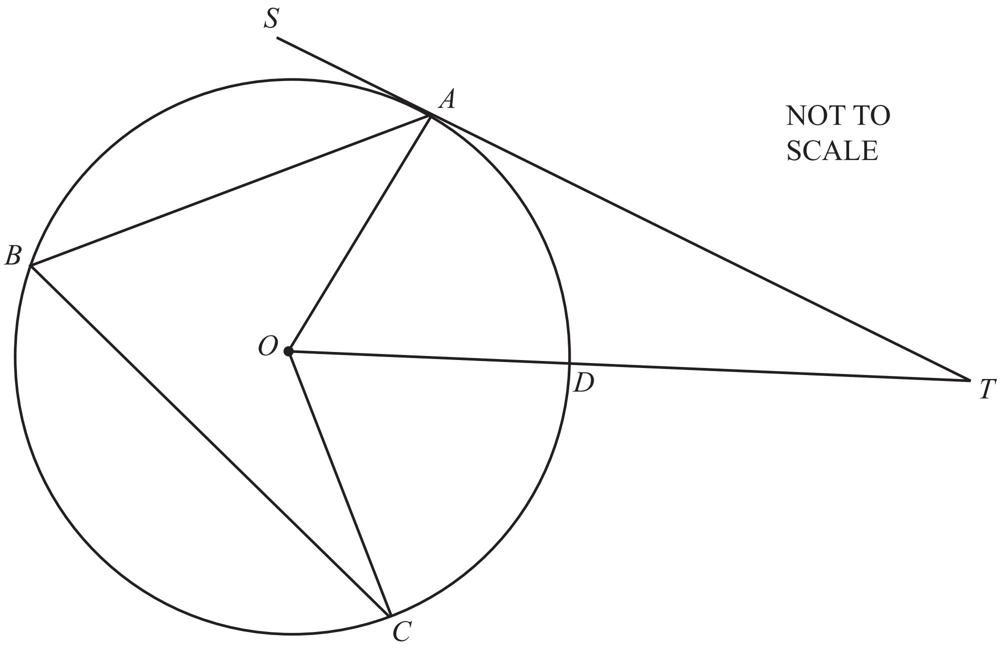
(i) Find the first three terms of this sequence.

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

(ii) Show that when $n = 41$ the number in this sequence is not prime.

[1]

8



A, *B*, C and *D* lie on a circle, centre *O*.
ST is a tangent to the circle at *A*.
ODT is a straight line that bisects angle *AOC*.

(a) Complete the statement.

Angle *OAT* = ... because ....

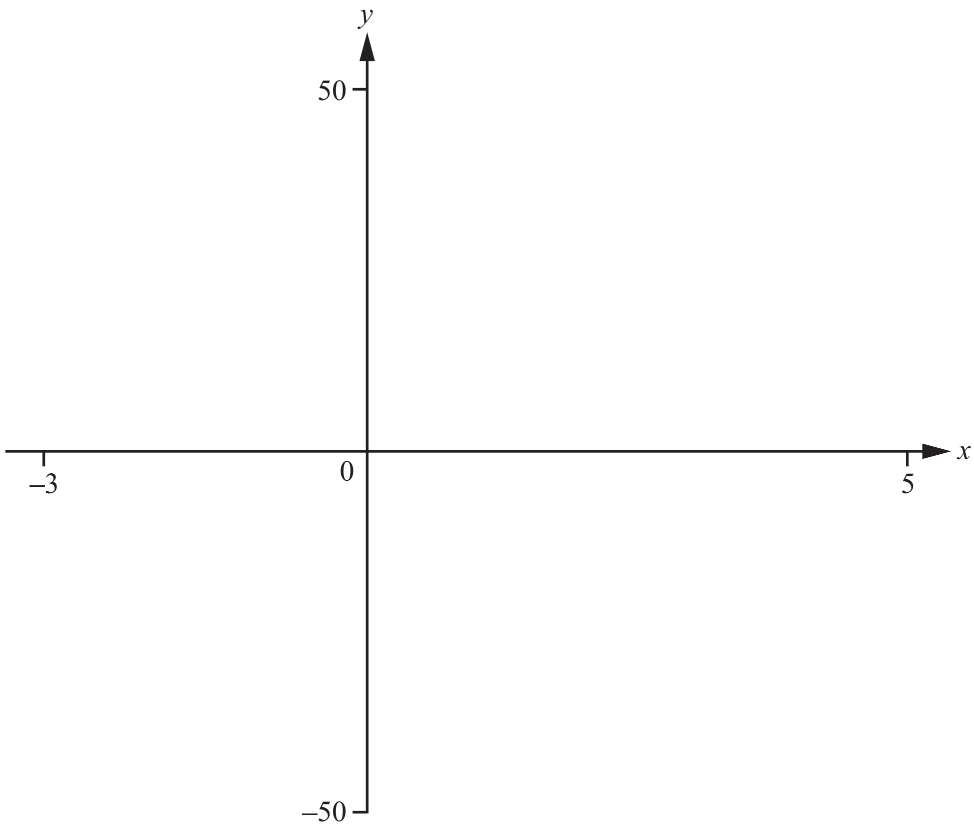
.... [2]

(b) *DT* = *OC*

Find angle *ABC*.

Angle *ABC* = ... [4]

9



$f(x) = x^3 - 3x^2 - 4x + 1$ for $-3 \leqslant x \leqslant 5$.

(a) On the diagram, sketch the graph of $y = f(x)$. [2]

(b) Write down the co-ordinates of the local minimum.

(.................... , ...) [2]

(c) Find the range of values of k so that $f(x) = k$ has only one solution.

.... [2]

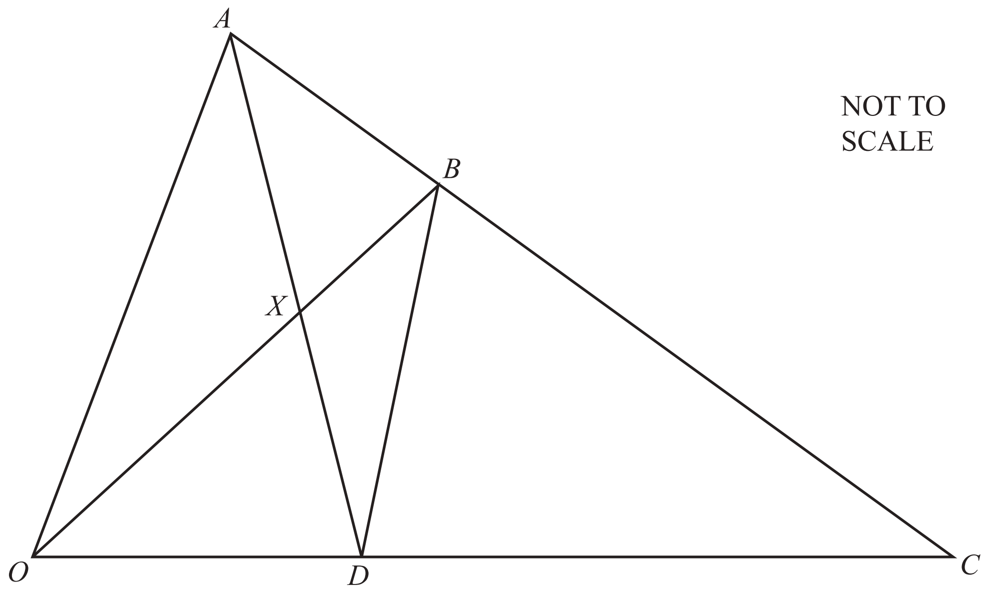
(d) $g(x) = 3x^2 - 6x - 4$ for $-3 \leqslant x \leqslant 5$.

The graph of $y = f(x)$ intersects the graph of $y = g(x)$ twice.

Solve $f(x) > g(x)$.

.... [2]

10



OAC is a triangle with $AB : BC = 1 : 2$ and $OD : DC = 1 : 2$.

The lines *OB* and *AD* intersect at *X*.

$\overrightarrow{OA} = 6\mathbf{a}$ and $\overrightarrow{OC} = 6\mathbf{c}$.

(a) Find an expression, in terms of **a** and/or **c**, for

(i) $\overrightarrow{AC}$,

$\overrightarrow{AC} =$ .... [1]

(ii) $\overrightarrow{BC}$,

$\overrightarrow{BC} =$ .... [1]

(iii) $\overrightarrow{BD}$, giving your answer in its simplest form.

$\overrightarrow{BD} =$ .... [2]

(b) Use your answer to **part (a)(iii)** to explain why OA and BD are parallel.

.... [1]

(c) Explain why triangle OAX and triangle BDX are similar.

....

.... [2]

(d) Find an expression, in terms of **a** and **c**, for

(i) $\overrightarrow{AD}$,

$\overrightarrow{AD}$ = ... [2]

(ii) $\overrightarrow{XD}$, giving your answer in its simplest form.

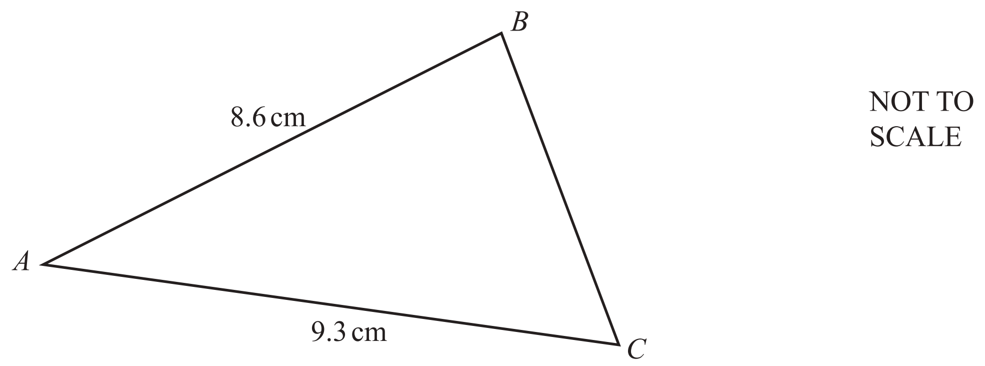
$\overrightarrow{XD}$ = ... [2]

(e) Find the ratio area AXO : area BXD.

.... : .... [2]

Question 11 is printed on the next page.

11



The area of triangle *ABC* = 23.5 cm^2.

(a) Show that angle *BAC* = 36.0°, correct to 1 decimal place.

[2]

(b) Use the cosine rule to find *BC*.

BC = ... cm [3]

(c) All the angles in triangle *ABC* are acute.

Use the sine rule to find the largest angle in the triangle *ABC*.

.... [3]