

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

**SECONDARY EDUCATION CERTIFICATE LEVEL**

**SEPTEMBER 2013 SESSION**

**SUBJECT:** Mathematics  
**DATE:** 2<sup>nd</sup> September 2013

**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** Work out  $\frac{2^3 \times 54}{3^2 \times 16}$ .

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

**2** Write down the **sum** of the next two numbers in the sequence:

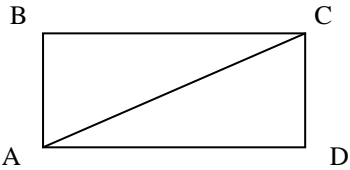
13, 9, 5, 1, \_\_\_\_, \_\_\_\_.

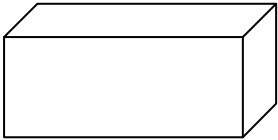
\_\_\_\_\_ **Ans**

**3** Change 2.72 to an improper fraction in its lowest terms.

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

<b>QUESTIONS AND ANSWERS</b> <b>ALL QUESTIONS CARRY ONE MARK</b>	<b>SPACE FOR ROUGH</b> <b>WORK</b> <b>(IF NECESSARY)</b>
<b>4</b> How much is 150% of €200?  <p style="text-align: right;">_____ <b>Ans</b></p>	
<b>5</b> Express 0.6725 litres in mls.  <p style="text-align: right;">_____ <b>Ans</b></p>	
<b>6</b> A sum of money is divided between Peter and Paul in the ratio of 7: 13. If Paul gets €60 more than Peter, what was the sum of money?  <p style="text-align: right;">_____ <b>Ans</b></p>	
<b>7</b> There are 20 pink pages, 15 green pages and 25 yellow pages in a book. I open the book at random and choose a page. What is the probability that I land on a green page?  <p style="text-align: right;">_____ <b>Ans</b></p>	
<b>8</b> The area of triangle XYZ is $25\text{cm}^2$ . If the altitude XP is 4cm, find the length of YZ.  <p style="text-align: right;">_____ <b>Ans</b></p>	
<b>9</b> Find the gradient of a line parallel to the line with equation $2y = 6x - 17$ .  <p style="text-align: right;">_____ <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> Find the area of rectangle ABCD, given that the diagonal AC is of length 5m and side CD is 3m long.</p>  <p style="text-align: right;">_____ <b>Ans</b></p>	
<p><b>11</b> The price of an object increased from €20 to €23. What is the percentage increase?</p> <p style="text-align: right;">_____ <b>Ans</b></p>	
<p><b>12</b> Give an estimate of <math>\frac{201^2}{96(\pi)}</math>, correct to two significant figures.</p> <p style="text-align: right;">_____ <b>Ans</b></p>	
<p><b>13</b> The mean of four numbers is 13. Three of the numbers are 7, 12 and 14. What is the fourth number?</p> <p style="text-align: right;">_____ <b>Ans</b></p>	
<p><b>14</b> Lara goes to sleep at 21:45 on Sunday. At what time does she wake up on Monday if she sleeps exactly 8 hours and 20 minutes?</p> <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> If a circle with radius <math>r</math> has an area of <math>100\text{cm}^2</math>, what is the area of a circle with radius <math>2r</math> ?</p> <p style="text-align: right;">_____ <b>Ans</b></p>	
<p><b>16</b> Work out <math>\frac{1}{2} + \frac{1}{3} - 1</math> .</p> <p style="text-align: right;">_____ <b>Ans</b></p>	
<p><b>17</b> Find the value of <math>x^2 - xy</math> when <math>x = 502</math> and <math>y = 2</math>.</p> <p style="text-align: right;">_____ <b>Ans</b></p>	
<p><b>18</b> Find the <i>negative</i> value of <math>x</math> that satisfies the equation:  <math>2x^2 = 12800</math></p> <p style="text-align: right;">_____ <b>Ans</b></p>	
<p><b>19</b> The cost of theatre tickets for 10 adults and 4 children is €152, while the cost of the same tickets for 4 adults and 10 children is €128. What is the cost of the theatre tickets for 1 adult and 1 child?</p> <p style="text-align: right;">_____ <b>Ans</b></p>	
<p><b>20</b> The edges of a closed box are to be sealed with glue. Find the total length of the edges to be sealed, if the box has sides 10 cm, 5cm and 6cm.</p> <div style="display: flex; align-items: center; margin-top: 10px;">  <p style="text-align: right;">_____ <b>Ans</b></p> </div>	

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

**SECONDARY EDUCATION CERTIFICATE LEVEL**

**September 2013 SESSION**

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SUBJECT: **Mathematics**  
 PAPER NUMBER: I – Section B (Calculator Section)  
 DATE: 2<sup>nd</sup> September 2013  
 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>Mental</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>

- 1 (a) When water freezes, its volume increases by 4%. What volume of water is needed to make  $468\text{cm}^3$  of ice?

- (b) Find the value of  $x$  such that  $3^{2x+1} = 81$

**3 marks**

**3 marks**

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- 2 The value  $R$  can be calculated from  $P$  and  $Q$ , using the formula:

$$\frac{1}{R} = \frac{1}{P} + \frac{1}{Q}$$

- (i) Given that  $P = 150$  and  $Q = 250$ , calculate the value of  $R$ .

**3 marks**

- (ii) Find  $P$  in terms of  $R$  and  $Q$ .

**3 marks**

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**3** Gary sells two kinds of books, hardbacks and paperbacks. The income from selling 15 hardbacks and 28 paperbacks is €779. When he sells 9 hardbacks and 16 paperbacks his income is €455.

**(i)** Let  $h$  represent the price of a hardback and let  $p$  represent the price of a paperback. Write down two equations to show the given data.

**4 marks**

**(ii)** Solve the two simultaneous equations to find the price of each kind of book.

**5 marks**

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**4** A wax candle is in the shape of a cylinder of radius 4 cm and height 6 cm.

**(i)** Find the volume of the wax cylinder. Give your answer in  $\text{cm}^3$ , correct to 2 decimal places.

**3 marks**

**(ii)** The wax cylinder is melted to form a cube, but 4% of the wax is lost in the process. Calculate the side of the cube formed from the wax, giving your answer in cm, correct to 2 decimal places.

**4 marks**

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**5** I use two digits from 1 to 5 to form a number.

(i) Draw a possibility space to show all the possible 2-digit numbers I can form.

**3 marks**

(ii) What is the probability that the two digits in the number add up to 7?

**2 marks**

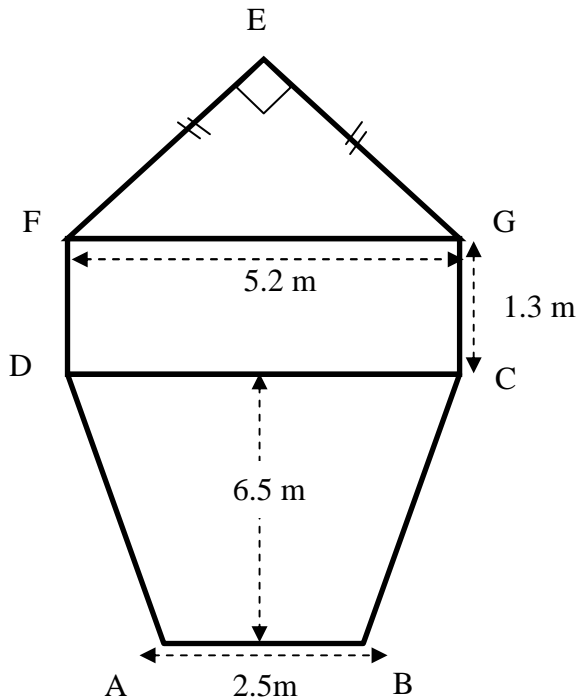
(iii) What is the probability that the number formed is a multiple of 4?

**2 marks**

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- 6 The following figure consists of a trapezium ABCD, a rectangle CDFG and an isosceles triangle FEG, right-angled at E.



The diagram is not drawn to scale

- (i) If  $FG = 5.2$  m, calculate the length of sides FE and EG of triangle GEF in m, correct to 3 significant figures.

**3 marks**

- (ii) Given also that the height of the trapezium is 6.5 m,  $AB = 2.5$  m and  $GC = 1.3$  m, work out the total area of the figure, giving your answer in  $m^2$ , correct to 3 significant figures.

**6 marks**

**7** The prices in a shop selling household appliances were all raised by 5% at the beginning of this year.

**(i)** Find the price of a washing machine which cost €355 last year.

**2 marks**

**(ii)** How much would I have paid for a microwave oven, now marked €103.95, had I bought it last year?

**3 marks**

**(iii)** A sale is announced at the shop for the Christmas season offering a discount. How much would the percentage discount have to be so that the prices return to those of last year? Give your answer correct to 2 decimal places.

**4 marks**

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- 8** (i) The cost of Platinum is quoted in dollars at \$1,687.80 per kg and that of Silver in Euro at €23.722 per kg. If \$1 = €0.7416, find the ratio of the price of Platinum to that of Silver. Give your answer in the form  $r : 1$  where  $r$  is correct to 2 decimal places.

**3 marks**

- (ii) The price of Gold is quoted as €38.75 per troy ounce. If 1g equals 0.03215 troy ounces, find the ratio of the price of Gold to that of Silver. Give your answer in the form  $r : 1$  where  $r$  is correct to 2 decimal places.

**5 marks**

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**9 Use ruler and compasses only to:**

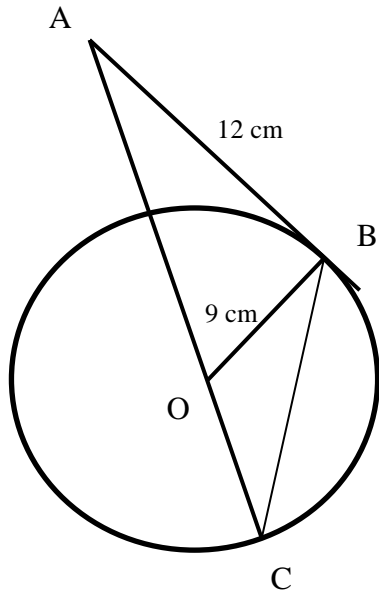
- (i) construct triangle ABC with  $AB = 6$  cm,  $AC = 11$  cm and  $BC = 7$  cm;
- (ii) drop a perpendicular CD from C to AB produced;
- (iii) bisect angle BAC and let this bisector cut CD at E;
- (iv) measure ED.
- (v) **Use a protractor** to measure angle CBD.

**8 marks**

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- 10** The diagram below shows a circle with centre O and tangent AB. The circle has radius 9 cm and AB is 12 cm long.

*The diagram is not drawn to scale.*



- (i) Calculate the length of AO.

**3 marks**

- (ii) Find angle BOA to the nearest degree.

**2 marks**

- (iii) Find angle BCO to the nearest degree.

**2 marks**

- (iv) If M is the midpoint of BC, explain why OM is perpendicular to BC.

**1 mark**

- (v) Calculate the length of the chord BC in cm, correct to 1 decimal place.

**3 marks**

**END OF EXAMINATION**

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UNIVERSITY OF MALTA, MSIDA

**SECONDARY EDUCATION CERTIFICATE LEVEL**

**SEPTEMBER 2013 SESSION**

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<b>SUBJECT:</b>	<b>Mathematics</b>
<b>PAPER NUMBER:</b>	IIB
<b>DATE:</b>	2 <sup>nd</sup> September 2013
<b>TIME:</b>	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>

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1 Write down  $2.65731 \times 10^4$  as an ordinary number to 3 significant figures.

2 marks

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2 Find the product of the sum and the difference of the numbers 23 and 173.

3 marks

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3 Find the Least Common Multiple (LCM) of the numbers 121, 220 and 880.

3marks

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4 One kilowatt-hour unit of electricity is consumed when an appliance of 1000W is used for one hour. How many kilowatt-hour units of electricity are consumed when a vacuum cleaner, having power of 900W, is used for 20 minutes?

2 marks

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5 Simplify:  $\frac{b^{-2}(a^2)^3}{a^5} \frac{1}{(ab)^{-1}}$

2 marks

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6 (i) Write down 3 prime numbers between 20 and 40.

**3 marks**

(ii) What is the smallest number that must be **added** to 220 to get a perfect square?

**1 mark**

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7 A club organises a lottery, selling tickets at 25c each. What is the least number of tickets that must be sold, if the prize cost the club €58 and the club aims to make a profit of €150?

**3 marks**

---

8 Using a calculator, work out  $3\sin 60^\circ \times \sqrt{\frac{45}{\cos 30^\circ}}$  correct to 2 decimal places.

**2 marks**

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9 The first 4 terms of a sequence are: 22, 17, 12, 7, ...

(i) Write down the next 2 terms in the sequence.

**2 marks**

(ii) Write down a formula for the  $n^{\text{th}}$  term of this sequence.

**2 marks**

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**10** Solve the equation  $x(x + 9) = x^2 - 3x + 48$

**3 marks**

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**11** Use the formula  $c^2 = b^2 + 2as$  :

(i) to calculate the two values of  $c$  when  $b = -2$ ,  $a = 9.8$  and  $s = 12$ , correct to 3 significant figures;

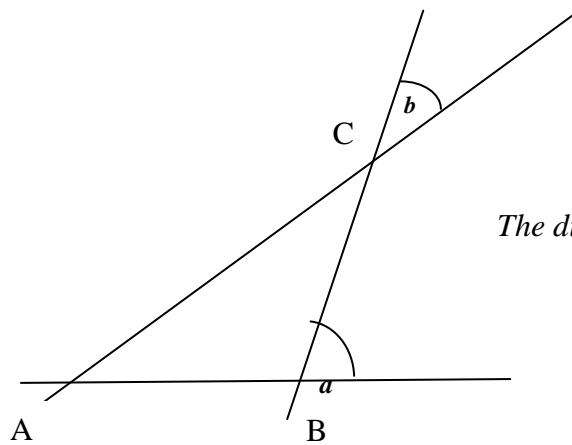
**3 marks**

(ii) to find an expression for  $s$  in terms of  $a$ ,  $b$  and  $c$ .

**2 marks**

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- 12 In the figure below, ABC is a triangle, with sides AB, AC and BC produced as shown. The angle marked  $a$  is  $82^\circ$  and the angle marked  $b$  is  $28^\circ$ .



*The diagram is not drawn to scale*

- (i) Write down the size of angle ACB, giving a reason for your answer.

**2 marks**

- (ii) Find angle CAB.

**2 marks**

- 13 Sara wakes up at 06:25 to prepare for work. She usually leaves home at 07:20 and drives to work for 28 minutes.

- (i) Calculate the time at which Sara arrives at work.

**1 mark**

- (ii) Find the time Sara takes from when she wakes up, to when she leaves home.

**2 marks**

- (iii) One day, Sara wants to arrive at work at 07:45, but decides to walk, taking 39 minutes. What is the latest time at which Sara should wake up, if she takes the usual time to prepare for work?

**2 marks**

- 14** The picture shows the scale on a thermometer. On the left side the scale is graduated in degrees Fahrenheit and on the right side in degrees Celsius.

**°F - °C**



- (i)** Write down the temperature reading shown in degrees Celsius.

**2 marks**

- (ii)** Degrees Celsius ( $C$ ) can be changed to degrees Fahrenheit ( $F$ ) by the formula  $F = \frac{9}{5}C + 32$ .  
Change a temperature of  $50^{\circ}\text{C}$  to degrees Fahrenheit.

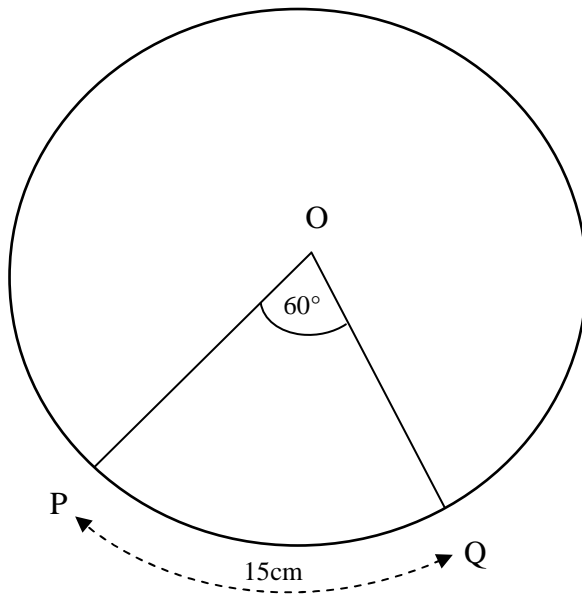
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**2 marks**

- (iii)** Calculate the temperature below freezing point, at which the temperature readings are the same in both degrees Celsius and degrees Fahrenheit.

**3 marks**

- 15 An arc PQ of length 15 cm subtends an angle of  $60^\circ$  at the centre O of a circle.



- (i) Calculate the radius of the circle, leaving your answer in terms of  $\pi$ .

**3 marks**

- (ii) Prove that the chord PQ is equal to the radius of the circle.

**3 marks**

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- 16** A college has 250 students. The number of days that students were absent in a particular period of 15 school days was recorded as follows:

<b>Days absent</b>	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
<b>No. of students</b>	18	11	12	8	15	20	19	16	17	13	15	11	8	5	4

- (i) How many students were never absent during that period?

**3 marks**

- (ii) Write down the mode.

**1 mark**

- (iii) What percentage of students were absent for more than 10 days?

**3 marks**

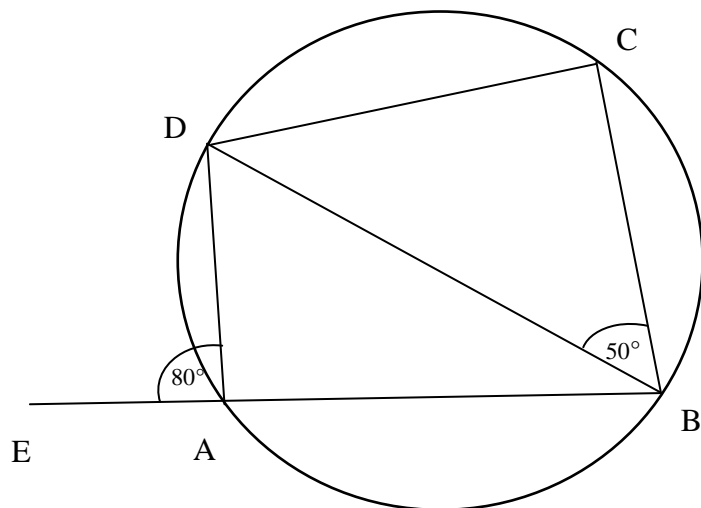
- (iv) Taking all the students at the college, what is the mean number of absent days per student, correct to 1 decimal place?

**3 marks**

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- 17 ABCD is a quadrilateral inscribed in a circle. BA is produced to E. Angle DAE =  $80^\circ$  and angle CBD =  $50^\circ$ .



*The diagram is not drawn to scale.*

- (i) Find angle DCB, explaining your reasoning.

- (ii) Prove that  $CD = CB$ .

**2 marks**

**3 marks**

**18** Consider the equation  $4y = x + 8$ .

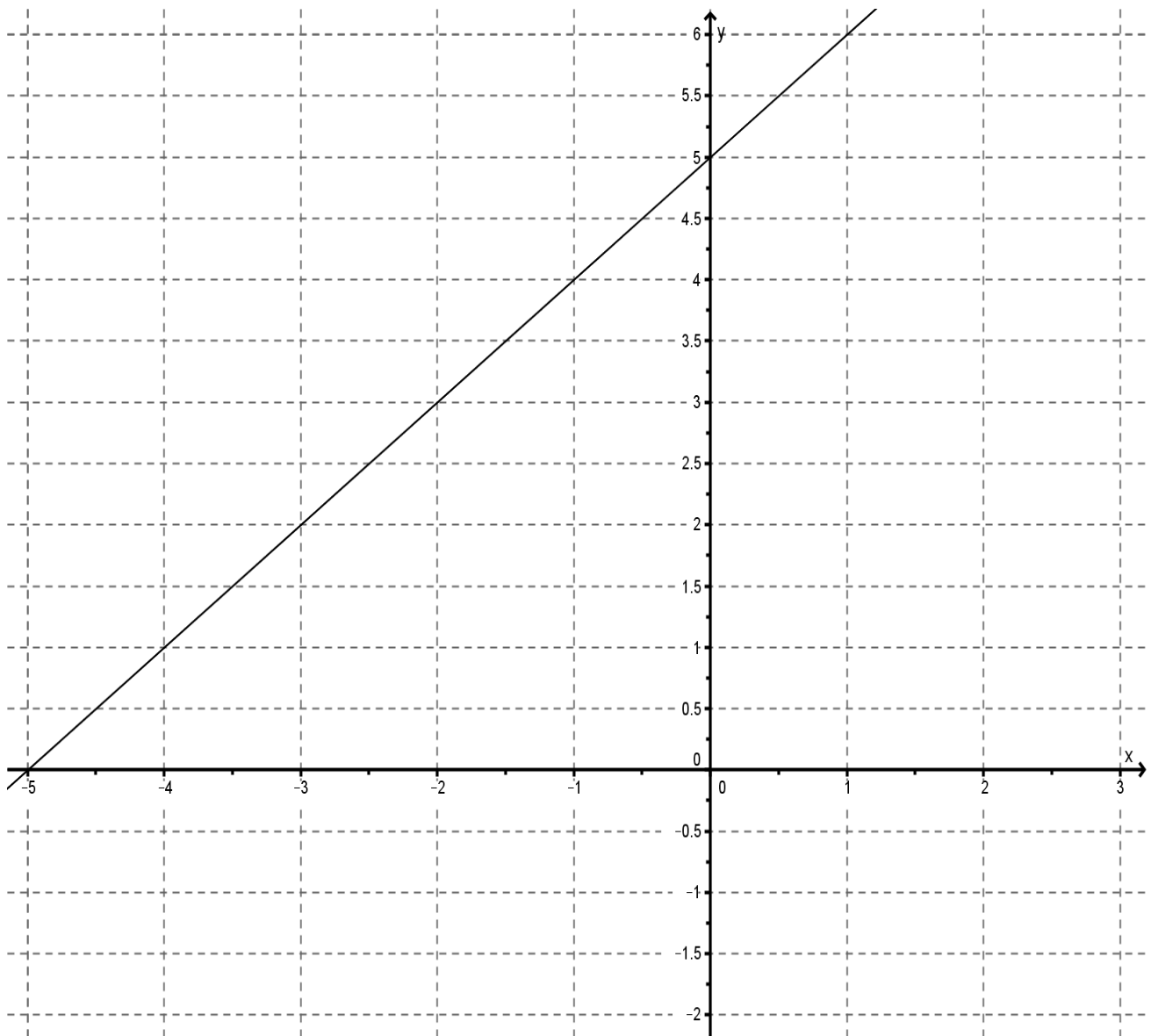
(i) Find the value of  $x$  when  $y = 0$ . **1 mark**

(ii) Fill in the table given below, for values of  $x$  between  $-5$  and  $3$ , in the given equation.

<b><math>x</math></b>	<b><math>-5</math></b>	<b><math>-4</math></b>	<b><math>-3</math></b>	<b><math>-2</math></b>	<b><math>-1</math></b>	<b><math>0</math></b>	<b><math>1</math></b>	<b><math>2</math></b>	<b><math>3</math></b>
<b><math>y</math></b>									

**3 marks**

(iii) On the diagram below, you are given the graph of the line with equation  $y = x + 5$ . Using the same set of axes, draw the graph of  $y$  against  $x$  for the table obtained in (ii).



**3 marks**

(iv) Use your graph to find the value of  $y$  at which  $x = \frac{x+8}{4} - 5$ .

**2 marks**

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**19** George can cycle at 15 km per hour and walk at 7 km per hour. One morning he starts on a journey, cycling a distance of 8 km and then proceeding on foot for 45 minutes.

(i) Express his cycling speed in m/s correct to 3 decimal places.

**2 marks**

(ii) Find the time that George spent cycling.

**2 marks**

(iii) Find the total distance covered by George.

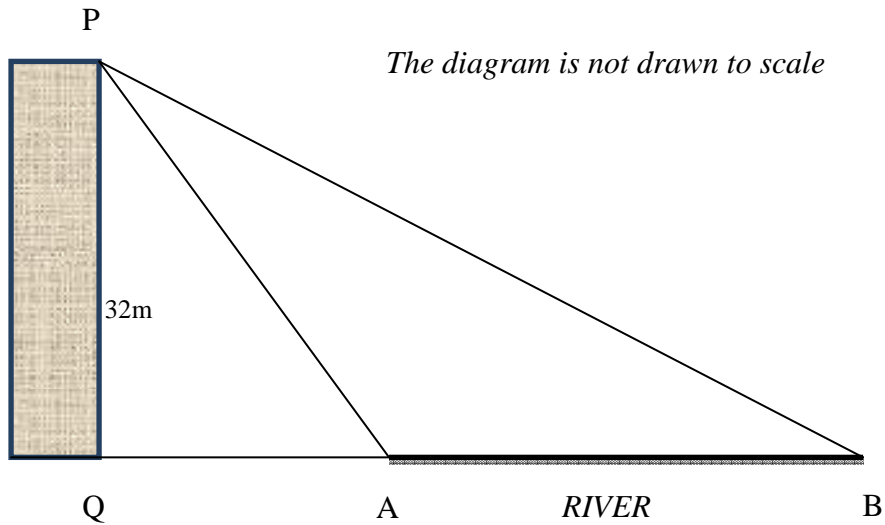
**3 marks**

(iv) Calculate the average speed over the whole journey, giving your answer in km/hour, correct to 2 decimal places.

**4 marks**

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- 20** The diagram shows a river running parallel to a block of flats. The height of the block is 32m. Looking down from the roof from a point P directly across the river, the angle of depression of the nearer bank A is  $53^\circ$  and that of the further bank B is  $34^\circ$ .



- (i) How far is the block from the nearer river bank A? Give your answer in metres, correct to 2 decimal places.

**3 marks**

- (ii) Calculate the width of the river in metres, correct to 2 decimal places.

**4 marks**

- (iii) Calculate how far P is from the river bank B, in metres, correct to 2 decimal places.

**3 marks**

**END OF EXAMINATION**