Surname	Centre Number	Candidate Number
Other Names		0

GCSE

3300U50-1

S18-3300U50-1

MATHEMATICS
UNIT 1: NON-CALCULATOR
HIGHER TIER

THURSDAY, 24 MAY 2018 – MORNING

1 hour 45 minutes

ADDITIONAL MATERIALS

The use of a calculator is not permitted in this examination.

A ruler, a protractor and a pair of compasses may be required.

INSTRUCTIONS TO CANDIDATES

Use black ink or black ball-point pen. Do not use gel pen or correction fluid.

You may use a pencil for graphs and diagrams only.

Write your name, centre number and candidate number in the spaces at the top of this page.

Answer **all** the questions in the spaces provided.

If you run out of space use the continuation page at the back of the booklet. Question numbers must be given for all work written on the continuation page.

Take π as 3·14.

INFORMATION FOR CANDIDATES

You should give details of your method of solution when appropriate.

Unless stated, diagrams are not drawn to scale.

Scale drawing solutions will not be acceptable where you are asked to calculate.

The number of marks is given in brackets at the end of each question or part-question.

In question **9**, the assessment will take into account the quality of your linguistic and mathematical organisation, communication and accuracy in writing.

For Examiner's use only		
Question	**Maximum Mark**	**Mark Awarded**
1.	**3**	
2.	**5**	
3.	**7**	
4.	**6**	
5.	**4**	
6.	**2**	
7.	**3**	
8.	**5**	
9.	**7**	
10.	**2**	
11.	**5**	
12.	**4**	
13.	**5**	
14.	**2**	
15.	**4**	
16.	**5**	
17.	**5**	
18.	**6**	
Total	**80**	

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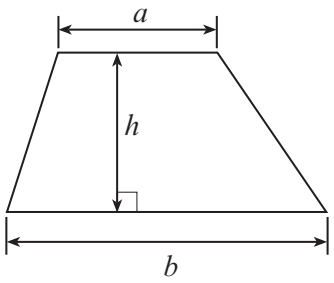
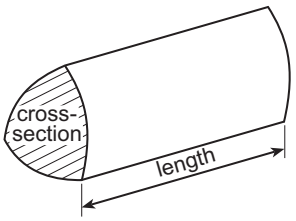
Formula List - Higher Tier

Area of trapezium = $\frac{1}{2}(a + b)h$

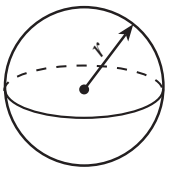


Volume of prism = area of cross-section × length



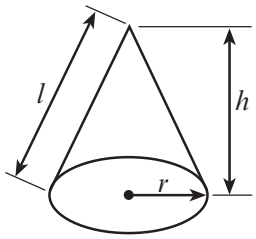
Volume of sphere = $\frac{4}{3}\pi r^3$

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



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

Curved surface area of cone = πrl

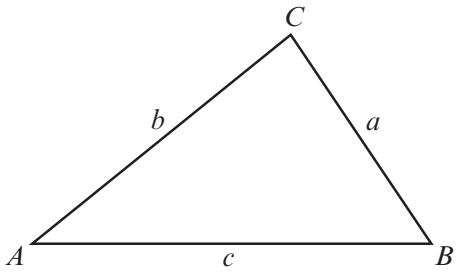


In any triangle ABC

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

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

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



The Quadratic Equation

The solutions of $ax^2 + bx + c = 0$ where $a \neq 0$ are given by $x = \frac{-b \pm \sqrt{(b^2 - 4ac)}}{2a}$

Annual Equivalent Rate (AER)

AER, as a decimal, is calculated using the formula $\left(1+\frac{i}{n}\right)^n - 1$, where i is the nominal interest rate per annum as a decimal and n is the number of compounding periods per annum.

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Examiner only

1. *(a)* Circle the **best** approximate value for the following calculation. [1]

$$\frac{596{\cdot}3}{38{\cdot}2 + 11{\cdot}5}$$

110 12 11 120 10

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(b) A number is increased by 4% of its value.
This is done 7 times, each time increasing the previous value by 4%.
Circle the multiplier that you would use to find the value after the 7 increases. [1]

$\times 1{\cdot}04^7$ $\times 1{\cdot}4^7$ $\times 0{\cdot}04^7$ $\times 1{\cdot}04^6$ $\times 1{\cdot}28$

.....

(c) Calculate $\frac{4}{5} \div \frac{1}{4}$.

Circle the correct answer. [1]

$1\frac{3}{5}$ $\frac{1}{5}$ $\frac{5}{16}$ 5 $3\frac{1}{5}$

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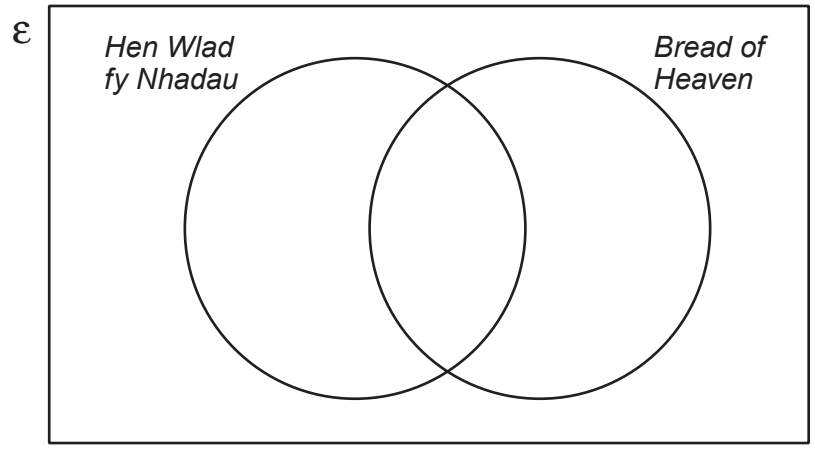
Examiner only

2. 30 rugby supporters travel to Cardiff on a coach.
They decide to investigate how many of them can sing one, or both, of the songs *'Hen Wlad fy Nhadau'* and *'Bread of Heaven'*.

- 12 say they can sing both songs.
- 18 say they can sing *'Bread of Heaven'*.
- 5 say they cannot sing either of the songs.

(a) Complete the Venn diagram below to show this information.
The universal set, ε, contains all of the 30 supporters on the coach. [3]



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(b) One of these supporters is chosen at random.
What is the probability that this person can sing *'Hen Wlad fy Nhadau'*? [2]

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Turn over.

Examiner only

3. *(a)* Expand and simplify the following expression. [4]

$$x(5x - 2) - 3(x^2 - 2x + 7)$$

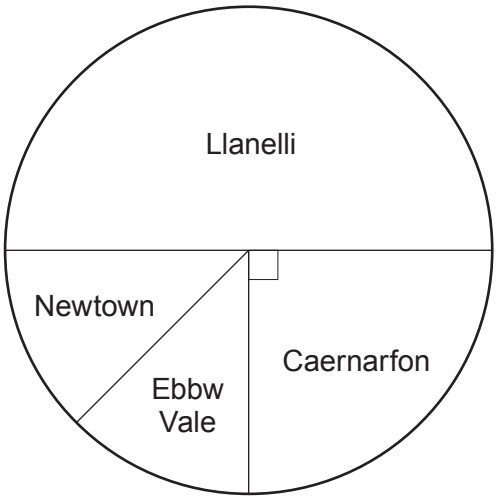
(b) Solve $\frac{22 - f}{3} = 6$. [3]

4. *(a)* A fair, six-sided dice is thrown twice.
What is the probability that a 3 is thrown on both occasions? [2]

Examiner only

(b) A company has offices in Llanelli, Caernarfon, Newtown and Ebbw Vale.
Its national committee is made up of workers from these four offices.

The pie chart below shows what fraction of the committee members come from each office.



There is an equal number of members from Newtown and Ebbw Vale.

A member is chosen at random from this committee to be its chairperson.

(i) The probability that the chosen member works at the Llanelli office is shown in the table below.

Complete the table. [2]

Office	Llanelli	Caernarfon	Newtown	Ebbw Vale
Probability	$\frac{1}{2}$			

.....

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.....

(ii) What is the probability that the member chosen as chairperson works at either the Llanelli or the Ebbw Vale office?
You must show all your working. [2]

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5. *(a)* Calculate the value of $(2 \times 10^{-4}) \times (7{\cdot}8 \times 10^{9})$.
Give your answer in standard form. [2]

(b) Calculate the value of $\dfrac{3{\cdot}9 \times 10^{8}}{3000}$.

Give your answer in standard form. [2]

6. Factorise $12x^2 + 3xy$. [2]

Examiner only

7. Calculate the size of angle x in the diagram below. [3]

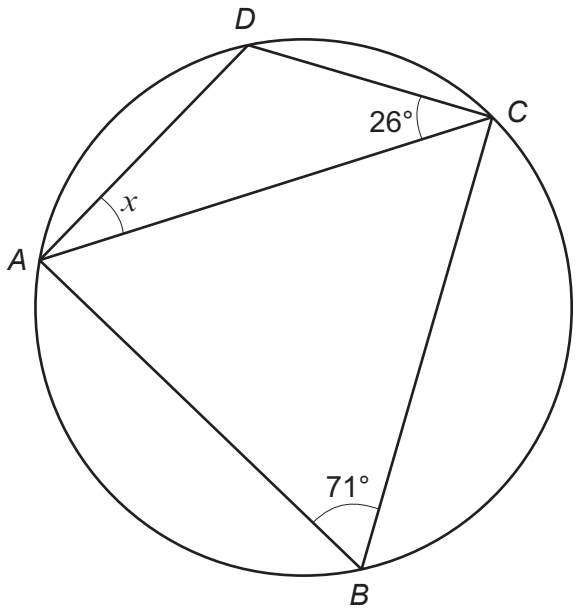


Diagram not drawn to scale

Examiner only

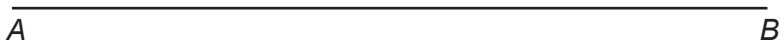
8. The line AB is drawn below.
The point P lies **above** the line AB.

The region in which P is located is such that

- P is nearer to point A than to point B,
- $B\hat{A}P \leqslant 60°$,
- $AP \geqslant 6\,\text{cm}$.

Using a ruler and a pair of compasses, **construct** suitable lines and arcs to represent these conditions.
Construction arcs must be clearly shown.

Shade the region in which the point P is located. [5]



Examiner only

9. *In this question, you will be assessed on the quality of your organisation, communication and accuracy in writing.*

In the triangle ABC shown below, $B\hat{A}C = 40°$ and $A\hat{C}B = 80°$.
X is a point on side AC such that $BX = BC$.

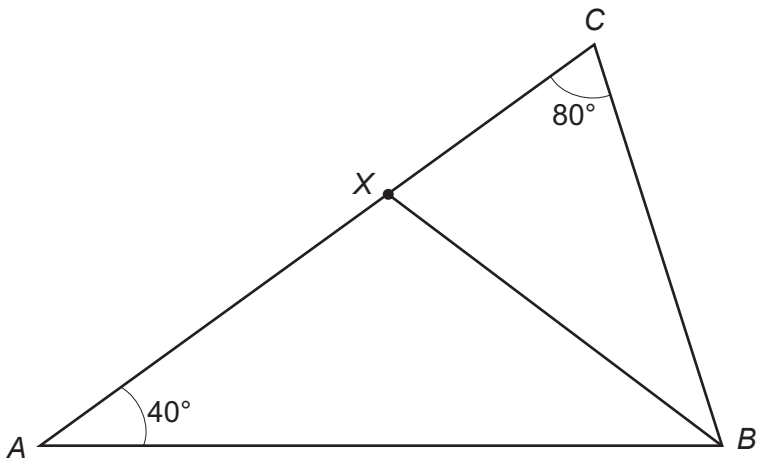


Diagram not drawn to scale

Prove that $AX = BX$.
Give reasons for each step of your proof.
You must show all your working. [5 + 2 OCW]

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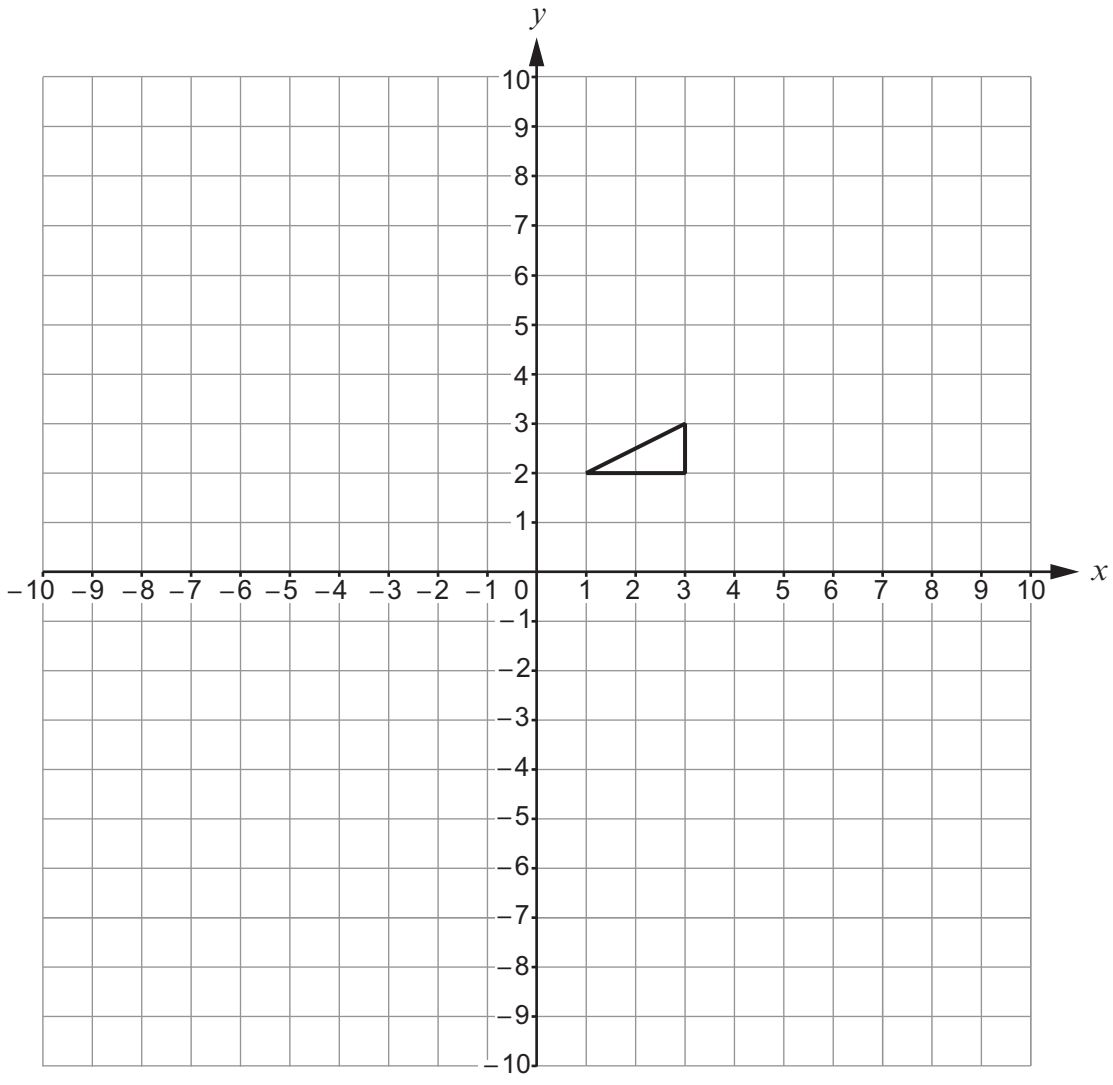
Examiner only

10. Enlarge the triangle below by a scale factor of –2. Use the origin as the centre of enlargement. [2]



Examiner only

11. Given that y is directly proportional to $\sqrt{x}$ and that $y = 30$ when $x = 36$,

(a) find an expression for y in terms of x, [3]

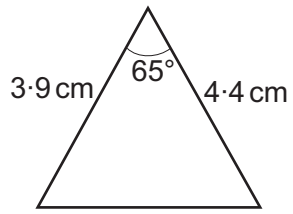
(b) use the expression you found in part *(a)* to complete the following table. [2]

x	36	49	
y	30		40

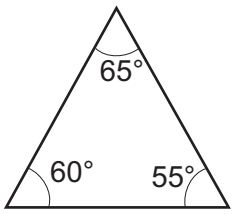
Examiner only

12. In the diagrams below, only two pairs of triangles are **definitely** congruent.
Identify the two pairs.
In each case, state the condition of congruency. [4]

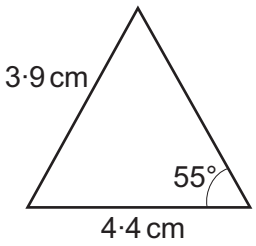
A



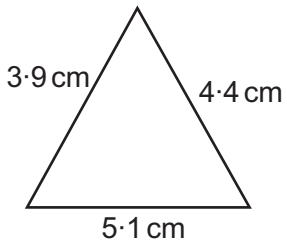
B



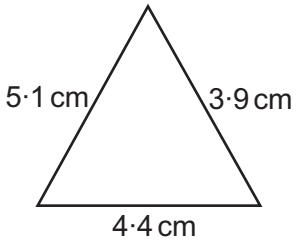
C



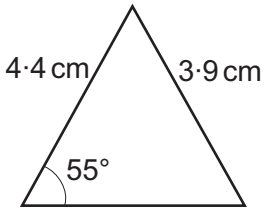
D



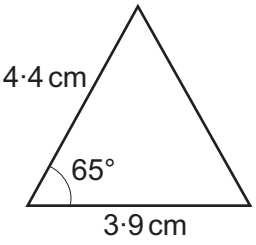
E



F



G



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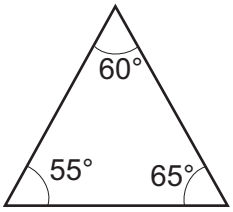

Diagrams not drawn to scale

Triangle ..... is congruent to triangle .....

Condition of congruency:

.....

Triangle ..... is congruent to triangle .....

Condition of congruency:

.....

Examiner only

13. A ball is thrown upwards from a height of 1 m above the ground.

After t seconds, its height above the ground is h metres, where h is given by

$$h = 1 + 8t - 5t^2.$$

(a) Show that the time taken to reach a height of 4 metres satisfies the equation

$$5t^2 - 8t + 3 = 0.$$ [1]

(b) Solve the equation

$$5t^2 - 8t + 3 = 0.$$ [3]

(c) Interpret your answer to part *(b)* in the context of the question. [1]

Examiner only

14. Circle the correct answer for each of the following statements.

(a) $9^{\frac{3}{2}}$ is equal to [1]

6 $\frac{21}{2}$ $\frac{27}{2}$ 27 $\frac{729}{2}$

.....

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.....

(b) $10\,000^{-\frac{1}{4}}$ is equal to [1]

$-10\,000$ -2500 $\frac{1}{2500}$ $\frac{1}{100}$ $\frac{1}{10}$

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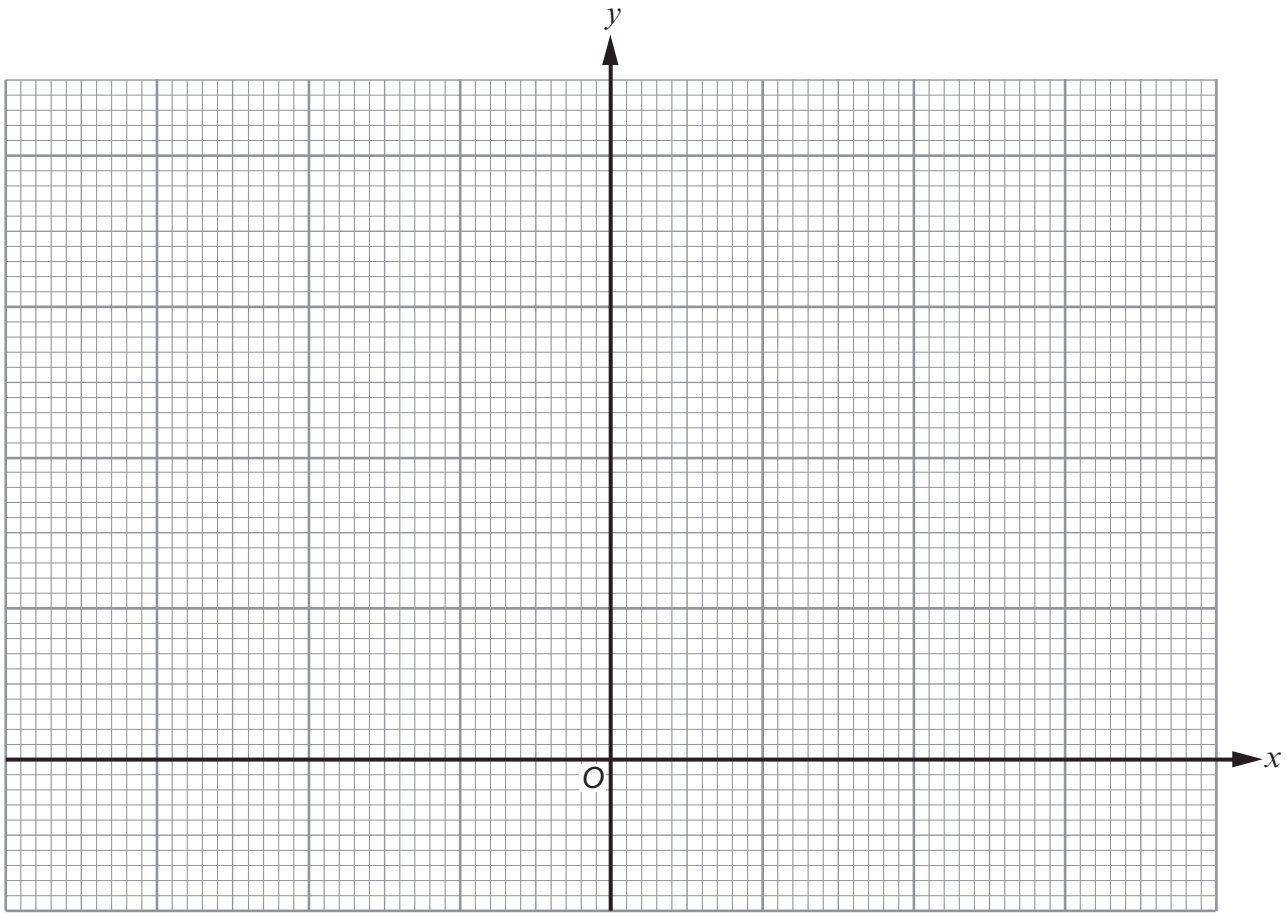
Examiner only

15. *(a)* Express $0\dot{2}\dot{4}\dot{5}$ as a fraction. [2]

(b) Expand and simplify $(8-3\sqrt{7})(5+\sqrt{7})$. [2]

Examiner only

16. *(a)* Draw the graph of the curve $y = 2^x$ for values of x from –2 to 2.
Use the graph paper below. [3]



(b) Use your graph to find the value of $2^{1\cdot4}$. [1]

(c) Use your graph to solve the equation $2^x = 1\cdot4$. [1]

Examiner only

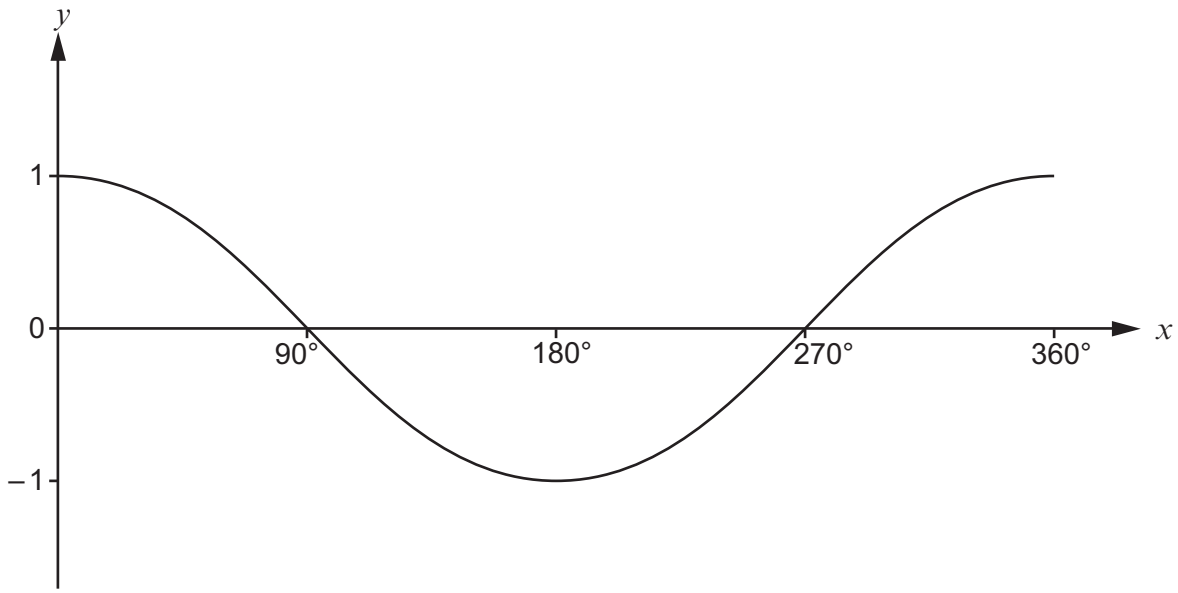
17. At a children's party, the children play a number of games.
The winner of each game chooses a ticket for a prize, at random, from a box.
The ticket is not returned to the box.
At the start of the party, there are 12 prizes available: 1 book, 3 key-rings and 8 pencils.

(a) Find the probability that the winners of the first two games choose the same type of prize. [3]

(b) After the winners of the first **three** games have chosen their prizes, find the probability that the ticket for the book is still in the box. [2]

Examiner only

18. The following diagram shows a sketch of $y = \cos x$ for values of x from 0° to 360°.



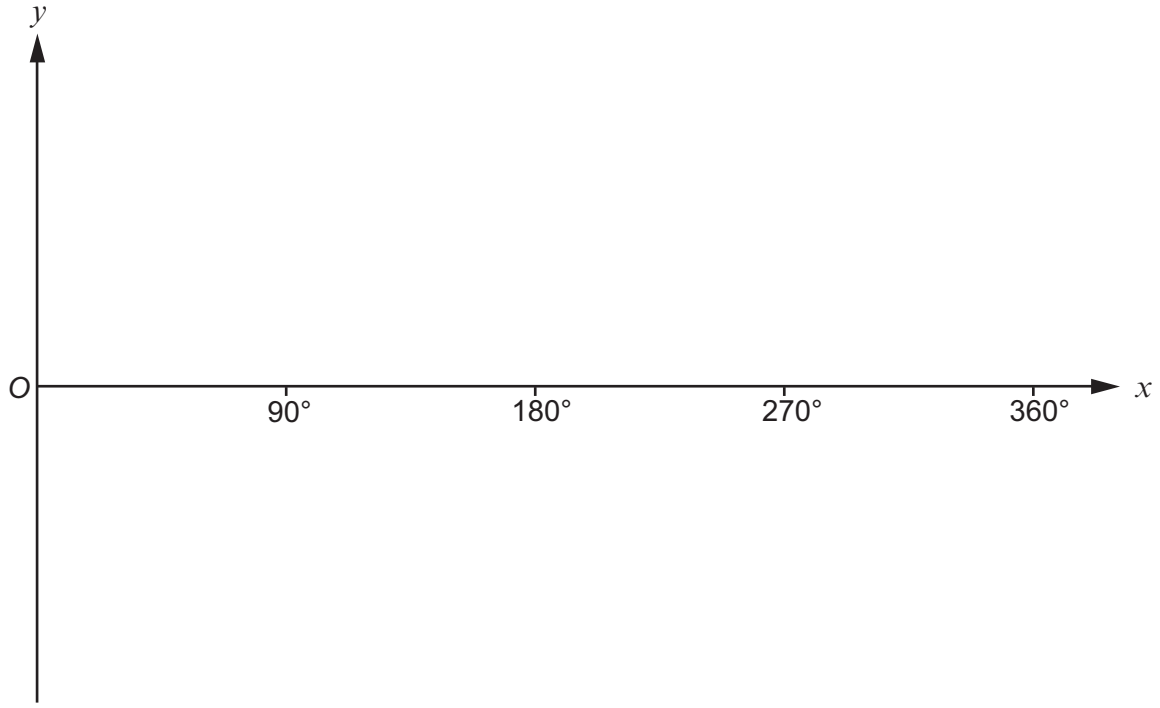
(a) Given that $\cos 21° = 0{\cdot}9336$, correct to 4 decimal places, write down all the solutions of the equation

$$\cos x = -0{\cdot}9336$$

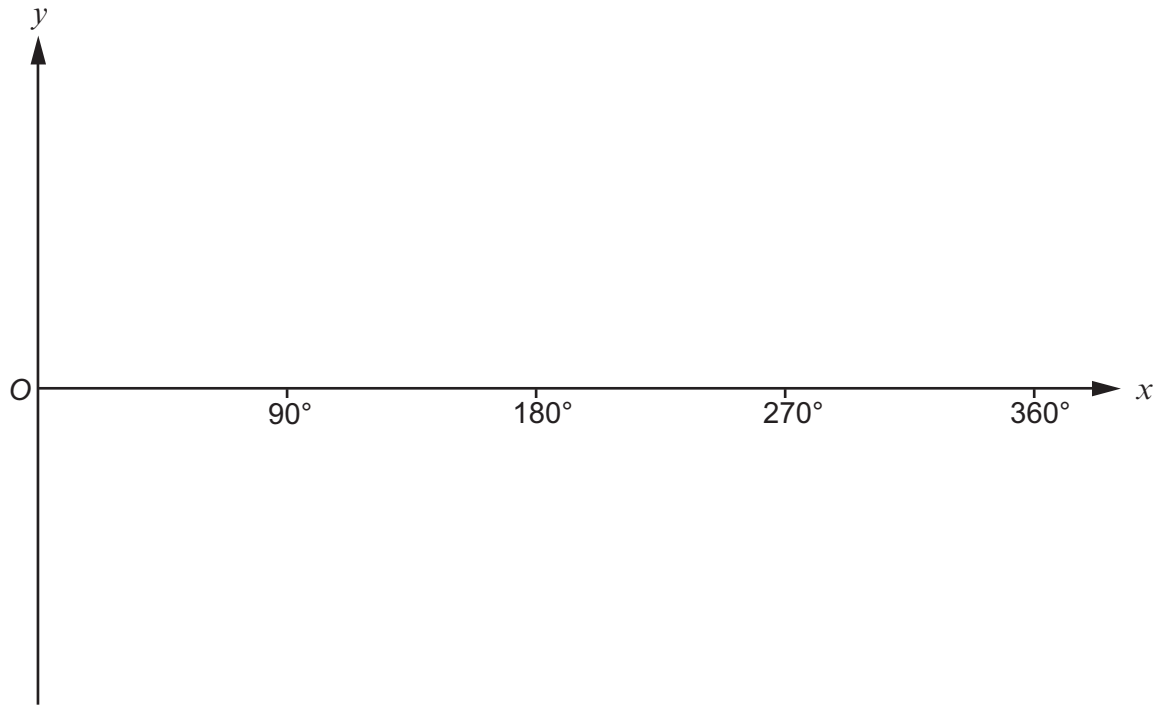
for values of x from 0° to 360°. [2]

Examiner only

(b) (i) Use the following axes to sketch the graph of $y = 2\cos x$ for values of x from 0° to 360°.
You must indicate any important points on both axes. [2]



(ii) Use the following axes to sketch the graph of $y = \cos x - 1$ for values of x from 0° to 360°.
You must indicate any important points on both axes. [2]



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Question number	Additional page, if required. Write the question number(s) in the left-hand margin.

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