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OXFORD CAMBRIDGE AND RSA EXAMINATIONS

General Certificate of Secondary Education

MATHEMATICS B (MEI) 1968/2316A

PAPER 2 SECTION A

HIGHER TIER

Monday **12 JUNE 2006** Morning 1 hour

Candidates answer on the question paper.
Additional materials:
Geometrical instruments
Tracing paper (optional)

Candidate Name	Centre Number	Candidate Number

TIME 1 hour

INSTRUCTIONS TO CANDIDATES

- Write your name, Centre number and candidate number in the boxes above.
- Answer **all** the questions.
- Write your answers, in blue or black ink, in the spaces provided on the question paper.
- Read each question carefully and make sure you know what you have to do before starting your answer.
- Show all your working. Marks may be given for working which shows that you know how to solve the problem, even if you get the answer wrong.

INFORMATION FOR CANDIDATES

- The number of marks is given in brackets [ ] at the end of each question or part question.
- The total number of marks for this section is 50.

WARNING

You are not allowed to use a calculator in Section A of this paper.

FOR EXAMINER'S USE	
Section A	
Section B	
TOTAL	

This question paper consists of 13 printed pages and 3 blank pages.

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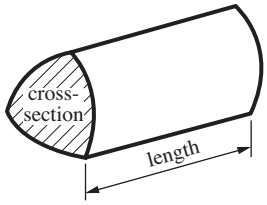
Formulae Sheet: Higher Tier

Volume of prism = (area of cross-section) × length

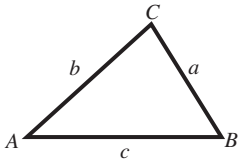


In any triangle *ABC*

Sine rule $\dfrac{a}{\sin A} = \dfrac{b}{\sin B} = \dfrac{c}{\sin C}$

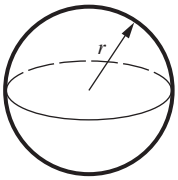
Cosine rule $a^2 = b^2 + c^2 - 2bc\cos A$

Area of triangle = $\frac{1}{2}ab\sin C$



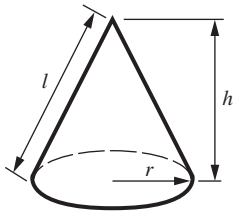
Volume of sphere = $\frac{4}{3}\pi r^3$

Surface area of sphere = $4\pi r^2$



Volume of cone = $\frac{1}{3}\pi r^2 h$

Curved surface area of cone = $\pi r l$



The Quadratic Equation

The solutions of $ax^2 + bx + c = 0$
where $a \neq 0$, are given by

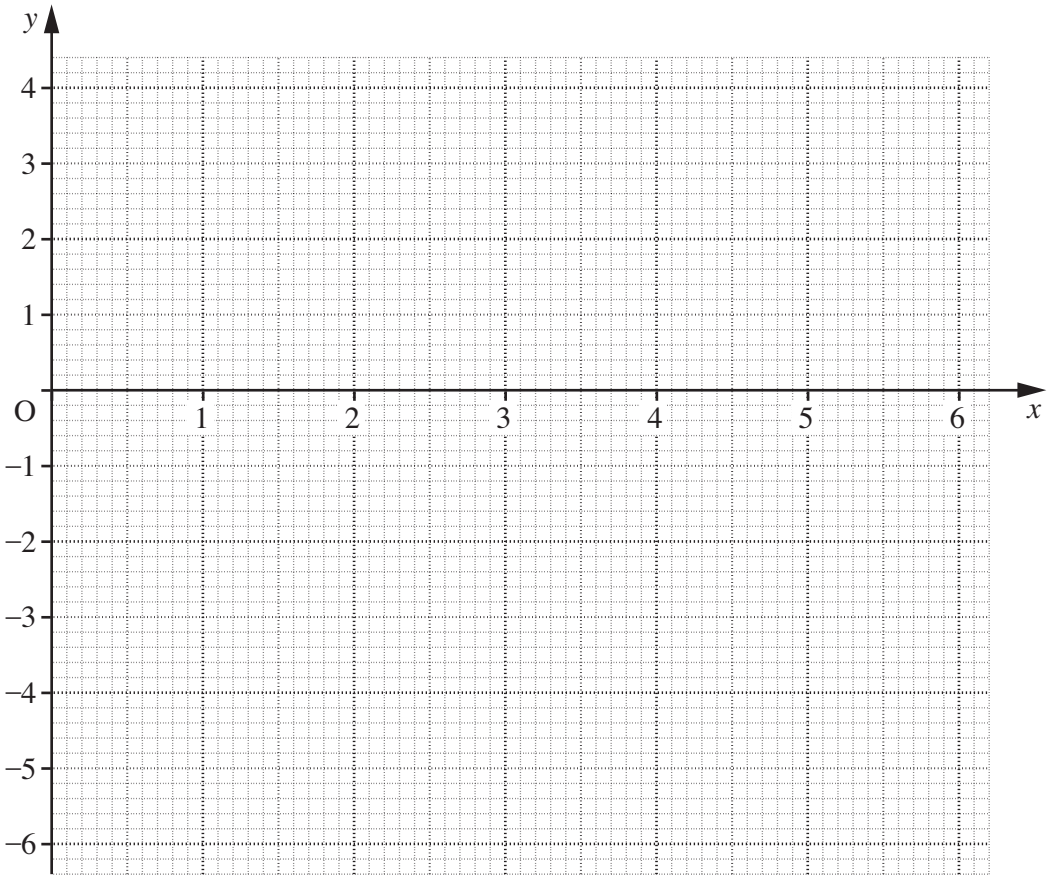
$$x = \frac{-b \pm \sqrt{(b^2 - 4ac)}}{2a}$$

1 **(a)** Complete the table for $y = x^2 - 6x + 4$.

x	0	1	2	3	4	5	6
y	4	–1	–4			–1	4

[2]

(b) Draw the graph of $y = x^2 - 6x + 4$.



[2]

(c) Use your graph to find the values of x for which $x^2 - 6x + 4 = 0$.

(c) .....[2]

[Turn over

2 The following statements describe a skydiver's flight in terms of her vertical speed.

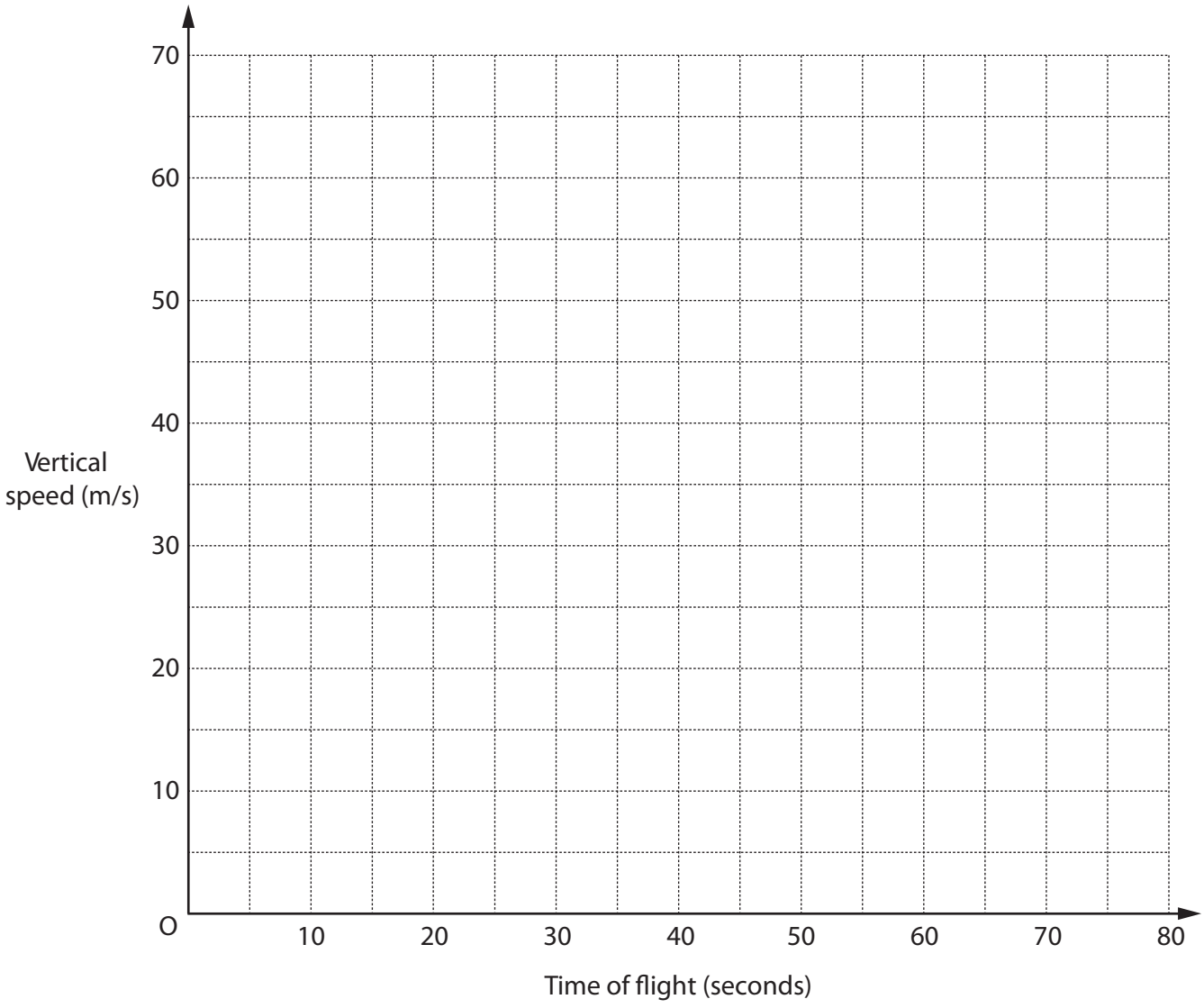
- Directly after leaving the plane her vertical speed increased steadily from zero to 60 m/s. This took 10 s.
- She carried on falling with a constant speed of 60 m/s for another 20 seconds.
- She then opened her parachute. Over the next 20 seconds her vertical speed reduced steadily to 5 m/s.
- She carried on falling with a constant speed of 5 m/s, until she landed 75 s after leaving the plane.

Two photographs have beenremoved due to third party copyright restrictions.

Details:

Two photographs of skydivers

On the grid below sketch a graph which shows the skydiver's vertical speed during her flight. [4]



3 The n^{th} term, u_n, of the sequence of oblong numbers, is given by this formula.

$$u_n = n(n + 1)$$

(a) **(i)** Work out u_5.

(a)(i) .....[1]

(ii) Write down the value of n for which $u_n = 90$.

(ii) .....[1]

(b) Prove that all oblong numbers are even. [2]

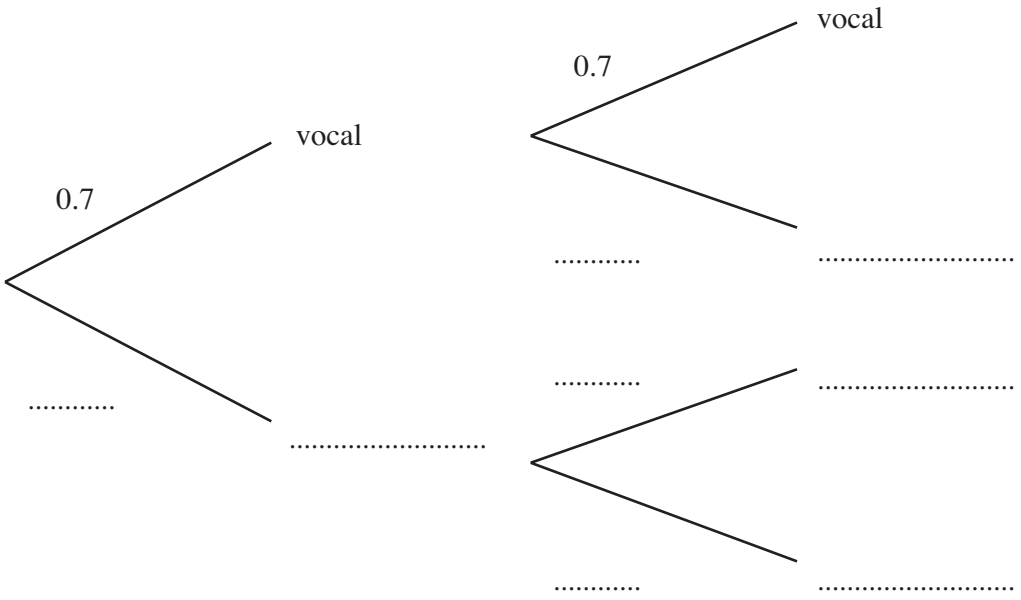
(c) Given that $u_{n-1} = n(n - 1)$, find an expression for $u_n - u_{n-1}$.
Give your answer as simply as possible.

(c) .....[2]

4 Jim has a CD with 10 tracks.
7 of the tracks are vocals and the remaining 3 are instrumentals.

Jim sets his CD player to play tracks of this CD at random.
(The same track can be repeated.)

(a) Complete this tree diagram to show probabilities for the first two tracks played.



[2]

(b) Calculate the probability that

(i) both tracks are vocals,

(b)(i) .....[2]

(ii) at least one track is a vocal.

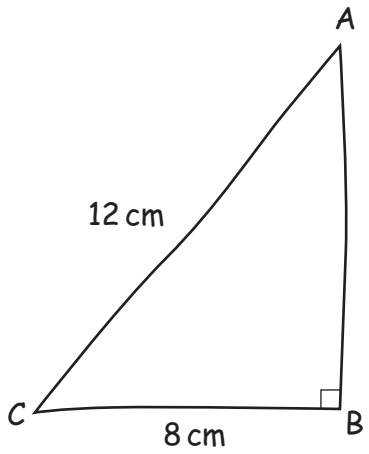
(ii) .....[3]

5 Write the recurring decimal 0.102102102102102... as a fraction in its simplest terms.

.....[3]

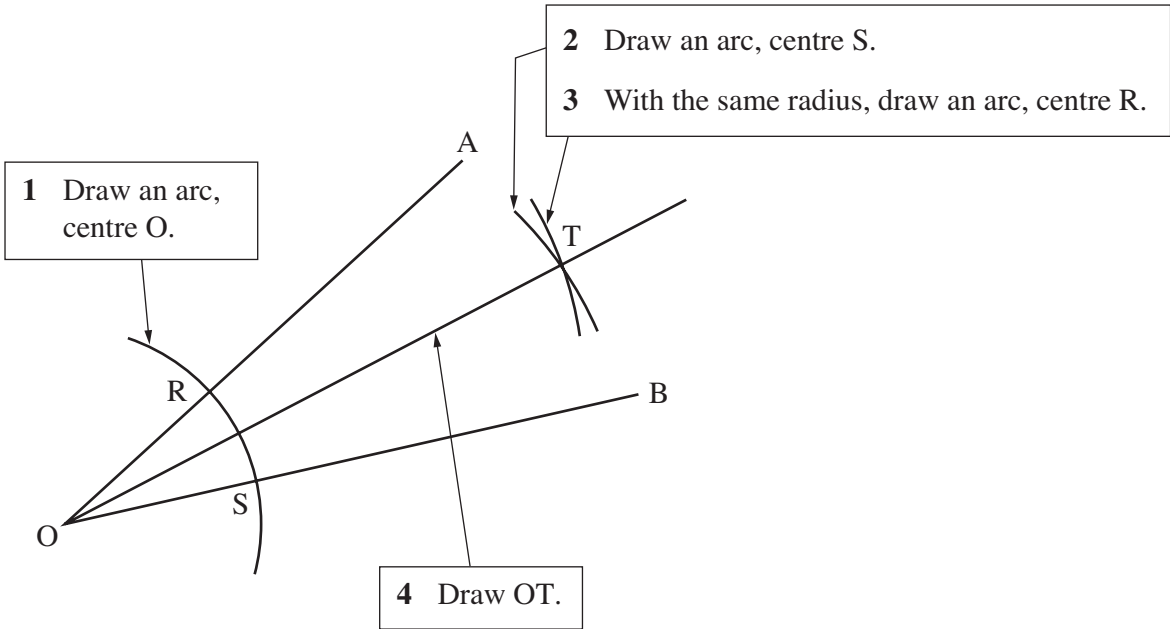
[Turn over

6 **(a)** Here is a sketch of triangle ABC.

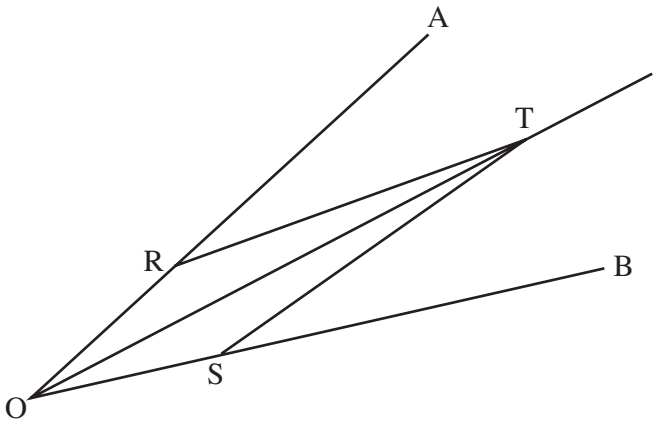


Using ruler and compasses, construct triangle ABC.
Leave in all your construction lines. [3]

(b) These are instructions for bisecting angle AOB, using a pair of compasses.



Use congruent triangles and this diagram to prove that the line OT bisects angle AOB.

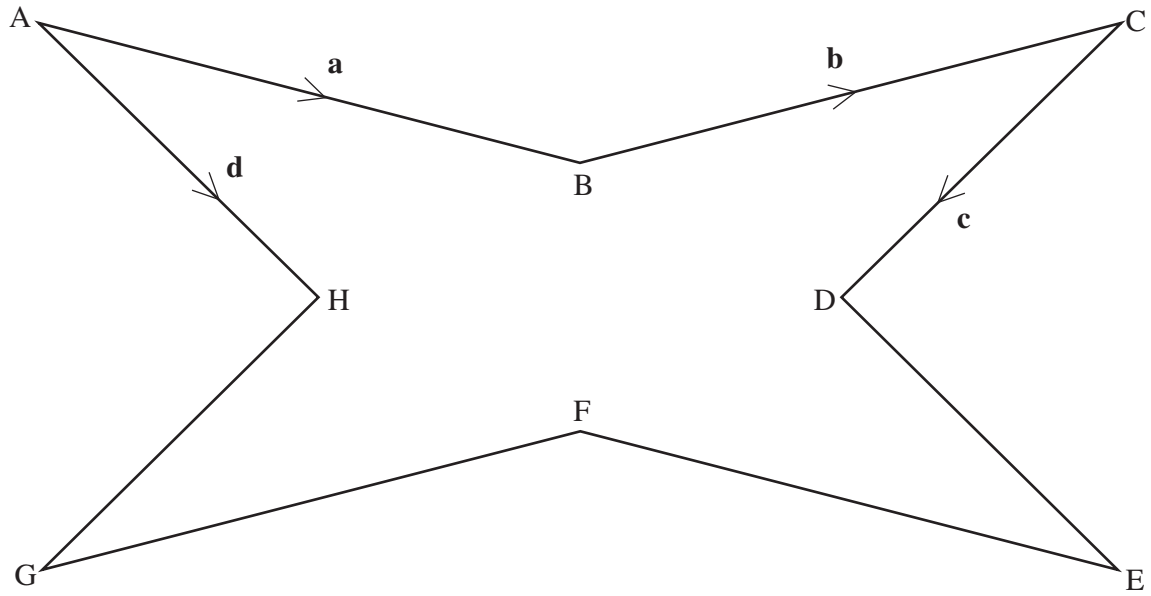


[4]

[Turn over

7 In the shape ABCDEFGH

$\overrightarrow{AB} = \overrightarrow{FE} = \mathbf{a}$, $\overrightarrow{BC} = \overrightarrow{GF} = \mathbf{b}$, $\overrightarrow{CD} = \overrightarrow{HG} = \mathbf{c}$, $\overrightarrow{DE} = \overrightarrow{AH} = \mathbf{d}$.



(a) (i) Write down an expression for $\overrightarrow{HB}$ in terms of **a** and **d**.

(a)(i) .....[1]

(ii) Show that BDFH is a parallelogram. [2]

(b) Write down an expression for $\overrightarrow{FB}$ in terms of **a**, **b**, **c** and **d**.

(b) .....[2]

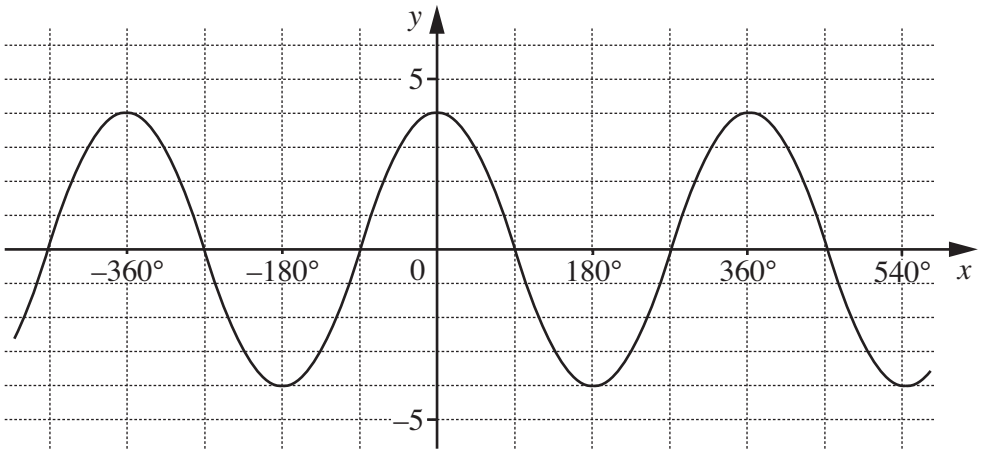
8 Solve algebraically.

$$\frac{1}{x-1} + \frac{1}{x+1} = \frac{3}{4}$$

.....[7]

TURN OVER FOR QUESTION 9

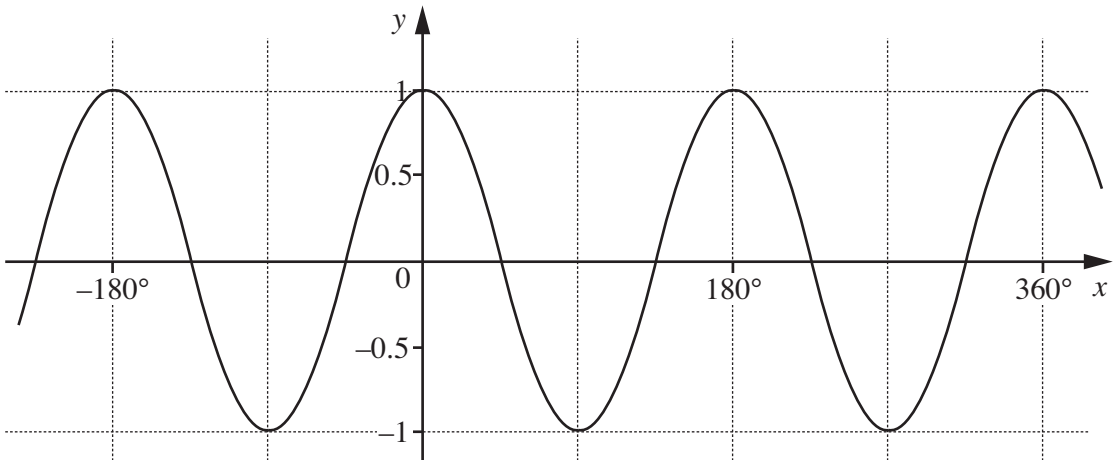
9 **(a)** This is the graph of $y = p\cos x°$.



Write down the value of p.

(a) .....[1]

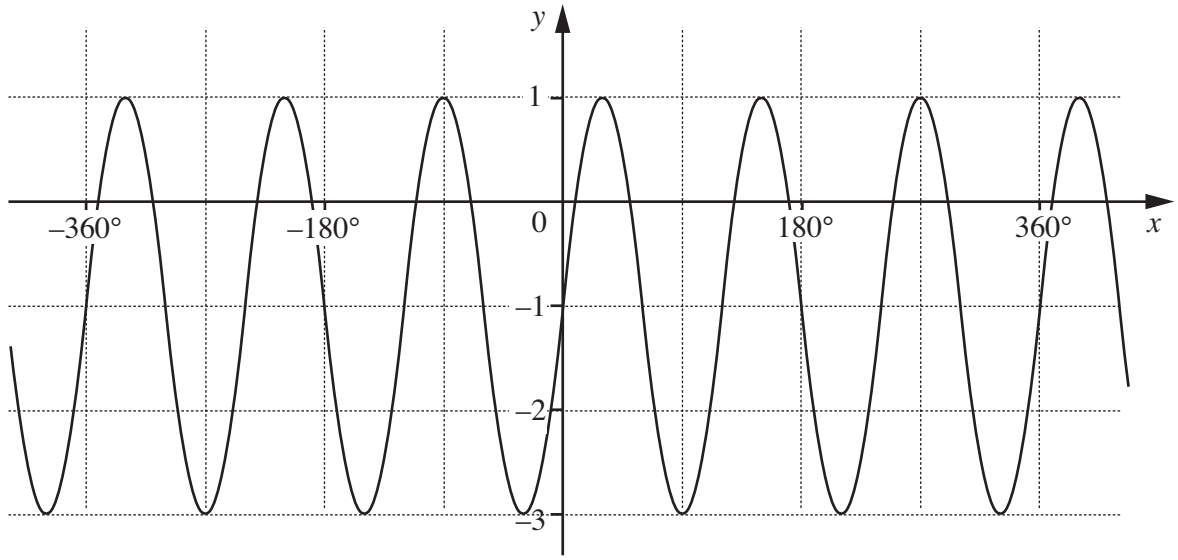
(b) This is the graph of $y = \cos(qx)°$.



Write down the value of q.

(b) .....[1]

(c) This is the graph of $y = r \sin (sx)° + t$.



Write down the values of r, s and t.

(c) r = ...[1]

s = ...[1]

t = ...[1]

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