ST. PATRICK'S SCHOOL
MID-YEAR EXAMINATIONS 2018
SECONDARY THREE EXPRESS

NAME

CLASS | INDEX NUMBER

MATHEMATICS **4048/01**

PAPER 1 **7 May 2018**

2 h

READ THESE INSTRUCTIONS FIRST

Write your Name, Class and Index Number on all the work you hand in.
Write in dark blue or black pen.
You may use a pencil for any diagrams or graphs.

Answer **all** questions.
Write your answers in the spaces provided on the question paper.
If working is needed for any question it must be shown with the answer.
Omission of essential working will result in loss of marks.
The use of an approved scientific calculator is expected, where appropriate.
If the degree of accuracy is not specified in the question, and if the answer is not exact, give the answer to three significant figures. Give answers in degrees to one decimal place.
For π, use either your calculator value or 3.142, unless the question requires the answer in terms of π.

The number of marks is given in brackets [ ] at the end of each question or part question.
The total number of marks for this paper is 80.

Parent's Signature : _____

Date: _____

Remarks (if any) :

For Examiner's Use	
Paper 1	/80
Paper 2	/60
Target Grade	
Total	%

This paper consists of 20 printed pages including this cover page.

Mathematical Formulae

Compound interest

$$\text{Total amount} = P\left(1+\frac{r}{100}\right)^n$$

Mensuration

$$\text{Curved surface area of a cone} = \pi rl$$

$$\text{Surface area of a sphere} = 4\pi r^2$$

$$\text{Volume of a cone} = \frac{1}{3}\pi r^2 h$$

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$$\text{Area of triangle } ABC = \frac{1}{2}ab\sin C$$

$$\text{Arc length} = r\theta, \text{ where } \theta \text{ is in radians}$$

$$\text{Sector area} = \frac{1}{2}r^2\theta, \text{ where } \theta \text{ is in radians}$$

Trigonometry

$$\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$$

$$a^2 = b^2 + c^2 - 2(b)(c)\cos A$$

Statistics

$$\text{Mean} = \frac{\sum fx}{\sum f}$$

$$\text{Standard deviation} = \sqrt{\frac{\sum fx^2}{\sum f} - \left(\frac{\sum fx}{\sum f}\right)^2}$$

1 (i) (a) Calculate $\dfrac{4.05}{\sqrt{0.045 \times 5.2913}}$.

Write down the first 5 digits of your answer.

Answer ..... [1]

(b) Write your answer to part (i) correct to 3 significant figures.

Answer ..... [1]

(ii) Write the following in order of size, smallest first.

$\dfrac{36}{70}$ $\quad \sqrt{0.25}$ $\quad 0.\dot{5}$ $\quad 0.0915^{\frac{1}{4}}$

Answer ..... [2]

---

2 Petrol costs p cents per litre.

Jake paid y dollars for some petrol.

Find an expression, in terms of p and y, for the number of litres that Jake buys.

Answer ..... [2]

---

3 (i) Simplify $\left(\frac{7}{x}\right)^{-3}$.

Answer ..... [1]

(ii) Given that $5^{12} \div 125^{k} = 1$, find the value of k.

Answer $k =$ ..... [2]

---

4 An atom of nitrogen has a mass of 2.3×10^{-26} kilograms. Leave your answer in standard form.

(i) Express this mass in grams.

Answer .....g [1]

(ii) A room contains 9.5×10^{15} atoms of Nitrogen. Find the mass of Nitrogen in grams in the room.

Answer .....g [2]

---

5 Given that $-8 \leq x < 4$ and $-2 \leq y < 3$, find

(i) the greatest value of $x - y$,

Answer ..... [1]

(ii) the least value of $2x + y^2$,

Answer ..... [1]

(iii) the greatest value of xy.

Answer ..... [1]

6

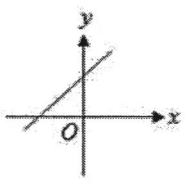


Figure 1

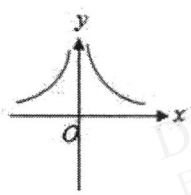


Figure 2

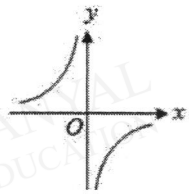


Figure 3

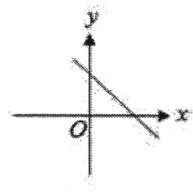


Figure 4

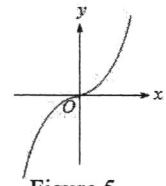


Figure 5

Write down the figure number of the graph that corresponds to the following equations.

(i) $y = 2x^3$

Answer Figure..... [1]

(ii) $y = \dfrac{1}{x^2}$

Answer Figure..... [1]

(iii) $y = x + 3$

Answer Figure..... [1]

---

7 A map of a town is drawn to a scale of 1 : 20 000.

(i) A stretch of street on the map measures 16.2 cm. Calculate the actual length of the street in kilometres.

Answer ..... km [1]

(ii) A library has an area of 0.5 km^2. Find the area of this library on the map in cm^2.

Answer ..... cm^2 [2]

8 Solve the simultaneous equations

$$2x + 5y = 12$$

$$4x + 3y = -4$$

Answer $x =$ ....., $y =$ ..... [3]

9 (i) Express 525 as the product of its prime factors.

Answer 525=..... [1]

(ii) Given that $297 = 3^3 \times 11$, find the LCM of 525 and 297.

Answer ..... [1]

(iii) If $525k$ is a perfect square, find the smallest possible integer value of k.

Answer k =..... [1]

10 (i) Express 30 km/h in m/s.

Answer ..... m/s [1]

(ii) A car travels the first 18 km of its journey at an average speed of 54 km/h and the remaining 55 km at an average speed of 110 km/h. Find the average speed of the car for its entire journey.

Answer .....km/h [3]

11 (i) James bought a watch for $500.

Several years later, he sold it at a profit of 250%.

Find the selling price.

Answer $..... [2]

(ii) $4000 is invested in an account which pays interest at 5.5% per annum compounded yearly. Find the total amount in the account at the end of 3 years.

Answer $..... [2]

12 (i) Solve the inequality $3x - 1 < 9 - 4x \leq 27$.

Answer ..... [3]

(ii) Show your solution on the number line below.

Answer

[1]

13 (i) y is inversely proportional to x^2.

$y = 4$ when $x = 6$.

Find y when $x = 10$.

Answer ..... [2]

(ii) p is directly proportional to q^3.

It is known that $p = 24$ for a particular value of q.

Find the value of p when this value of q is doubled.

Answer $p =$ ..... [2]

14 (i) Simplify $(x+5)^2 - 2(1+x)$.

Answer ..... [2]

(ii) Factorise $pq^2 - q^2 + p - 1$ completely.

Answer ..... [2]

15 James bought a drone under a hire purchase scheme with a monthly instalment of \$130 for 24 months and a down payment of 12.5% of the cash price.
If the cash price of the drone set is \$3450, find

(i) the interest charged by the hire purchase scheme,

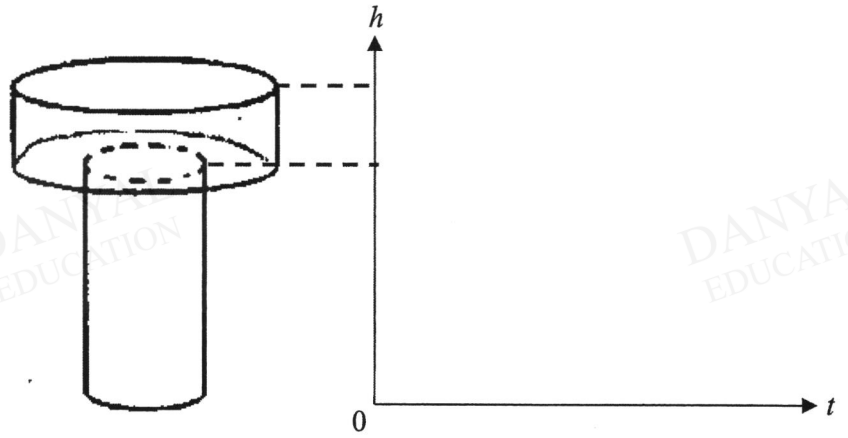
Answer \$..... [2]

(ii) the rate of interest charged per annum by the hire purchase scheme.

Answer .....% [2]

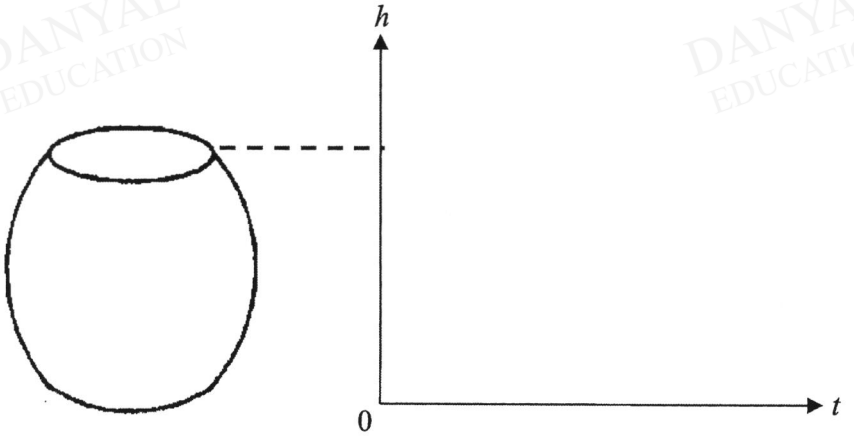
16 Water is poured at a constant rate into each of the containers shown below. In the diagram below, sketch the graphs to show the depth of water h in the containers as they are being filled with respect to time t.

(i)



[2]

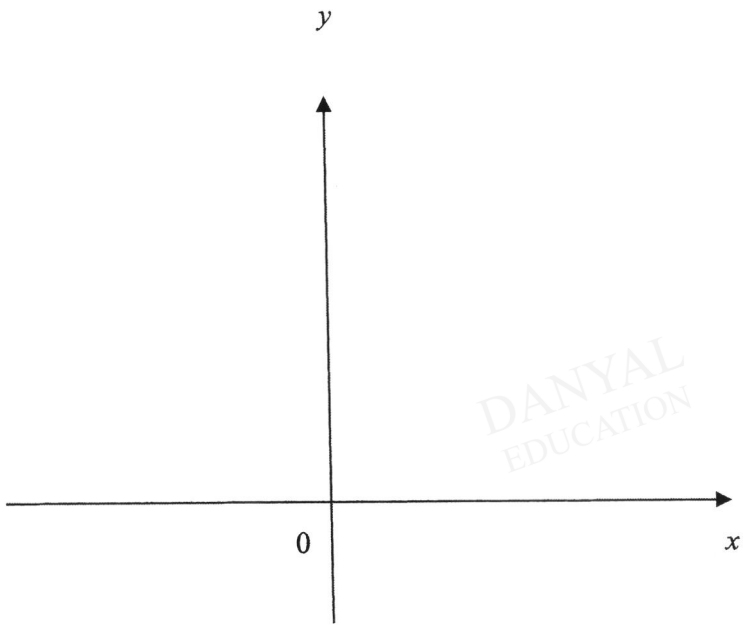
(ii)



[2]

17 (i) Sketch the graph of $y = (x-2)^2 + 3$.

Answer (i)



[2]

(ii) Write down the coordinates of the minimum point of the curve.

Answer (....., ...) [1]

(iii) Write down the equation of the line of symmetry.

Answer ..... [1]

18 Simplify

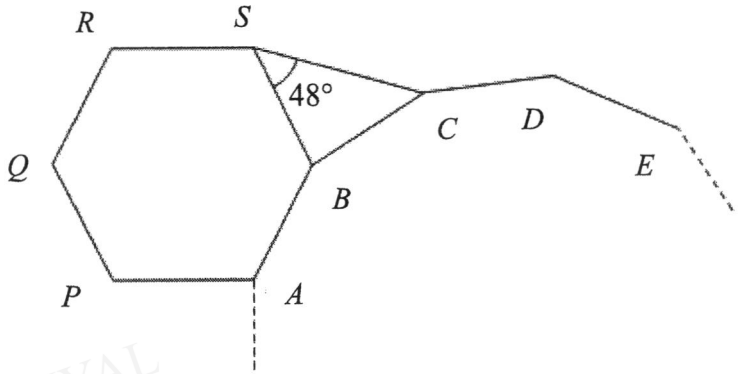
(i) $\dfrac{(2xy^3)^2}{\sqrt{x^2y^4}}$, leaving your answer in positive indices,

Answer ..... [3]

(ii) $\dfrac{3x}{(x-3)^2}+\dfrac{1}{x-3}$.

Answer ..... [2]

19 In the diagram below which is not drawn to scale, $ABCDE$ is part of an n-sided regular polygon, $PQRSBA$ is a regular hexagon, CBS is an isosceles triangle and $\angle BSC = 48°$.



By stating your reason(s) clearly, find

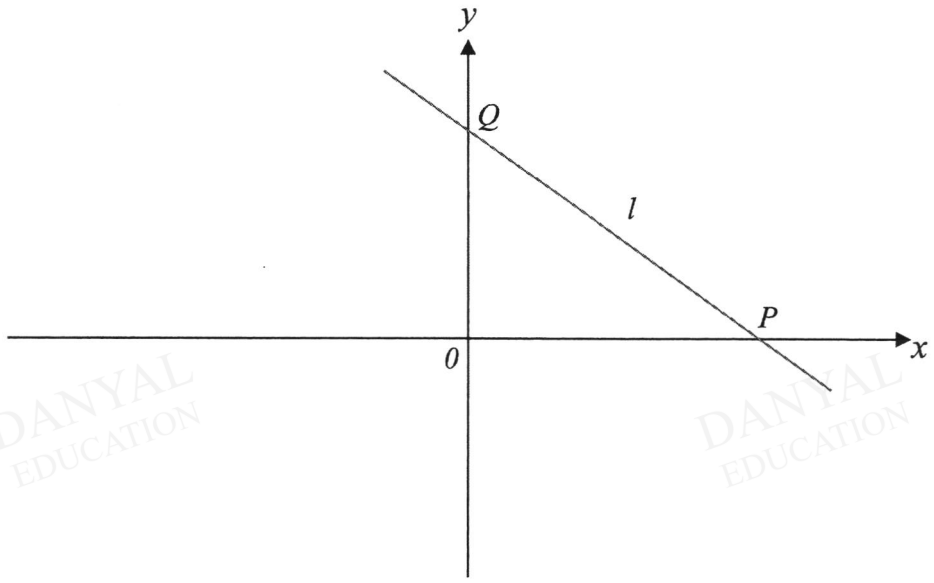
(i) $\angle ABC$,

Answer .....° [3]

(ii) the value of n.

Answer $n =$ ..... [2]

20 The equation $2y + 8x = 18$ is a straight line l that crosses the x-axis at P and the y-axis at Q. Find



(i) the coordinates of the points P and Q,

Answer P (....., ...)

Q (....., ...) [2]

(ii) the gradient of the line l,

Answer ..... [1]

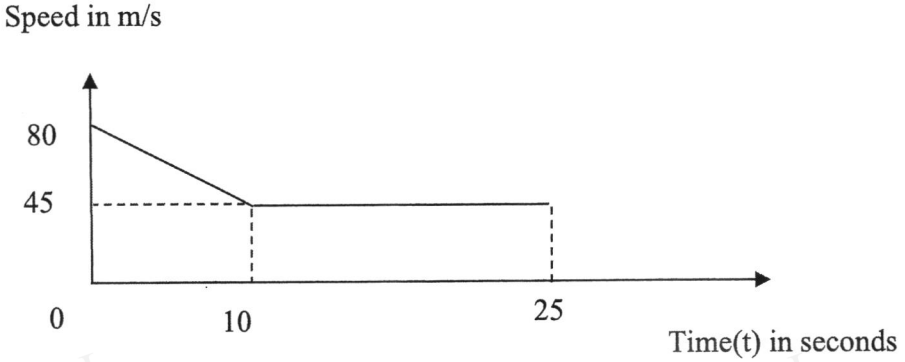
(iii) the length of PQ,

Answer ..... units [1]

(iv) the equation of a line which passes through the point $(0, -2)$ and is parallel to the line l.

Answer ..... [1]

21 The diagram is the speed-time graph of an object during a period of 25 seconds.



(i) Calculate the retardation during the first 10 seconds.

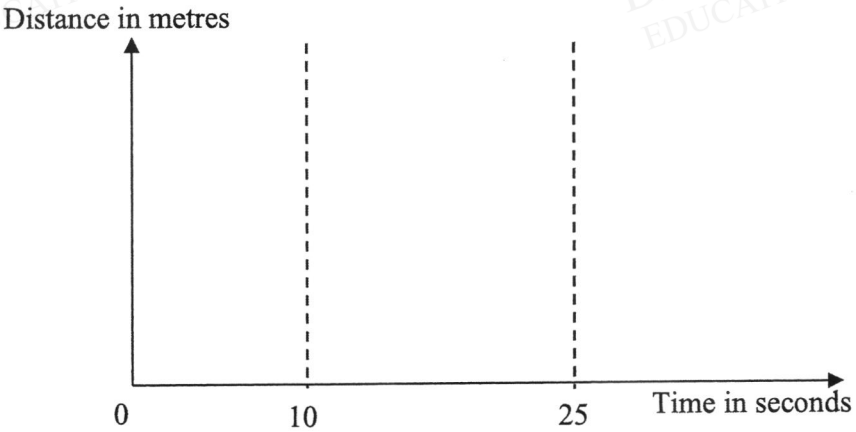
Answer .....m/s^2 [2]

(ii) Find the distance travelled by the object in the first 10 seconds.

Answer .....m/s [2]

(iii) On the axes in the answer space, complete the sketch of the distance-time graph for the object.

Answer



[2]

End of paper

ST. PATRICK'S SCHOOL
MID-YEAR EXAMINATIONS 2018
SECONDARY THREE EXPRESS

NAME

CLASS

INDEX NUMBER

MATHEMATICS **4048/02**

PAPER 2 **10 May 2018**

2 h

READ THESE INSTRUCTIONS FIRST

Write your Name, Class and Index Number on all the work you hand in.
Write in dark blue or black pen.
You may use a pencil for any diagrams or graphs.

Answer **all** questions.
Write your answers on the separate answer paper provided.
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At the end of the examination, fasten all your work securely together.
The number of marks is given in brackets [ ] at the end of each question or part question.
The total number of marks for this paper is 60.

Question papers are to be submitted.

This paper consists of 7 printed pages including this cover page.

Mathematical Formulae

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Surface area of a sphere $= 4\pi r^2$

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$$\text{Volume of a sphere} = \frac{4}{3}\pi r^3$$

$$\text{Area of triangle } ABC = \frac{1}{2}ab\sin C$$

Arc length $= r\theta$, where θ is in radians

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$$\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$$

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$$\text{Mean} = \frac{\sum fx}{\sum f}$$

$$\text{Standard deviation} = \sqrt{\frac{\sum fx^2}{\sum f} - \left(\frac{\sum fx}{\sum f}\right)^2}$$

Answer all questions.

1 (i) Given that $x = \sqrt{5y+1}$, express y in terms of x. [2]

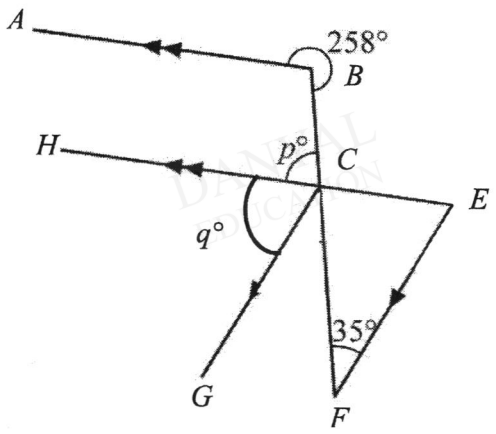
(ii) Solve the inequality $\frac{3x+1}{7} \leq \frac{5x-6}{4}$. [3]

(iii) Solve the equation $3 - \frac{x+1}{3-x} = 0$. [2]

(iv) Simplify $\frac{m^2-4}{(m-2)(m+3)}$. [2]

---

2 In the diagram below, $AB // HE$, $GC // FE$, reflex $\angle ABC = 258°$, $\angle CFE = 35°$ and BCF is a straight line.



Stating your reasons clearly, find the values of

(i) p, [2]

(ii) q. [2]

---

3 The points $A(20, 10)$ and $B(14, 0)$ lie on a coordinate plane.

(i) Find the equation of the line AB. [3]

(ii) Given that the point $W(9, p)$ lies on the line AB, find the value of p. [1]

---

4 The first four terms in a sequence of numbers T_1, T_2, T_3 and T_4 are given below.

$$T_1 = 4 - 3 = 1$$
$$T_2 = 9 - 6 = 3$$
$$T_3 = 16 - 9 = 7$$
$$T_4 = 25 - 12 = 13$$

(i) Study the pattern and write down the line for T_5. [1]

(ii) T_n can be expressed in the form $an^2 + bn + c$, where a, b and c are constants. Find the values of a, b and c. [2]

(iii) Find k such that $T_k = 73$ where $k > 0$. [2]

---

5 (i) A consignment of cattle feed can feed 600 cattle for 30 days. Given that all the cattle consume the feed at the same rate, find

(a) The number of cattle the same consignment of feed can feed for 80 days. [2]

(b) The number of days the same consignment of feed can last if it is used for 400 cattle. [1]

(ii) Bloom invested a sum of money in a bank at 6 % per annum compounded every 6 months. She received an interest of $11798.38 at the end of 3 years. Calculate the sum of money invested, giving your answer correct to the nearest dollar. [3]

(iii) Kane went to London for a holiday in 2017.

(a) He exchanged some Singapore dollars (S$) for British Pounds (£) from a money changer at an exchange rate of S$1.83 = £1. Calculate the amount of Singapore dollars he had to pay to buy £5000. [1]

(b) He bought a bag in London for £650. Upon his return to Singapore, he sold the bag on Carousell and made a profit of 15%. Find the selling price of the bag in Singapore dollars. [2]

---

6 Mr Tan made a 240 km journey by car from point A to B at an average speed of v km/h.

(i) Write down an expression in terms of v, for the number of hours taken for the journey. [1]

On his return journey, his average speed was reduced by 10 km/h due slow traffic.

(ii) Write down an expression in terms of v, for the number of hours taken for the return journey. [1]

(iii) If the return journey takes 20 minutes longer, form an equation in v and show that it reduces to $v^2 - 10v - 7200 = 0$. [3]

(iv) Solve the equation $v^2 - 10v - 7200 = 0$. [3]

(v) Using your answer in (iv), find the time taken for his entire journey. [1]

7 **Answer the whole of this question on a sheet of graph paper.**

The following table gives corresponding values of x and y which are connected by the equation $y = \frac{x^2}{5} + \frac{5}{x}$.

x	1	1.5	2	3	4	5	6
y	5.2	p	3.3	3.5	4.5	6.0	8.0

(i) Calculate the value of p, leaving your answer to 1 decimal place. [1]

(ii) Using a scale of 2 cm to present 1 unit on both axes, draw the graph of $y = \frac{x^2}{5} + \frac{5}{x}$ for $0 \leq x \leq 6$. [3]

(iii) Use your graph to find the values of x for which

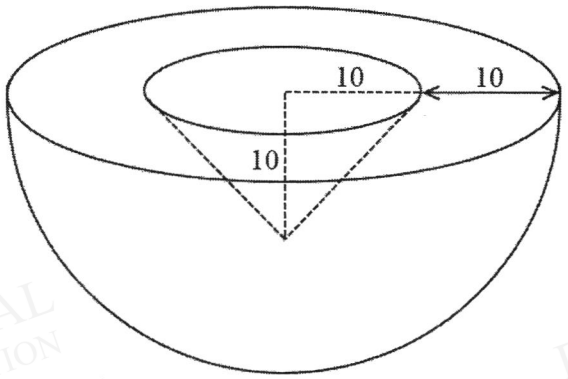
$$\frac{x^2}{5} + \frac{5}{x} = 4.$$ [2]

(iv) By drawing a tangent, find the gradient of the curve at the point $(4,4.5)$. [2]

(v) (a) On the same axes, draw the graph of $y = \frac{1}{2}x + 3$. [1]

(b) Write down the x coordinates of the points at which the two graphs intersect. [1]

8 The diagram shows an object in the shape of a hemisphere of radius 20 cm. The object has a conical hole of radius 10 cm and height 10 cm, at the centre of the hemisphere as shown.



(i) Find

(a) the volume of the object, [3]

(b) the total surface area of the object. [4]

(ii) The object must not have a mass greater than 80 kg.
Two types of metal are available and the table below shows their densities. ($Mass = Density \times Volume$)

Metal	Aluminum	Copper
Density (g/cm^3)	2.70	8.96

Which of these metals should be used to manufacture the object? Show your working. [3]

End of Paper

ST. PATRICK'S SCHOOL
MID-YEAR EXAMINATIONS 2018
SECONDARY THREE EXPRESS

NAME SOLUTIONS

CLASS _____ INDEX NUMBER _____

MATHEMATICS **4048/01**

PAPER 1 **7 May 2018**

2 h

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Date: _____

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Paper 2	/60
Target Grade	
Total	%

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1 (i) (a) Calculate $\dfrac{4.05}{\sqrt{0.045 \times 5.2913}}$.

Write down the first 5 digits of your answer.

Answer .....8.2997..... [1]

(b) Write your answer to part (i) correct to 3 significant figures.

Answer .....8.30..... [1]

(ii) Write the following in order of size, smallest first.

$\dfrac{36}{70}$ $\qquad$ $\sqrt{0.25}$ $\qquad$ $0.\dot{5}$ $\qquad$ $0.0915^{\frac{1}{4}}$

Answer ..... $\sqrt{0.25}, \dfrac{36}{70}, 0.0915^{\frac{1}{4}}, , 0.\dot{5}$ ..... [2]

---

2 Petrol costs p cents per litre.

Jake paid y dollars for some petrol.

Find an expression, in terms of p and y, for the number of litres that Jake buys.

Y dollars = 100y cents ----------M1

No. of litres. = $\dfrac{100y}{p}$ ----------A1

[2]

Answer .....

---

3 (i) Simplify $\left(\frac{7}{x}\right)^{-3}$.

Answer ..... $\left(\frac{x^3}{343}\right)$ ..... [1]

(ii) Given that $5^{12} \div 125^k = 1$, find the value of k.

$5^{12} \div 125^k = 1$

$5^{12} \div 5^{3k} = 5^0$ --------M1

$12 - 3k = 0$

$3k = 12$

$k = 4$ ----------A1

Answer $k =$ ..... [2]

---

4 An atom of nitrogen has a mass of 2.3×10^{-26} kilograms. Leave your answer in standard form.

(i) Express this mass in grams.

Answer ..... 2.3×10^{-23} .....g [1]

(ii) A room contains 9.5×10^{15} atoms of Nitrogen. Find the mass of Nitrogen in grams in the room.

$= 9.5 \times 10^{15} \times 2.3 \times 10^{-23}$ ----------M1

$= 2.185 \times 10^{-7}$ ----------A1

Answer .....g [2]

---

5 Given that $-8 \le x < 4$ and $-2 \le y < 3$, find

(i) the greatest value of $x - y$,

$3-(-2)=5$ ---------B1

Answer ..... [1]

(ii) the least value of $2x + y^2$,

$2(-8)+0^2=-16$ --------B1

Answer ..... [1]

(iii) the greatest value of xy.

$-8(-2)=16$ ------B1

Answer ..... [1]

6

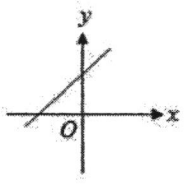


Figure 1

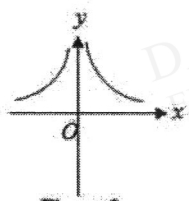


Figure 2

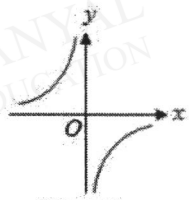


Figure 3

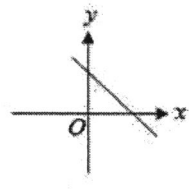


Figure 4

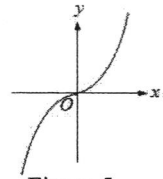


Figure 5

Write down the figure number of the graph that corresponds to the following equations.

(i) $y = 2x^3$

Answer Figure.....5..... [1]

(ii) $y = \dfrac{1}{x^2}$

Answer Figure.....2..... [1]

(iii) $y = x + 3$

Answer Figure.....1..... [1]

7 A map of a town is drawn to a scale of 1 : 20 000.

(i) A stretch of street on the map measures 16.2 cm. Calculate the actual length of the street in kilometres.

$1 : 0.2km$

$16.2cm : 3.24km$ ----------B1

[1]

Answer ..... km

(ii) A library has an area of 0.5 km^2. Find the area of this library on the map in cm^2.

$1\,cm^2 : 0.04\,km^2$ --------M1

Map area $= \frac{0.5}{0.04}$

$=12.5$ cm^2----------A1

[2]

Answer ..... cm^2

8 Solve the simultaneous equations

$$2x+5y=12$$
$$4x+3y=-4$$

(1) X 2 : $4x+10y=24$ ----------M1

(2) –(3): $-7y=-28$

$y=4$ ----------A1

Sub y=4 into (1):

$2x+5(4)=12$

$2x=-8$

$x=-4$ ----------A1

Answer $x=$ ....., $y=$ ..... [3]

9 (i) Express 525 as the product of its prime factors.

Answer $525 = \ldots 3 \times 5^2 \times 7 \ldots$ [1]

(ii) Given that $297 = 3^3 \times 11$, find the LCM of 525 and 297.

$3^3 \times 5^2 \times 7 \times 11 = 51975$

Answer ..... [1]

(iii) If $525k$ is a perfect square, find the smallest possible integer value of k.

Answer $k = \ldots\ldots 21 \ldots\ldots$ [1]

10 (i) Express 30 km/h in m/s.

Answer ..... $8\frac{1}{3}$ ..... m/s [1]

(ii) A car travels the first 18 km of its journey at an average speed of 54 km/h and the remaining 55 km at an average speed of 110 km/h. Find the average speed of the car for its entire journey.

Total time $= \frac{18}{54} + \frac{55}{110}$

$= \frac{5}{6}$ ----------M1

Average speed $= \frac{18+55}{\frac{5}{6}}$ ----------M1

$= 87\frac{3}{5}$ ----------A1

[3]

Answer .....km/h

11 (i) James bought a watch for \$500.

Several years later, he sold it at a profit of 250%.

Find the selling price.

$$\text{Selling price} = \frac{350}{100} \times 500 \text{----------M1}$$

$$= \$1750 \text{----------A1}$$

Answer \$..... [2]

(ii) \$4000 is invested in an account which pays interest at 5.5% per annum compounded yearly. Find the total amount in the account at the end of 3 years.

$$A = 4000\left(1 + \frac{5.5}{100}\right)^3 \text{----------M1}$$

$$A = 4696.9655$$

$$A = 4696.97 \text{----------A1}$$

Answer \$..... [2]

12 (i) Solve the inequality $3x-1<9-4x\leq 27$.

$3x-1<9-4x$

$7x<10$

$x<\frac{10}{7}$ ------M1

$9-4x\leq 27$

$-4x\leq 18$

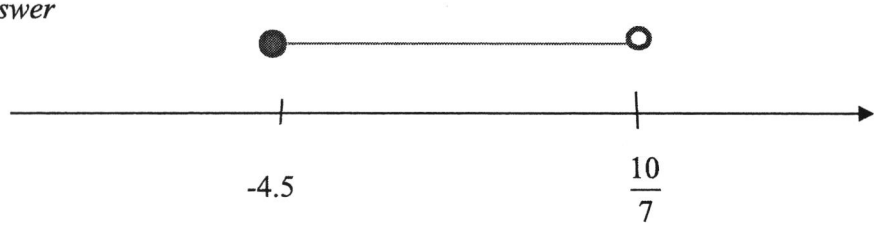
$x\geq -4.5$ --------M1

$\therefore \quad -4.5\leq x<\frac{10}{7}$ ----------A1

Answer ..... [3]

(ii) Show your solution on the number line below.

Answer



[1]

13 (i) y is inversely proportional to x^2.

$y = 4$ when $x = 6$.

Find y when $x = 10$.

$$y = \frac{k}{x^2}$$

$$4 = \frac{k}{6^2}$$

$k = 144$ -----M1

$$y = \frac{144}{x^2}$$

$$y = \frac{144}{100} = 1.44 \text{ -----A1}$$

[2]

Answer .....

(ii) p is directly proportional to q^3.

It is known that $p = 24$ for a particular value of q.

Find the value of p when this value of q is doubled.

$$p = kq^3$$

$$24 = kq^3$$

$$k = \frac{24}{q^3} \text{ --------m1}$$

$$p_{new} = \frac{24}{q^3}(2q)^3$$

$$P_{new} = \frac{24}{q^3} \times 8q^3 = 192 \text{ \_\_\_\_\_A1}$$

Answer $p =$ ..... [2]

14 (i) Simplify $(x+5)^2-2(1+x)$.

$=x^2+10x+25-2-2x$ --------M1

$=x^2+8x+23$ ---------A1

Answer ..... [2]

(ii) Factorise pq^2-q^2+p-1 completely.

$=q^2(p-1)+(p-1)$ ----------M1

$=(q^2+1)(p-1)$ ----------A1

Answer ..... [2]

15 James bought a drone under a hire purchase scheme with a monthly instalment of \$130 for 24 months and a down payment of 12.5% of the cash price.
If the cash price of the drone set is \$3450, find

(i) the interest charged by the hire purchase scheme,

$$\text{total paid} = \frac{12.5}{100} \times 3450 + 130 \times 24$$

$$= \$3551.25 \text{ ----------M1}$$

$$\text{Interest} = 3551.25 - 3450$$

$$= \$101.25 \text{ ----------A1}$$

Answer \$..... [2]

(ii) the rate of interest charged per annum by the hire purchase scheme.

$$I = \frac{PRT}{100}$$

$$101.25 = \frac{\frac{87.5}{100} \times 3450 \times R \times 2}{100} \text{ ----------M1}$$

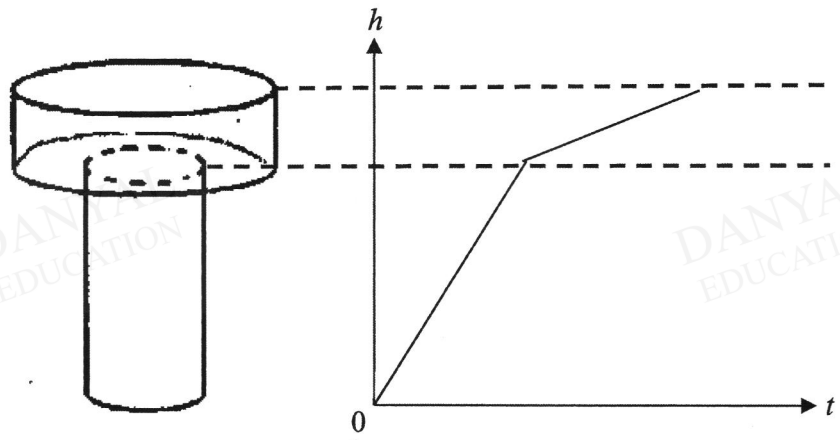
$$R = 1.677$$

$$= 1.68\% \text{ ----------A1}$$

Answer .....% [2]

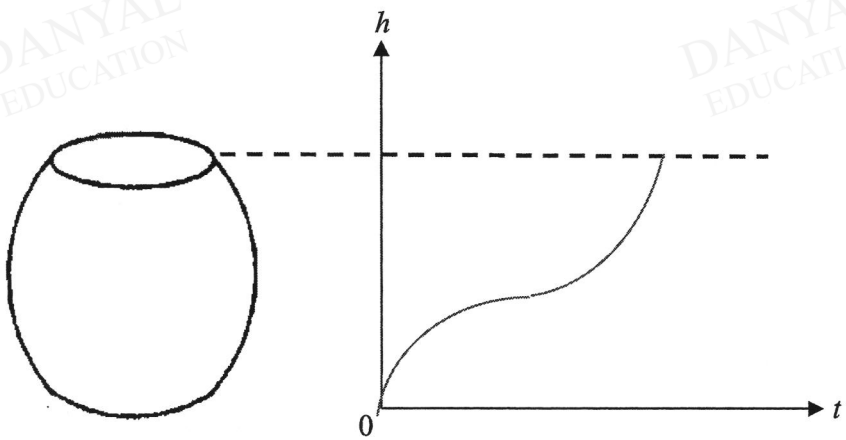
16 Water is poured at a constant rate into each of the containers shown below. In the diagram below, sketch the graphs to show the depth of water h in the containers as they are being filled with respect to time t.

(i)



[2]

(ii)



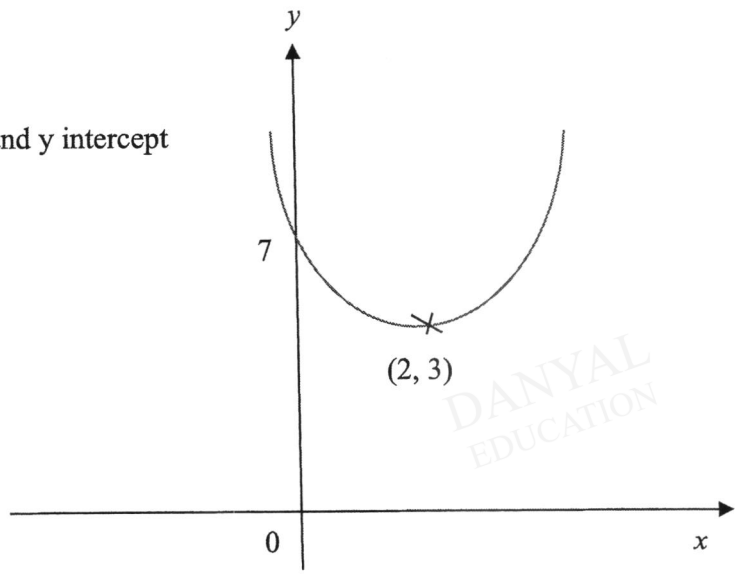
[2]

17 (i) Sketch the graph of $y = (x-2)^2 + 3$.

Answer (i)

M1 – shape

M1 – turning point and y intercept



[2]

(ii) Write down the coordinates of the minimum point of the curve.

Answer (.....2..... , ...3.....) [1]

(iii) Write down the equation of the line of symmetry.

Answer .....x=2..... [1]

18 = Simplify

(i) $\dfrac{(2xy^3)^2}{\sqrt{x^2y^4}}$, leaving your answer in positive indices,

$= \dfrac{4x^2y^6}{xy^2}$ ----------M1 (numerator)

----------M1 (denominator)

$= 4xy^4$ ----------A1

Answer ..... [3]

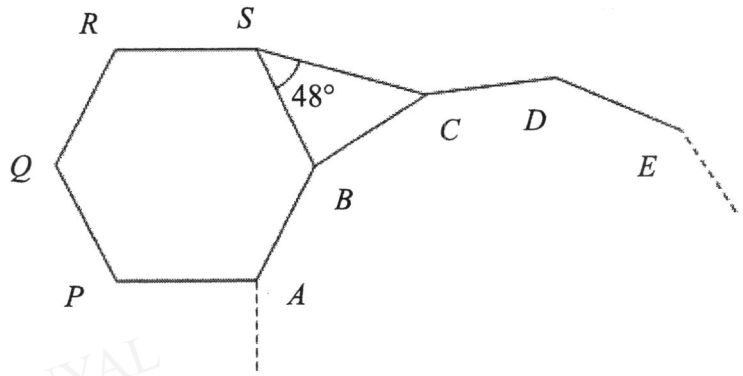
(ii) $\dfrac{3x}{(x-3)^2} + \dfrac{1}{x-3}$.

$= \dfrac{3x+x-3}{(x-3)^2}$ ----------M1

$= \dfrac{4x-3}{(x-3)^2}$ ----------A1

Answer ..... [2]

19 In the diagram below which is not drawn to scale, $ABCDE$ is part of an n-sided regular polygon, $PQRSBA$ is a regular hexagon, CBS is an isosceles triangle and $\angle BSC = 48°$.



By stating your reason(s) clearly, find

(i) $\angle ABC$,

$$\angle SBA = \frac{180(6-2)}{6}$$

$=120$------M1

$\angle SBC = 180 - 48(2) = 84$ (angle sum of isos triangle)---------- M1

$\angle CBA = 360 - 84 - 120 = 156°$ (angles at a pt)----------A1

Answer .....° [3]

(ii) the value of n.

ext $\angle = 180 - 156$

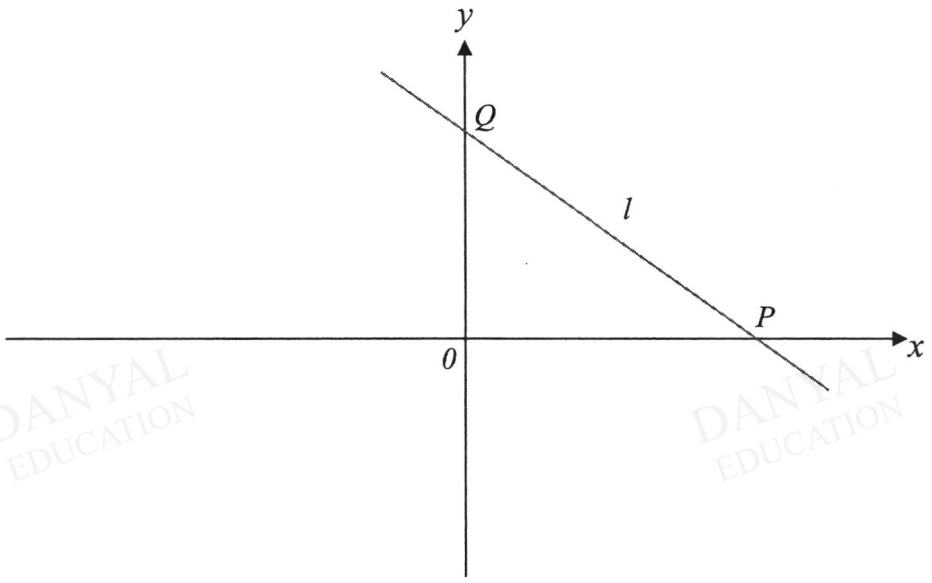
$=24$

$n = \frac{360}{24}$ ----------M1

$=15$----------A1

Answer $n =$ ..... [2]

20 The equation $2y + 8x = 18$ is a straight line l that crosses the x-axis at P and the y-axis at Q. Find



(i) the coordinates of the points P and Q,

Answer $P(\ldots\ldots\frac{9}{4}\ldots\ldots, \ldots\ldots 0\ldots\ldots)$

$Q(\ldots\ldots 0\ldots\ldots, \ldots\ldots 9\ldots\ldots)$ [2]

(ii) the gradient of the line l,

Answer ……-4…… [1]

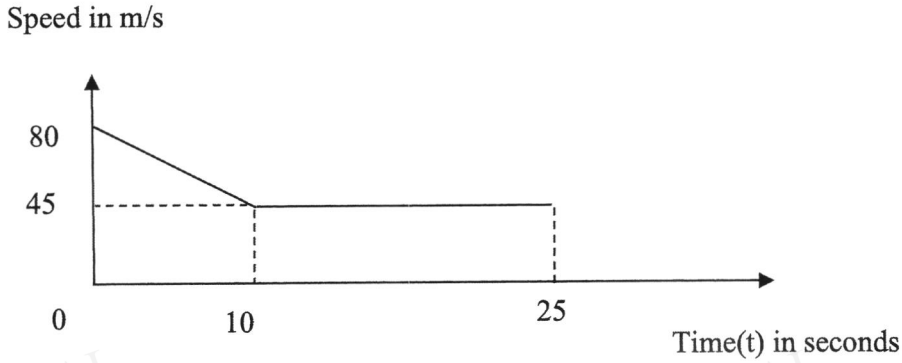
(iii) the length of PQ,

Answer ……9.28…… units [1]

(iv) the equation of a line which passes through the point $(0, -2)$ and is parallel to the line l.

Answer $\ldots y = -4x - 2 \ldots\ldots$ [1]

21 The diagram is the speed-time graph of an object during a period of 25 seconds.



(i) Calculate the retardation during the first 10 seconds.

$$\text{Retardation} = = \frac{80-45}{0-10} \text{ ----------M1}$$

$$= -3.5 m/s^2$$ [2]

Answer .....3.5.....m/s^2

(ii) Find the distance travelled by the object in the first 10 seconds.

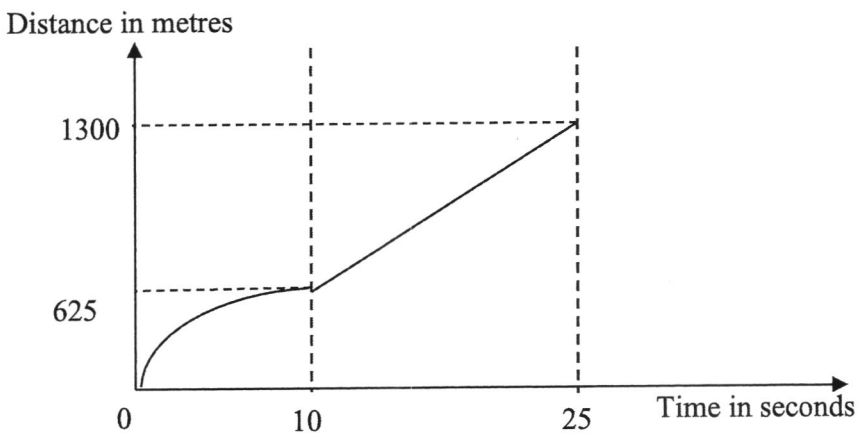
$$\text{Distance} = 0.5(80+45)(10)$$

$$= 625$$ [2]

Answer .....305.....m/s

(iii) On the axes in the answer space, complete the sketch of the distance-time graph for the object.

Answer



[2]

End of paper

1.	i)	$x = \sqrt{5y+1}$ $x^2 = 5y+1$ ---------M1 $x^2 - 1 = 5y$ $y = \frac{x^2-1}{5}$ ----------A1
	ii)	$\left(\frac{3x+1}{7}\right) \leq \left(\frac{5x-6}{4}\right)$ $4(3x+1) \leq 7(5x-6)$ ----------M1 $12x+4 \leq 35x-42$ $-23x \leq -46$ ----------M1 $x \geq 2$ ----------A1
	iii)	$3 - \frac{x+1}{3-x} = 0$ $3 = \frac{x+1}{3-x}$ $3(3-x) = x+1$ ----------M1 $9-3x = x+1$ $8 = 4x$ $x = 2$ ----------A1
	iv)	$\frac{m^2-4}{(m-2)(m+3)}$ $= \frac{(m+2)(m-2)}{(m-2)(m+3)}$ ----------M1 $= \frac{(m+2)}{(m+3)}$ ----------A1

2.	i)	$\angle ABC = 360 - 258$ (*angles at a pt*) $= 102°$ ----------M1 $\angle p = 180 - 102$(int $\angle$, $AB//HC$) $= 78°$ ----------A1
	ii)	$\angle GCF = 35°$ (*alt.* $\angle$, $GC//FE$) $\angle q = 102 - 35$ (*corr.*$\angle$, $AB//HE$) ----------M1 $= 67°$ ----------A1
3.	i)	Grad of AB = $\frac{10-0}{20-14}$ $= \frac{5}{3}$ ----------M1 Sub $(14, 0)$, $0 = \frac{5}{3}(14) + c$ $c = -\frac{70}{3}$ ----------M1 $y = \frac{5}{3}x - \frac{70}{3}$ or $3y = 5x - 70$ ----------A1
	ii)	$3p = 5(9) - 70$ $p = -\frac{25}{3}$ ----------B1
4.	i)	$T_5 = 36 - 15 = 21$ ----------B1
	ii)	$T_n = (n+1)^2 - 3n$ ------M1 $= n^2 + 2n + 1 - 3n$ $= n^2 - n + 1$ ----------A1

	iii) $T_k = 73$ $k^2 - k + 1 = 73$ ----------M1 $k^2 - k - 72 = 0$ $(k-9)(k+8) = 0$ $k = 9$ or $k = -8$ (rej) ----------A1
5.	Ia) 600 cattles 30 days. 1 cattle 18000 days ----------M1 225 cattles 80 days----------A1
	Ib) 600 cattle 30 days 1 cattle 18000 days 400 cattle 45 days ----------Bas1
	ii) $p + 11798.38 = p(1 + \frac{3}{100})^6$ ----------M1 $p + 11798.38 = 1.19405229653p$ ----------M1 $11798.38 = 0.19405229653p$ $p = 60800.00$ ----------A1
	iii) A) s$1.83= £ 1 £5000= 1.83 × 5000 =s$9150 ----------B1 b) £650=1.83 × 650 $= s\$1189.50$ ----------M1 Selling price = $\frac{115}{100} \times 1189.50$ = $1367.925 = $1367.93 (2.dp)----------A1

6.

i) Time A to B = $\frac{240}{v}hrs$ ----------B1

ii) Time B to A = $\frac{240}{v-10}hrs$ ----------B1

iii) $\frac{240}{v-10}-\frac{240}{v}=\frac{1}{3}$ ----------M1

$240(v)(3)-240(3)(v-10)=v(v-10)$ ----------M1

$720v-720v+7200=v^2-10v$

$v^2-10v-7200=0$ (shown) ----------A1

iv) $v=\frac{-(-10)\pm\sqrt{(-10)^2-4(1)(-7200)}}{2(1)}$ ---------M1

$v=\frac{10\pm\sqrt{28900}}{2}$

$v=\frac{10\pm170}{2}$ ----------M1

$v=90$ or -80 (rej) -----A1

v) Time A to B + Time B to A = $\frac{240}{90}+\frac{240}{80}$

$=\frac{17}{3}$

$=5\frac{2}{3}$ ----------B1

8.

i) A) Vol. = $\frac{2}{3}\pi(20)^3-\frac{1}{3}\pi(10)^2(10)$ ----------M2 (1 mark each)

= 5000π

=15707.963

= 15700 cm^3 ----------B1

b) Total Surface Area = $2\pi(20)^2+\pi(10)(\sqrt{10^2+10^2})+\left(\pi(20)^2-\pi(10)^2\right)$

----------M3 (1 mark each)

$=1100\pi+10\sqrt{200\pi}$

=3900.40

=3900 cm^2 ----------A1

	ii)	Mass of aluminium = $5000\pi(2.70)$ =42.4 kg ----------M1 Mass of copper = $5000\pi(8.96)$ = 141 kg (3sf)----------M1 Aluminium should be used. ----------A1

Name : _____ Index No. : _____

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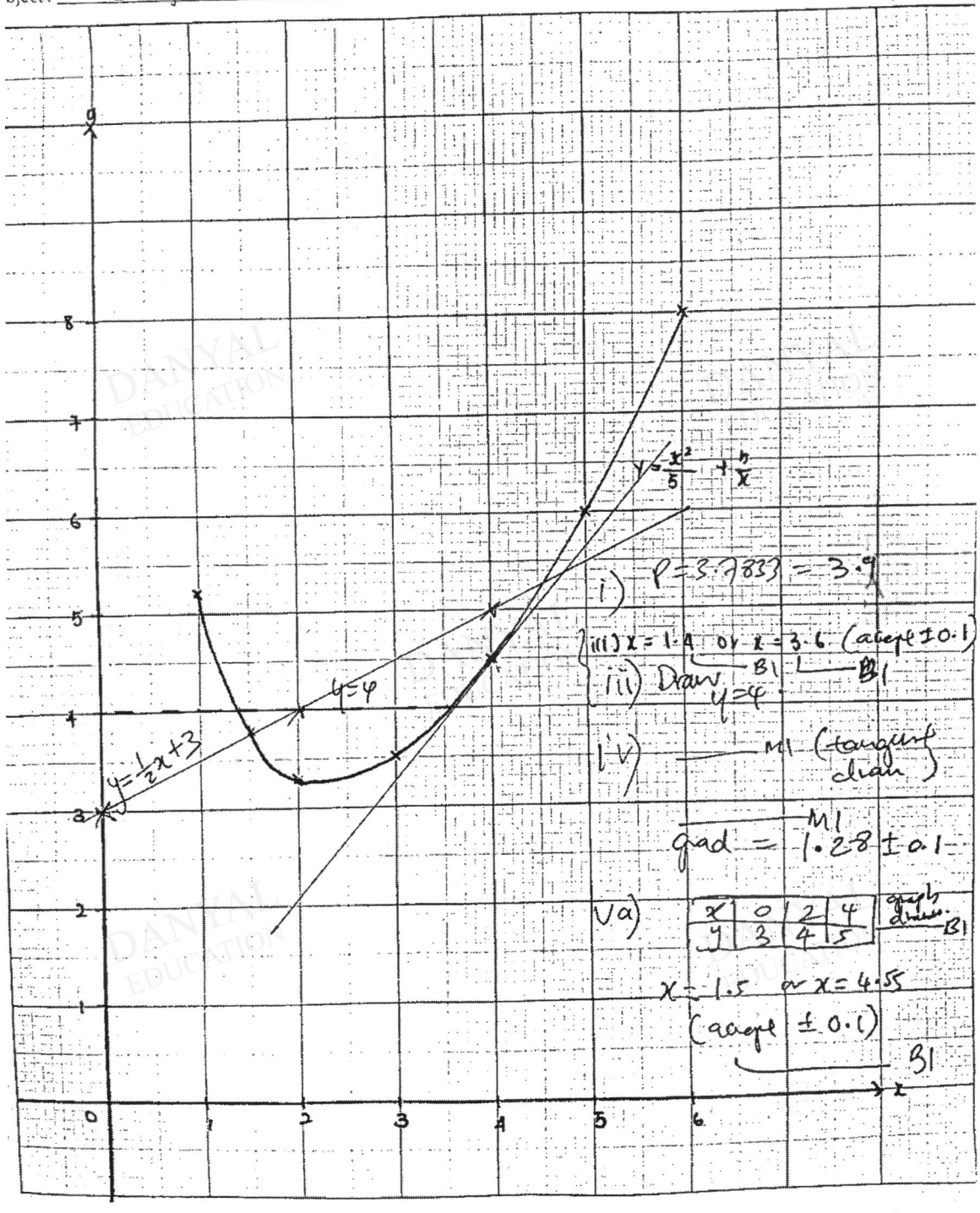

i) $P = 3.7833 = 3.9$

ii) $x = 1.4$ or $x = 3.6$ (accept ± 0.1)
B1 B1

iii) Draw $y = 4$.
B1

iv) M1 (tangent drawn)

M1
grad = 1.28 ± 0.1

v a)

x	0	2	4
y	3	4	5

graph drawn B1

$x = 1.5$ or $x = 4.55$
(accept ± 0.1)
B1