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## 0580/33

May/June 2016

**2 hours**

|                       |                          |                         |
|-----------------------|--------------------------|-------------------------|
| Additional Materials: | Electronic calculator    | Geometrical instruments |
|                       | Tracing paper (optional) |                         |

**READ THESE INSTRUCTIONS FIRST**

DO **NOT** WRITE IN ANY BARCODES.

For  $\pi$ , use either your calculator value or 3.142.

The total of the marks for this paper is 104.

The syllabus is approved for use in England, Wales and Northern Ireland as a Cambridge International Level 1/Level 2 Certificate.

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

**1** A wildlife park covers an area of 18 hectares.

**(a)** The 18 hectares is divided between enclosures, paths and buildings in the ratio

$$\text{enclosures} : \text{paths} : \text{buildings} = 11 : 14 : 5.$$

**(i)** Show that the area for enclosures is 6.6 hectares.

[1]

**(ii)** Calculate the area for paths and the area for buildings.

Paths ..... hectares

Buildings ..... hectares [2]

**(b)** Of the 6.6 hectares for enclosures,  $\frac{7}{11}$  is for mammals and 30% is for reptiles.

Calculate the area for mammals and the area for reptiles.

Mammals ..... hectares

Reptiles ..... hectares [2]

- (c) The table shows the opening times of the wildlife park.

| Days                | Opening times  |
|---------------------|----------------|
| Monday to Friday    | 09 30 to 17 15 |
| Saturday and Sunday | 10 00 to 18 30 |

- (i) Work out how long, in hours and minutes, the wildlife park is open on a Wednesday.

..... h ..... min [1]

- (ii) Calculate the total time, in hours and minutes, that the wildlife park is open in one week.

..... h ..... min [2]

- (d) This table shows the ticket prices for the wildlife park.

|                          |         |
|--------------------------|---------|
| Adult                    | \$11.00 |
| Senior (age 65 and over) | \$9.25  |
| Child (age 4 to 16)      | \$7.50  |
| Child (age 3 and under)  | Free    |

Mr Lu visits the wildlife park with his wife, their children (aged 6 and 2) and his parents (both aged 67).

- (i) Work out the total cost of the tickets for this visit.

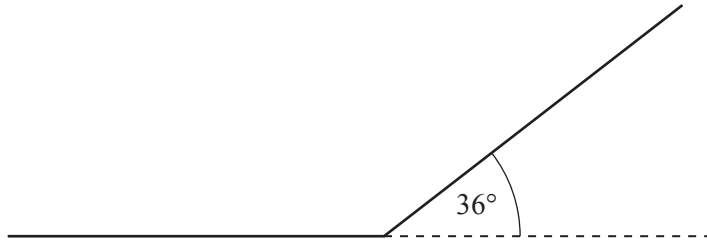
\$..... [2]

- (ii) Mr Lu has a voucher for the wildlife park that reduces the total cost of the tickets to \$42.

Calculate the percentage saving.

.....% [3]

2 (a)

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The diagram shows 2 sides of a regular polygon with exterior angle  $36^\circ$ .

For this regular polygon, work out

(i) the number of sides,

..... [2]

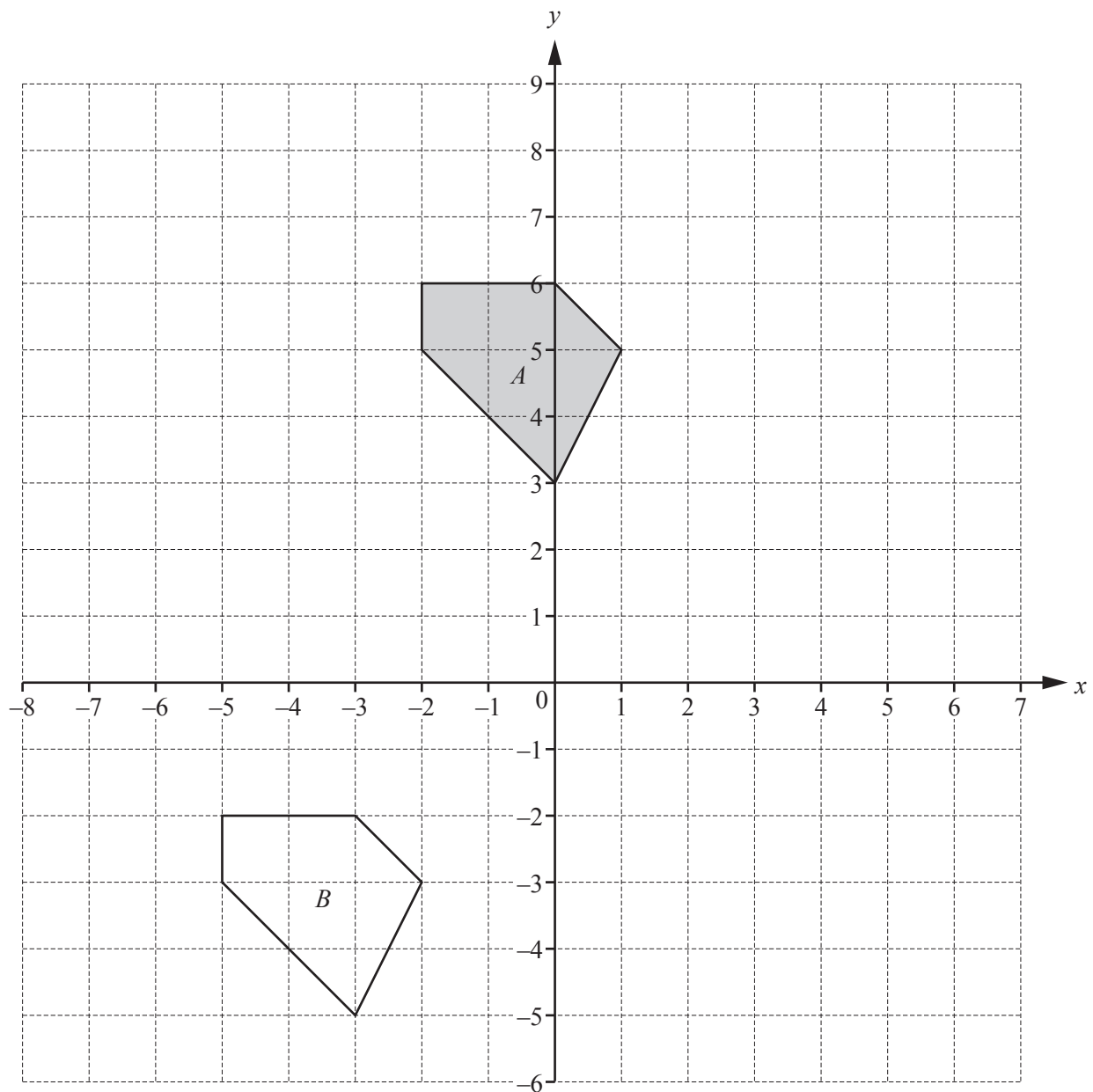
(ii) the interior angle,

..... [1]

(iii) the sum of the interior angles.

..... [1]

(b) The diagram shows two shapes,  $A$  and  $B$ , on a  $1\text{ cm}^2$  grid.



(i) Find the area of shape  $A$ .

.....  $\text{cm}^2$  [1]

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

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

(iii) On the grid,

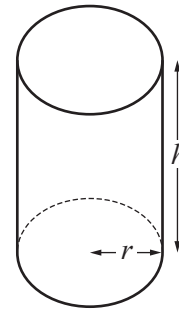
(a) draw the reflection of shape  $A$  in the line  $x = 2$ , [2]

(b) draw the enlargement of shape  $A$  with scale factor 2 and centre  $(1, 5)$ . [2]

- 3 The diagram shows a cylindrical flower vase with radius,  $r$ , and height,  $h$ .

The volume,  $V$ , of the vase is  $V = \pi r^2 h$ .

The surface area,  $A$ , of the vase is  $A = 2\pi r h + \pi r^2$ .



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SCALE

- (a) The vase has radius 4 cm and height 15 cm.

- (i) Calculate the volume of the vase.  
Write down the units of your answer.

..... [3]

- (ii) Calculate the surface area of the vase.

.....  $\text{cm}^2$  [2]

- (b) Make  $h$  the subject of the formula  $A = 2\pi r h + \pi r^2$ .

$h =$  ..... [2]

- (c) Factorise completely.

$$2\pi r h + \pi r^2$$

..... [2]

- (d) Another cylindrical flower vase has radius 6 cm and height 22.5 cm.

- (i) For this vase and the vase in **part (a)** the ratio of the radii is 4 : 6  
and the ratio of the heights is 15 : 22.5 .

Write these ratios in their simplest form.

4 : 6 = ..... : .....

15 : 22.5 = ..... : ..... [2]

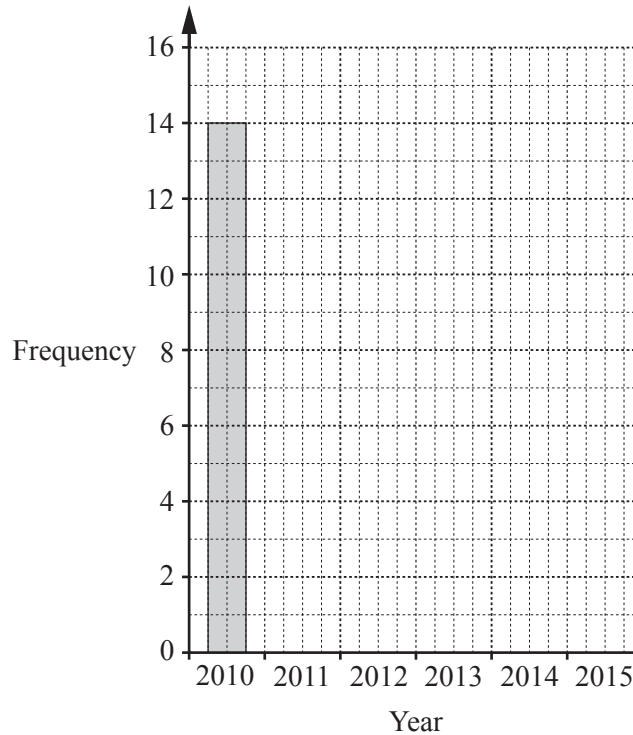
- (ii) Write down a mathematical word to complete the statement.

The ratios show that the two vases are ..... [1]

- 4 A garage sells second-hand cars.  
The table shows the number of cars sold and the year they were made.

| Year      | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 |
|-----------|------|------|------|------|------|------|
| Frequency | 14   | 13   | 4    | 8    | 0    | 11   |

- (a) Complete the bar chart to show this information.



[2]

- (b) For these cars, write down the modal year.

..... [1]

- (c) The garage sold 6 cars last week.  
The selling prices, in dollars, are listed below.

920      1070      3100      2240      2650      1840

- (i) Work out the range.

\$..... [1]

- (ii) Work out the median.

\$..... [2]

- (iii) Calculate the mean.

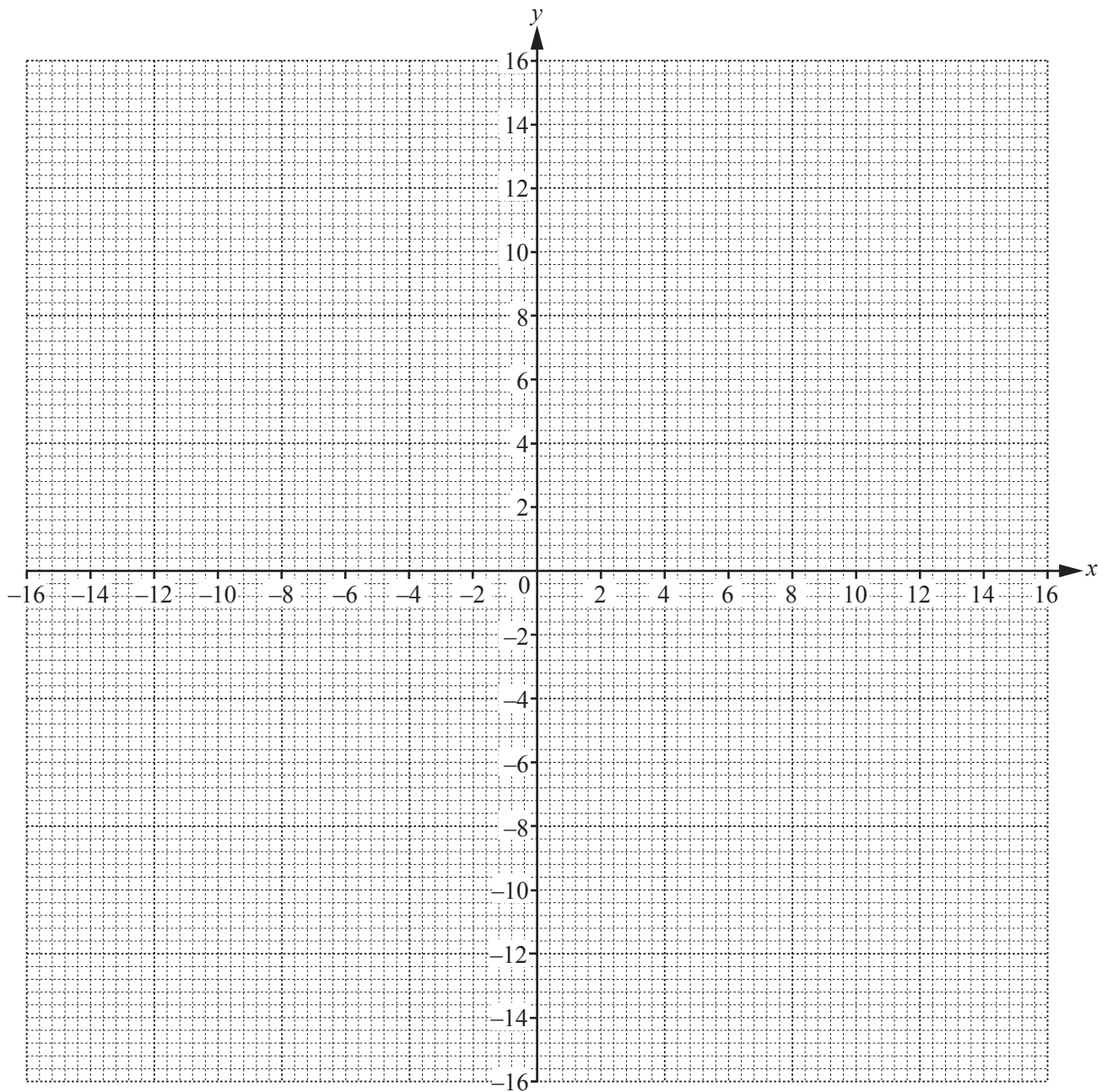
\$..... [2]

- 5 (a) (i) Complete the table of values for  $y = \frac{16}{x}$ ,  $x \neq 0$ .

|     |     |    |    |    |    |  |    |   |   |   |    |
|-----|-----|----|----|----|----|--|----|---|---|---|----|
| $x$ | -16 | -8 | -4 | -2 | -1 |  | 1  | 2 | 4 | 8 | 16 |
| $y$ | -1  | -2 |    | -8 |    |  | 16 |   | 4 | 2 |    |

[2]

- (ii) On the grid, draw the graph of  $y = \frac{16}{x}$  for  $-16 \leq x \leq -1$  and  $1 \leq x \leq 16$ .



[4]



- (b) Write down the order of rotational symmetry of your graph.

..... [1]

- (c) One line of symmetry crosses the graph twice.

(i) Draw this line of symmetry on the grid. [1]

- (ii) Write down the equation of this line of symmetry.

..... [1]

- (d) By drawing a suitable line on the grid, solve the equation  $\frac{16}{x} = 7$ .

$x =$  ..... [2]

6 (a) For the integers from 40 to 70, write down

(i) a multiple of 19,

..... [1]

(ii) a common multiple of 6 and 8,

..... [1]

(iii) the square root of 2500,

..... [1]

(iv) a factor of 106,

..... [1]

(v) an odd number where the tens digit is double the units digit,

..... [1]

(vi) a number that is **both** a square number **and** a cube number,

..... [1]

(vii) a number that has exactly 3 factors,

..... [1]

(viii) three prime numbers.

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

(b) Write 234 as a product of its prime factors.

..... [2]

(c) Write the answer to  $3^4 \times 3^7$

(i) in the form  $3^x$ ,

..... [1]

(ii) as an integer,

..... [1]

(iii) in standard form.

..... [1]

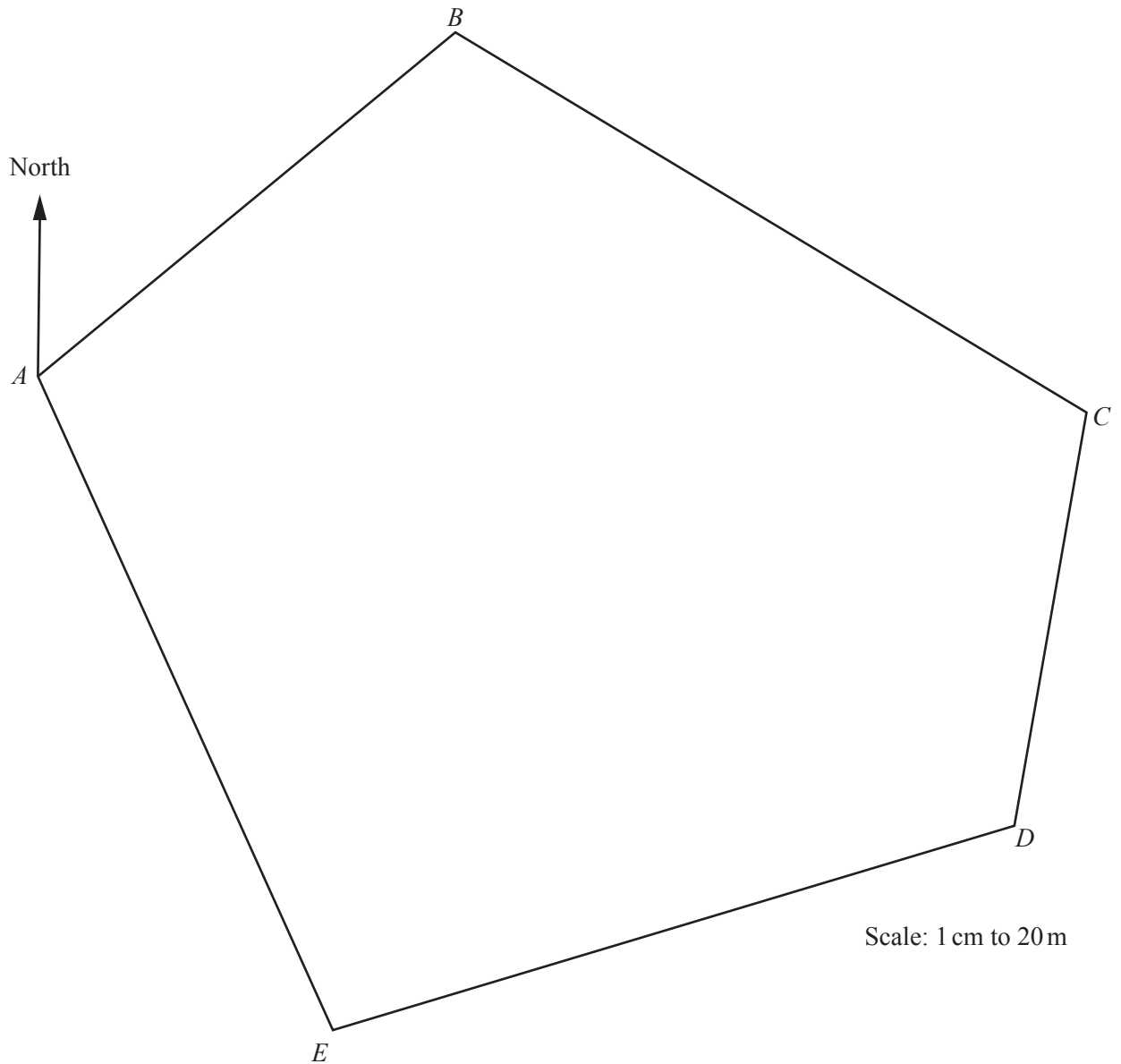
(d) (i) Write  $3^{-2}$  as a fraction.

..... [1]

(ii) Find the value of  $3x^0$  when  $x = 5$ .

..... [1]

- 7 The scale drawing shows a park,  $ABCDE$ .  
The scale is 1 centimetre represents 20 metres.



- (a) Measure the bearing of  $B$  from  $A$ .

..... [1]

All constructions in the following parts must be completed using a straight edge and compasses only.  
All construction arcs must be clearly shown.

- (b) A straight cycle path crosses the park from  $E$  to  $BC$ .  
The path bisects angle  $AED$ .

(i) Construct the cycle path. [2]

(ii) Work out the actual length, in metres, of the cycle path.

..... m [2]

- (iii) Alice cycles from  $E$  to  $BC$  along the path at a constant speed of 9 km/h.

(a) Show that 9 km/h is equivalent to 2.5 m/s.

[1]

(b) Find the time she takes to cycle from  $E$  to  $BC$ .  
Give your answer in seconds.

..... s [2]

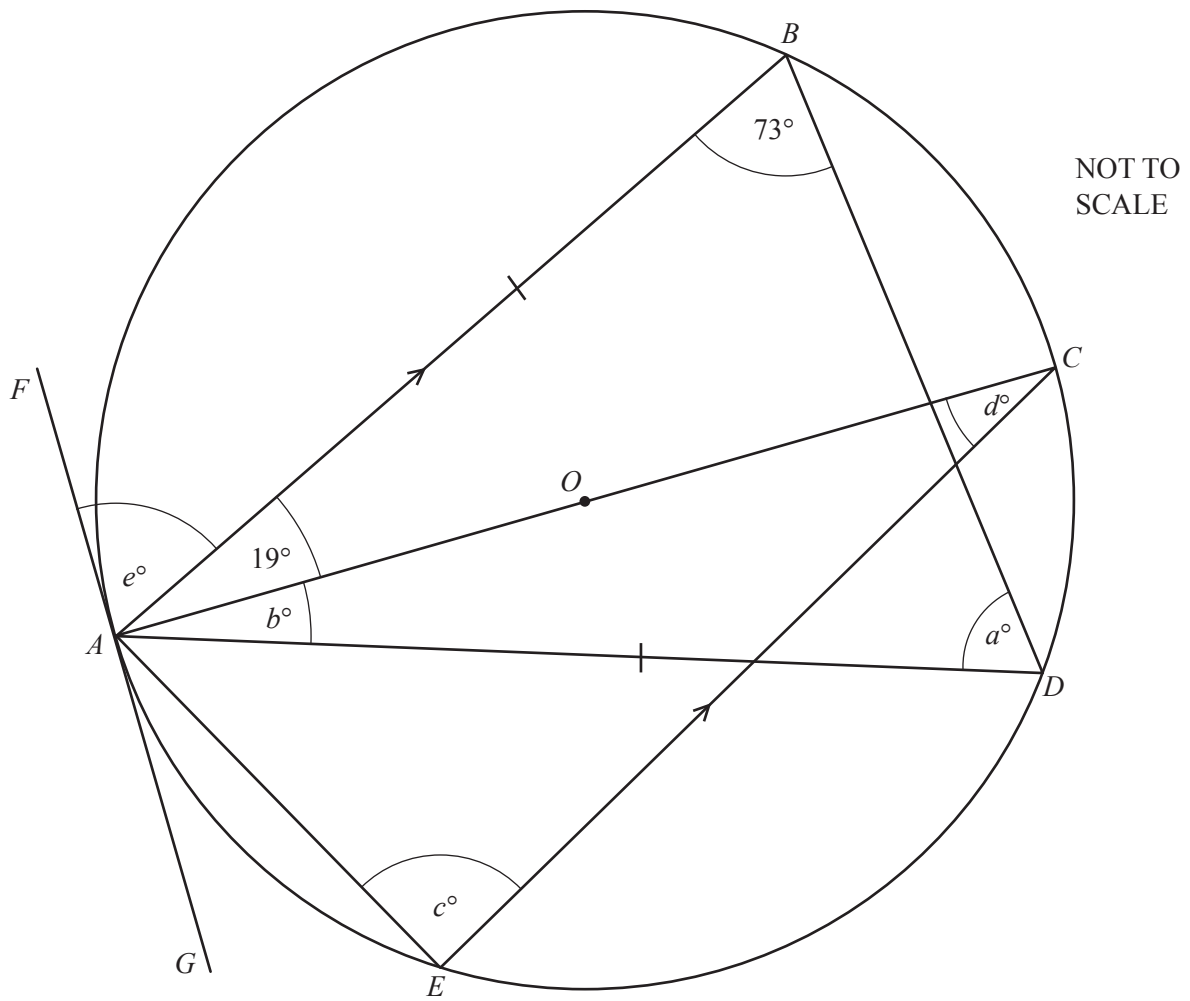
- (c) A straight footpath, equidistant from  $D$  and  $E$ , crosses the park from  $DE$  to  $AB$ .

Construct the footpath. [2]

(d) (i) Construct the locus of points 150 metres from  $A$  and inside the park. [2]

(ii) A region for sports activities is less than 150 metres from  $A$  and closer to  $E$  than to  $D$ .

Shade this region. [1]



$A, B, C, D$  and  $E$  are points on the circumference of a circle, centre  $O$ .  
 $GAF$  is a tangent to the circle at  $A$ .  
 $AB$  is parallel to  $EC$  and  $AB = AD$ .

- (a) Write down the mathematical name of triangle  $ABD$ .

..... [1]

(b) Find the value of

(i)  $a$ ,

$$a = \dots\dots\dots [1]$$

(ii)  $b$ ,

$$b = \dots\dots\dots [1]$$

(iii)  $c$ ,

$$c = \dots\dots\dots [1]$$

(iv)  $d$ ,

$$d = \dots\dots\dots [1]$$

(v)  $e$ .

$$e = \dots\dots\dots [2]$$

(c) The diameter,  $AC$ , of the circle is 13 cm.

Calculate the circumference of the circle.

Give your answer correct to 1 decimal place.

$$\dots\dots\dots \text{ cm } [3]$$

**Question 9 is printed on the next page.**

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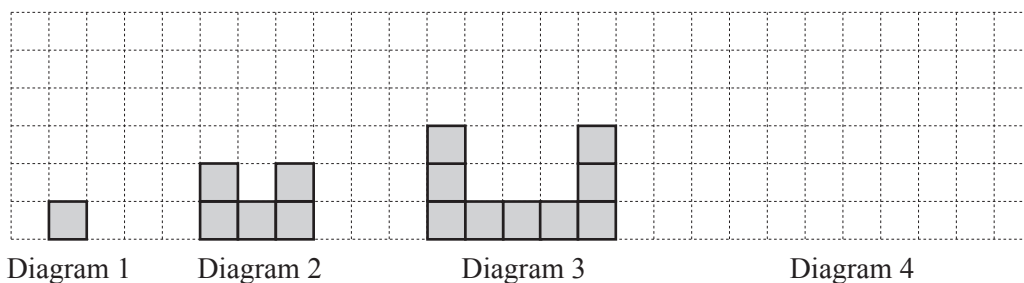
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- 9 (a) A solid has 6 faces, 8 vertices and 12 edges.  
All the edges have the same length.

Write down the mathematical name of this solid.

..... [1]

- (b) Here is a sequence of diagrams made from identical square tiles.



- (i) On the grid, draw Diagram 4. [1]

- (ii) Complete the table.

|                 |   |   |   |   |   |
|-----------------|---|---|---|---|---|
| Diagram         | 1 | 2 | 3 | 4 | 5 |
| Number of tiles | 1 | 5 | 9 |   |   |

[2]

- (iii) Find an expression, in terms of  $n$ , for the number of tiles in Diagram  $n$ .

..... [2]

- (iv) Find the number of tiles in Diagram 19.

..... [1]

- (v) A box contains 98 of these tiles.

- (a) Diagram  $x$  is made from as many tiles as possible from this box.

Find the value of  $x$ .

$x =$  ..... [2]

- (b) When Diagram  $x$  is made, how many tiles are left in the box?

..... [1]