

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

SECONDARY EDUCATION CERTIFICATE LEVEL

MAY 2012 SESSION

SUBJECT: Mathematics
DATE: 4th May 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 Write down the next term in the sequence:

36, 49, 64, 81, 100, ____ .

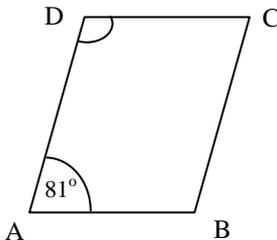
_____ **Ans**

2 Arrange in order, starting from the smallest:

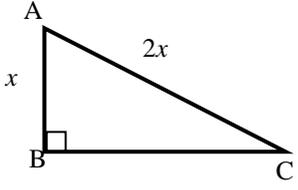
$\frac{1}{3}$, 3×10^{-2} , 0.3, -3 .

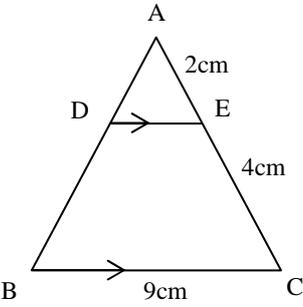
_____ **Ans**

3 Calculate angle ADC in the following diagram, in which ABCD is a parallelogram and angle DAB = 81°



_____ **Ans**

<p style="text-align: center;">QUESTIONS AND ANSWERS ALL QUESTIONS CARRY ONE MARK</p>	<p style="text-align: center;">SPACE FOR ROUGH WORK (IF NECESSARY)</p>
<p>4 Find the value of $\frac{5a^2}{8b}$ when $a = 4$ and $b = \frac{1}{2}$.</p> <p style="text-align: right;">_____ Ans</p>	
<p>5 The mean of 5 numbers is 24. Four of them are: 20, 21, 25 and 27. Find the fifth number.</p> <p style="text-align: right;">_____ Ans</p>	
<p>6 Work out: $\frac{(90+100)(90-10)}{(90-82)}$.</p> <p style="text-align: right;">_____ Ans</p>	
<p>7 ABCD is a quadrilateral in which its opposite sides AB and DC are parallel but not equal. What is the name of the shape of ABCD?</p> <p style="text-align: right;">_____ Ans</p>	
<p>8 ABC is a triangle, right-angled at B. AB is x cm long and AC is $2x$ cm long. Find the numerical value of $\sin C$. (The diagram is not drawn to scale.)</p> <div style="display: flex; align-items: center;"> <div style="margin-right: 20px;">  </div> <div style="margin-left: 20px;"> <p style="text-align: right;">_____ Ans</p> </div> </div>	
<p>9 If $5^p = 125$, find the value of p.</p> <p style="text-align: right;">_____ Ans</p>	

<p style="text-align: center;">QUESTIONS AND ANSWERS ALL QUESTIONS CARRY ONE MARK</p>	<p style="text-align: center;">SPACE FOR ROUGH WORK (IF NECESSARY)</p>
<p>10 The area of triangle XYZ is 60 cm^2 and XY is 4 cm long. Find the length of the altitude from Z to XY.</p> <p style="text-align: right;">_____ Ans</p>	
<p>11 A film is 1 hour 25 minutes long. If the film ends at 1pm, at what time does the film start?</p> <p style="text-align: right;">_____ Ans</p>	
<p>12 Amy and Betty share €350 between them such that Betty gets one and a half times as much as Amy. How much does Amy get?</p> <p style="text-align: right;">_____ Ans</p>	
<p>13 The point with co-ordinates $(3, a)$ lies on the line with equation $y = 2x - 7$. Find the value of a.</p> <p style="text-align: right;">_____ Ans</p>	
<p>14 In the given diagram (not drawn to scale), DE is parallel to BC. $AE = 2 \text{ cm}$, $EC = 4 \text{ cm}$ and $BC = 9 \text{ cm}$. Find the length of DE.</p> <div style="text-align: center;">  </div> <p style="text-align: right;">_____ Ans</p>	

<p style="text-align: center;">QUESTIONS AND ANSWERS ALL QUESTIONS CARRY ONE MARK</p>	<p style="text-align: center;">SPACE FOR ROUGH WORK (IF NECESSARY)</p>
<p>15 A DVD player is priced €90 but a discount of 10% is given. Find the discounted price of the DVD player.</p> <p style="text-align: right;">_____ Ans</p>	
<p>16 Express $\frac{4}{25}$ as a percentage.</p> <p style="text-align: right;">_____ Ans</p>	
<p>17 Find the sum of the two prime numbers that are between 20 and 30.</p> <p style="text-align: right;">_____ Ans</p>	
<p>18 Find an estimate for $\left(\frac{9.6\pi}{5}\right)^2$.</p> <p style="text-align: right;">_____ Ans</p>	
<p>19 The distance between two towns is 39 km. A car takes 39 minutes to go from one town to the other. Find the average speed of the car in km per hour.</p> <p style="text-align: right;">_____ Ans</p>	
<p>20 Four machines working together would take 12 days to finish an order of merchandise. If one of the machines breaks down, how long will it take the three machines to complete the order?</p> <p style="text-align: right;">_____ Ans</p>	

Index No: _____

SEC23/1b.12m

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

SECONDARY EDUCATION CERTIFICATE LEVEL

MAY 2012 SESSION

SUBJECT:	Mathematics
PAPER NUMBER:	I – Section B (Calculator Section)
DATE:	4 th May 2012
TIME:	1hr and 40 minutes

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>											
Question No	1	2	3	4	5	6	7	8	9	10	Total

DO NOT WRITE ABOVE THIS LINE

1 (i) Write 16 356.23 in standard form.

1 mark

(ii) Express $12.\dot{3}$ (meaning 12.3333333....) as a fraction of the form $\frac{p}{q}$, where p and q are integers.

1 mark

(iii) Evaluate $\frac{1}{3} + \frac{2}{9} - \frac{4}{27}$ giving your answer as a fraction, showing your working.

2 marks

(iv) Find the value of $2(-3)^3 - \frac{1}{2}(5 \times \sqrt{144})$.

2 marks

2 Two normal six-sided dice have their spots covered and replaced by the letters A, B, C, D, E and F, with one letter on each face. If the two dice are thrown, complete the possibility space given below, to show the occurrence of the events.

2 marks

Ist throw \ 2nd throw	A	B	C	D	E	F
A	AA	BA	CA	DA	EA	FA
B	AB	BB	CB			
C	AC					
D						
E						
F						

DO NOT WRITE ABOVE THIS LINE

Hence calculate the probability that the two dice show:

(i) the same letter,

2 marks

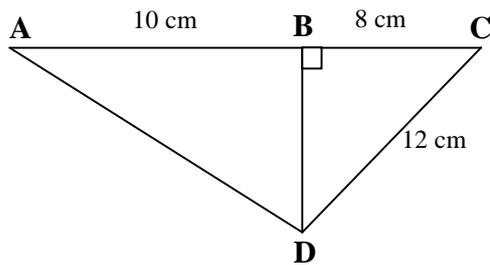
(ii) two vowels,

2 marks

(iii) a vowel and a consonant.

2 marks

- 3** In the given figure, ACD is a triangle and B is a point on AC, such that angle DBC is a right angle, AB = 10 cm, BC = 8 cm and CD = 12 cm.



(i) Find the length of BD in cm to 2 decimal places.

3 marks

(ii) Find the length of AD in cm to 2 decimal places.

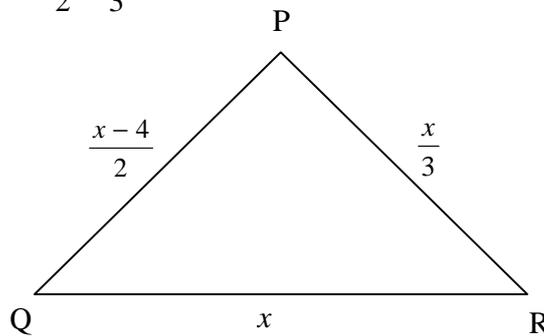
3 marks

DO NOT WRITE ABOVE THIS LINE

- (iii) Is angle ADC a right angle? Show your reasoning.

2 marks

- 4 (a) The triangle PQR given below is not drawn to scale. Its sides PQ, PR and QR are given as $\frac{x-4}{2}$, $\frac{x}{3}$ and x respectively.



If the perimeter of triangle PQR is 20 cm, form an equation in x and solve it to find the length of side QR.

4 marks

- (b) The sum of the first n squares, given by the sum of the terms $1 + 4 + 9 + \dots + n^2$ can be calculated by using the formula $\frac{n}{6}(n+1)(2n+1)$.
- (i) What is the value of the 20th term of the series?

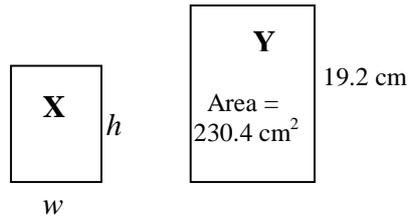
1 mark

- (ii) Find the sum of the first 25 squares.

2 marks

DO NOT WRITE ABOVE THIS LINE

- 5 The width and height of rectangle **Y** are both 20% greater than the width and height of rectangle **X**. The height of rectangle **Y** is 19.2 cm and its area is 230.4 cm^2 .



- (i) Find the width of rectangle **Y**.

2 marks

- (ii) Calculate the height of rectangle **X**.

3 marks

- (iii) Calculate the width of rectangle **X**.

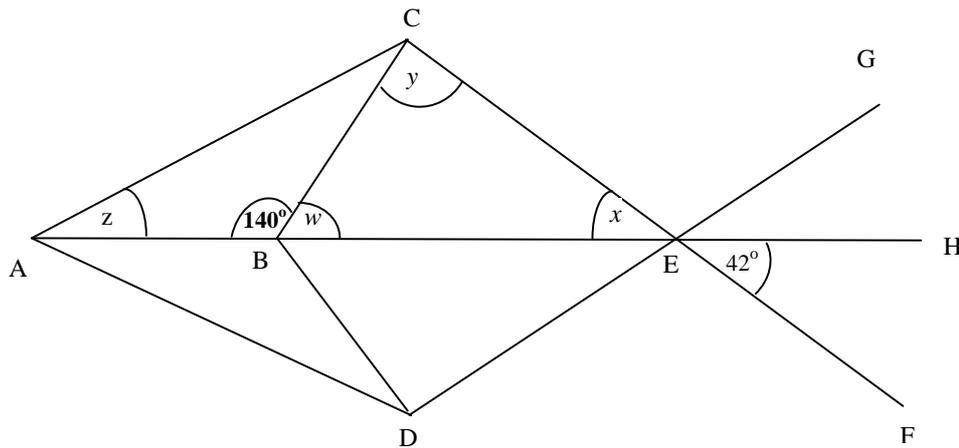
3 marks

- (iv) Determine the ratio of the area of rectangle **X** to that of rectangle **Y**.

3 marks

DO NOT WRITE ABOVE THIS LINE

- 6 The figure below (not drawn to scale), represents the pointed edge of an arrow in which CF, AH and DG are straight lines and $AB = BC = BD$.



- (i) Name the line of symmetry in the diagram. **1 mark**
- (ii) Without calculating the values of x and of y , write down the value of $(x + y)$. **1 mark**
- (iii) Calculate each of the marked angles w, x, y, z , giving reasons for your answers.

6 marks

DO NOT WRITE ABOVE THIS LINE

- 7 The Borg family received the following bill for electricity and water consumption for the period 1st January to 1st March 2012. The total amount due is calculated by adding the cost of consumption and the service charge of both electricity and water.

Electricity	Euro	Consumption	
Service charge	32.50	Meter Reading	
		Previous	Current
		12956	13295
Water			
Service Charge	10.00		
		143	151
TOTAL	111.68		

- (i) The first 200 electricity units cost 16c per unit, while the next 400 units cost 18c per unit. Calculate the cost of electricity consumption in euro.

4 marks

- (ii) Calculate the cost of water consumption in euro.

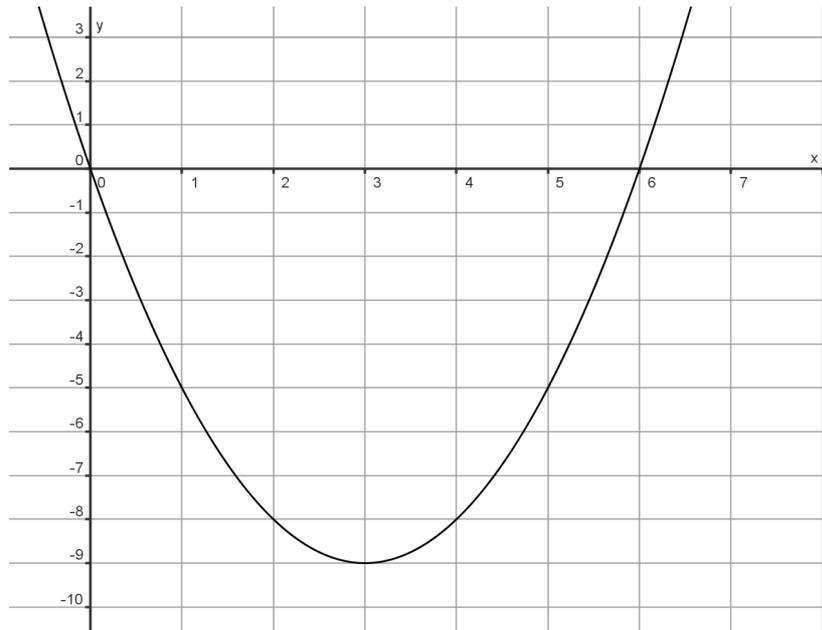
3 marks

- (iii) How much does a unit of water cost?

2 marks

DO NOT WRITE ABOVE THIS LINE

- 8 The quadratic curve is defined by $y = x^2 - kx$ where k is a positive constant. The graph of this curve is shown below.



Use the given graph to answer the following questions.

- (i) What is the least value of y ?

1 mark

- (ii) What are the values of x that make $y = -5$?

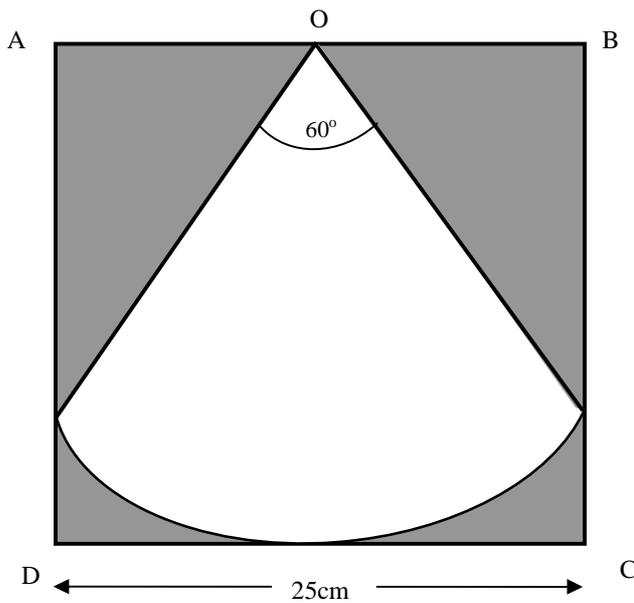
2 marks

- (iii) By factorising the expression $x^2 - kx$, solve the equation $x^2 - kx = 0$ and determine the value of k .

3 marks

DO NOT WRITE ABOVE THIS LINE

- 9 The diagram below (not drawn to scale) shows a square tile of side 25 cm, to be used on the walls of a bathroom. The central white part consists of a sector of a circle centre O, at which it subtends an angle of 60° . O is also the midpoint of side AB of the square ABCD.



- (i) Calculate the area of the central white sector in cm^2 , correct to two decimal places.

3 marks

- (ii) Calculate the area of the shaded part of the tile, in cm^2 correct to two decimal places.

3 marks

- (iii) Find the least number of tiles needed to cover a wall which is 4m by 7.5m.

3 marks

DO NOT WRITE ABOVE THIS LINE

- 10** An ironmonger sells two brands of paint brushes; those that are made from natural bristles and those made from synthetic fibres. The natural bristle brush is more expensive than the synthetic brush.

Let x denote the price of each expensive brush and let y denote the price of the cheaper brush.

- (i) If the difference in price of the two kinds of brushes is €3.00, write down an equation involving x and y .

1 mark

- (ii) The total cost of 12 brushes with natural bristles and 9 brushes with synthetic fibres is €61.20. Construct another equation to show the given information.

2 marks

- (iii) Solve the two equations to find the cost of each type of paint brush.

5 marks

END OF EXAMINATION

SECONDARY EDUCATION CERTIFICATE LEVEL

MAY 2012 SESSION

SUBJECT:	Mathematics
PAPER NUMBER:	IIA
DATE:	7 th May 2012
TIME:	4:00 p.m. to 6:00 p.m.

ANSWER ALL QUESTIONS.

Write your answers on the booklet provided.

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.

Table of formulae

Area of triangle	$\frac{1}{2} ab \sin C$
Curved Surface Area of Right Circular Cone	$\pi r l$
Surface Area of a Sphere	$4\pi r^2$
Volume of a Pyramid / Right Circular Cone	$\frac{1}{3} \text{base area} \times \text{perpendicular height}$
Volume of a Sphere	$\frac{4}{3} \pi r^3$
Solutions of the equation $ax^2 + bx + c = 0$	$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$
Sine Formula	$\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$
Cosine Formula	$a^2 = b^2 + c^2 - 2bc \cos A$

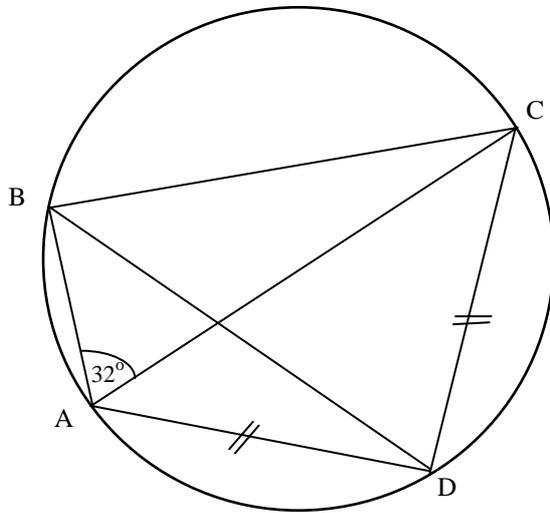
- 1 An n -sided figure has $\frac{1}{2}n(n-3)$ diagonals.
- (i) How many **diagonals** does an octagon have? **2 marks**
- (ii) How many **sides** does a figure with 54 diagonals have? **4 marks**
-

- 2 Before starting the scholastic year, $\frac{5}{7}$ of the students in a school, have had a flu vaccine. If a student has had the vaccine, the probability of catching the flu is $\frac{1}{35}$. If a student has NOT had the vaccine, the probability of catching the flu is $\frac{9}{14}$.
- (i) Draw a tree diagram to show the given data. **5 marks**
- (ii) Calculate the probability that a student, chosen at random from this school, does NOT catch the flu. **3 marks**
- (iii) It is expected that around 150 students from this school will catch the flu. How many students attend this school? **3 marks**
-

- 3 The value of a car is €18 500, when new. It depreciates in value by 25% in the first year and by 20% in the following years.
- (i) Find the value of the car after one year. **2 marks**
- (ii) Determine the value of the car after four years from date of purchase. **5 marks**
- (iii) Calculate the total depreciation after the four years, expressed as a percentage of the original value of the car. **3 marks**
-

- 4 Given that $f(x) = \frac{1}{4}(x^2 - 8)$ and $g(x) = 2\sqrt{x}$:
- (i) Find the value of $f(0) + g(4)$. **3 marks**
- (ii) Find expressions for $f^{-1}(x)$ and $g^{-1}(x)$ **4 marks**
- (iii) Obtain the quadratic equation resulting from $f(x) = x - \frac{29}{12}$. **3 marks**
- (iv) Solve the equation obtained in (iii), giving your answers to 2 decimal places. **4 marks**
-

- 5 ABCD is a cyclic quadrilateral and AC is a diameter. If $AD = DC$ and angle BAC is 32° , calculate the angles:
 (i) BDC, (ii) CAD, (iii) BCD (iv) ABD. **Explain your reasoning.**



9 marks

- 6 If the numerator of a certain fraction is doubled and the denominator is increased by 1, the fraction becomes $\frac{1}{2}$.
 If the numerator of the original fraction is squared and the denominator is decreased by 2, the fraction becomes equal to 1.

Let x be the numerator and let y be the denominator of the original fraction.
 Write down two simultaneous equations in x and y .

4 marks

Solve these equations to find two possible values for the given fraction.

5 marks

- 7 In triangle ABC, $AB = 6.2$ cm, $AC = 8.1$ cm and $BC = 5.7$ cm. Calculate, giving your answer to 2 decimal places:

(i) angle B;

4 marks

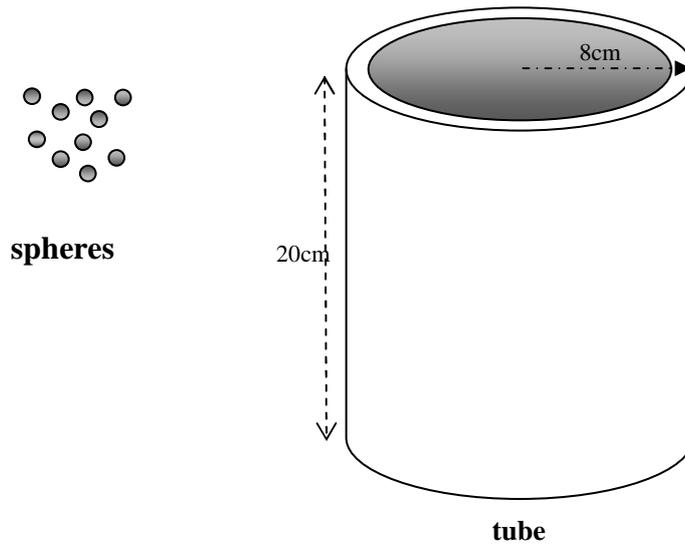
(ii) the perpendicular height from A to BC;

3 marks

(iii) the area of triangle ABC.

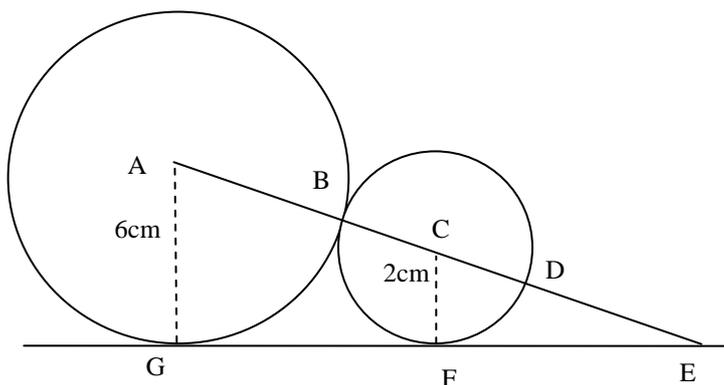
2 marks

- 8** A number of small solid copper spheres are to be melted down in order to make a hollow copper tube. The small spheres have radius 0.5 cm.



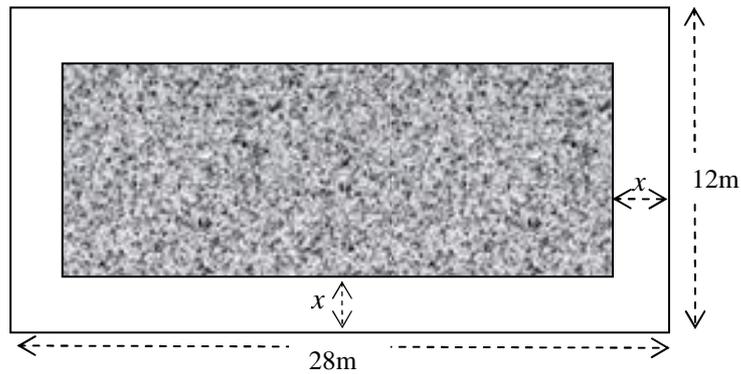
- (i) Find the volume of a small copper sphere, giving your answer in terms of π . **2 marks**
- (ii) If the tube has external radius 8 cm and the thickness of copper is 1 cm, calculate the cross-sectional area of the copper tube, giving your answer in terms of π . **3 marks**
- (iii) Calculate the least number of small spheres to be melted to make the copper tube 20 cm long, if no copper is lost in the process. **4 marks**

- 9** The figure below, (not drawn to scale) shows two circles, with centres A and C and radii 6 cm and 2 cm respectively. The circles touch each other at B. ABCD is a straight line. GFE is a common tangent to the circles.



- (i) Show that triangles ECF and EAG are similar. **4 marks**
- (ii) Find the length of AE. **5 marks**
- (iii) Find angle ECF. **3 marks**
- (iv) Find the area of triangle CFE, in cm^2 correct to 3 significant figures. **2 marks**

- 10** The following diagram (not drawn to scale) shows a garden with a path around a central flower-bed. Let the width of the path be x metres, all around.



Given that the flower-bed has an area of 260m^2 :

- (i) Form an equation in x and solve it to find the width of the path;

6 marks

- (ii) Calculate the length and width of the flower bed.

3 marks

END OF EXAMINATION

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

SECONDARY EDUCATION CERTIFICATE LEVEL

MAY 2012 SESSION

SUBJECT:	Mathematics
PAPER NUMBER:	IIB
DATE:	7 th May 2012
TIME:	4:00 p.m. to 6:00 p.m.

ANSWER ALL QUESTIONS

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

Question No	11	12	13	14	15	16	17	18	19	20
Mark										

Total

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- 1 Kenneth is in the 12th floor of a hotel and his car is parked in the garage marked as floor – 4. How many floors does he have to go down, for his car?

1 mark

- 2 Estimate the length of the pencil, from tip to tip, using the ruler in the given figure.

**2 marks**

- 3 Use your calculator to work out the following, giving your answer to 3 decimal places.

$$\frac{(0.732)^2 - \sqrt{4.25}}{1.86}$$

2 marks

- 4 Evaluate $50 \times 5^{-2} \times 4^2 \times 2^{-2}$.

2 marks

- 5 Water is being poured in a 10-litre bucket using a bottle of capacity 750 mls. Assuming no water is lost in the process, how many times must the bottle be filled so as to fill 90% of the bucket?

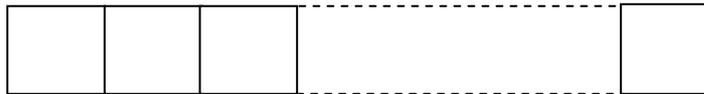
3 marks

DO NOT WRITE ABOVE THIS LINE

- 6 Sandra is given €30 to spend on fridge-magnets. She has to pay €2.75 for delivery and the magnets cost €1.20 each. How many magnets can she buy?

3 marks

- 7 A pattern is made by attaching squares of side 10cm to form a long strip as shown below.



- (i) Find the **perimeter** of the strip with 7 squares.

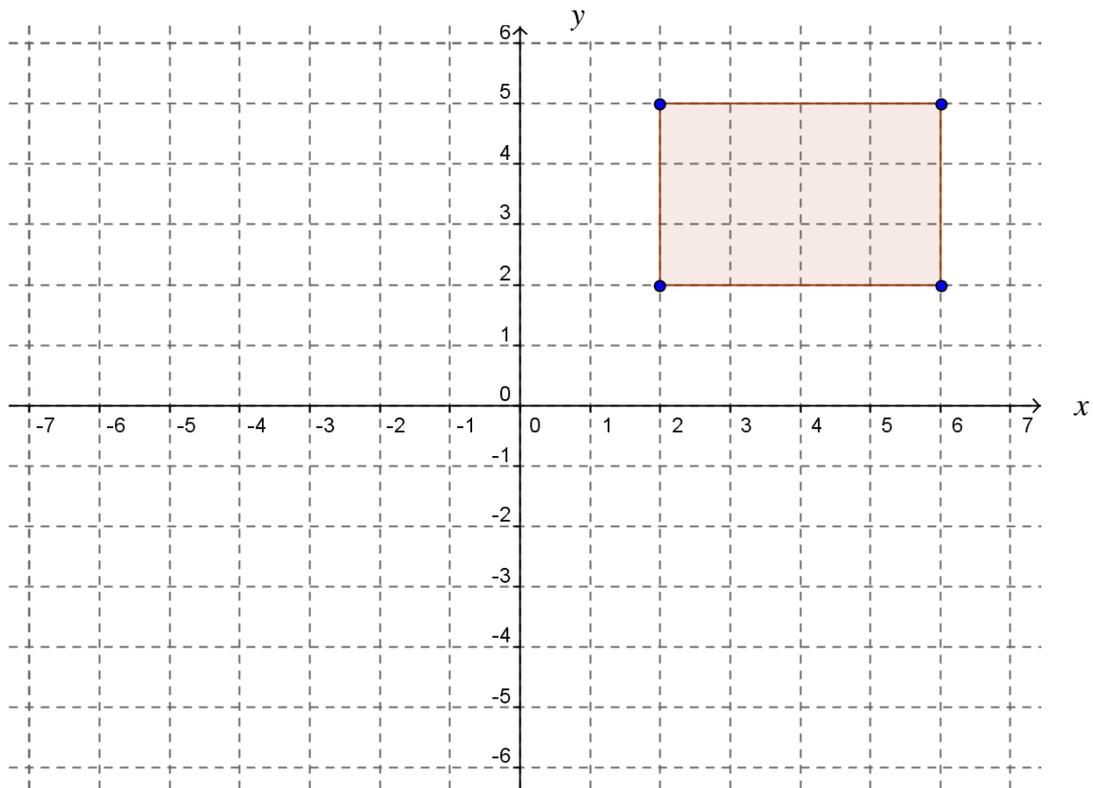
2 marks

- (ii) Write down an expression for the perimeter of the strip with n squares.

2 marks

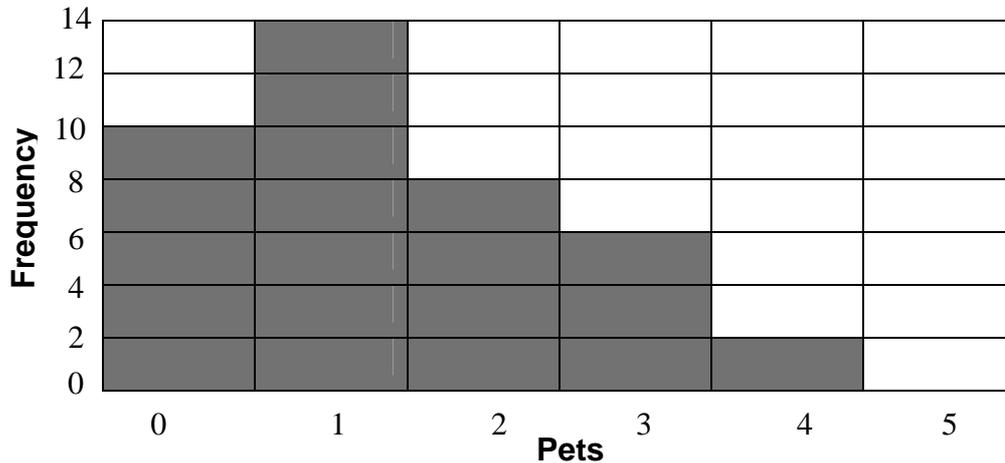
- (iii) Find the number of squares needed to form a strip with perimeter 3.6 m.

3 marks

DO NOT WRITE ABOVE THIS LINE**8** On the grid below,**(i)** draw the reflection of the given rectangle, in the y -axis. Label it **P**;**2 marks****(ii)** rotate the given rectangle clockwise through 90° about the origin. Label it **Q**.**2 marks****9** Given that $f(x) = 3x - 2$,**(i)** evaluate $f(0) + f(2)$;**3 marks****(ii)** find x when $f(x) = 7$.**3 marks**

DO NOT WRITE ABOVE THIS LINE

- 10** In a survey among students, the number of pets at home was recorded. The bar chart shows the results.



- (i) Complete the frequency table for the data.

No. of Pets	0	1	2	3	4	5
Frequency						

2 marks

- (ii) Write down the mode for the table above.

1 mark

- (iii) Work out the mean number of pets per student.

2 marks

- (iv) What is the probability of choosing a student who has two pets?

2 marks

DO NOT WRITE ABOVE THIS LINE

- 11 (i) Find the gradient of the line which passes through the points A(-1, 10) and D(2, -2).

2 marks

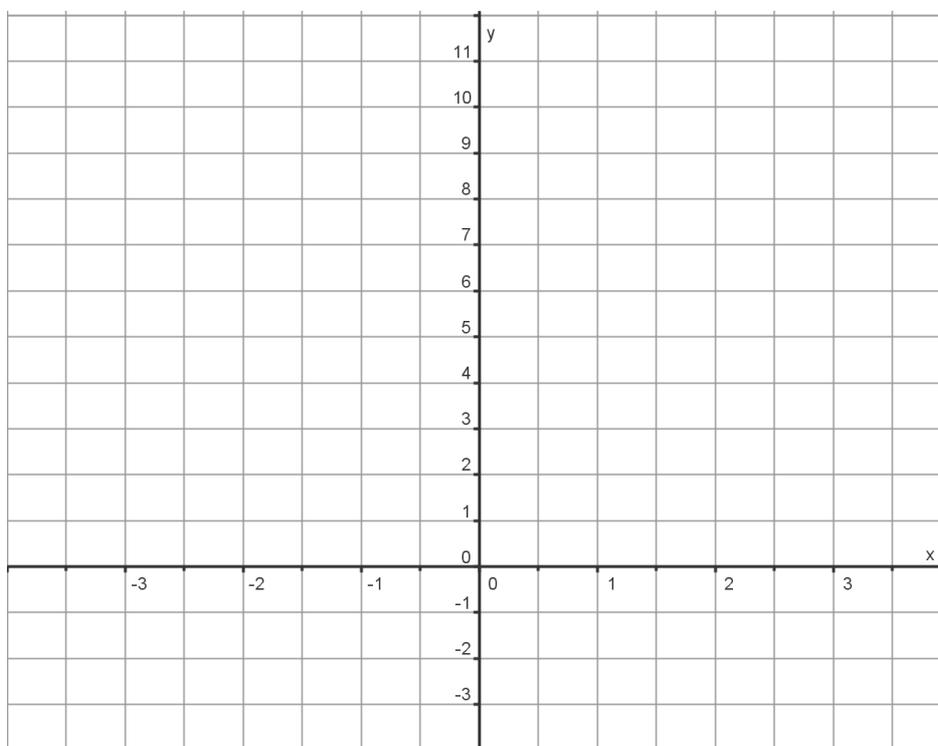
- (ii) Find the equation of the line AD.

3 marks

- (iii) AD intersects the y -axis at B and the x -axis at C. Use the equation of the line to determine the coordinates of B and C.

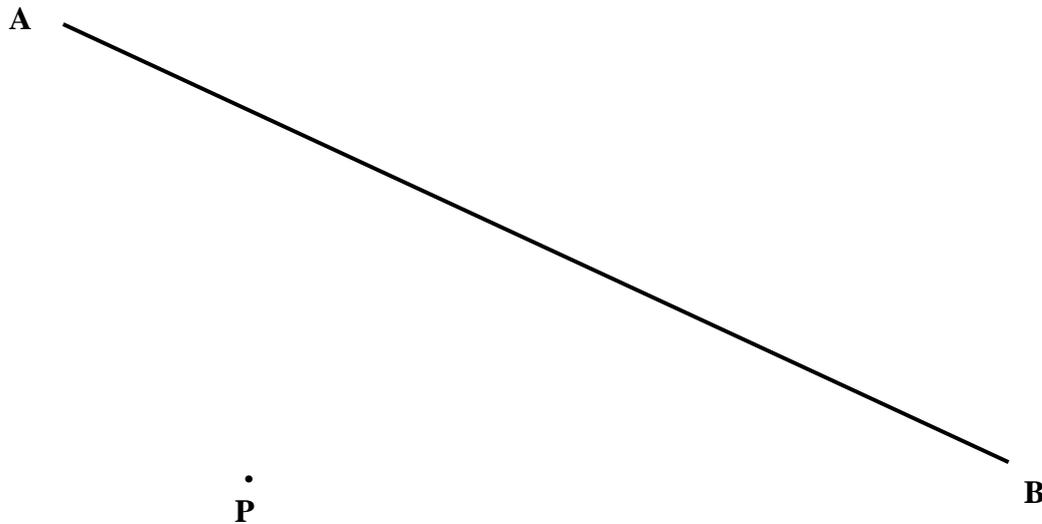
2 marks

- (iv) On the grid below, draw the line AD. Label the points A, B, C and D.

**3 marks**

DO NOT WRITE ABOVE THIS LINE

- 12** Line AB and point P are given below. Construct a line perpendicular to AB, passing through P.
Let this line intersect AB at C.
Find point D on AB such that $AC = CD$.
Let E be the point on the line through P such that $PC = CE$.
Measure angle APD.
What is the quadrilateral APDE called? Give reasons for your answer.

**8 marks**

DO NOT WRITE ABOVE THIS LINE

- 13** While on holiday, Jack noticed that the same Smart phone model can be bought for £394.99 in England and for 550.50 francs in Switzerland.

(i) Given that € 1 = £0.837, find the cost in euro of the Smart phone in England.

2 marks

(ii) Given that 1 franc = € 0.820, find the cost in euro of the Smart phone in Switzerland.

2 marks

(iii) In which country is it cheaper to buy this Smart phone and by how much? Give your answer in euro.

1 mark

-
- 14** Make u the subject of the formula: $\frac{1}{f} = \frac{1}{v} - \frac{1}{u}$.

3 marks

DO NOT WRITE ABOVE THIS LINE

15 (i) Draw a *rough* diagram of a kite ABCD in which $AC = 6$ cm and $BD = 12$ cm.

(ii) Find the area of the kite ABCD.

2 marks**3 marks**

16 There is a gathering of football fans in a stadium. Two-fifths of the fans are wearing a red T-shirt, one-third of the fans are wearing a white T-shirt and the rest are wearing T-shirts of other colours.

(i) What fraction of the football fans are not wearing a red or a white T-shirt?

3 marks

(ii) If the number of fans wearing a red T-shirt is 612, how many fans are there in the stadium?

2 marks

DO NOT WRITE ABOVE THIS LINE

- 17 A cruise-liner leaves from a point X and sails 140 km on a bearing of 240° arriving at Y.
- (i) Draw a diagram, to scale, showing the path XY of the cruise-liner.

2 marks

- (ii) From your scale drawing, find how far south the cruise-liner is from X, when it gets to Y.

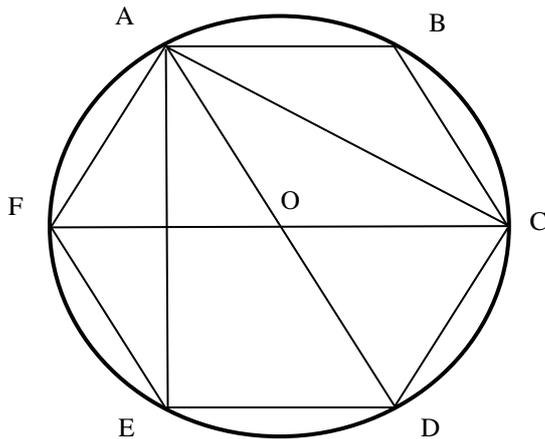
2 marks

- (iii) By calculation, find how far west of X the cruise-liner is, when it gets to Y. Give your answer in km, correct to 2 decimal places.

2 marks

DO NOT WRITE ABOVE THIS LINE

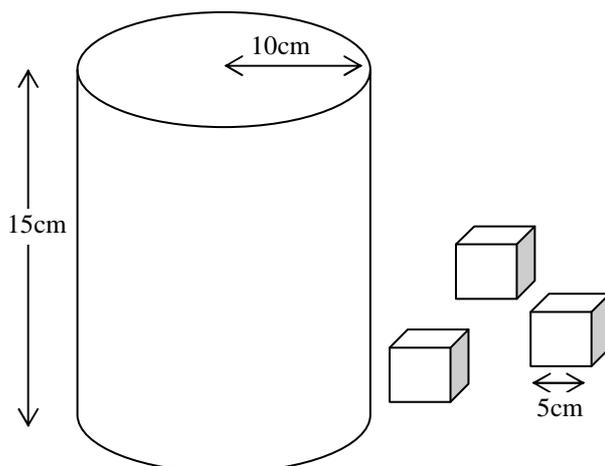
- 18** ABCDEF is a regular hexagon, whose vertices lie on the circumference of a circle with centre O. Show, explaining your reasoning, that triangles AED and CAF are congruent.



7 marks

- 19** A solid silver right cylinder, of radius 10cm and height 15cm, is melted down to form a number of silver cubes of side 5cm.

(i) Find the volume of the cylinder.



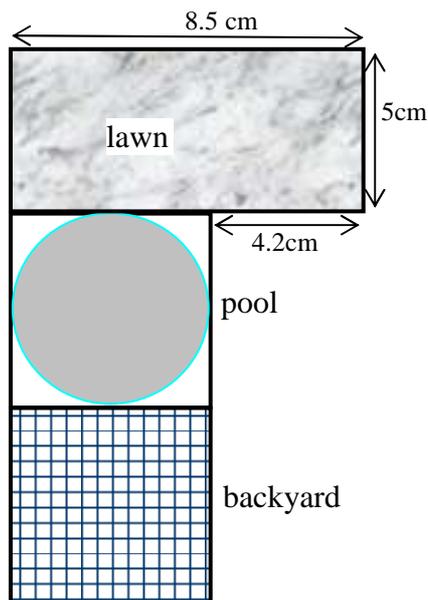
2 marks

(ii) Assuming no silver is lost in the process, calculate how many complete cubes can be made from the molten silver.

3 marks

DO NOT WRITE ABOVE THIS LINE

- 20 The diagram below (not drawn to scale) shows a satellite photo of the back garden of a house, showing a square, tiled backyard, a round swimming pool and an oblong lawn. The dimensions given are those in the photo. The scale is such that 1cm represents 2m.



- (i) What is the actual width of the square tiled backyard?

2 marks

- (ii) What actual area is occupied by the real pool? Give your answer correct to the nearest m^2 .

4 marks

- (iii) Find the actual perimeter of the lawn. Hence, calculate the cost of putting up a fence all around the lawn with wire costing 39 cents per m. Give your answer to the nearest euro.

4 marks**END OF EXAMINATION**