WJEC CBAC

GCSE LINKED PAIR PILOT

4363/02

METHODS IN MATHEMATICS
UNIT 1: Methods (Non-Calculator)
HIGHER TIER

A.M. MONDAY, 9 June 2014

2 hours

CALCULATORS ARE
NOT TO BE USED
FOR THIS PAPER

INSTRUCTIONS TO CANDIDATES

Use black ink or black ball-point pen.

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.

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.

You are reminded that assessment will take into account the quality of written communication (including mathematical communication) used in your answer to question **2**.

Formula List

Area of trapezium $= \frac{1}{2}(a + b)h$
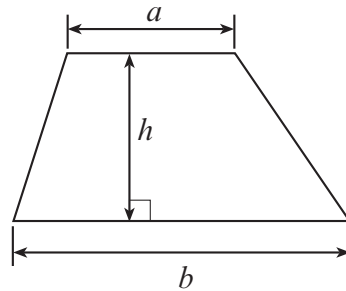
Volume of prism = area of cross-section × length
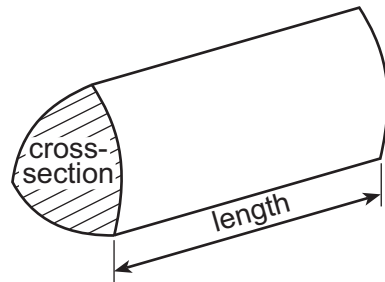
Volume of sphere $= \frac{4}{3}\pi r^3$

Surface area of sphere $= 4\pi r^2$
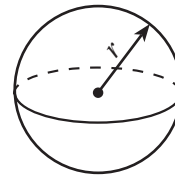
Volume of cone $= \frac{1}{3}\pi r^2 h$

Curved surface area of cone $= \pi r l$
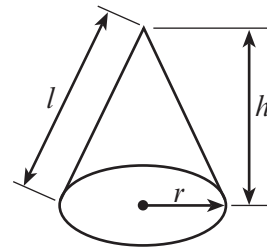
In any triangle ABC

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 $= \frac{1}{2}ab \sin C$
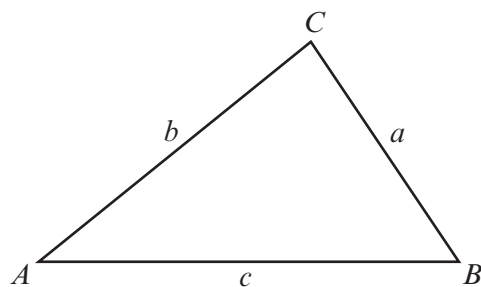
The Quadratic Equation

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.
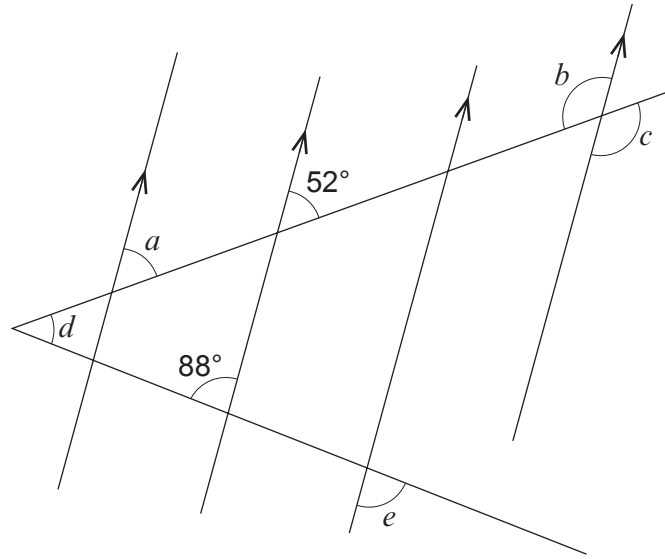
Diagram not drawn to scale

Find the size of each of the angles a, b, c, d and e.   [5]

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$a =$ ....°

$b =$ ....°

$c =$ ....°

$d =$ ....°

$e =$ ....°

(4363-02)   **Turn over.**

2. *You will be assessed on the quality of your written communication in this question.*
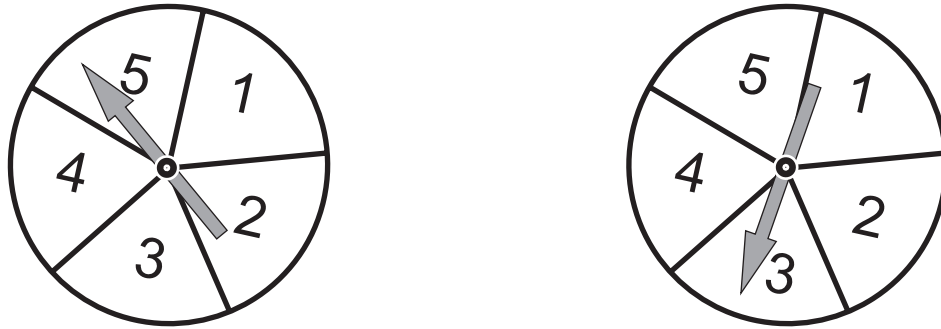
The two spinners are spun.
The score is the total of the two numbers shown on the spinners.
The score shown above is eight.

There are two different game cards, card A and card B.
A game is played, crossing out the scores from the spinners on the game card as the spinners are spun repeatedly.
The first game card with all four scores crossed out is the winning card.

Game card A

3	2
9	10

Game card B

4	6
5	7

Which game card is more likely to be the winning card?
You must show your working and give a reason for your answer.   [6]

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3. *(a)* Find the highest common factor of 36 and 90. [1]

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(b) Find the lowest common multiple of 4 and 6. [1]

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(c) Evaluate $\left(2{\cdot}5 \div 10 + 2\frac{3}{4}\right)^2$. [2]

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(d) Express $\dfrac{0{\cdot}15 \times 0{\cdot}4}{60}$ as a fraction in its simplest form. [3]

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4. *(a)* Write down the name of a quadrilateral with diagonals that are equal in length. [1]

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(b) Write down the name of a quadrilateral with rotational symmetry of order 2. [1]

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(c) The diagram below shows four quadrilaterals drawn on a grid.
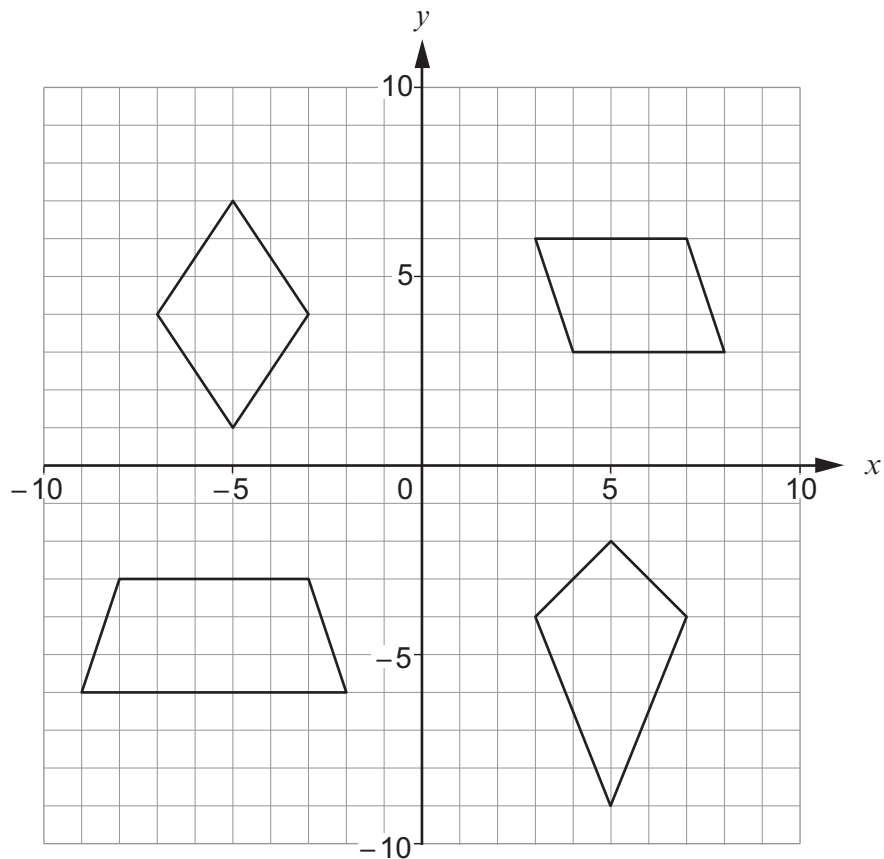
(i) Write down the coordinates of the centre of rotational symmetry of the rhombus. [1]

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

(ii) Write down the coordinates of the intersection of the diagonals of the kite. [1]

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

5. *(a)* Make e the subject of the following formula. [2]

$$h = 5e - 4$$

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(b) Given that $a = 10$, $b = -3$ and $c = -5$, find the value of each of the following expressions.

(i) b^2 [1]

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(ii) $\dfrac{ab}{c}$ [1]

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(iii) $\dfrac{2bc}{a}$ [1]

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6. State whether the following statements are true or false.
You must give a reason for each of your answers.

(a) "All prime numbers have more than two factors." [2]

True or False? ....

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(b) "All square numbers have an odd number of factors." [2]

True or False? ....

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7. There are two regular polygons, *X* and *Y*.
The size of each **exterior** angle in regular polygon *X*, is 9°.
Each **interior** angle of regular polygon *Y* is 120°.

Complete the sentences below. [4]

Regular polygon *X* has .... sides.

Regular polygon *Y* has .... sides.

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8.

     A   *B*   *C*

Diagram not drawn to scale

ABC is a straight line, *AB:BC* is 3:8 and the length of *BC* = 36 cm.
Calculate the length of *AC*. [3]

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9. *(a)* Write down the smallest possible number by which 24 has to be multiplied to create a perfect square. [2]

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(b) Write $\frac{12}{99}$ as a recurring decimal. [2]

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(c) Express 0·025 as a fraction in its simplest terms. [2]

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10. *(a)* Find the nth term of each of the following sequences.

   (i)   7, 11, 15, 19, 23, 27, ... [2]

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   (ii)   72, 70, 68, 66, 64, 62, ... [2]

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   (iii)   −7, −4, 1, 8, 17, 28, ... [2]

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(b) A sequence has an nth term of $3n^2 + 4$.
Find the 20th term of this sequence. [2]

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11. Evaluate the following, giving each of your answers in standard form.

(a) $(2{\cdot}5 \times 10^6) \times (8 \times 10^3)$ [2]

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(b) $5 \times 10^8 + 6{\cdot}8 \times 10^9$ [2]

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12. (a) Factorise the following expressions.

(i) $12x^2 + 18xy$ [2]

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(ii) $x^2 - 100$ [1]

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(b) Factorise $x^2 - 5x - 14$ and hence solve $x^2 - 5x - 14 = 0$. [3]

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13. The graph of the equation $y = x$ is shown on the axes below.
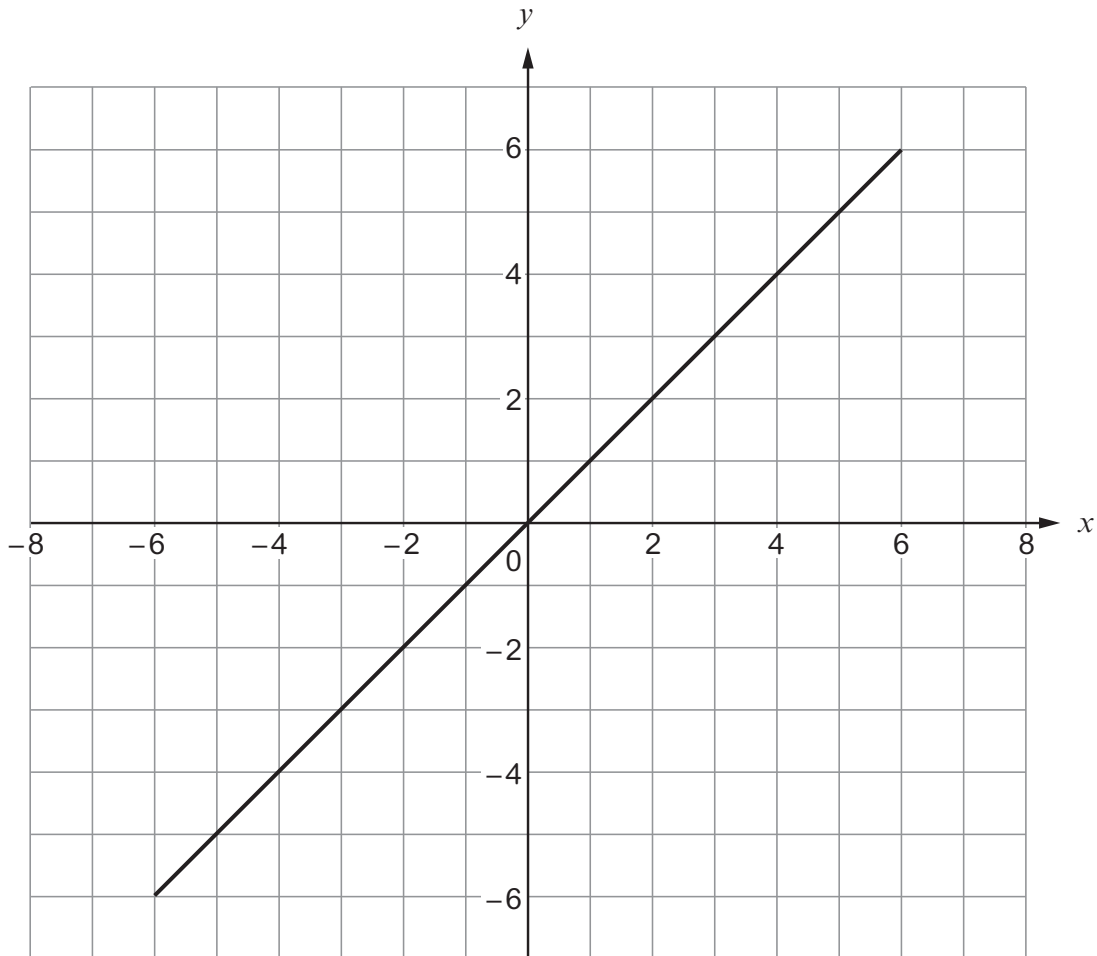
Explain how you would use the graph of $y = x$ to draw the graphs of the following equations.

(a) $y = x + 3$ [1]

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(b) $y = -x$ [1]

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14. Carys has a Monday to Friday job and a weekend job.
Working Monday to Friday and working weekends are independent events.

In any given week, the probability that Carys works every day from Monday to Friday is 0·65.
The probability that she works both days during a weekend is 0·2.

(a) Complete the following tree diagram. [2]

Works
every day
from
Monday to
Friday

Works
both days
during a
weekend

0·2 — Yes

0·65 — Yes

No
....

.... — Yes

No

.... — No
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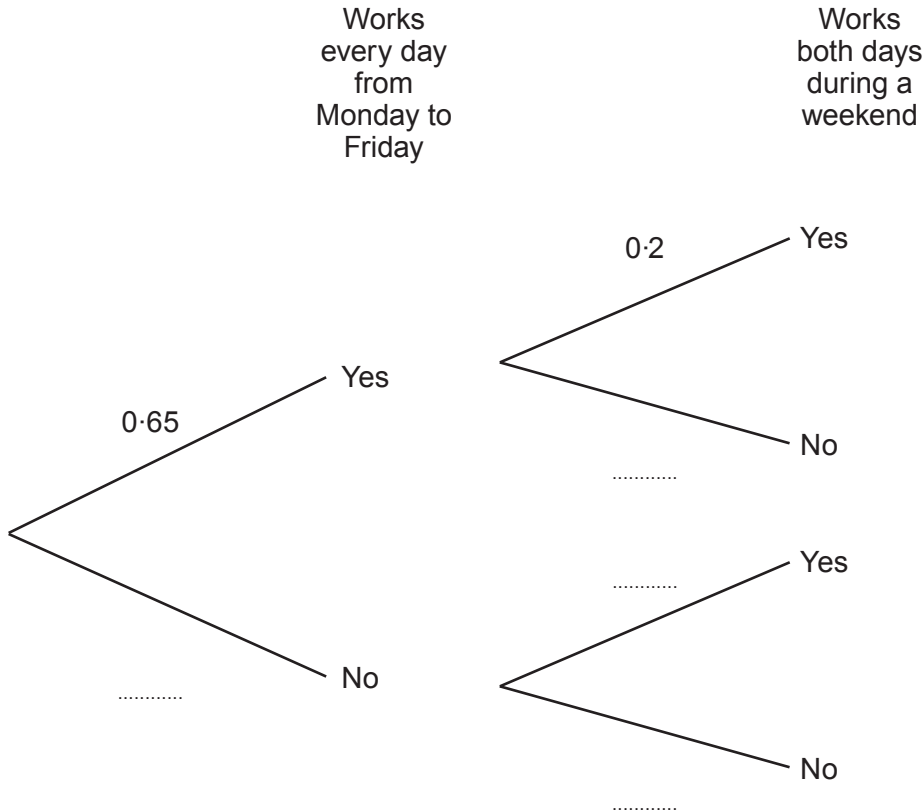
(b) Calculate the probability that next week Carys will work every day from **Monday to Sunday**. [2]

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15. On each Venn Diagram, shade the appropriate region to represent the information given in the question.

(a) $A \cup B$ [1]
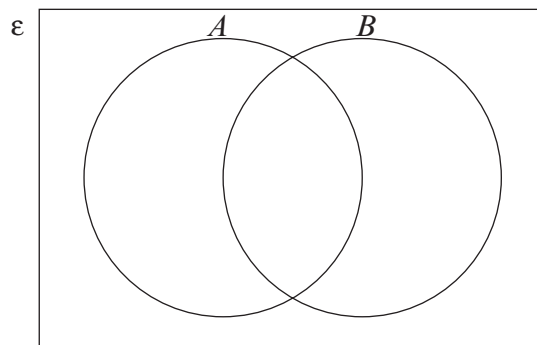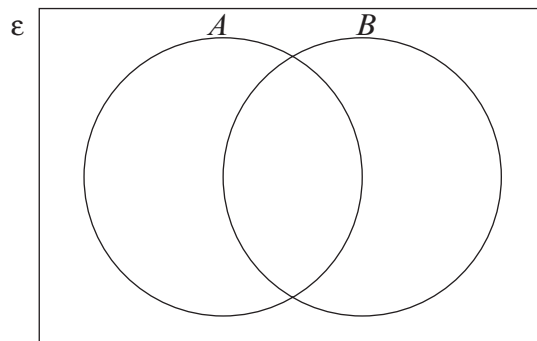
ε

A B

(b) $(A \cap B)'$ [1]

ε

A B

(c) $A' \cup B$ [1]

ε

A B
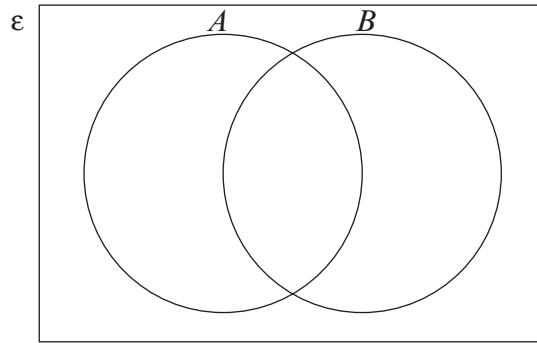
16. The three points *A*, *B* and *C* lie on the circumference of a circle centre *O*.
The tangent *XAY* touches the circle at *A*.

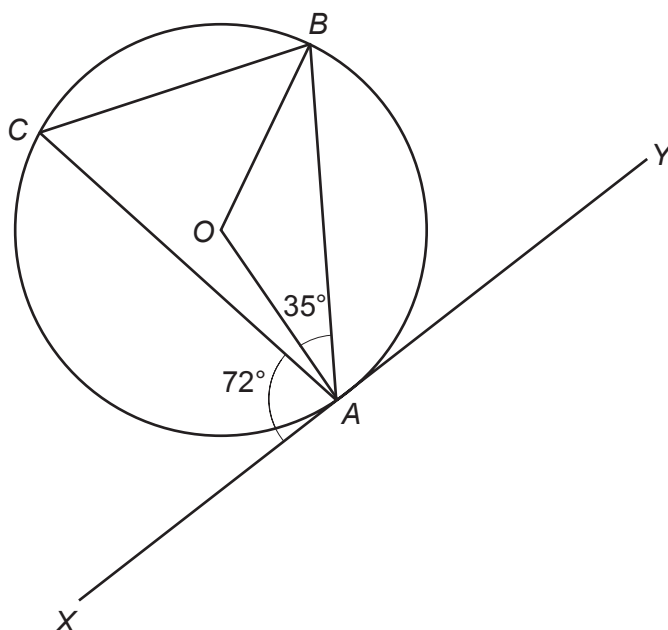*Diagram not drawn to scale*

Find each of the following angles.
Give reasons for your answers.

(a) $C\hat{B}O$ [2]

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(b) $B\hat{C}A$ [2]

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Examiner
only

17. The diagram shows a circle with *DC* = 30 cm, *ED* = 40 cm and *BC* = 35 cm.
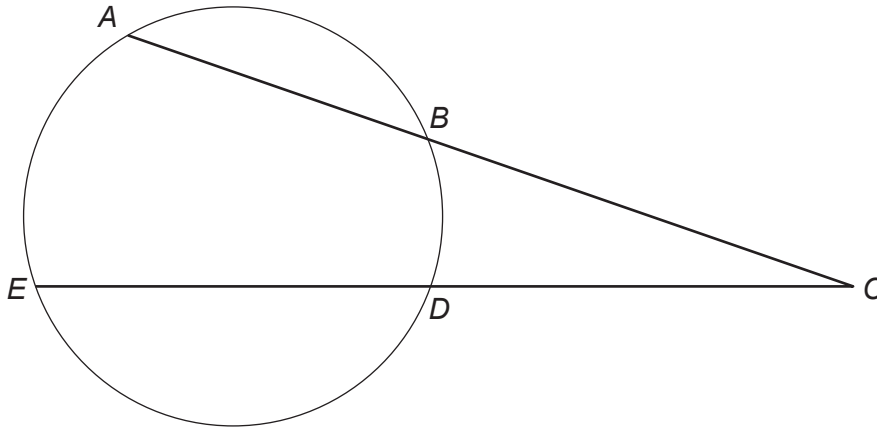
Diagram not drawn to scale

Calculate the length of *AB*. [4]

18. *(a)* Use the axes below to sketch the graphs represented by each of the following equations.

(i) $y = x^2$ [1]
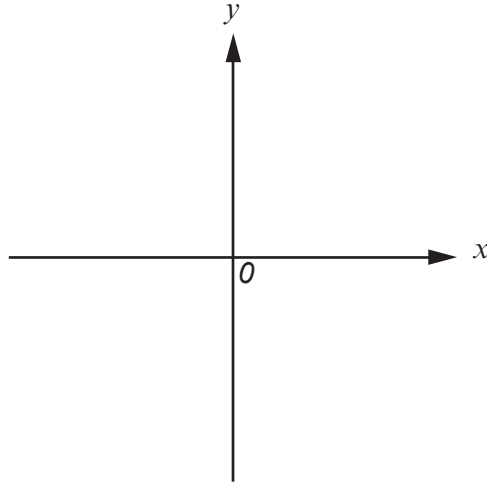
(ii) $y = \dfrac{1}{x}$ [2]
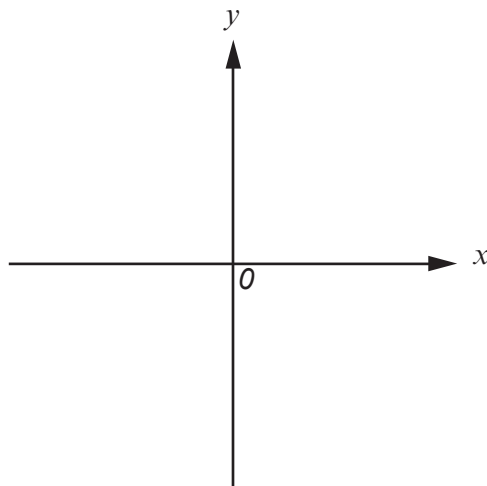
(b) Use the axes below to sketch the graph of $y = 2^x$.
You must give the coordinates of any point at which your sketch intersects an axis.   [2]

19. The point (2, 26) lies on the curve $y = kx^2 + 3x$, where k is a constant.
Find the coordinates of the points where the curve $y = kx^2 + 3x$ intersects the x-axis.　　[6]

20. *(a)* Express $x^2 + 14x + 53$ in the form $(x + a)^2 + b$ where a and b are values to be found.　[2]

(b) Show that the following identity is true. [5]

$$\frac{3x+2}{5} - \frac{5x-2}{4} + \frac{7}{10} \equiv \frac{32-13x}{20}.$$

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21. The probability of an event A occurring is 0·4, and is written $P(A) = 0.4$.
Independently, the probability of an event B occurring is x, and is written $P(B) = x$.
The probability of A' and B occurring together is 0·48, and is written $P(A' \cap B) = 0.48$.

Calculate x. [3]

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