

MATRICULATION AND SECONDARY EDUCATION CERTIFICATE EXAMINATIONS BOARD  
UNIVERSITY OF MALTA, MSIDA

**SECONDARY EDUCATION CERTIFICATE LEVEL**

**SEPTEMBER 2012 SESSION**

**SUBJECT:** Mathematics  
**DATE:** 3rd September 2012

**PAPER:** I – Section A (Non-Calculator Section)  
**TIME:** 20 minutes

**ATTEMPT ALL QUESTIONS.**

*Write your answers in the space available on the examination paper.  
The use of calculators and protractors is NOT allowed.  
It is not necessary to show your working.  
This paper carries a total of 20 marks.*

**QUESTIONS AND ANSWERS**  
**ALL QUESTIONS CARRY ONE MARK**

**SPACE FOR ROUGH  
WORK  
(IF NECESSARY)**

- 1** What is the least number that can be added to 67 to make the sum a perfect square?

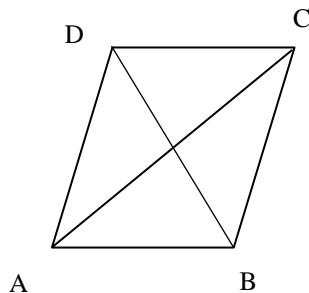
\_\_\_\_\_ **Ans**

- 2** Work out:  $15 - 34 \div 2 + 4 \times 3$

\_\_\_\_\_ **Ans**

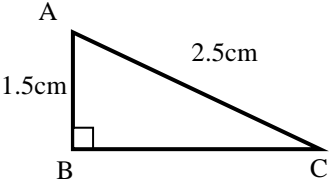
- 3** ABCD is a rhombus whose diagonals AC and BD are 8 cm and 6 cm respectively. Find the length of AB.

*The diagram is not drawn to scale.*



\_\_\_\_\_ **Ans**

<b>QUESTIONS AND ANSWERS ALL QUESTIONS CARRY ONE MARK</b>	<b>SPACE FOR ROUGH WORK (IF NECESSARY)</b>
<p><b>4</b> Find the value of <math>4a\left(\frac{b}{2a}\right)^2</math> when <math>a = 3</math> and <math>b = 6</math>.</p> <p>_____ <b>Ans</b></p>	
<p><b>5</b> Find the median of the numbers: 13, 5, 10, 6, 9, 8, 12</p> <p>_____ <b>Ans</b></p>	
<p><b>6</b> Find 18 times the difference between <math>\frac{1}{2}</math> and <math>\frac{1}{3}</math>.</p> <p>_____ <b>Ans</b></p>	
<p><b>7</b> What name is given to an angle between <math>90^\circ</math> and <math>180^\circ</math>?</p> <p>_____ <b>Ans</b></p>	
<p><b>8</b> Find the total surface area of a cube with side 3 cm.</p> <p>_____ <b>Ans</b></p>	
<p><b>9</b> If the 23<sup>rd</sup> June 1999 fell on a Saturday, on what day did the 29<sup>th</sup> July 1999 fall?</p> <p>_____ <b>Ans</b></p>	

<p style="text-align: center;"><b>QUESTIONS AND ANSWERS</b> <b>ALL QUESTIONS CARRY ONE MARK</b></p>	<p style="text-align: center;"><b>SPACE FOR ROUGH WORK (IF NECESSARY)</b></p>
<p><b>10</b> The area of square PQRS is equal to the area of rectangle ABCD with sides 5.5 cm and 22 cm. Find the length of a side of the square PQRS.</p> <p style="text-align: right;">_____ <b>Ans</b></p>	
<p><b>11</b> A flight leaves Berlin at 22:35 and arrives in Malta at 01:30 of the next day. If Berlin is in the same time zone as Malta, how long does the flight take?</p> <p style="text-align: right;">_____ <b>Ans</b></p>	
<p><b>12</b> If 90 candidates out of 500 failed a test, what percentage passed the test?</p> <p style="text-align: right;">_____ <b>Ans</b></p>	
<p><b>13</b> A line cuts the y-axis at (0, 3) and has gradient 7. Write down the equation of this line.</p> <p style="text-align: right;">_____ <b>Ans</b></p>	
<p><b>14</b> ABC is a triangle, right-angled at B. Given that AB is 1.5 cm and AC is 2.5 cm, calculate the value of <math>\tan C</math>. <i>The diagram is not drawn to scale.</i></p> <div style="text-align: center;">  </div> <p style="text-align: right;">_____ <b>Ans</b></p>	

<b>QUESTIONS AND ANSWERS</b> <b>ALL QUESTIONS CARRY ONE MARK</b>	<b>SPACE FOR ROUGH</b> <b>WORK</b> <b>(IF NECESSARY)</b>
<p><b>15</b> What is the next term in the following sequence?</p> <p style="text-align: center;"><math>-17, -12, -7, -2, \dots</math></p> <p style="text-align: right;">_____ <b>Ans</b></p>	
<p><b>16</b> Work out the interior angle of a regular octagon.</p> <p style="text-align: right;">_____ <b>Ans</b></p>	
<p><b>17</b> Find the LCM of 26 and 39.</p> <p style="text-align: right;">_____ <b>Ans</b></p>	
<p><b>18</b> Write down the reciprocal of <math>\left(\frac{1}{2}\right)^3</math>.</p> <p style="text-align: right;">_____ <b>Ans</b></p>	
<p><b>19</b> Find <math>r</math> if <math>x^r = x^{10} \left(\frac{x^{-3}}{x^5}\right)</math>.</p> <p style="text-align: right;">_____ <b>Ans</b></p>	
<p><b>20</b> Express <math>\frac{210}{252}</math> as a fraction reduced to its lowest terms.</p> <p style="text-align: right;">_____ <b>Ans</b></p>	

MATRICULATION AND SECONDARY EDUCATION CERTIFICATE EXAMINATIONS BOARD  
UNIVERSITY OF MALTA, MSIDA

**SECONDARY EDUCATION CERTIFICATE LEVEL**

**SEPTEMBER 2012 SESSION**

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SUBJECT:	<b>Mathematics</b>
PAPER NUMBER:	I – Core Paper
DATE:	3 <sup>rd</sup> September 2012
TIME:	1hr and 40 minutes

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**ANSWER ALL QUESTIONS**

*Write your answers in the space available on the examination paper.*

*Show clearly all the necessary steps, explanations and construction lines in your working.*

*Unless otherwise stated, diagrams are drawn to scale.*

*The use of non-programmable electronic calculators with statistical functions and mathematical instruments is allowed.*

*Candidates are allowed to use transparencies for drawing transformations.*

*This paper carries a total of 80 marks.*

<i>For Office Use Only</i>											
<b>Question No</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>	<b>7</b>	<b>8</b>	<b>9</b>	<b>10</b>	<b>Total</b>

**DO NOT WRITE ABOVE THIS LINE**

**1** Bob works in the construction industry. He is to make a mixture of which 28% is cement, twice as much is sand and the rest is powdered marble.

(i) What percentage of powdered marble must Bob put in the mixture?

**3 marks**

(ii) Write down the ratio of **cement: sand: marble** in its simplest form.

**2 marks**

(iii) How many kg of marble are there in a mixture weighing 50 kg?

**2 marks**

(iv) If cement costs 43c per kg, sand costs 35c per kg and marble costs 62c per kg find the cost of 100 kg of mixture.

**4 marks**

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**2** Amy is  $x$  years old, and Ralph is 6 years older than Amy.

(i) Write down an expression for Ralph's age.

**1 mark**

(ii) Sue is half Amy's age. Write an expression for Sue's age.

**1 mark**

(iii) The ages of all three people add up to 41 years. Work out their ages.

**4 marks**

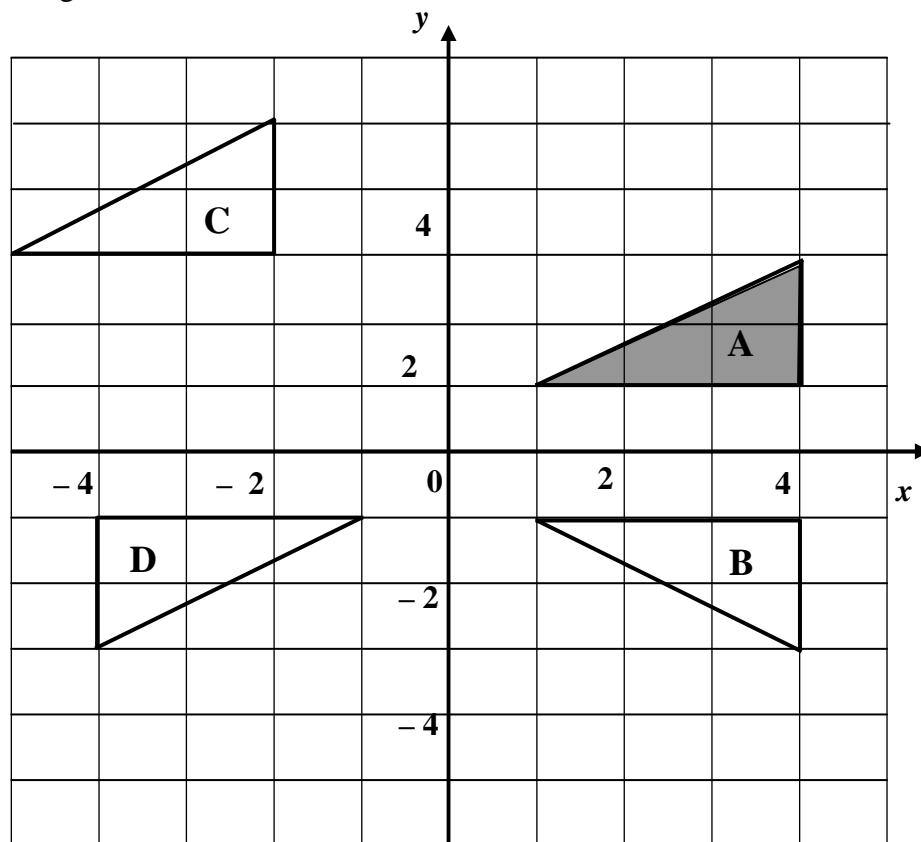
**DO NOT WRITE ABOVE THIS LINE**

3 Describe the single transformation which maps triangle **A** to:

(i) triangle **B**;

(ii) triangle **C**;

(iii) triangle **D**.



6 marks

**DO NOT WRITE ABOVE THIS LINE**

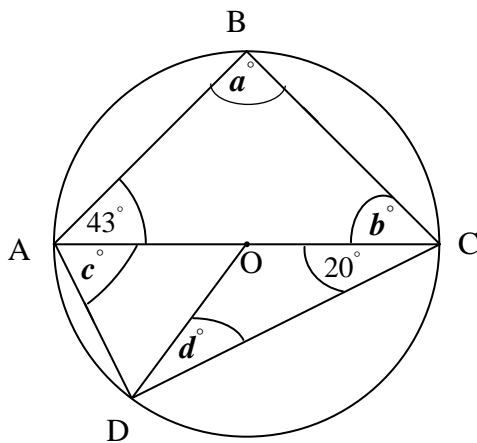
- 4 A retailer buys glasses at €105 per box and sells them at €7.74 for 6 glasses.  
 (i) If a box contains 120 glasses, find the profit, correct to the nearest cent made on each glass, assuming no glasses are damaged.

**5 marks**

- (ii) If in fact, the retailer finds 6 broken glasses in the box, calculate the percentage profit made when he sells all the remaining glasses. Give your answer to 2 places of decimal.

**5 marks**

- 5 The diagram shows a circle, with centre O and a cyclic quadrilateral ABCD. Angle BAC is  $43^\circ$  and angle ACD is  $20^\circ$ . Work out the missing angles,  $a$ ,  $b$ ,  $c$  and  $d$ , giving reasons for your answers.



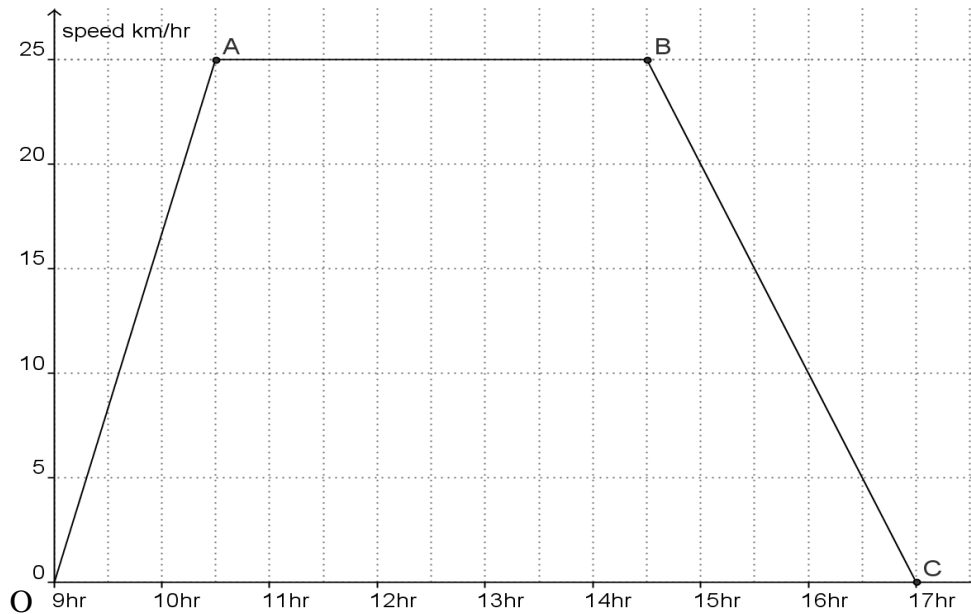
*The diagram is not drawn to scale*

**9 marks**



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- 6 The graph below shows the speed of a boat during a day cruise around the Maltese Islands.



- (i) How long did the cruise take? **1 mark**
- (ii) For how long did the boat move at constant speed? **2 marks**
- (iii) Find the rate of change of the speed of the boat, as it slows down in the last hour. **2 marks**
- (iv) Calculate the area of the trapezium OABC. **3 marks**
- (v) The area found in (iv) gives the total distance covered in km. Use your answer to calculate the average speed of the boat for the complete journey in km/hr. **2 marks**

**DO NOT WRITE ABOVE THIS LINE**

- 7 The cost of the entrance tickets to a zoo are as follows:

	<b>ENTRANCE FEE</b>
<b>Child</b>	<b>€12</b>
<b>Adult</b>	<b>€20</b>
<b>Group of 2 adults and 3 children</b>	<b>€72</b>

A class of 25 students, together with their 5 teachers visit the zoo.

- (i) If **no** group tickets are bought, calculate the total entrance fee paid for the entire class, together with the teachers.

**2 marks**

- (ii) If group tickets can be bought, find the best possible division of the class and teachers, so as to pay the least entrance fee on the tickets.

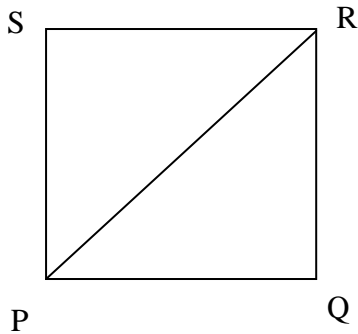
**2 marks**

- (iii) Work out the amount of money saved when the least entrance fee is paid, instead of individual tickets.

**3 marks**

**DO NOT WRITE ABOVE THIS LINE**

- 8 The area of a square PQRS is  $386 \text{ cm}^2$ . Find the length of the diagonal PR, giving your answer in cm correct to two decimal places.

**4 marks**

- 
- 9 A clock showed the exact time at 3 o'clock. A few minutes later, the hour hand has moved through 2 degrees.

(i) Through what angle has the minute hand moved?

**2 marks**

(ii) If the hour hand has moved  $x$  degrees from 3 o'clock, find the angle in terms of  $x$ , between the two hands.

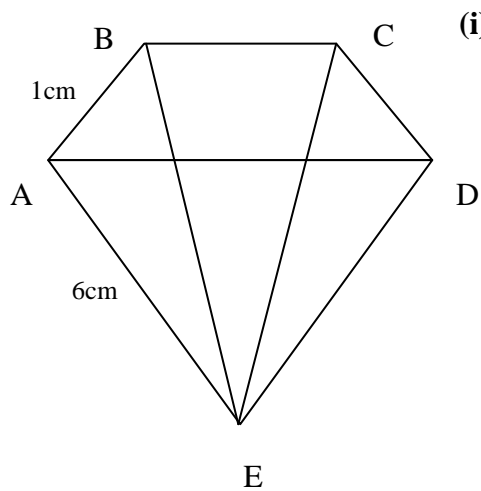
**2 marks**

(iii) At what time does the minute hand first come exactly over the hour hand after 3 o'clock? Give your answer to the nearest second.

**4 marks**

**DO NOT WRITE ABOVE THIS LINE**

- 10** A diamond company logo is drawn below. ADE is an equilateral triangle of side 6cm. Sides AB and CD are both 1cm in length and angles BAE and CDE are right angles.



- (i) Show that triangles BAE and CDE are congruent.

*The diagram is not drawn to scale*

**4 marks**

- (ii) Find angle CBE, giving reasons. Give your answer to the nearest degree.

**5 marks**

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**END OF EXAMINATION**

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UNIVERSITY OF MALTA, MSIDA

**SECONDARY EDUCATION CERTIFICATE LEVEL**

**SEPTEMBER 2012 SESSION**

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SUBJECT:	<b>Mathematics</b>
PAPER NUMBER:	IIB
DATE:	3 <sup>rd</sup> September 2012
TIME:	4:00 p.m. to 6:00 p.m.

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**ANSWER ALL QUESTIONS**

*Write your answers in the space available on the examination paper.*

*Show clearly all the necessary steps, explanations and construction lines in your working.*

*Unless otherwise stated, diagrams are drawn to scale.*

*The use of non-programmable electronic calculators with statistical functions and mathematical instruments is allowed.*

*Candidates are allowed to use transparencies for drawing transformations.*

*This paper carries a total of 100 marks.*

<i>For Office Use Only</i>										
<b>Question No</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>	<b>7</b>	<b>8</b>	<b>9</b>	<b>10</b>
<b>Mark</b>										

<b>Question No</b>	<b>11</b>	<b>12</b>	<b>13</b>	<b>14</b>	<b>15</b>	<b>16</b>	<b>17</b>	<b>18</b>	<b>19</b>	<b>20</b>
<b>Mark</b>										

<b>Total</b>

**SEC MATHEMATICS****PAPER IIB****DO NOT WRITE ABOVE THIS LINE**

- 1 (a) In a certain city, the average night temperature during February was  $2^{\circ}\text{C}$ . This year the night temperature during the same month was 5 degrees below average. How low did the average temperature in this city get?

**1 mark**

- (b) Evaluate  $2^4 + 3^2 - 4^0$ .

**1 mark**

- 
- 2 Write down 30030 as a product of its prime factors.

**2 marks**

- 
- 3 (a) Write the following in order, starting from the smallest:  
 $0.55$ ,  $\frac{3}{5}$ ,  $50\%$ ,  $\frac{4}{7}$ ,  $15\%$

**1 mark**

- (b) What is the value of  $\frac{3}{7}$  of €210?

**1 mark**

- 
- 4 (a) Given that  $p = 4$ ,  $q = 7$  and  $r = -3$ , find the value of  $q^2 - 2pr$ .

**2 marks**

- (b) Find  $x$  in terms of  $a$ ,  $b$  and  $c$  if  $ax - b = 36 - c + x$ .

**2 marks**

## SEC MATHEMATICS

## PAPER IIB

DO NOT WRITE ABOVE THIS LINE

- 5 The picture shows the scale on a weighing machine used in the kitchen. The outer scale is in kg while the inner scale is in lbs (pounds).



- (i) If a bag of fruit weighs 7lbs, what is its approximate weight in kg?

**1 mark**

- (ii) What is the approximate weight in lbs of 2 kg of apples?

**1 mark**

- (iii) A baby's weight is 9.5 lbs. Calculate the baby's approximate weight in kg, using any of your previous answers.

**2 marks**

**DO NOT WRITE ABOVE THIS LINE**

- 6 Find the acute angle  $x$  if  $\sin x = \frac{\sqrt{3}}{2 + \frac{1}{\sqrt{3}}}$ , giving your answer to the nearest degree.

**2 marks**

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- 7 The air bags in a certain car inflate if the car reaches a speed of 338 km per hour. Convert this speed to metres per second, to 3 significant figures.

**3 marks**

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- 8 Yesterday the wind was blowing from the West. This morning it was blowing from the North. By this afternoon the wind was from the South East. Through what angle has the direction of the wind changed since yesterday?

**2 marks**

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## SEC MATHEMATICS

## PAPER IIB

DO NOT WRITE ABOVE THIS LINE

- 9 The following is part of a spreadsheet.

	<b>A</b>	<b>B</b>	<b>C</b>	<b>D</b>
<b>1</b>	<i>Item</i>	<i>Cost Price</i>	<i>Selling Price</i>	<i>Discounted Price</i>
<b>2</b>	Laptop	980	1200	1150
<b>3</b>	Netbook	450	580	

- (i) What is the profit made on the laptop if it is sold at the discounted price?

**1 mark**

- (ii) There is a special offer on the Netbook, offering a reduction of 25% from the selling price.  
Write down a **formula** which should be written in cell **D3** to work out the discounted price.

**2 marks**

- 10 Given that  $f(x) = 2x^2 - 8$  find:

(i)  $f(-3)$ ;

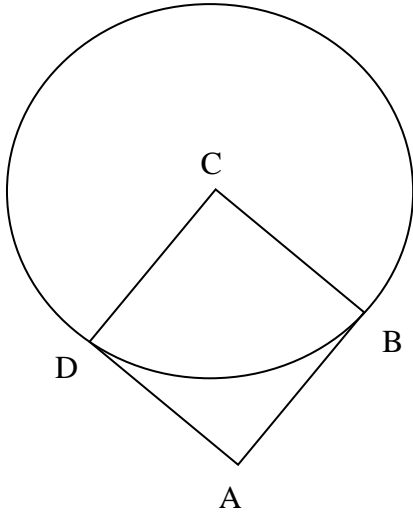
**2 marks**

- (ii) two values of  $x$  for which  $f(x) = 0$ .

**3 marks**

DO NOT WRITE ABOVE THIS LINE

- 11 A square ABCD and a circle of radius 4 cm are drawn such that the centre of the circle is vertex C of the square. The diagram is not drawn to scale.



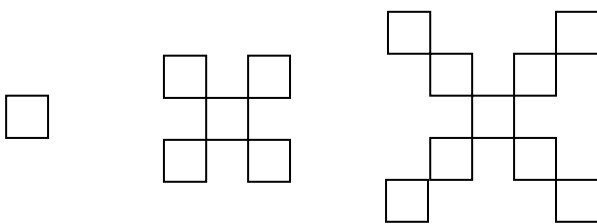
- (i) Write down the length of the tangent AB to the circle at B.

**1 mark**

- (ii) Find the area of that part of the square that is outside the circle. Give your answer in  $\text{cm}^2$ , correct to 2 decimal places.

**4 marks**

- 12 Martha constructed a number sequence by arranging squares in the following pattern:



- (i) Draw the next pattern in the sequence, in the space above.

**2 marks**

- (ii) Write down the number of squares in each of the first 5 patterns.

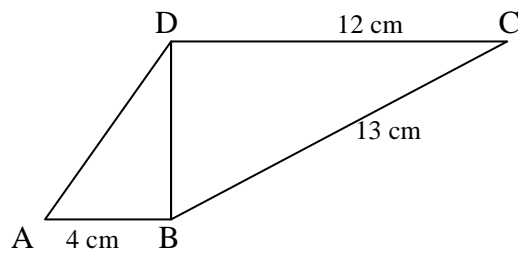
**2 marks**

- (iii) Write down a formula for finding the number of squares in the  $n$ th pattern.

**2 marks**

**DO NOT WRITE ABOVE THIS LINE**

- 13** ABCD is a quadrilateral with angle ABD and angle BDC being right angles. AB is 4 cm long, BC is 13 cm long and CD is 12 cm long.



- (i) Find angle ABC, correct to the nearest degree.

**4 marks**

- (ii) Find the length of AD in cm, correct to one decimal place.

**3 marks**

- (iii) Find the area of quadrilateral ABCD.

**4 marks**

**DO NOT WRITE ABOVE THIS LINE**

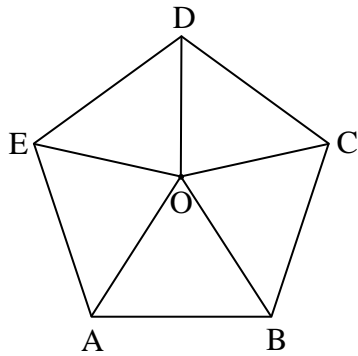
- 14** Using ruler and compasses only,
- (i) construct triangle XYZ such that XY is 9 cm long, XZ is 11 cm long and angle ZXY is  $60^\circ$ .
  - (ii) Draw the perpendicular bisector of XY and let it cut XZ at P.
  - (iii) Measure PZ.

**5 marks**

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DO NOT WRITE ABOVE THIS LINE

- 15 O is the centre of a regular pentagon ABCDE of side 6 cm.



Work out:

(i)  $\angle AOB$

2 marks

(ii)  $\angle OAB$ ;

2 marks

(iii) the height of triangle AOB, in cm correct to 2 decimal places;

2 marks

(iv) the area of the pentagon ABCDE, in  $\text{cm}^2$  correct to 2 decimal places.

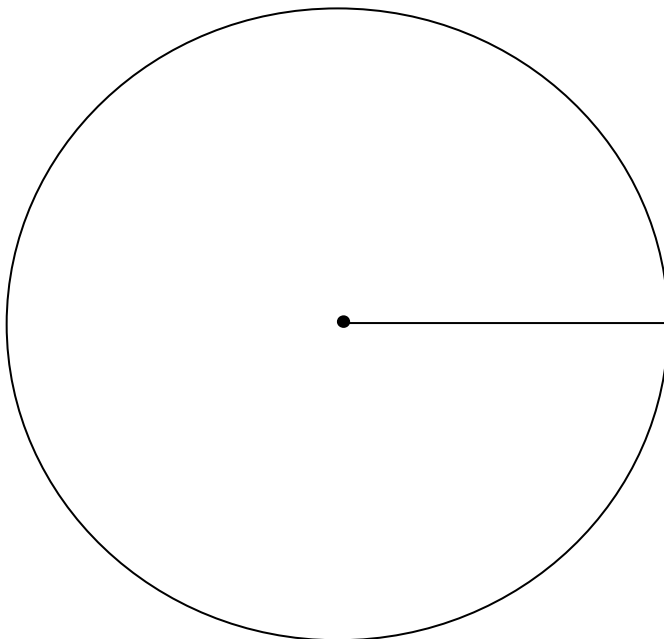
3 marks

**DO NOT WRITE ABOVE THIS LINE**

- 16** A group of 3000 people were asked in what type of accommodation they live and the following information was recorded.

Type	Maisonette	Flat	House	Bungalow	Villa
Frequency	900	1500	350	150	100

- (i) Draw a pie chart to show this data.

**8 marks**

- (ii) What percentage of the group live in a maisonette?

**2 marks**

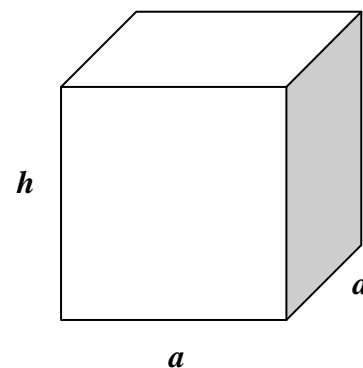
**DO NOT WRITE ABOVE THIS LINE**

- 17 Solve the simultaneous equations:  $3x + y = 2$ ;  $2x - 3y = -83$ .

**4 marks**

- 
- 18 The cuboid shown in the diagram has a square base of side  $a$ .  
The height of the cuboid is  $h$ .  
The volume of the cuboid is  $100 \text{ cm}^3$ .

(i) Show that  $a = \sqrt{\frac{100}{h}}$ .

**3 marks**

- (ii) Calculate the value of  $a$  when  $h = 4 \text{ cm}$ .

**2 marks**

- (iii) Calculate the value of  $h$  when  $a = 2.5 \text{ cm}$

**3 marks**

DO NOT WRITE ABOVE THIS LINE

19 Find the value of  $z$  if  $\frac{2z-3}{5} - \frac{z-5}{2} = \frac{3}{10}$ .

3 marks

20 Consider the nursery rhyme:

**Twinkle, Twinkle Little Star, how I wonder what you are.**

Complete the following table, filling in the frequency for each letter. There are 44 letters in all, some of which are repeated.

3 marks

<i>Letter</i>	<b>A</b>	<b>B</b>	<b>C</b>	<b>D</b>	<b>E</b>	<b>F</b>	<b>G</b>	<b>H</b>	<b>I</b>	<b>J</b>	<b>K</b>	<b>L</b>	<b>M</b>
<i>Frequency</i>	3	0	0	1	5	0	0	2					
<i>Letter</i>	<b>N</b>	<b>O</b>	<b>P</b>	<b>Q</b>	<b>R</b>	<b>S</b>	<b>T</b>	<b>U</b>	<b>V</b>	<b>W</b>	<b>X</b>	<b>Y</b>	<b>Z</b>
<i>Frequency</i>													

(i) Which letter is the MODE?

1 mark

(ii) If I had to pick at random a letter from the given rhyme, what is the probability of picking a vowel?

2 marks

(iii) What percentage frequency does the letter E have?

2 marks

(iv) What **fraction** of the whole alphabet is made up of the letters that do not appear in the rhyme?

2 marks

**END OF EXAMINATION**