Name:_____ ( )	Class: S2____Grp____

SERVE·LEAD·EXCEL

GREENDALE SECONDARY SCHOOL
End-of-Year Examination 2021

60

MATHEMATICS

Paper 1 — 12 Oct 2021

Secondary Two Express — **1 hour 30 minutes**

Candidates answer on the Question Paper.

READ THESE INSTRUCTIONS FIRST

Target Before:

Target After:

Write your index number and name on all the work you hand in.
Write in dark or blue pen.
You may use a soft pencil for any diagrams or graphs.
Do not use staples, paper clips, glue or correction fluid.

Answer **all** questions.

If working is needed for any question it must be shown with the answer.
Omission of essential working may result in loss of marks.
You are expected to use a scientific calculator to evaluate explicit numerical expressions.
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 required the answer in terms of π.

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	Q1	Q2	Q3	Q4	Q5(i), (iii)	Q5(ii)	Q6	Q7	Q8
Strand	N1	A7	N1	A5	S1	N3	A5	N7	N1
Marks									

Question	Q9	Q10	Q11	Q12	Q13	Q14	Q15	Q16	Q17
Strand	N2	A5	A7	S1	A7	G5	G1	G4	G5
Marks									

This document consists of **19** printed pages, including this cover page.

Mathematical Formulae

Compound interest

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

Mensuration

Curve surface area of a cone $= \pi rl$

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

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

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

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

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

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

Trigonometry

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

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

Statistics

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

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

Answer **all** questions.

1 Evaluate $\frac{\sqrt{783.25}}{23\times 3.14^2}$, giving your answer to 2 decimal places.

Answer _____ [1]

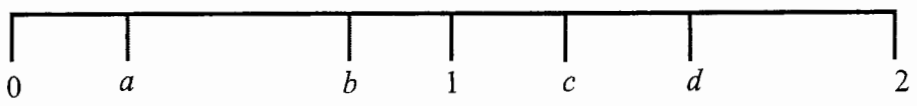
---

2 Solve $\frac{2x}{5}+\frac{3x-1}{2}=8$.

Answer x = _____ [2]

---

3 The numbers a, b, c and d are represented on the number line.



Match the values below to the numbers a, b, c and d.

$$\frac{4}{5},\ \frac{\pi}{2},\ 0.3,\ \frac{5}{4}$$

Answer $a =$ _____, $b =$ _____, $c =$ _____, $d =$ _____ [2]

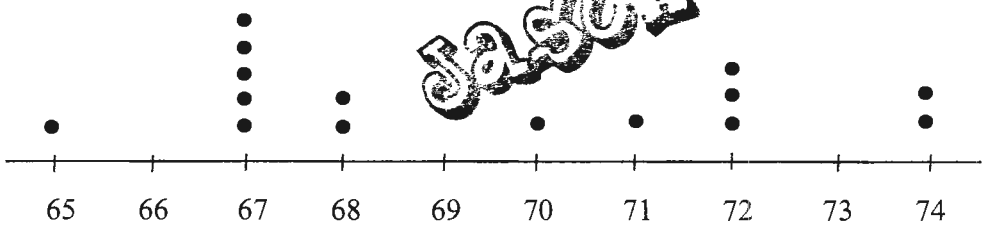
---

4 Make T the subject of the formula $P = \sqrt{\dfrac{5R}{2T-1}}$.

Answer $T =$ _____ [3]

---

5 The dot diagram shows the number of marks obtained by 15 students in a test.



(i) Find the median mark.

Answer _____ marks [1]

(ii) The score for a distinction is at least 70 marks.
Find the percentage of students who scored distinction.

Answer _____% [1]

(iii) Linda joined the class and scored 35 marks.
Without any calculation, describe how the mean would be affected and explain why.
Answer

_____

_____

_____ [1]

6 **(i)** Expand and simplify $x^2-(x+2y)(x-2y)$.

*Answer*_____ [2]

(ii) **Hence**, find the value of $1200^2-1204\times1196$.

*Answer*_____ [1]

7 Solve the simultaneous equations.

$$x-2y=-1$$

$$5x-4y=16$$

Answer $x=$_____ and $y=$_____ [3]

8 **(i)** Written as a product of its prime factors, $6000 = 2^x \times 3 \times 5^y$.

Find the value of x and of y.

Answer $x =$_____ and $y =$_____ [2]

(ii) Find the smallest positive integer n such that $\frac{6000}{n}$ is a perfect cube.

Answer $n =$ _____ [1]

9 M is directly proportional to the square of d.

(i) Given that $M = 54$ when $d = 3$, form an equation connecting M and d.

Answer _____ [2]

(ii) Find M when $d = \frac{1}{4}$.

Answer _____ [1]

---

10 **(a)** Simplify $\frac{3p^2q^5}{4r} \div \frac{15p^3}{2q^2}$.

Answer _____ [2]

(b) Factorise $4x - 5y - 12ax + 15ay$.

Answer _____ [2]

---

11 One solution of the equation $kx^2-(k+2)x-2=0$ is 2.

(i) Show that the value of k is 3. [2]

Answer

(ii) Find another solution of the equation.

Answer $x =$ _____ [2]

12 The table below shows the shoe sizes of a group of female tennis players.

Shoe size	35	36	37	38	39	40
Frequency	3	x	8	6	5	2

(i) Write down the largest possible value of x if the mode is 37.

Answer $x =$ _____ [1]

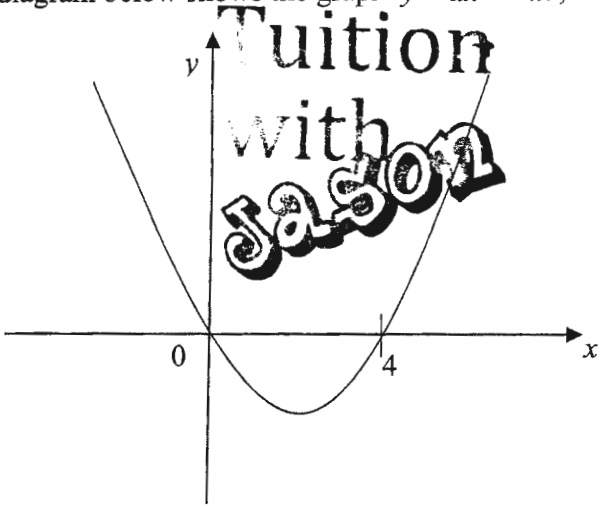
(ii) Write down the smallest possible value of x if the median is 37.

Answer $x =$ _____ [1]

(iii) Calculate the value of x if the mean size is 37.25.

Answer $x =$ _____ [2]

13 The diagram below shows the graph $y = ax^2 - 4x$, where a is a constant.



(i) Show that the value of a is 1. [1]

Answer

(ii) Find the coordinates of the minimum point.

Answer (_____, _____) [2]

(iii) The line $y = b$ intersects the graph $y = ax^2 - 4x$ at two intersection points.

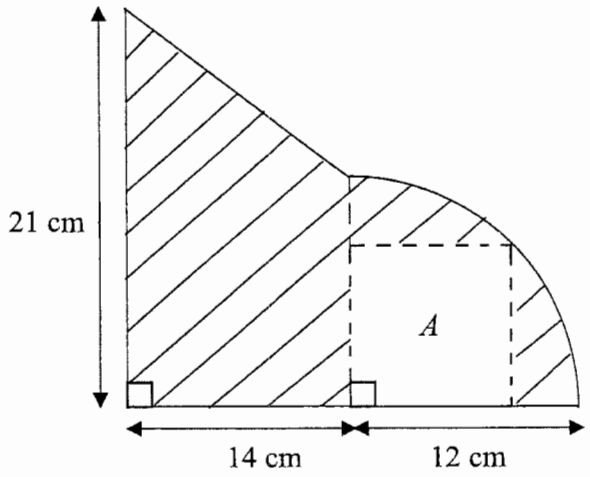
Write down the range of values of b.

Answer _____ [1]

14 The diagram below is made up of a trapezium and a quadrant.

Square A is cut out of the quadrant.

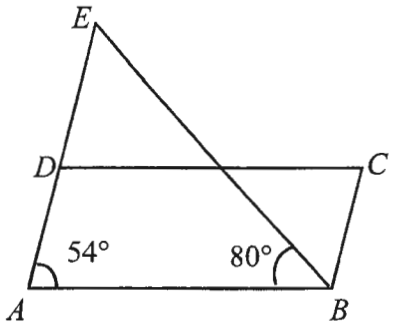
Find the area of the shaded part.



Answer _____ cm^2 [4]

15 **(a)** In the diagram, ADE is a straight line and $ABCD$ is a parallelogram.

Angle $BAD = 54°$ and angle $ABE = 80°$.



Stating your reasons clearly, find

(i) angle EDC,

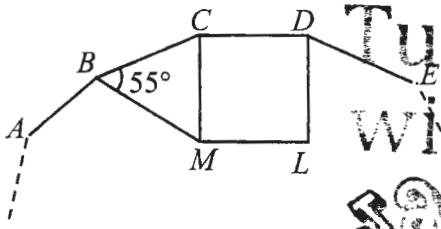
Answer _____ ° [1]

(ii) angle CBE.

Answer _____ ° [1]

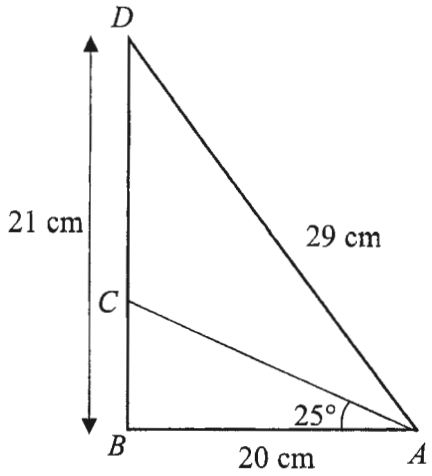
15 (b) The diagram shows part of a regular n-sided polygon, $ABCDE\ldots$.

Angle $CBM = 55°$ and $CDLM$ is a square. Find the value of n.



Answer $n =$ _____ [3]

16



In ΔABD, $AB = 20$ cm, $BD = 21$ cm and $AD = 29$ cm.

C is a point on BD and $\angle BAC = 25°$.

(i) Show that ΔABD is a right-angled triangle.

Answer [2]

(ii) Find

(a) the length of AC,

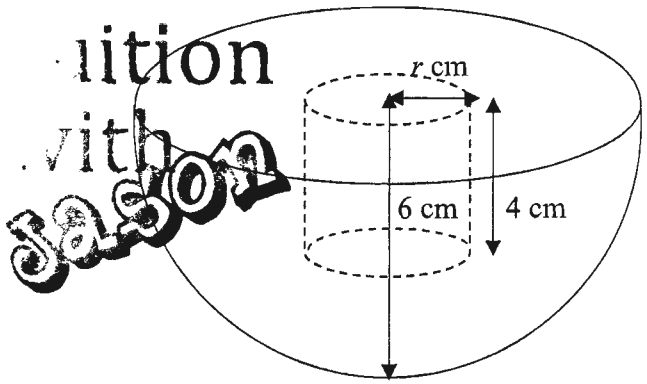
Answer _____cm [2]

(b) $\angle CAD$.

Answer _____° [2]

17 The object below is a candle holder which is made by drilling a cylindrical hole in the middle of a solid hemisphere with radius 6 cm.

The cylindrical hole has a radius r cm and height 4 cm.



(i) Given that the volume of the hemisphere is 9 times the volume of the cylinder, show that $r = 2$ cm.

Answer [3]

(ii) Find the total surface area of the candle holder.

Answer _____ cm^2 [3]

END OF PAPER

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MATHEMATICS

Paper 2 — 6 Oct 2021

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Included 1 graph paper

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Strand	A5	G1	M5	A5	A5	A7	S1	A7	A6	*G4*	*M5*	M5	M8	A6
Marks	2	3	4	3	2	2	4	7	4	*6*	*1*	8	5	9

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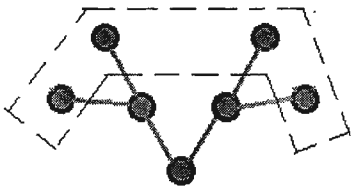
Answer **all** questions.

1 A sequence of patterns are formed by dots and lines as shown in the diagram.

(i) On the diagram draw Pattern 4. [1]

Pattern 1 **Pattern 2** **Pattern 3** **Pattern 4**

(ii) Each pattern has an outermost ring of dots. In Pattern 3, there are 4 dots. It is shown enclosed by the dotted lines in the diagram below.



Write down the number of dots in the outermost ring of Pattern 6.

Answer .....dots [1]

2 **(i)** Construct the quadrilateral $ABCD$ with $BC = 7.5$ cm, $AD = 6.5$ cm, $AC = 10.8$ cm and angle $BAD = 62°$. The side AB is already drawn for you. [2]

(ii) The quadrilateral is a special quadrilateral. State the name of this quadrilateral.

Answer ..... [1]

3 A cube of size 7 cm is melted to form small spheres of radius 1.4 cm. Calculate

(i) the number of complete spheres formed,

Answer .....spheres [2]

(ii) the surface area of 1 sphere.

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

4 **(a)** In some countries, the unit of measurement for temperature is Fahrenheit (° F). The conversion between Fahrenheit and Celsius (° C) is given by the formula

$$5F - 9C = 160,$$

where F is the temperature in ° F and C is the corresponding temperature in ° C.

(i) Express C in terms of F.

Answer $C =$ ..... [1]

(ii) If the temperature of the room is 68° F, find the temperature in ° C.

Answer..... ° C [1]

(iii) If the temperature in Tokyo is −17.8° C, calculate the temperature in ° F

Answer..... ° F [1]

5 **(a)** The **length** of a big square is x^2. The **area** of a small square is y^2.
Find the difference between the areas of the 2 squares. Factorise your answer.

Answer..... [2]

(b) If $\frac{a-2b}{10}=\frac{b}{6}$, find the ratio of $a : b$.

Answer.....:..... [2]

6 **(a)** The number of floors in some buildings in Marina Bay Financial Centre (MBFC) and Shenton Way Financial Centre (SWFC) were recorded. The results are shown in back-to-back stem and leaf diagram.

SWFC	Stem	MBFC
9 6 4	2	2 3 3 5 6
8 8 7 6 6	3	1 3 3 7
5 5 5 0	4	2 3 4 4 4 4 8
6 5 0	5	

Key: 4 | 2 : 24 floors. 2 | 2 : 22 floors

Find the

(i) mean number of floors in SWFC

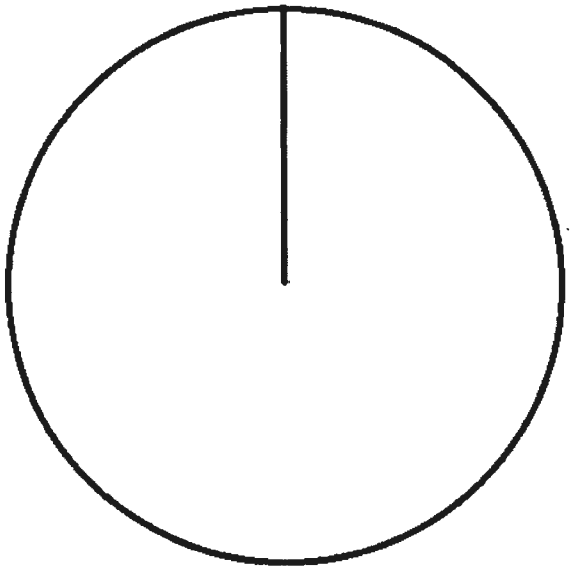
Answer ..... Floors [1]

(ii) mode number of floors in MBFC.

Answer ..... Floors [1]

(b) Megan ordered 600 flowers from a florist. 150 of them were Roses, 20% were Orchids and the rest Carnations.
Draw a fully labelled pie-chart to represent the different flowers. [2]

Answer



7 An **open** cylindrical container has a base radius of x cm. Its height is 6 cm more than its base radius.

(i) If the external surface area of the container is 63π cm^2, form an equation in terms of x and show that it reduces to $x^2+4x-21=0$. [3]

(ii) Solve the equation $x^2+4x-21=0$.

Answer $x=$....., $x=$.....[2]

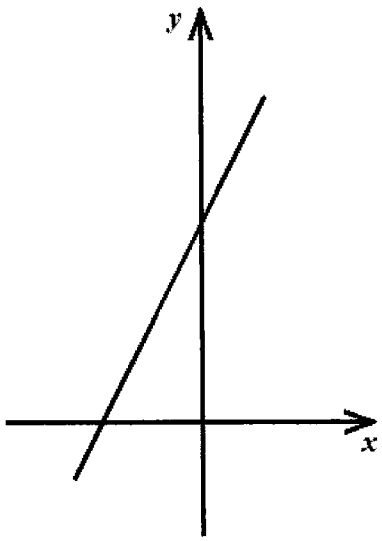
(iii) Hence find the volume of the container.

Answer ..... cm^3[2]

8 The graphs of some equations are shown below.
Write down the equation of each graph from the given list:

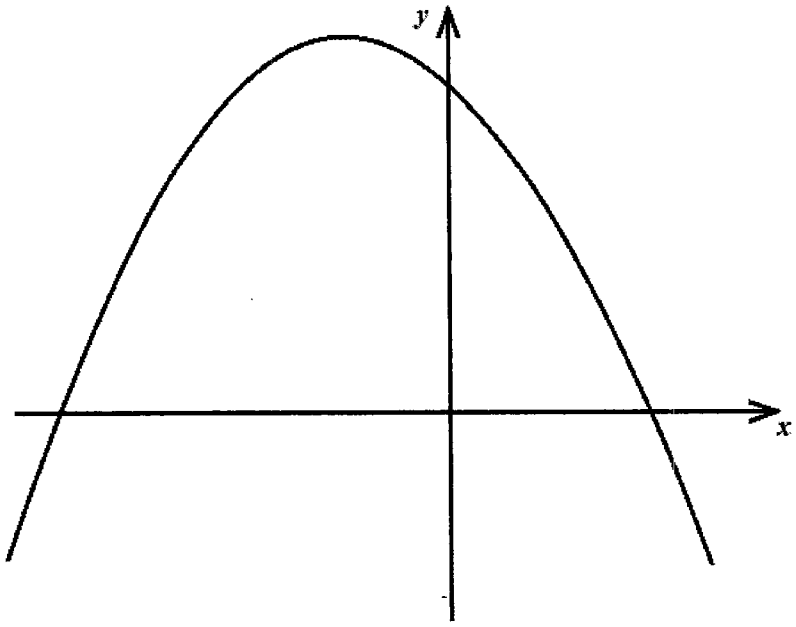
$y=3$	$y=3x+2$	$y=2x^2$	$y=x^2-x-6$
$x=3$	$y=-2x-3$	$y=-x^2+4$	$y=-x^2-x+6$

(a)



Answer ..... [1]

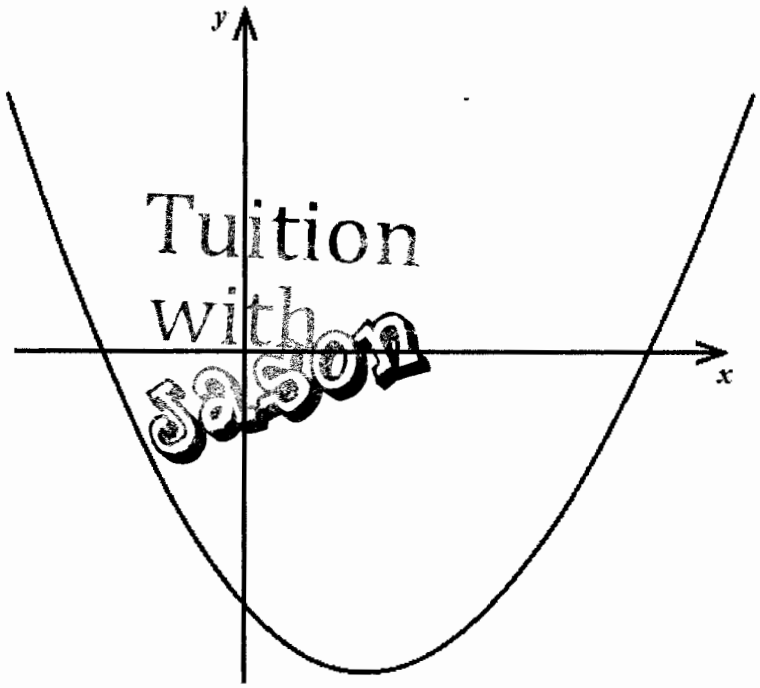
(b)



Answer ..... [1]

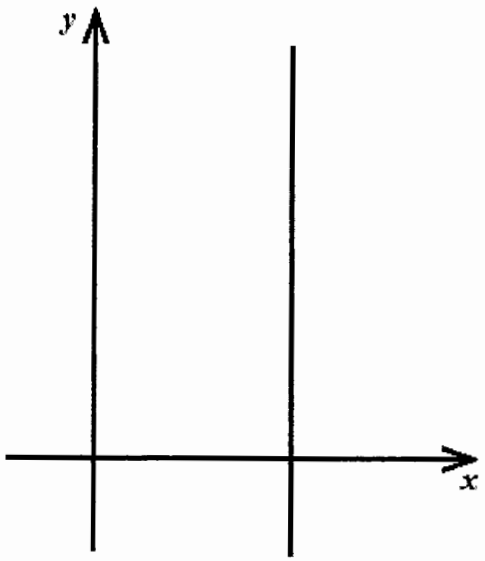
Question 8 continued

(c)



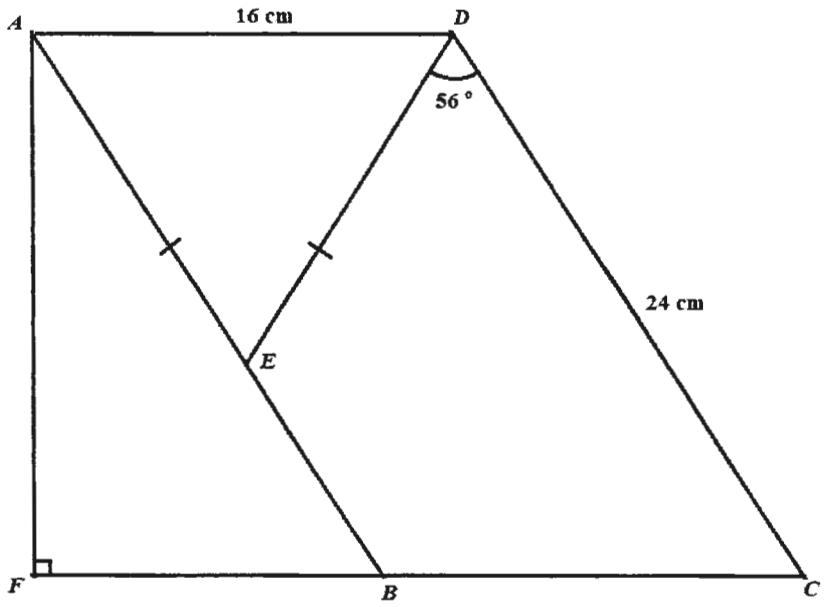
Answer ..... [1]

(d)



Answer ..... [1]

9 The diagram shows a parallelogram $ABCD$. E is a point on AB such that $EA = ED$.
$AD = 16$ cm, $CD = 24$ cm and angle $EDC = 56°$.
F lies on CB produced such that angle $AFB = 90°$.



(a) Find

(i) angle ADE,

Answer ..... ° [1]

(ii) DE,

Answer .....cm [2]

Question 9 Continued

(iii) angle BAF,

Answer .....° [1]

(iv) AF.

Answer .....cm [2]

(b) Hence find the area of $ABCD$.

Answer .....cm^2 [1]

10 Diagram 1 shows a right rectangular pyramid *VABCD*. *VK* is the height of the pyramid. Given that *AB* = 20 cm, *BC* = 10 cm and *VK* = 8 cm.

Diagram 1

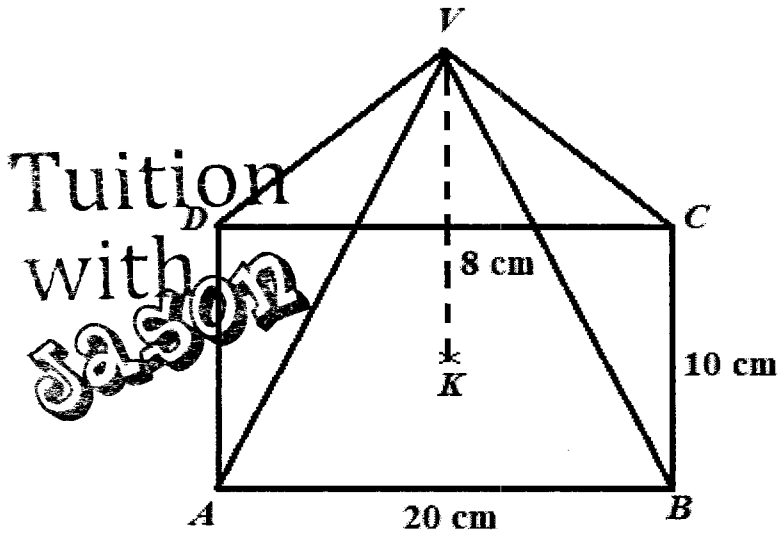
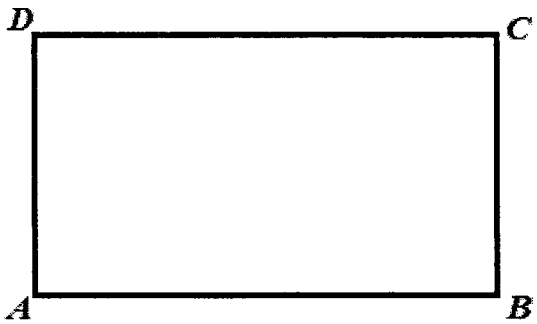


Diagram 2 shows part of a net for the pyramid.

(i) Complete the net drawing. [1]

Diagram 2



Question 10 continued

(ii) Find the volume of the pyramid.

Answer .....cm^3 [2]

(iii) Find the length of the slant height to the slant face *VBC* and show that it is less than 13 cm.

Answer .....cm [2]

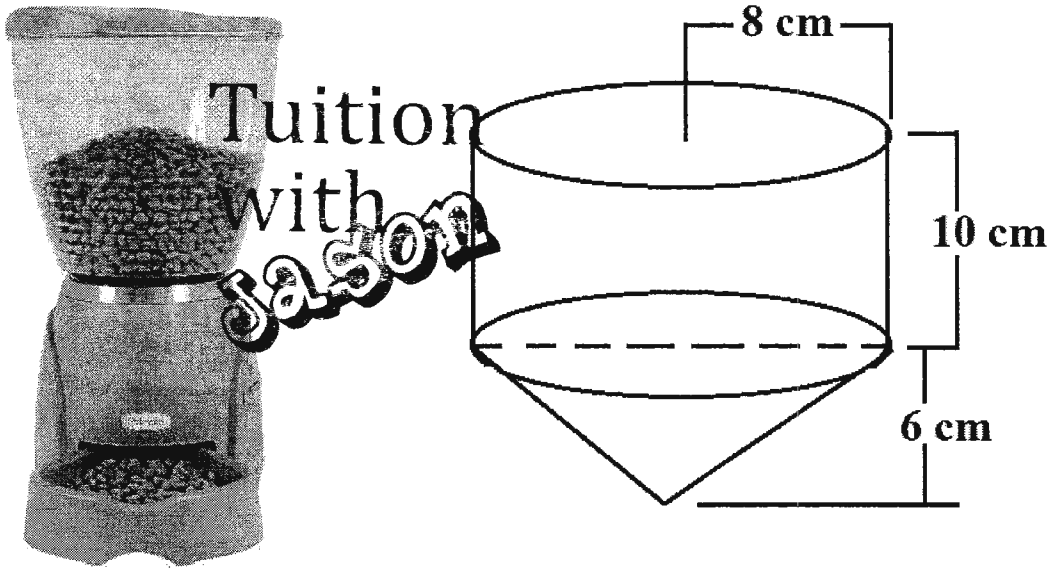
(iv) Hence, find the length of *VB*.

Answer .....cm [2]

(v) John claims it is possible to find *VB* by considering another triangle. State this triangle. [A worked solution is **NOT** necessary.]

Answer ..... [1]

11 The diagram shows an automatic pet feeder which is modelled by a cylinder at the top and an inverted cone of the same radius fixed to its bottom. The cylinder has a base radius of 8 cm and a height of 10 cm. The inverted cone has a height of 6 cm.



(a) Assume the feeder is completely full.

(i) Find the capacity of the feeder.

Answer .....cm^3 [2]

(ii) The density of the pet food is 0.5 g/cm^3. Find the total mass of food that is stored in this feeder. $\left[\text{Density} = \frac{\text{mass}}{\text{volume}}\right]$.

Answer .....g [1]

Question 11 continued

(b) The owner of the pet is going away on a 7-day holiday. The feeder is programmed to feed the pet twice a day. The pet eats between 70 g and 90 g each time.
By showing your working clearly, determine if the pet has sufficient food for 7 days.
State clearly any assumptions you make. **[2]**

12 The table shows the values of x and y for the equation $y=-4x^2-8x+21$.

x	-4	-3	-2	-1	0	1	2
y	-11	9	21	25	21	p	-11

(i) Calculate the value of p.

Answer $p=$ ..... [1]

(ii) Using a scale of 2 cm : 1 unit for the x-axis for the range $-4 \le x \le 2$ and a scale of 1 cm : 2 units for the y-axis for the range $-12 \le y \le 28$, draw the graph of $y=-4x^2-8x+21$ on **the given graph paper.** [3]

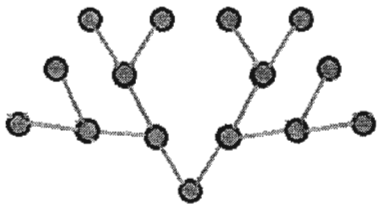
(iii) Use your graph to solve the equation $-4x^2-8x+21=0$.

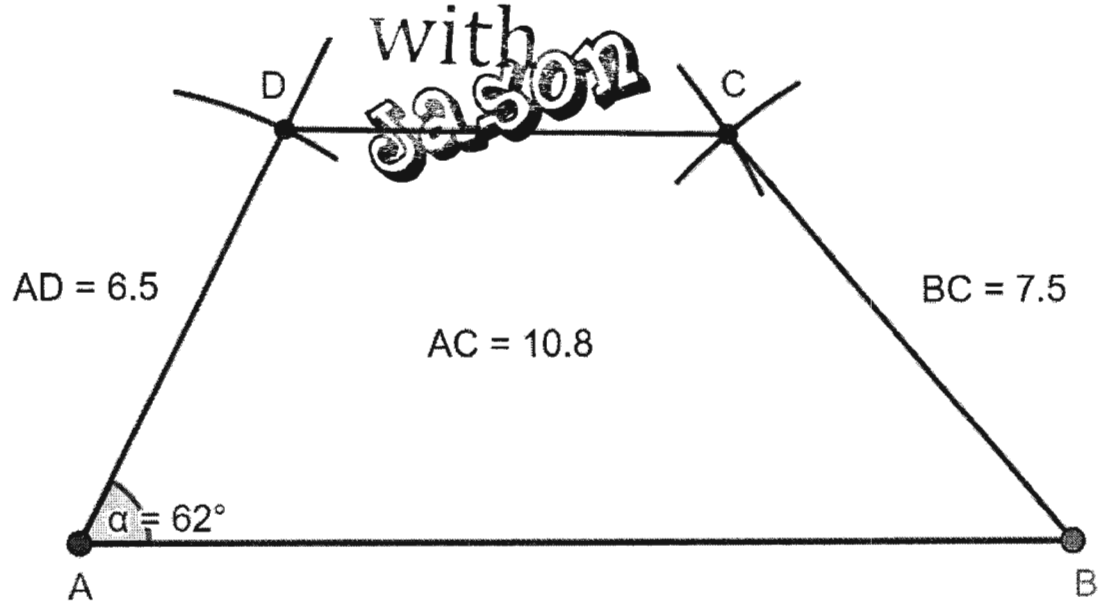
Answer $x=$ ....., $x=$..... [2]

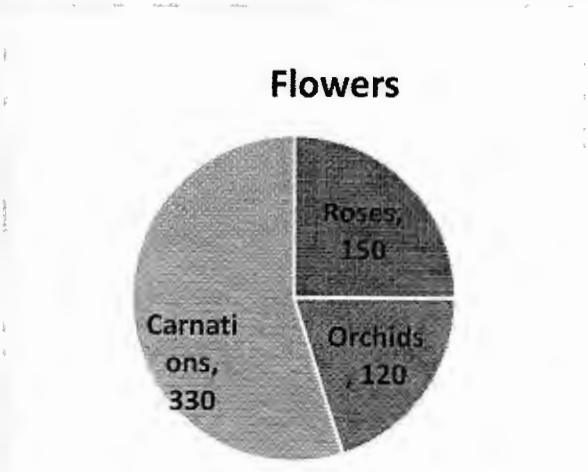
(iv) By drawing a suitable straight line, solve the equation $-4x^2-8x+21=-2x+15$

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

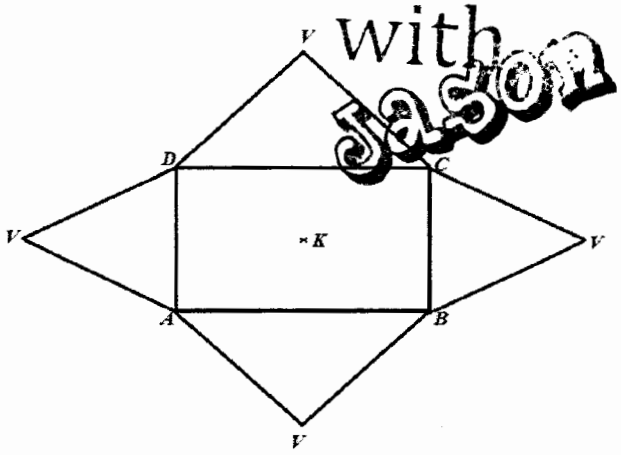
Marking Scheme

Q	Process	Mark
1(i)		B1
(ii)	$2^{6-1} = 32$	B1. By drawing acceptable.
		2m
2(i)		*C* [B1] *D* [B1]
(ii)	Trapezium	B1
		3m
3(i)	$\# = \frac{V_{cube}}{V_{sphere}}$ $= \frac{7^3}{\frac{4}{3}\pi(1.4)^3}$ $= 29.841...$ $= 29$ spheres	M1 A1
(ii)	$SA_{sphere} = 4\pi(1.4)^2$ $= 24.630...$ $= 24.6$ cm	M1 A1
		4m



Q	Process	Mark
4a(i)	$9C = 5F - 160$ $C = \frac{5F-160}{9}$	B1
(ii)	$C = \frac{5(68)-160}{9}$ $= 20°C$	B1
(iii)	$5F - 9(-17.8) = 160$ $F = \frac{160-9(17.8)}{5}$ $= -0.04°F$	B1
		3m
5a	$A = (x^2)^2 - y^2$ or $x^4 - y^2$ $= (x^2+y)(x^2-y)$	M1 A1
b	$\frac{a-2b}{10} = \frac{b}{6}$ $6(a-2b) = 10b$ $6a = 10b + 12b$ $3a = 11b$ $\frac{a}{b} = \frac{11}{3}$ $a:b \rightarrow 11:3$	M1 A1
		4m
6(a)	SWFC = 40; MBFC = 44	B1, B1
(b)	 Roses = 90°. Orchids = 72°. Carnations = 198°. Roses = 150. Orchids = 120. Carnations = 330.	3 correct – B2 1 correct – B1 Degrees or numbers both acceptable.
		4m

Q	Process	Mark
7(i)	$SA = \pi r^2 + 2\pi rh$ $\pi x^2 + 2\pi x(x+6) = 63\pi$ $x^2 + 2x^2 + 12x - 63 = 0$ $x^2 + 4x - 21 = 0$	M1 M1 A1
(ii)	$(x+7)(x-3) = 0$ $x = 3, \quad -7$	M1 A1
(iii)	$V = \pi r^2 h$ $= \pi(3)^2(3+6)$ $= 254.46...$ $= 254 \text{ cm}^3$	M1 A1 (255, if 3.142 is used)
		7m
8(a)	$y = 3x + 2$	B1
(b)	$y = -x^2 - x + 6$	B1
(c)	$y = x^2 - x - 6$	B1
(d)	$x = 3$	B1
		4m
9a(i)	$\angle DEA = 56°$ (alt $\angle$) $\angle ADE = \frac{180-56}{2}$ ($\angle$ in isos $\triangle$) $= 62°$	B1
(ii)	$\cos 62° = \frac{8}{DE}$ $DE = \frac{8}{\cos 62°}$ $= 17.040...$ $= 17.0 \text{ cm}$	M1 A1
(iii)	$\angle BAF = 90 - 62$ $= 28°$	B1
(iv)	$\cos 28 = \frac{AF}{24}$ $AF = 24\cos 28$ $= 21.190...$ $= 21.2 \text{ cm}$	M1 A1
b	$A = bh$ $= 16(21.190...)$ $= 339.051$ $= 339 \text{ cm}^2$	Use AF from a(iv) B1 [ECF]

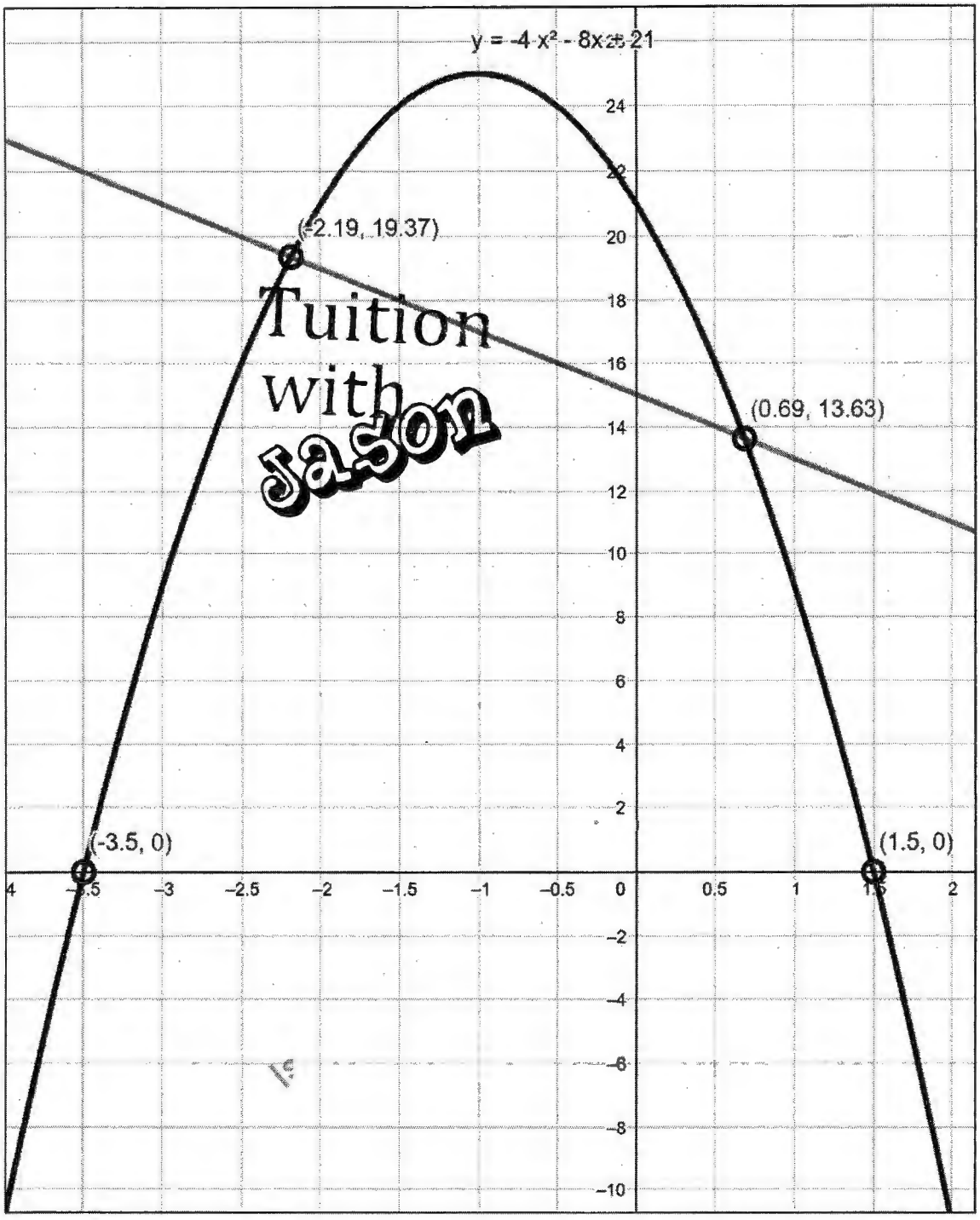
		7m
Q	**Process**	**Mark**
10(i)		B1
(ii)	$V=\frac{1}{3}(20\times10)(8)$ $=533.33...$ $=533\ \text{cm}^3$	M1 A1
(iii)	$VP^2=10^2+8^2$ $VP=12.806...$ $=12.8\ \text{cm}$	M1 A1
(iv)	$VB^2=12.806...^2+5^2$ $VB=13.747...$ $=13.7\ \text{cm}$	M1 A1
(v)	VLB	B1 [o.e.]
		8m

"when you **FAIL**,
that is when you get
CLOSER to success."
— Stephen Richards

Q	Process	Mark
11a(i)	$V = \pi r^2 h_1 + \frac{1}{3}\pi r^2 h_2$ $= \pi(8)^2\left[10 + \frac{1}{3}\times 6\right]$ $= 2412.74...$ $= 2410\ \text{cm}^3$	M1 A1
(ii)	$0.5 = \frac{m}{2412.74...}$ $m = 1206.37...$ $= 1210\ \text{g}$	B1
b	70 g feed. $70g \times 2$ feeds per day $\times 7$ days = 980 g Sufficient. *OR* 90 g feed. $90g \times 2$ feeds per day $\times 7$ days = 1260 g Insufficient. *OR* 80 g feed. $80g \times 2$ feeds per day $\times 7$ days = 1120 g Sufficient. *OR* $\frac{1206.37\ \text{g}}{7\ \text{days} \times 2\ \text{feeds per day}} = 86.169...\ \text{g}$ +Sufficient/Insufficient. Based on statement.	M1 B1 M1 B1 M1 B1 M1 B1
		5m
12(i)	$p = -4(1)^2 - 8(1) + 21$ $= 9$	B1
(ii)		Plot – B1 Curve – B1 Accuracy – B1
(iii)	$x = 1.5,\ -3.5$	B1, B1
(iv)	$y = -2x + 15$ seen $x = 0.7 \pm 0.1;\ -2.2 \pm 0.1$	B1 B1, B1
		9m

MISTAKES are proof you are TRYING.

Q12(ii)



2E EOY 2021 P1 Marking Scheme

Qn	Solution	Marks
1	0.12	B1
2	$\frac{2x}{5}+\frac{3x-1}{2}=8$ $\frac{2(2x)+5(3x-1)}{10}=8$ $\frac{4x+15x-5}{10}=8$ $19x-5=80$ $19x=85$ $x=4\frac{9}{19}$ or 4.47	M1 A1
3	$a=0.3, b=\frac{4}{5}, c=\frac{5}{4}, d=\frac{\pi}{2}$	B2 – all correct B1 – at least 2 correct
4	$P=\sqrt{\frac{5R}{2T-1}}$ $P^2=\frac{5R}{2T-1}$ $P^2(2T-1)=5R$ $2P^2T-P^2=5R$ $2P^2T=P^2+5R$ $T=\frac{P^2+5R}{2P^2}$	$P=\sqrt{\frac{5R}{2T-1}}$ $P^2=\frac{5R}{2T-1}$ $P^2(2T-1)=5R$ $2T-1=\frac{5R}{P^2}$ $2T=\frac{5R}{P^2}+1$ $T=\frac{5R}{2P^2}+\frac{1}{2}$	M1 M1 A1
5(i)	68	B1
5(ii)	$\frac{7}{15}\times100\%=46\frac{2}{3}\%$ or 46.7%	B1
5(iii)	The mean will decrease as 35 marks is the lowest score.	B1

6(i)	$x^2-(x+2y)(x-2y)$ $=x^2-(x^2-4y^2)$ $=x^2-x^2+4y^2$ $=4y^2$	M1 A1
6(ii)	$1200^2-1204\times1196$ $=1200^2-(1200+2(2))\times(1200-2(2))$ $=4(2)^2$ $=16$	 B1 (must show subst of $y=2$)
7	$x-2y=-1$ ------- (1) $5x-4y=16$ ------ (2) (1) × 2: $2x-4y=-2$ ---------- (3) (2) – (3): $3x=18$ $x=6$ $\therefore y=3.5$ Fr (1): $x=2y-1$-----(3) Sub (3) into (2): $5(2y-1)-4y=16$ $10y-5-4y=16$ $6y=21$ $y=3.5$ $x=6$	 M1 A1 A1
8(i)	$x=4, y=3$	B1, B1
8(ii)	$n=2\times3=6$	B1
9(i)	$M=kd^2$ $54=k(3)^2$ $k=6$ $M=6d^2$	M1 A1
9(ii)	$M=6d^2$ $=6\left(\frac{1}{4}\right)^2$ $=\frac{3}{8}$	 B1 (ecf)

10(a)	$\frac{3p^2q^5}{4r} \div \frac{15p^3}{2q^2}$ $= \frac{3p^2q^5}{4r} \times \frac{2q^2}{15p^3}$ $= \frac{q^7}{10pr}$	M1 A1
10(b)	$4x-5y-12ax+15ay$ $=4x-5y-3a(4x-5y)$ $=(4x-5y)(1-3a)$	M1 A1
11(i)	$k(2)^2-(k+2)(2)-2=0$ $4k-2k-4-2=0$ $2k=6$ $k=3$	M1 A1
11(ii)	$3x^2-5x-2=0$ $(3x+1)(x-2)=0$ $x=-\frac{1}{3}$ or $x=2$ (rejected)	M1 A1
12(i)	7	B1
12(ii)	$3+x+7=6+5+2$ $x=3$	B1
12(iii)	$\frac{35(3)+36x+37(8)+38(6)+39(5)+40(2)}{3+x+8+6+5+2}=37.25$ $\frac{904+36x}{24+x}=37.25$ $904+36x=37.25(24+x)$ $904+36x=894+37.25x$ $10=1.25x$ $x=8$	M1 A1
13(i)	When $x=4, y=0$: $0=a(4)^2-4(4)$ $16a=16$ $a=1$ $y=(x)(x-4)$ $=x^2-4x$ $\therefore a=1$	AG1
13(ii)	$x=2$	

	$y=(2)^2-4(2)$ $=-4$ $(2,-4)$	B1, B1
13(iii)	$b>-4$	B1 (ecf) Only accept if value is –ve
14	Area of trapezium $=\frac{1}{2}(21+12)(14)$ $=231\text{ cm}^2$ Area of quadrant $=\frac{1}{4}\pi(12)^2$ $=36\pi\text{ cm}^2$ Let the length of sq A be x cm. $x^2+x^2=12^2$ $2x^2=144$ $x^2=72$ Area of sq $A=72\text{ cm}^2$ Area of shaded part $=231+36\pi-72$ $=272.09$ $\approx 272\text{ cm}^2$	M1 M1 M1 A1
15(a)(i)	54° (corr ∠s)	B1
15(a)(ii)	$\angle AEB=180°-54°-80°$ (∠ sum of Δ) $=46°$ $\angle CBE=46°$ (alt ∠s)	B1
		(deduct 1m w/o reasons in (a))

15(b)	$\angle BCM = 180° - 55° - 55°$ $= 70°$ $\angle BCD = 70° + 90°$ $= 160°$ 1 ext $\angle = 180° - 160°$ $= 20°$ $n = \frac{360°}{20°}$ $= 18$	M1 A1
16(i)	$AD^2 = 29^2$ $= 841$ $AB^2 + BD^2 = 20^2 + 21^2$ $= 841$ Since $AB^2 + BD^2 = AD^2$, by converse of Pyth Thm, ΔABD is a right angled triangle.	M1 M1 A1
16(ii)(a)	$\cos 25° = \frac{20}{AC}$ $AC = \frac{20}{\cos 25°}$ $= 22.067$ ≈ 22.1 cm	M1 A1
16(ii)(b)	$\sin \angle BAD = \frac{21}{29}$ $\angle BAD = 46.397°$ $\angle CAD = 46.397° - 25°$ $= 21.397°$ $\approx 21.4°$	M1 (can use any trigo function) A1
17(i)	Vol of hemisphere $= \frac{1}{2}\left(\frac{4}{3}\pi\right)(6)^3$ $= 144\pi$ Vol of cylinder $= \pi(r)^2(4)$ $= 4\pi r^2$	M1 (either vol of hemisphere or cylinder) M1

	$144\pi = 9 \times 4\pi r^2$ $r^2 = 4$ $r = 2$	A1
17(ii)	$\text{TSA} = 2\pi(6)^2 + \pi(6)^2 + 2\pi(2)(4)$ $= 124\pi$ ≈ 389.55 $\approx 390 \text{ cm}^2$	M1 – curved s.a. of cylinder M1 – curved s.a. of hemisphere A1