UNIVERSITY OF MALTA

SECONDARY EDUCATION CERTIFICATE
SEC

MATHEMATICS
May 2012

MARKING SCHEME

MATRICULATION AND SECONDARY EDUCATION
CERTIFICATE EXAMINATIONS BOARD

Mental Paper	
ALL QUESTIONS CARRY ONE B-MARK *IGNORE ALL UNITS*	**COMMENTS**
1 **121**	
2 **– 3, 3x10^{-2}, 0.3, $^1/_3$**	Accept all expressed as decimals
3 **99°**	**Accept 99**
4 20	
5 27	
6 **1 900**	
7 **trapezium**	
8 $\frac{1}{2}$ or 0.5	**Do not accept $^x/_{2x}$**
9 **3**	**Accept 5^3**
10 **30 cm**	**Units can be left out**
11 **11:35 or 11.35 am or 11.35**	**Do not accept 11.35pm**
12 € 140	Ignore units
13 **– 1**	
14 **3 cm**	**Units can be left out**
15 **€ 81**	Accept 81
16 **16%**	
17 **52**	
18 **36**	Accept from 33 to 40 inclusive up to 1d.pl.
19 **60 km/hr**	Ignore units
20 **16 days**	

Core Paper

1 (i) $1.6(35623) \times 10^4$ Do not award if given with wrong rounding   **B1**

   (ii) $^{37}/_3$ only   **B1**

   (iii) $\frac{11}{27}$ or equivalent.   **For finding LCM = 27. (Accept 81, 243 or 729)**   **M1**

   Correct fraction   A1
   [If no work is shown give only last A1]]

   (iv) -84 **Working of $(-3)^3$ and any other computation shown but final answer wrong**
   M1
   Correct answer   A1

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2   **Ten entries correct**   **B1**
   Possibility space all filled correctly   **B 1**

   (i) $^6/_{36}$ or $^1/_6$ (even if no fraction given)   numerator = 6 : **B1**
   For final correct fraction: **B1**

   (ii) $^4/_{36}$ or $^1/_9$ (only if a fraction is given)   numerator = 4:   **B1**
   For final correct fraction: **B1**

   (iii) $^{16}/_{36}$ or $^4/_9$ (only if a fraction is given)   numerator = 16:   **B1**
   For final correct fraction: **B1**

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3   **(i)** Use of Pythagoras Theorem correctly   **M1**
   $BD^2 = 80$ **M1**
   Answer for BD = **8.94**cm. Answer must be correct to 2 d.p.   **A1**
   If answer only is given without any work give only A1 mark
   (ii) Use of Pythagoras Theorem correctly   **M1**
   $AD^2 = 180$ up to AD^2 **M1**
   AD = 13.416 cm **Answer must be rounded to 13.42**cm   **A1 FT**

   (iii) $AD^2 + DC^2 = 180 + 144 = 324$ **M1**
   $AC = 18$cm and $AC^2 = 18^2 = 324$**.**
   By the converse of Pythagoras Theorem, angle ADC is a right angle.   **A1 FT**
   Note that an alternative method is using trigonometry.

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4 (a) $\dfrac{x-4}{2} + \dfrac{x}{3} + x = 20$ For adding to find perimeter (LHS of equation)   **M1**

   $3(x-4) + 2(x) + 6x = 6(20)$ For multiplying throughout by 6   **M1**
   $3x - 12 + 2x + 6x = 120$ giving $11x = 132$ For collecting like terms   **M1**

   $x = 12$ cm   **A1**

(b) **(i)** ($n = 20$), $n^2 =$ **400**   **B1**

(ii) sum $= \dfrac{25}{6}(25+1)(50+1)$ **For substitution of n**   **M1**

$= $ **5525**   **A1**

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5   **(i)** width of **Y** is $\dfrac{230.4}{19.2}$ **M1**

$= $ **12** cm   **A1**

(ii) height of **X** $= \dfrac{100}{120} \times 19.2$ **For correct percentage ($^{100}/_{120}$)**   **M1**

For correct multiplication by 19.2   **M1**

$=$**16cm**   **Answer**   **A1**

(iii) width of **X** $= \dfrac{100}{120} \times 12$ **For correct percentage**   **M1**

For correct multiplication of $^{100}/_{120}$ by 12   **M1**

$= $ **10** cm   **Answer = 10**   **A1**

(iv) Area of X $= 16 \times 10 = 160$ cm^2 For finding area of X using previous results **M1**
Area of Y $= 230.4$ cm^2 (given)
Ratio $= 160 : 230.4$ **For expressing ratio correctly, even if order wrong**   **M1**
$25 : 36$ or $1 : 1.44$ or $0.69 : 1$
If also X : Y is given not Y: X,even if not reduced to lowest terms **A1**

Alternatively ratio is 1:1.20^2 = 1: 1.44

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6   **(i)** Line of symmetry is **AH or ABEH or AEH or ABH**   **B1**

(ii) $x + y = $ **140^0** (exterior angle of triangle)   **B1**

(iii) $w = 180 - 140 = $ **40^0** (angles on a straight line)   **B1**
$x = $ **42^0 (vertically opposite angles) Reason must be seen**   **B1**
$y = 140^0 - x = 140^0 - 42^0 = $ **98^0**   **M1 A1**
$z = $ **½ (180 – 140)^0 = 20^0**   **M1 A1**

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7   **(i)** Electricity reading $= 13295 - 12956 = 339$ units   For subtracting: **M1**
200 units @ 16c $= $ **€ 32**   **A1**
$339 - 200 = 139$ units
139 units @ 18c $= $ €25.02   **M1**

Total = 32 + 25.02 =€ 57. 02   **A1**

(ii) cost of water = 111.68 – (10 + 32.50 + 57.02)

            For subtracting from 111.68:   **M1**

            For subtracting the rest   **M1**

            = **€12.16**   **A1 FT**

(iii) Water consumption = 151 – 143 = **8 units**   **M1**

    Cost per unit = € 12.16 / 8 = **€ 1.52**   **A1 FT**

---

8   **(i)**   Least value of y is **– 9**   **B1**

    (ii)   When $y = – 5$, $x =$ **1 or 5**.   **B1, B1**

    (iii) $x^2 – kx = x(x – k)$ **B1**

        $x(x – k) = 0$ when $x = 0$ or k.   **A1**

        $k = 6$ **B1**

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9   **(i)**   **radius of sector = 25 cm**   **B1**

      area of sector = $\dfrac{60}{360} \times \pi \times 25^2 = 327.24923$ **M1**

      Rounded area = **327.25** cm^2 **A1**

    (ii)   Area of square = 25x25= **625** cm^2 **B1**

        shaded area = 625 – 327.25   **M1**

        = **297.75** cm^2 [Ignore Rounding]   **A1**

    (iii)   Area of 1 tile = 25x25 = 625 cm^2

        Area of wall = 7.5 x 4 =30m^2 = 30x100x100 cm^2 = 300 000 cm^2

                For 7.5 x 4   **M1**

            For correct conversion of units   **M1**

        No. of tiles = $\dfrac{300000}{625} =$ **480**   **A1**

    Alternatively, no. of tiles is (4x7.5) x(4x4) = 30 x 16 = 480 tiles

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10   **(i)** $x – y = 3$ or $x = y + 3$ or $x – 3 = y$ **A1**

    (ii)   **$12x + 9y = 61.20$**   **For LHS of eqtn.**   **M1**

                  For complete correct equation   **A1**

    (iii)   For multiplying 1st equation by 12 to eliminate x [or by 9 to eliminate y]   **M1**

            $12x – 12y = 36$ **[or $9x – 9y = 27$]**   **A1**

        Subtracting the 2 equations, $21y = 25.20$ **[or $21x = 88.20$]**   **M1**

$y = 1.20$ euro   **A1**

$x = 3 + 1.20 = 4.20$ euro   **A1**

Alternative method by substitution:

For substituting $x = y + 3$ or $y = x - 3$ **M1**

$12y + 36 + 9y = 61.20$ [or $12x + 9(x - 3) = 61.20$]   **A1**

Collecting like terms to get $21y = 25.20$ [or $21x = 88.20$]   **M1**

$x = 4.20$ euro   **A1**

$y = 1.20$ euro   **A1**

For trial and error method, give last A2 only.

6

Paper 2A

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1   **(i)** An *n*-sided figure has ½ *n*(*n* – 3) diagonals.

Substituting *n* by 8 **: 4(8 – 3)**   **M1**

No. of diagonals = **20**   **A1**

(ii)   ½ *n*(*n* – 3) = 54   **M1**

$n^2 – 3n – 108 = 0$ **For forming quadratic eqtn.**   **M1**

(*n* – 12)(*n* + 9) = 0   For factors or formula   **M1**

n = 12 or – 9.

Ignore negative answer. So no. of sides = 12.   **A1**

Give no marks if answer is –9 onlybut give this mark if answer is 12 only or both
For trial and error method give first M1 and last A1 only.

2

(i)

$^1/_{35}$ flu

$^5/_7$ vaccine

$^{34}/_{35}$ No flu

students

No vaccine $^9/_{14}$ flu

$^2/_7$

No flu

$^5/_{14}$

For 2 branches M2
For $^2/_7$ A1
For $^{34}/_{35}$ A1
For $^5/_{14}$ A1
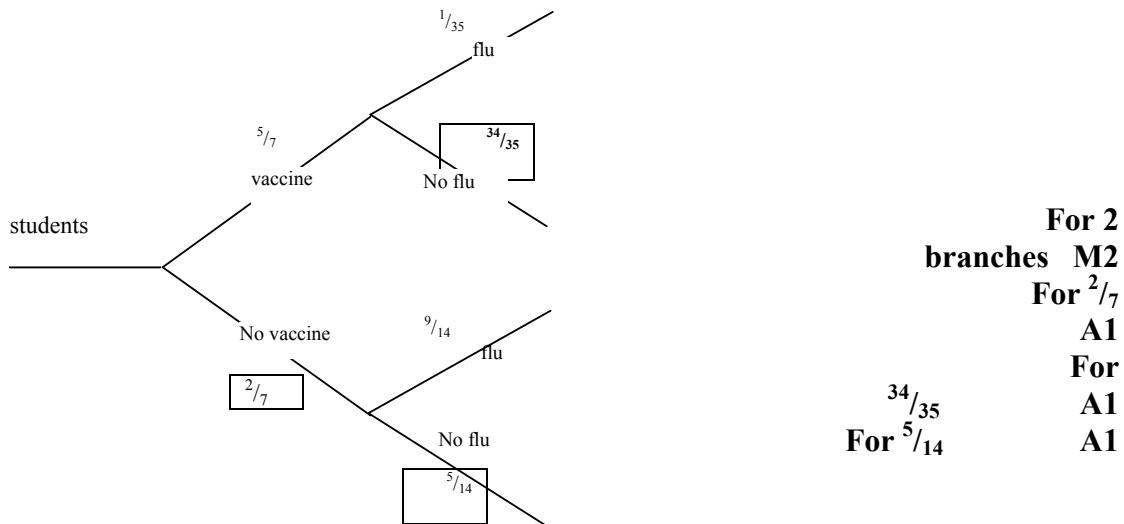
(ii) P(No flu) =

$$\frac{5}{7} \times \frac{34}{35} + \frac{2}{7} \times \frac{5}{14}$$ **M1 M1**

$$= \frac{34}{49} + \frac{5}{49} = \frac{39}{49}$$

[If no work is shown, do not award first M1]

Ans = $^{39}/_{49}$ or 0.7959   **A1**

(iii)   P(flu) = $1 – ^{39}/_{49} = ^{10}/_{49}$ or $(^1/_{35})(^5/_7) + (^9/_{14})(^2/_7)$

[minus from 1 seen or implied]   **M1 A1**

7

$$\text{Total no. of students} = 150 \times \frac{49}{10} = \textbf{735} \qquad \textbf{A1}$$

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3   **(i)**   Find the value of the car after one year.
         After 1 year value = 75% of €18 500 = €13 875   **M1 A1**
   OR 25% of 18500 followed by subtraction

   (ii)   Determine the value of the car after four years from date of purchase.
         After 1 yr 13875   **M1**
         After 2 yrs 80% of 13875 = €11 100   **M1**
         After 3 yrs 80% of 11100 = **€8880**   **A1**
         After 4 yrs 80% of 8880 = **€7104**   **M1A1**

Alternative method:
$A = P(1 - r/100)^n$ *M1 for correct formula*
Putting P = 13875 M1
Putting r = 20   M1
Putting n = 3 M1
Answer = 7104Euro A1

   (iii)   Calculate the final depreciation, after the four years, expressed as a
   percentage of the original value of the car.
         Depreciation = 18 500 − 7 104 = 11396   **M1**
$$\textbf{% depreciation} = \frac{11396}{18500} \times 100 = \qquad \textbf{M1}$$
         61.6%[Accept 62% or more accurate]   **A1**
         Last A1 can be followed through from (ii) only if method correct in (ii)

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4   **(i)** $f(0) = \frac{1}{4}(-8) = -2$ $;g(4) = 2(2) = 4$ for substitutions   **M1 M1**
         $f(0) + g(4) = -2 + 4 = 2$ **A1**

       (ii) $4y = x^2 - 8$
           $x^2 = 4y + 8$
           $x = \sqrt{(4y + 8)}$ **M1**

         $f^{-1}(x) = \sqrt{(4x + 8)}$ or $2\sqrt{(x + 2)}$ **A1**

      $y = 2x^{1/2}$ or $y^2 = 4x$
          $x = y^2 / 4$ **M1**
          $g^{-1}(x) = x^2/4$ or $(\frac{1}{2}x)^2$ **A1**

   (iii) $f(x) = x - \dfrac{29}{12}$

8

$$\frac{1}{4}(x^2 - 8) = x - \frac{29}{12}$$ for substituting correct $f(x)$ **A1**

$$3(x^2 - 8) = 12x - 29$$
$$3x^2 - 24 = 12x - 29$$

For multiplying throughout correctly or collecting constants **M1**

or $3x^2 - 12x + 5 = 0$ or equivalent **A1**

(iv) $3x^2 - 12x + 5 = 0$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$ or completing the square **M1**

$$= \frac{12 \pm \sqrt{144 - 4(3 \times 5)}}{2(3)} = \frac{12 \pm \sqrt{84}}{6}$$ or equivalent **A1**

FT from (iii) if quadratic eqtn.

$x = 3.5275$ or 0.4725 giving

$x = \mathbf{3.53}$ **or** $\mathbf{0.47}$ **to 2 d.p.** **(Must be correct to 2 decimal places)**
A1   A1

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5 The figure shows a circle centre O. 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 and **(iv)** ABD. Explain your reasoning.
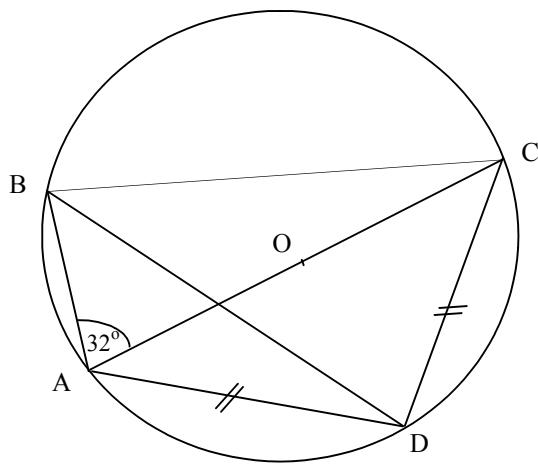
(i) angle BDC = 32^0 **A1**
(angles in same segment) **M1**

(ii) In triangle ACD, angle D = 90^0 **A1**
(in a semicircle)
AD = CD, or triangle ACD is isosceles **M1**
angle CAD = 45^0 **A1**

(iii) angle BAD = $32^0 + 45^0 = 77^0$ **M1**
Opposite angle of a cyclic quadrilateral are
supplementary.

9

Hence angle BCD = $180^0 - 77^0 = \mathbf{103^0}$ **A1**

Alternative method: angle ADB = $90^0 - 32^0 = 58^0$
Angle BCA = 58^0(angles in same segment)
Angle BCD = $58^0 + 45^0 = 103^0$ *A1*

(iv) Angle ABD =angle ACD (angles in same segment)   **M1**
     $= 45^0$ **A1**

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6 $\dfrac{2x}{y+1} = \dfrac{1}{2}$

     $\dfrac{x^2}{y-2} = 1$

For correct LHS of 1st eqtn   **M1**
     and for complete equation   A1

For correct LHS of 2nd equation   **M1**
     and for complete equation   A1

$4x = y +1$ For cross-multiplying correctly any one equation   **M1**
$x^2 = y - 2$
$x^2 = (4x - 1) - 2$ after substituting for y [or x]   **M1**
$x^2 - 4x + 3 = 0$ [or $y^2 - 14y + 33 = 0$]   **A1**
$(x - 3)(x - 1) = 0$ [or $(y - 11)(y - 3) = 0$]
$x = 1$ or 3 **All 4 answers given and correct**   **A1**
$y = 3$ or 11
Fraction is $^1/_3$ or $^3/_{11}$ **Both fractions correct**   **A1**

7
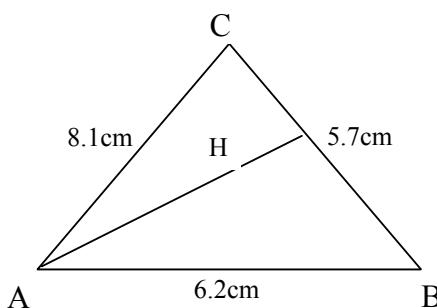
(i) $AC^2 = AB^2 + BC^2 - 2\,AB.BC \cos B$
    for using the cosine formula   **M1**
$8.1^2 = 6.2^2 + 5.7^2 - 2(6.2)(5.7) \cos B$
         For correct substitution M1
$65.61 - 38.44 - 32.49 = - 70.68 \cos B$
         $- 5.3 = - 70.68 \cos B$ **A1**
         $\cos B = 0.075269$
         angle B = $85.68(3)^0$ **A1**

(ii)   the perpendicular height from A to BC;

$\sin 85.683 = {}^H/_{6.2}$ **M1**
$H = 6.2 \sin 85.683$ **M1**

$$= \mathbf{6.18}(24) \text{ cm}$$

A1 FT

(iii) the area of triangle ABC.
Area of triangle ABC = ½ base x Height
$$= \text{½ } 5.7 \times 6.1824$$ **M1**
$$= \mathbf{17.62 \text{ cm}^2} \quad \textbf{Must be rounded correctly}$$ **A1**

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8 **(i)** Vol of sphere $= \dfrac{4}{3}\pi r^3$ **with correct substitution** **M1**

$$= \dfrac{4}{3}\pi 0.5^3 = \boldsymbol{\pi/6} \text{ (or } \mathbf{0.16666666\,\pi}\text{)}$$ **A1**

(ii) **Internal radius = 7cm** **A1**
Cross-sectional area $= \boldsymbol{\pi(8^2 - 7^2)}$ **M1**
$$= \mathbf{15\,\pi}$$ **A1**

(iii) Vol. of copper = area x length **M1**
$$= \quad \mathbf{15\,\pi \times 20 = 300\,\pi} \text{ (or 942.477)}$$ **A1**
No. of spheres needed is $\dfrac{300\pi}{\frac{\pi}{6}} = 1800$

or $\dfrac{942.48}{0.5236}$ **M1**

No. of spheres = 1800 **A1**

9
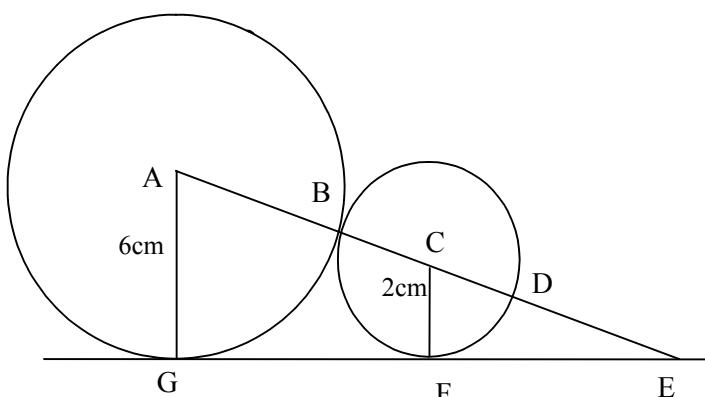
(i) To show that triangles ECF and EAG are similar.
Angle E is common **A1**
CFE = EGA **A1**
(right angles between tangent and radius) **M1**

FCE = GAE (remaining angle)
or:
Hence the triangles ECF, EAG are similar. **A1**

(ii) Find the length of AE.
EC : AE = 2: 6 =1 : 3 or AE = 3EC **M1**
EC = AE – (6 + 2) = AE – 8 **M1**
AE = 3(AE – 8) **M1**

11

AE = 3AE – 24 or 24 = 2AE   **A1**
AE = 12   **A1**

Alternative Method
Let DE = x   M1
(2 + x)/(x + 10) = 1/3   M1
6 + 3x = x + 10   M1
x = 2(not to be assumed but proved) A1
AE = 2 +10 = 12   A1

(iii) Find angle ECF.
    EC = 12 – 8 = 4   **A1**
    cos ECF = $^2/_4$ = ½   **M1**
        ECF = 60^0.   **A1**

(iv) Find the area of triangle CFE, correct to 3 significant figures.
    Area   = ½ CF.EC sin 60^0 **M1**
           = ½ (2)(4)sin 60^0 = 3.46(41) cm^2.   **[3.46 or more accurate]**   **A1**
Alternatively:
$FE^2 = 4^2 – 2^2 = 16 – 4 = 12$ so that FE = 3.4641
Area = ½ base x height = ½ (3.4641)(2) = 3.46(41) to 3 significant figures.

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10 **(i)**   Sides of flower-bed are 28 – 2x and 12 – 2x   *for both expressions* **A1**
           Area   = (28 – 2x)(12 – 2x) = 260   *for LHS* **M1**
               = 336 – 24x – 56x + 4x^2 = 260   **A1**
                    x^2 – 20x + 19 = 0
                 (x – 19)(x – 1) = 0 or correct substitution in formula **A1**
                              x = 19 or 1 **A1**
                        but x < 12. Hence **x = 1m** **A1**
Give NO marks for trial and error methods

  (ii)   calculate the length and width of the flower bed.
     Length = 28 – 2 = **26m** **For subtracting 2cm from at least one value** **M1**
                  and width = 12 – 2 = **10m**
    For each correct answer **A1 A1**

Paper IIB

1 16 floors

B1

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

6.7 cm   Accept any value between 6.6 and 6.9 cm

M1 A1

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

$$\frac{(0.732)^2 - \sqrt{4.25}}{1.86} = (0.535824 - 2.0615528) / 1.86 = -1.525729 / 1.86 = -0.820284$$

Answer to 3 d.p. is **0.820**

A1 A1

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4 Evaluate $50 \times 5^{-2} \times 4^{2} \times 2^{-2} = \dfrac{50 \times 16}{25 \times 4} = 8$

M1 A1

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5 Water is being poured in a 10-litre bucket using a bottle of capacity 750mls. How many times must the bottle be filled so as to fill 90% of the bucket?

90% of bucket has volume 0.9 x 10 x 1000 = 9000 mls   **M1 A1**
No. of bottles is 9000 / 750 = 12   **A1**

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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?

Magnets can cost up to 30 – 2.75 = 27.25 euro   **M1**
No. of magnets < 27.25 / 1.20 or < 22.7   **M1**
Hence no. of magnets she can buy is 22   **A1**

7

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

$$(2 \times 7 \times 10) + (2 \times 10) = 140 + 20 = 160 \text{ cm}$$

M1A1

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

$$(2 \times n \times 10) + (2 \times 10) = 20n + 20$$

M1A1

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

$$20n + 20 = 360$$ **M1**
$$20n = 340$$ **M1**
$$n = 17$$ **A1**

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8   **(i)**   draw the reflection of the given rectangle in the *y*-axis. Label it P;

2 marks

  (ii)   rotate the given rectangle clockwise through 90^0 about the origin. Label it Q.

2 marks

14
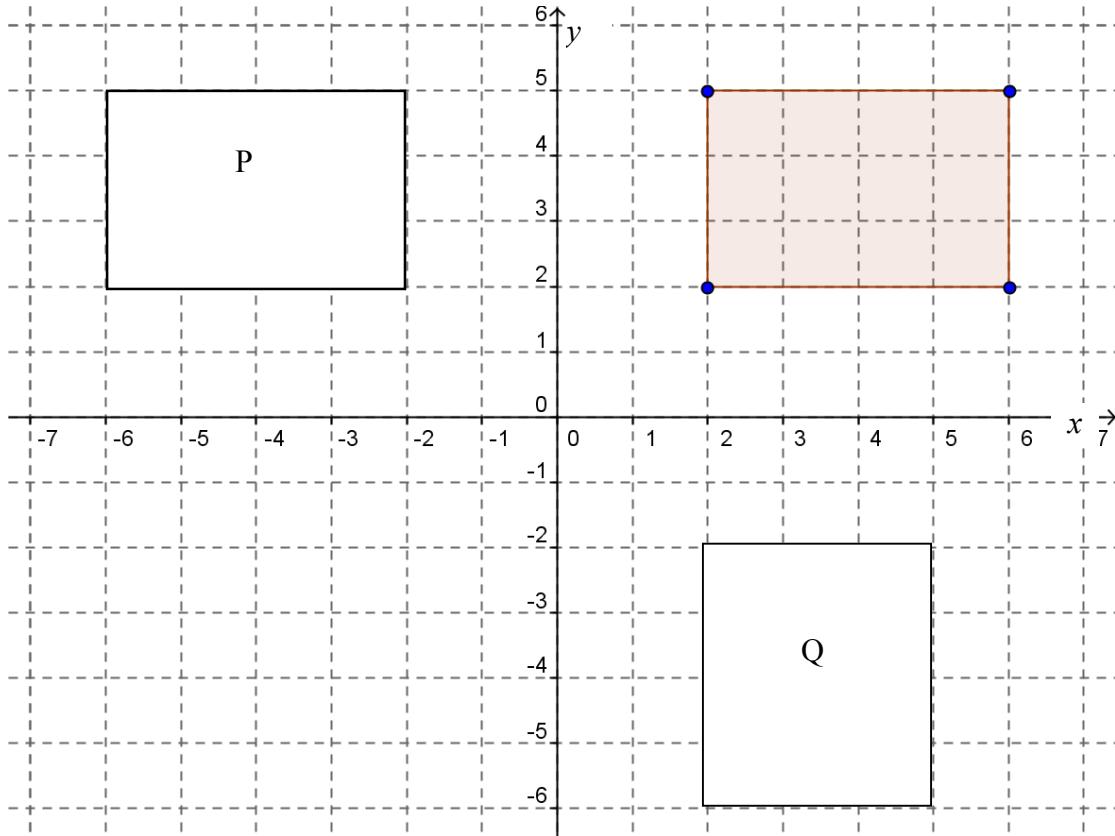
9 Given that $f(x) = 3x - 2$,

(i) evaluate $f(0) + f(2)$;

$$f(0) = -2 \text{ and } f(2) = 4$$ **B2**
$$-2 + 4 = 2$$ **A1**

(ii) find x when $f(x) = 7$.

$3x - 2 = 7$ **M1**

$3x = 9$ **M1**
$x = 3$ **A1**

10 In a survey among students, the number of pets at home was recorded. The bar chart shows the results.
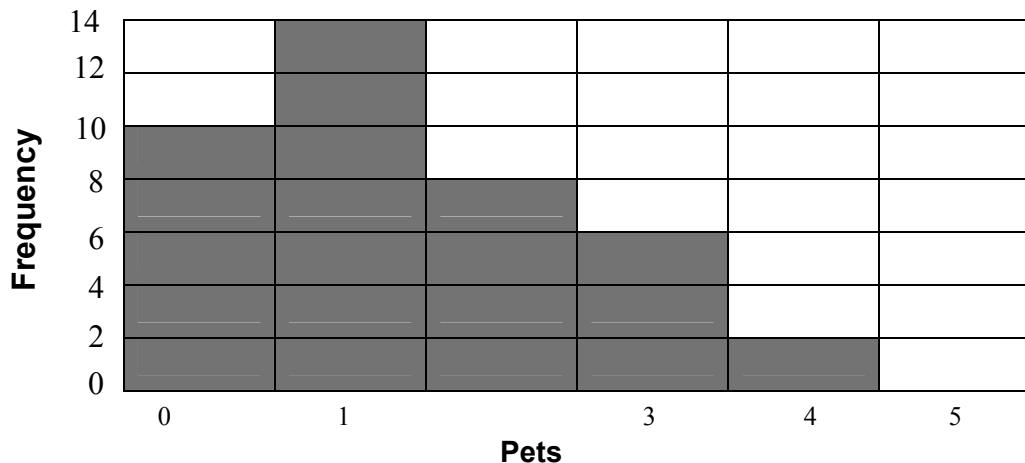
(i) Complete the frequency table for the data.

No. of Pets	0	1	2	3	4	5
Frequency	10	14	8	6	2	0

B2

(ii) What is the mode?
Mode $= 1$ **B1**

(iii) Work out the mean number of pets per child
Total no. of pets $= 0 + 14 + 16 + 18 + 8 + 0 = 56$ **M1**
Total no. of children $= 10 + 14 + 8 + 6 + 2 = 40$
Mean $= 56 / 40 = \textbf{1.4}$ pets per child **A1**

15

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

Probability $= {}^8/_{40} = {}^1/_5$

M1 A1

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11 **(i)** Gradient $= \dfrac{10-(-2)}{-1-2}$ **M1**

$\qquad = \dfrac{12}{-3} = -4$ **A1**

(ii) $y = mx + c$ **M1**
$10 = -4(-1) + c$ at A (or using B) **M1**
c = 6

$y = -4x + 6$ **A1**

(iii) At C, $y = 0$. Hence $0 = -4x + 6$ giving $x = {}^3/_2$.
$\qquad\qquad$ **C($^3/_2$, 0)** **B1**
At B, $x = 0$ giving $y = 6$
$\qquad\qquad$ **B(0, 6)** **B1**

(iv)

B3

16
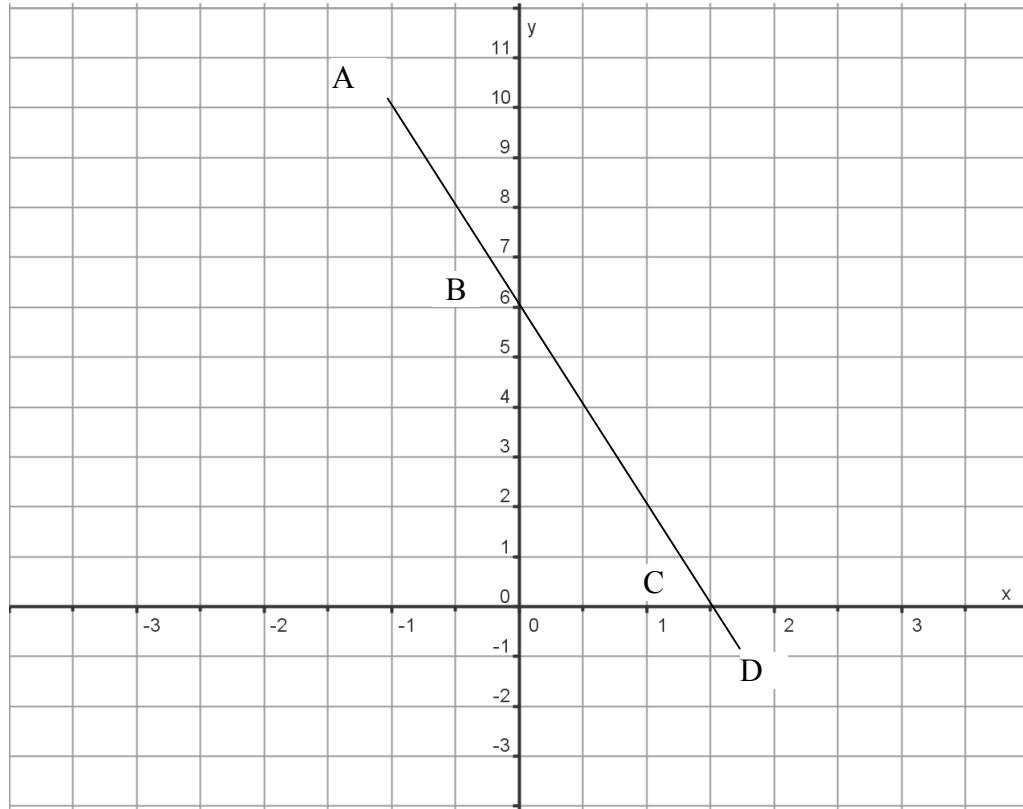
12 Construct a line perpendicular to AB, passing through P.

2A marks

Let this line intersect AB at C. **1 A mark**

Find point D on AB such that AC = CD. **1A mark**

Let E be the point on the line through P such that PC = CE. **1A mark**

Angle APD = 108 $\mp$ 3^0. **1A mark**

What is the quadrilateral APDE called? Give reasons for your answer.

If answer is parallelogram or rhombus give **1A mark**

If answer is RHOMBUS give another 1A mark

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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.

Given that € 1 = £0.837 and 1 Franc = € 0.820, in which country is it cheaper to buy this Smart phone and by how much ? Give your answer in Euro.

$£394.99 = \dfrac{394.99}{0.837}$ euro **M1**

$= 471.91$ euro **A1**

550.50 francs = 550.50 x 0.820 = **451.41 euro** **M1**

Cheaper in Swizerland by 471.91 – 451.41 = **20.50 euro** **A1**

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

$\dfrac{1}{u} = \dfrac{1}{v} - \dfrac{1}{f}$ **M1**

$\dfrac{1}{u} = \dfrac{f-v}{vf}$ **M1**

$u = \dfrac{vf}{f-v}$ **A1**

15 **(i)** Draw a *rough* diagram of a kite ABCD in which AC = 6cm and BD = 12cm.
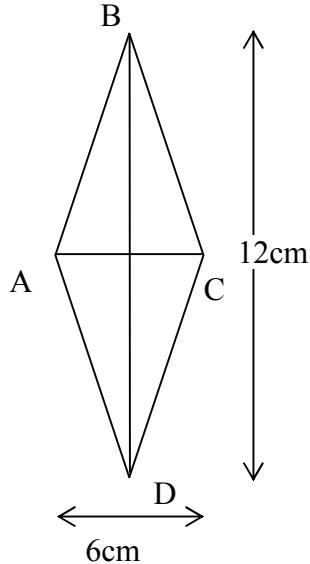
B2

(ii)   Area of kite = 2 area of triangle BCD   **M1**
$$= 2(\text{½ } 12 \text{ x } 3) = 36 \text{ cm}^2$$ **M1**

A1

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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?

$$\frac{2}{5}+\frac{1}{3}=\frac{6+5}{15}=\frac{11}{15}$$ are wearing red or white   **M1 A1**

$$1-\frac{11}{15}=\frac{4}{15}$$ are wearing other colours   **A1**

(ii)   If the number of fans wearing a red T-shirt is 612, how many fans are there in the stadium?
2/5 of fans = 612   **M1**
$$\text{All fans} = \frac{612\times5}{2} = 1530$$ **A1**

17 A cruise-liner leaves from a point X and sails 140 km on a bearing of $240°$ arriving at Y. Draw a diagram, showing the path XY of the cruise-liner, relative to the North.
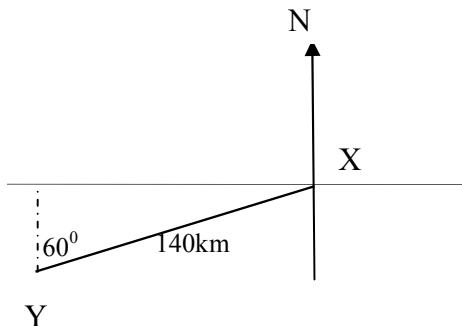
B2

(i) Calculate find how far south the cruise-liner is from its starting point when it gets to Y.

$\cos 60^0 = $ adj / 140 **M1**
Adj $= 140 \cos 60^0 = 70$ km **A1**

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

$\sin 60^0 = $ opp / 140 **M1**
Opp $= 140 \sin 60^0 = 121.24$ km **A1**

18
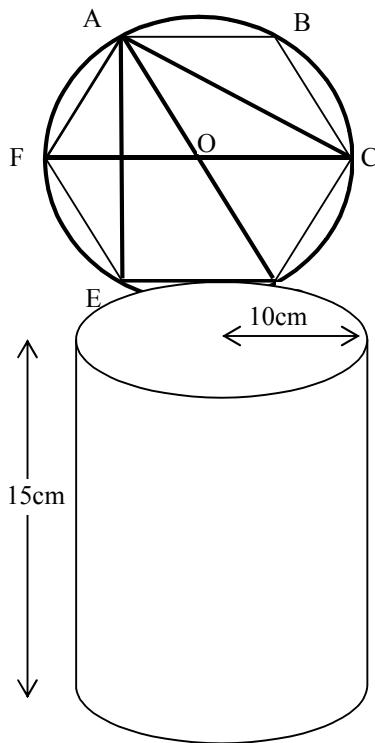
In triangles AED and CAF:

AD = FC (diameters)   A2
AF = ED (hexagon is regular)   A2
Angle FAC = AED (right angles) A2
Triangles are congruent RHS   A1

19
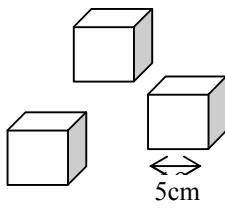
(i) Vol of cylinder $= \pi r^2 h$ **M1**

$$= \pi(10)^2(15)$$

$$= \textbf{4712.389 cm}^3 \qquad \textbf{A1}$$

(ii) Vol of cube $= 5^3$ **M1**
$= 125\text{cm}^3$

No. of cubes $= 4712.389/125 = 37.7$ **M1**

No. of complete cubes $= \textbf{37}$ **A1**

20
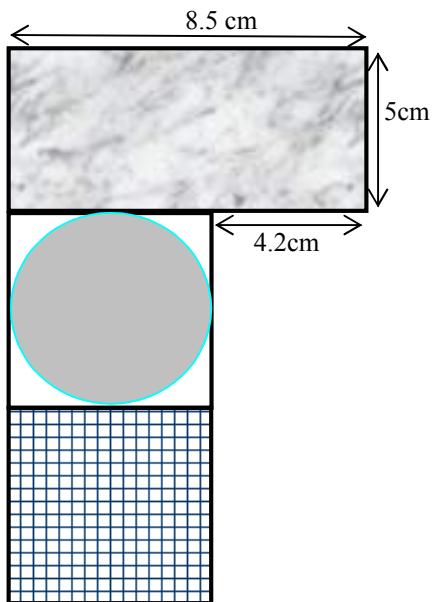
The scale is such that 1cm represents 2m.

(i)   Width in photo $= 8.5 - 4.2 = 4.3$ cm

                                                       M1

Actual width $= 4.3 \times 2\text{m} = \textbf{8.6m}$ **A1**

(ii)   Area of pool in photo is πr^2 **M1**
$= \pi\, 4.3^2$
$= 58.088 \text{ cm}^2$ **A1**

Actual area $= 58.088 \times 2^2 \text{ m}^2$ **M1**
$= \textbf{232.352 m}^2 \textbf{ or 232m}^2$ **A1**

(iii) Perimeter in photo is $8.5 + 5 + 8.5 + 5 = 27\text{cm}$

                                                       M1

Actual Perimeter $= 27 \times 2$ m $= 54$m

                                                       M1

Cost of fencing $= 0.39 \times 54 = 21.06$ euro

                                                       M1

Answer $= \textbf{21 euro}$ **A1**