O

ANDERSON SECONDARY SCHOOL
Preliminary Examination 2020
Secondary Four Express & Five Normal

CANDIDATE NAME:

CLASS: /

INDEX NUMBER:

MATHEMATICS

4048/01

Paper 1

29 July 2020

2 hours

0800-1000h

Candidates answer on the Question Paper
Additional Materials: Nil

READ THESE INSTRUCTIONS FIRST

Write your name, class and index number in the spaces at the top of this page.
Write in dark blue or black pen.
You may use an HB pencil for any diagrams or graphs.
Do not use paper clips, highlighters, glue or correction fluid/tape.

Answer **all** the questions.
If working is needed for any question it must be **neatly and clearly** shown in the space below the question.
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.

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 of the marks for this paper is 80.

Setter : Mr Mohd Alfin H R

Mathematical Formulae

Compound Interest

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

Mensuration

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

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

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

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

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

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

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

Trigonometry

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

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

Statistics

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

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

1 The number of spectators who attended a football match was 40 000 when rounded off to 1 significant figure. State the smallest and largest possible turnout for the match.

Answer smallest = ...

largest = ... [2]

---

2 **(a)** Factorise $x^2+9y^2-6xy-1$ completely.

DANYAL EDUCATION

Answer ..... [2]

(b) Express $\frac{2}{3(x-4)^2}+\frac{1}{4-x}$ as a single fraction.

DANYAL EDUCATION

Answer ..... [2]

---

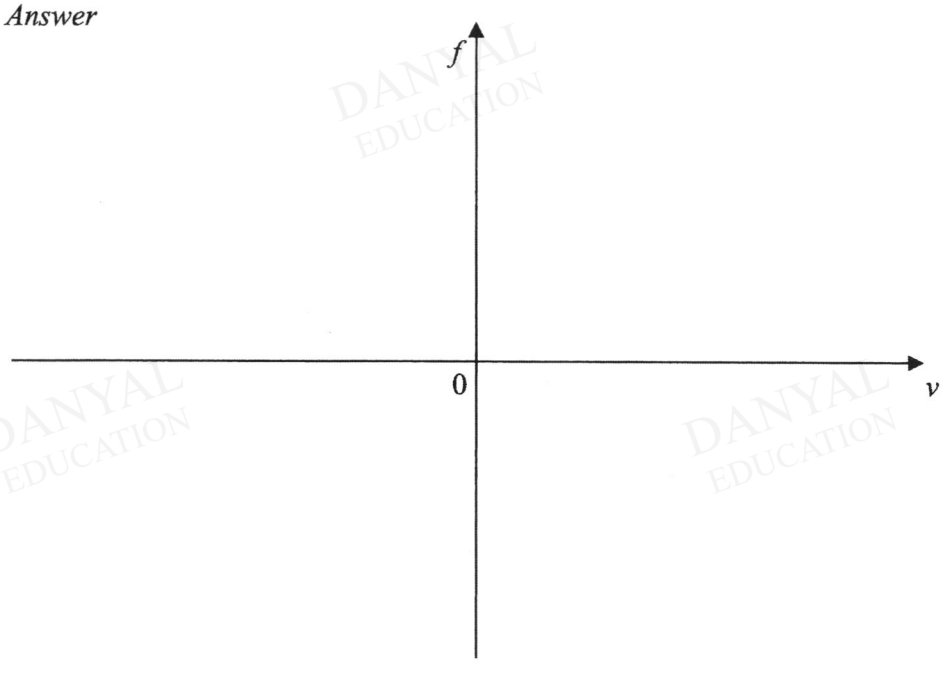
3 **(a)** Given that v is inversely proportional to t^3 and $v = 20$ for a particular value of t, find the new value of v when this value of t is doubled.

DANYAL EDUCATION

Answer ..... [3]

(b) Given that f is directly proportional to v^2, sketch a graph of f against v in the axes drawn below.

Answer



[1]

4 The total area of a town is 36 km^2. It is represented by a total area of 4 cm^2 on a map.

(a) Express the scale of the map in the form 1: r.

Answer 1: ..... [2]

(b) Find the area of the town on a second map with scale is 1 : 60 000. Leave your answer in cm^2.

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

DANYAL EDUCATION

5 **(a)** Solve the inequality $9-5x<2-\frac{x}{4}\leq\frac{x}{3}-\frac{4x}{7}$.

DANYAL EDUCATION

Answer ..... [3]

(b) Solve the equation $\frac{3}{(2x-1)^2}=\frac{1}{3}$.

DANYAL EDUCATION

Answer x =..... or ..... [2]

6 **(a)** Simplify $\left(\frac{x^6}{25y^4}\right)^{-\frac{1}{2}}$, giving your answer in positive indices.

Answer ..... [2]

(b) Solve the equation $9\sqrt[3]{3^{3x}} = \frac{1}{3^{3(2-x)}}$.

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

(c) Given that $a > 0$ and n is an even number, deduce the number of solutions for the equation $ax^n - x = 0$. Explain your answer clearly.

Answer .....

.....

.....

..... [3]

7 **(a)** Express $x^2 - 2x + 3$ in the form $(x - a)^2 + b$.

Answer ..... [2]

(b) Hence state the minimum value of $x^2 - 2x + 3$.

Answer ..... [1]

(c) State the equation of the line of symmetry of the graph of $y = x^2 - 2x + 3$.

Answer ..... [1]

---

8 **(a)** Express 13 824 as a product of its prime factors.

Answer 13 824 = ... [1]

(b) Using your answer to part **(a)**, explain why 13 824 is a perfect cube.

Answer.....

.....

..... [1]

(c) Given that a and b are both prime numbers and $\frac{a}{b}<1$, find the values of a and b such that $\frac{a}{b}\times 13\ 824$ is a perfect square.

DANYAL EDUCATION

Answer a = ...

b = ... [2]

---

9 Solve the following simultaneous equations.

$$4x-y=-4$$
$$\frac{1}{3}y+x=\frac{5}{2}$$

Answer x = ...

y = ... [3]

---

10 A is the point $(-4, 2)$ and B is the point $(3, 0)$.

(a) Find the equation of the line AB.

Answer ..... [3]

(b) Find the length AB.

Answer .....units [2]

(c) State the number of points of intersection between the line AB and the line $y = \frac{1}{2}x + 1$. Explain your answer.

Answer.....

.....

..... [2]

11 Consider the sequence

$$1^2-5,\quad 2^2-7,\quad 3^2-9,\quad 4^2-11,\ \ldots$$

(a) Find an expression, in terms of n, for the nth term, T_n, of this sequence.

Answer T_n =..... [1]

(b) Evaluate T_8.

Answer T_8 =..... [1]

---

12 A and B are two geometrically similar objects such that

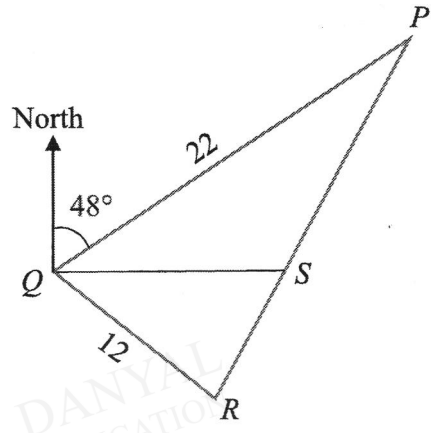
$$\frac{\text{surface area of } A}{\text{surface area of } B}=\frac{y}{y+7} \quad \text{and} \quad \frac{\text{volume of } A}{\text{volume of } B}=\frac{1}{8}.$$

Find the value of y.

Answer y = ... [3]

---

13 In the diagram below, $PQ = 22$ km, $QR = 12$ km, the bearing of P from Q is 048° and angle PQR is acute. S is due east of Q. The area of triangle PQR is thrice the area of triangle SQR. Find angle SQR.



Answer angle SQR =..... ° [3]

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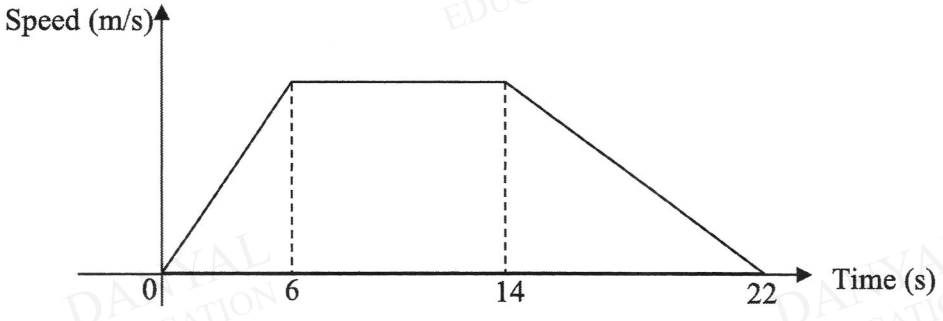
14 The diagram shows the speed-time graph of a racing car driving along a road.
The total distance travelled is 720 m.



(a) Calculate the maximum speed of the racing car.

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

(b) Find the deceleration in the last 8 seconds of the journey.

Answer ..... m/s^2 [1]

(c) Find the speed of the racing car at time $t = 16$ s.

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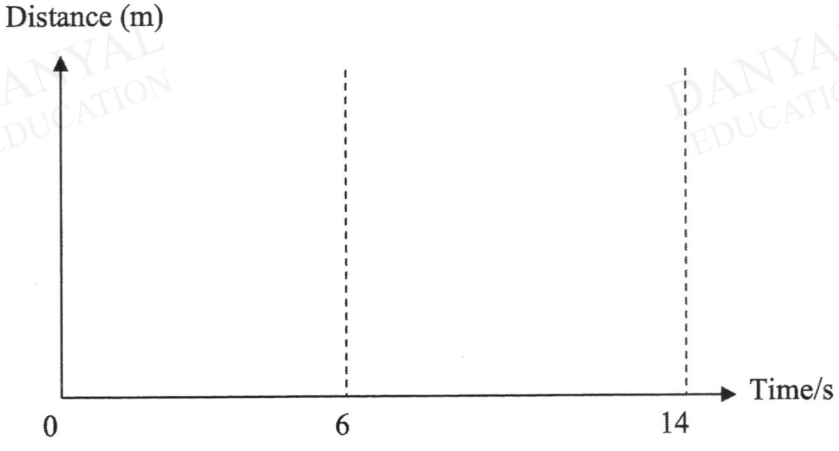
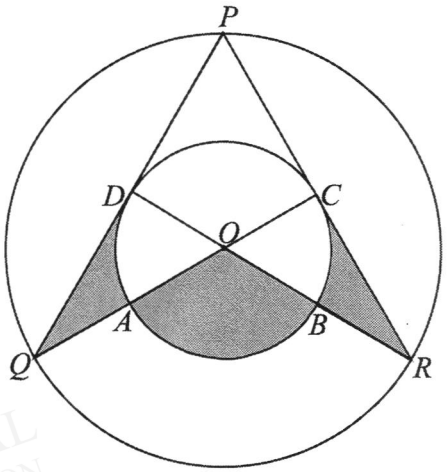
Answer ..... m/s [2]

(d) Sketch the distance-time graph for the first 14 seconds of the racing car's journey, in the axes provided below. [2]



15 In the diagram below, O is the centre of both circle $ABCD$ and circle PQR.

PQ and PR are tangents to the smaller circle at points D and C respectively.



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(a) Show that triangle PQC is congruent to triangle PRD.

Answer.....

.....

.....

..... [3]

(b) Show that triangle OCR is similar to triangle PDR.

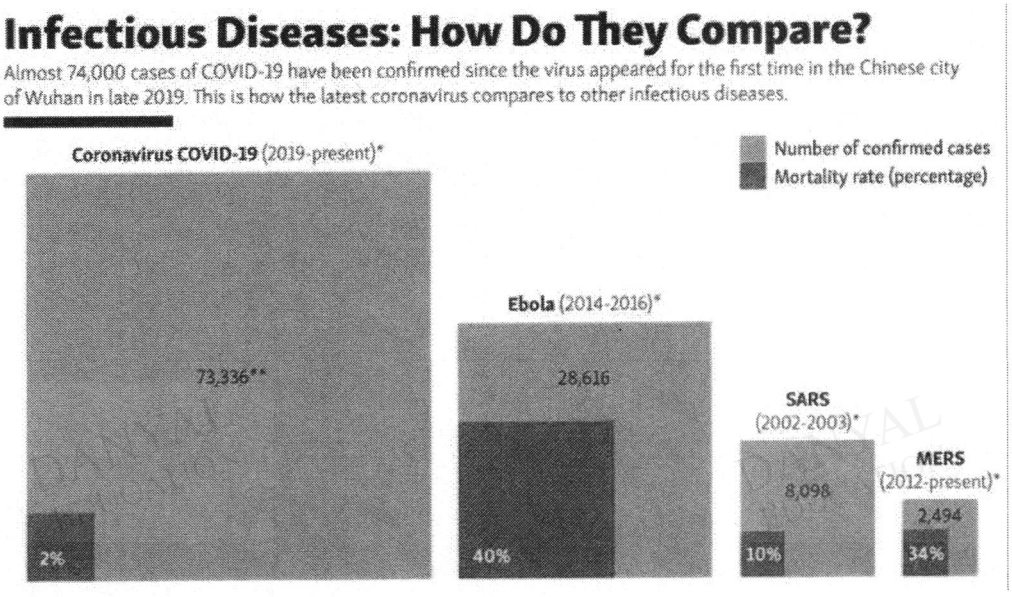
Answer.....

.....

.....

..... [2]

16 The infographic shown below provides a statistical comparison of the latest coronavirus to other infectious diseases which are similar in nature.



Explain why this infographic could be misleading in nature.

Answer.....

.....

.....

..... [2]

17 **(a)** The radius of planet A and B is approximately 6.95×10^5 km and 6×10^6 m. Find the difference in the diameter, in kilometres, of both the planets. Give your answer in standard form.

Answer..... km [2]

(b) **(i)** Factorise completely $(y-2)^3-4y+8$.

Answer ..... [2]

(ii) Hence, find the minimum value of $(y-2)^3-4y+8$ when $y\geq4$.

Answer ..... [1]

18 The test score of Class 4A consisting of 25 students is given in the stem-and-leaf diagram below.

Stem	Leaf						
4	0	2					
5	1	3	3				
6	3	4	8	8	8	9	
7	0	1	2	5	6	7	8
8	2	4	7	7	8		
9	3	5					

Legend: 4 | 0 represents 40.

(a) Find the median score.

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Answer ..... [1]

(b) Find the interquartile range.

DANYAL EDUCATION

Answer ..... [2]

(c) Find the modal score.

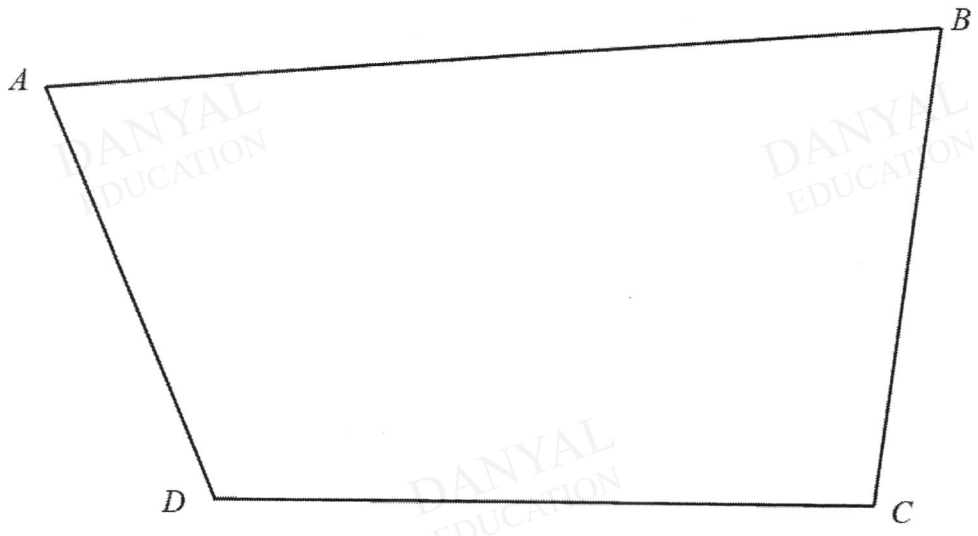
DANYAL EDUCATION

Answer ..... [1]

(d) A score of at least 76 is required for a student to obtain a distinction. Find the percentage of students in class 4A who obtained a distinction.

Answer ..... [1]

19 The diagram below shows a plot of farming land *ABCD*.



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(a) Construct the perpendicular bisector of *AB*. [1]

(b) Construct the bisector of angle *ADC*. [1]

(c) A water pump is to be installed at *ABCD* such that it is closer to the line *CD* than the line *AD*. Shade the region representing the area where the water pump can be installed. [1]

End of Paper

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ANDERSON SECONDARY SCHOOL
Preliminary Examination 2020
Secondary Four Express and Five Normal

CANDIDATE NAME:

CLASS: / INDEX NUMBER:

MATHEMATICS 4048/02

Paper 2

30 July 2020

2 hours 30 minutes

0800 – 1030h

Candidates answer on the Question Paper.

Additional Materials: Nil

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 an HB pencil for any diagrams or graphs.
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Answer all questions on the answer spaces 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 of the marks for this paper is **100**.

Setter: Ms Farn Haing Chieh

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

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Trigonometry

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

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

Statistics

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

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

1 **(a)** It is given that $\frac{2px+9qy}{2py+qx}=3$, p and q are constants and $2p \neq 3q$.

(i) Show that $x = 3y$. [2]

DANYAL EDUCATION

(ii) Evaluate $\frac{x+y}{y}$.

Answer _____ [2]

(b) Simplify $\dfrac{3a+7b}{16a^2-49(a+b)^2}$.

Answer _____ [3]

(c) Solve the equation $2^{x+3}=320-2^{x+1}$.

Answer $x =$ _____ [3]

2 The Singapore Indoor Stadium has a seating capacity of 12 000. For shows in February 2020, tickets for Disney on Ice are priced at $50 per adult and $35 per child.

(a) For one of the evening shows in February, 85% of the seats in the stadium are occupied. 3200 of the people present are children. Calculate the total amount of money collected from the sale of tickets for that evening.

Answer $_____ [2]

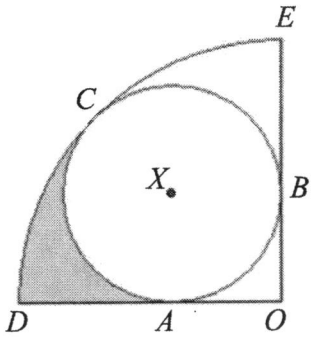
(b) In light of the Covid-19 situation, the price of the adult ticket for a show in February 2020 is 20% cheaper than a show in December 2019. Calculate the price of the adult ticket in December 2019.

Answer $_____ [2]

(c) The amount of money collected from the sales of tickets from one day in February 2020 was $375 000. This sum of money is divided among cost of operation, wages and profit in the ratio 3 : 5 : 7.
The profit is invested at a rate of 4% per annum compounded quarterly for a period of 2 years.
Calculate the compound interest earned.

Answer $_____ [3]

3 *ODE* is a quadrant with centre *O* and radius 6 cm.
ABC is a circle with centre *X* which touches the sides of the quadrant *ODE* at the points *A*, *B* and *C*.



(a) Show that the radius of the circle *ABC* is 2.49 cm, correct to 3 significant figures. [3]

(b) Find the length of the minor arc *AC*.

Answer _____ cm [3]

(c) Find the area of the shaded region.

Answer _____ cm^2 [3]

4 **(a)** It is given that $\varepsilon = \{x : x \text{ is a real number such that } 10 \leq x \leq 30\}$,
$A = \{x : x \text{ is a multiple of } 4\}$,
$B = \{x : x \text{ is a multiple of } 3\}$ and
$C = \{x : x \text{ is a multiple of } 12\}$.

(i) List all the elements in B.

Answer $B =$ _____ [1]

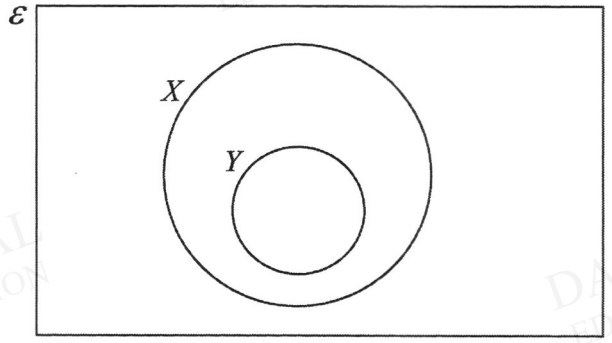
(ii) Find $\text{n}(A' \cap B')$.

Answer _____ [1]

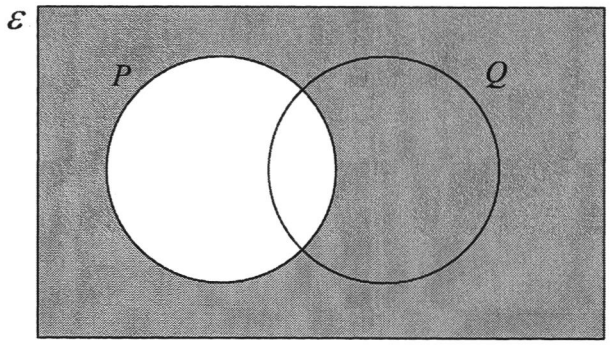
(iii) Write down, in set notation, the relationship between sets A, B and C.

Answer _____ [1]

(b) **(i)** On the Venn diagram shown in the answer space, shade the set $X' \cup Y$. [1]

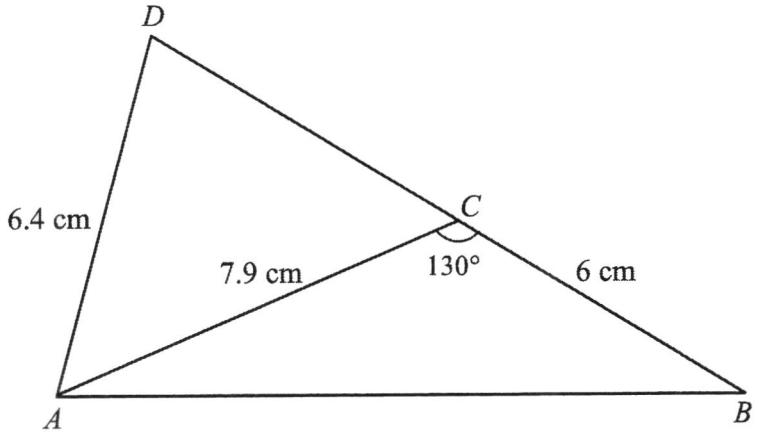


(ii) Use set notation to describe the set shaded in the Venn diagram below.



Answer _____ [1]

5



BCD is a straight line.
$AC = 7.9$ cm, $AD = 6.4$ cm and $BC = 6$ cm.
Angle $ACB = 130°$.

(a) Calculate *AB*.

Answer _____ cm [3]

(b) Calculate angle *ADC*.

Answer _____ [2]

(c) Calculate the shortest distance from *C* to *AB*.

Answer _____ cm [3]

6 The table shows the number of bottles of AndClean hand sanitizers, sold in three shops over the months of December 2019, January and February 2020.

	Selling Price ($)	December 2019	January 2020	February 2020
Shop A	3.80	280	320	345
Shop B	3.50	250	265	280
Shop C	4.00	190	235	290

The selling price of AndClean hand sanitizers in each of the three shops can be represented by the matrix $\mathbf{P} = \begin{pmatrix} 3.80 & 3.50 & 4.00 \end{pmatrix}$.

(a) Write down a 3×3 matrix **Q** to represent the number of bottles of AndClean hand sanitizers sold in each of the three shops over the three months.

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Answer **Q** = _____ [1]

(b) **(i)** State a 3×1 matrix **R** such that the product **QR** represents the total number of AndClean hand sanitizers sold in each shop for the three months.

DANYAL EDUCATION

Answer **R** = _____ [1]

(ii) Evaluate the product **QR**.

DANYAL EDUCATION

Answer **QR** = _____ [1]

(c) Given that the cost price of a bottle of AndClean hand sanitizers is \$2.60, show that the profit each shop makes for selling a bottle of AndClean is given by $\mathbf{S} = \begin{pmatrix} 1.20 & 0.90 & 1.40 \end{pmatrix}$. [1]

(d) **(i)** Evaluate the matrix $\mathbf{T} = \mathbf{S(QR)}$.

Answer $\mathbf{T} =$ _____ [1]

(ii) Explain what the elements in **T** represent.

Answer _____

_____

_____ [1]

(e) The World Health Organisation classified Covid-19 as a pandemic in March 2020. The number of bottles of AndClean hand sanitizers sold in March 2020 increased by 40% across all 3 shops as compared to February 2020.

Using scalar multiplication, find the number of bottles of AndClean sold in each of the three shops in March 2020.

Answer _____ [2]

7 The variables x and y are connected by the equation $y = \frac{1}{5}x^3 - \frac{4}{5}x^2$.

Some corresponding values of x and y are given in the following table.

x	–2	–1	0	1	2	3	4	5
y	–4.8	–1	0	–0.6	p	–1.8	0	5

(a) Calculate the value of p.

DANYAL EDUCATION

Answer $p =$ _____ [1]

(b) Using a scale of 2 cm to 1 unit, draw a horizontal x-axis for $-2 \le x \le 5$.
Using a scale of 2 cm to 1 unit, draw a vertical y-axis for $-5 \le y \le 5$.
On the grid provided, plot the points given in the table and join them with a smooth curve. [3]

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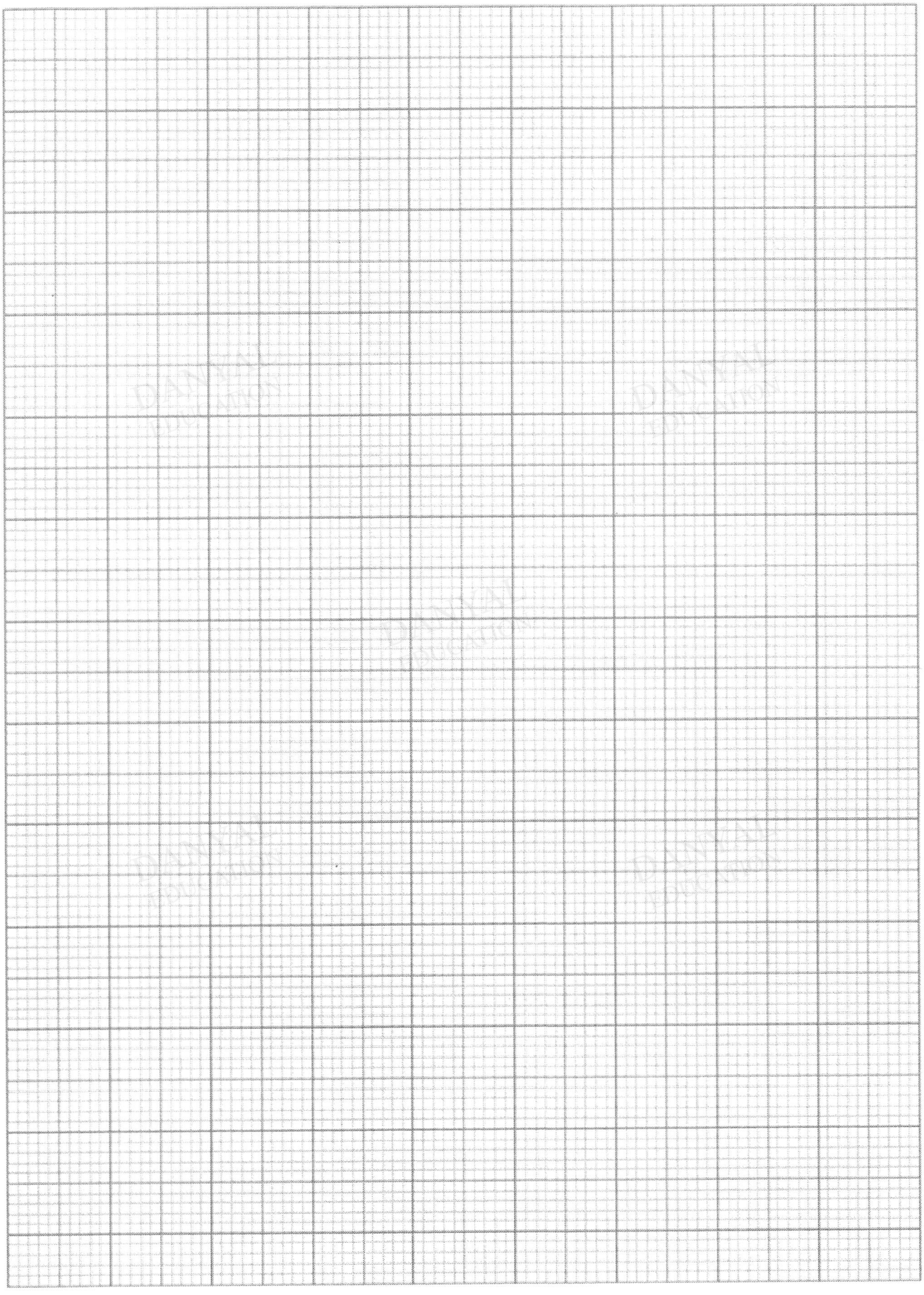


(c) Use your graph to solve the equation $\frac{1}{5}x^3 - \frac{4}{5}x^2 - 2 = 0$.

Answer $x =$ _____ [2]

(d) By drawing a tangent, find the gradient of the curve at the point (4, 0).

DANYAL EDUCATION DANYAL EDUCATION

Answer _____ [2]

(e) **(i)** On the same axes, draw the line $y = 4 - 2x$ for $0 \leq x \leq 5$. [1]

(ii) Write down the x-coordinate of the point where this line intersects the curve.

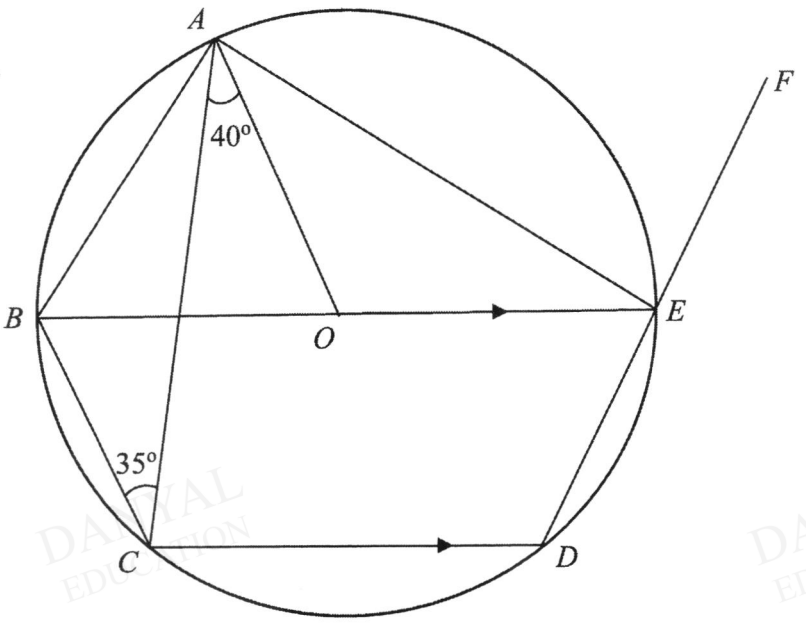
DANYAL EDUCATION DANYAL EDUCATION

Answer _____ [1]

(iii) This value of x is a solution of the equation $x^3 - 4x^2 + Ax + B = 0$.
Find the value of A and of B.

Answer $A =$ _____, $B =$ _____ [3]

8



A, B, C, D and E are points on the circle, with centre O.
The diameter of the circle, BE, is parallel to CD.
Angle $OAC = 40°$ and angle $ACB = 35°$.
DEF is a straight line.

Find, giving reasons for each answer,

(a) angle OEA,

Answer _____ [1]

(b) reflex angle AOB,

Answer _____ [2]

(c) angle *BAC*,

Answer _____ [2]

(d) angle *FEB*,

Answer _____ [2]

(e) angle *DOE*.

Answer _____ [2]

9 **(a)** Students from three classes A, B and C took a Mathematics examination and their mean marks and standard deviation were recorded in the table.

Class	Number of students	Mean mark	Standard deviation
A	15	85.4	0.313
B	10	86.5	2.128
C	14	75	0

(i) State how it may be deduced from the data that the mark scored by each student in class C was 75 marks.

Answer _____

_____

_____

_____

_____ [2]

(ii) Compare the performance of the classes.

Answer _____

_____

_____

_____

_____ [2]

(iii) A new student Raymond joined class C and the standard deviation of the marks of class C changed to 2.30. Find the possible values of Raymond's marks, giving your answer correct to the nearest whole number.

Answer _____ or _____ [4]

(b) A box contains 8 cards, numbered '1' to '8' respectively. A card is drawn with replacement from the box until an '8' is obtained. Find the probability that

(i) the first draw was **not** an '8',

Answer _____ [1]

(ii) it will take exactly n draws to obtain an '8', giving your answer in terms of n,

Answer _____ [1]

(iii) it will take at least n draws to obtain an '8', giving your answer in terms of n.

Answer _____ [1]

(c) Krystal said that since she has not drawn an '8' for the last 15 draws, her next draw will likely be an '8'. Comment on the validity of her statement.

Answer _____

_____

_____

_____

_____ [2]

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10 The volume of mixture required to make one cookie is 15 cm^3.

(a) The mixture is first rolled into a sphere before baking.
Calculate the radius of the sphere.

DANYAL EDUCATION DANYAL EDUCATION

Answer _____ cm [2]

(b) After it is baked, the cookie takes the shape of a cylinder of radius 3 cm and height of 6 mm due to air trapped in the cookie during baking.

(i) Calculate the volume of air trapped in the cookie.

DANYAL EDUCATION DANYAL EDUCATION

Answer _____ cm^3 [2]

(ii) Express this volume of air as a percentage of the total volume of the cookie.

Answer _____ % [1]

(c) The cookies are then packed into a box in the shape of a regular hexagon which can contain 7 cookies.
The cross-section of the box is as shown in Figure 1.

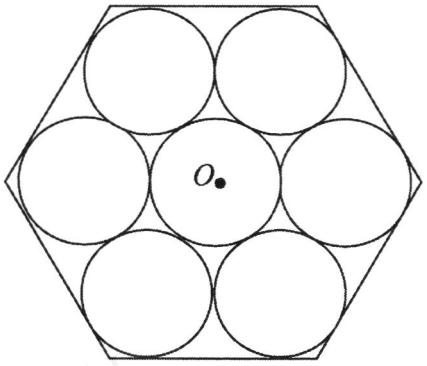

Figure 1

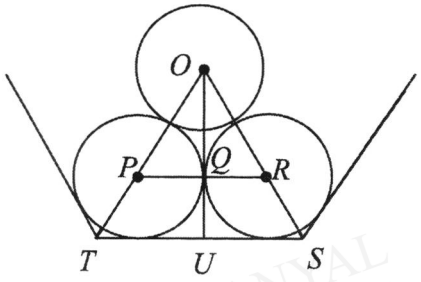

Figure 2

Three of the cookies are shown in Figure 2.
O is the centre of the hexagonal box and P and R are the centres of two cookie as shown in Figure 2. Q is the point where the two cookies touch and U is the midpoint of TS, a side of the box.

(i) Calculate the length of OP.

Answer _____ cm [1]

(ii) Calculate the length of OQ.

Answer _____ cm [2]

(iii) Calculate the length of one side of the box.

Answer _____ cm [2]

11 The interior of a chest freezer as shown in Figure *A* can be modelled as a cuboid with length and height of 100 cm and a width of 55 cm as shown in Figure *B*.

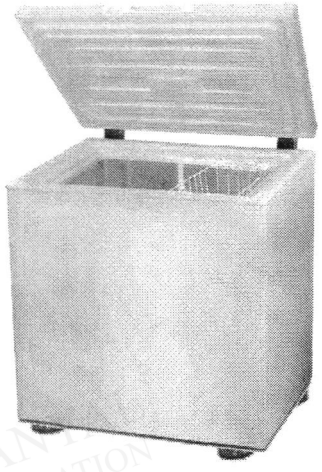

Figure *A*

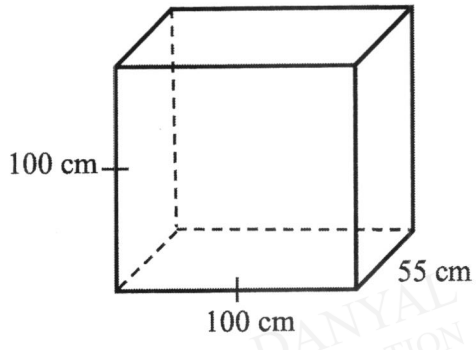

Figure *B*

Cool air must be circulated inside the freezer at any time.
When cool air meets the warm and humid air that is outside of the freezer, frost is formed at the point of contact.
To allow the freezer to work efficiently, defrosting is required when the layer of frost exceeds 1 cm.

(a) Due to the opening and closing of the freezer door, frost of x cm is formed uniformly on the four vertical walls of the freezer. The area of the horizontal base of the freezer not covered by the frost is $105(50-x)$ cm^2.

Explain if defrosting is required and show your calculations clearly.

Answer _____

_____

_____ [4]

(b) Kara wants to design a box that can contain the freezer for shipping.
There must be free space between the freezer and the box to allow for ease of removal and addition of protective materials to prevent scratches.

It is recommended to have a minimum distance of 2 cm of free space around the sides and a minimum distance of 3 cm of free space at the top.
The thickness of the freezer wall and door of the freezer is 3.5 cm.

Find the smallest dimensions of the box required. State one assumption made in your calculation.

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Answer Length = _____ cm [1]

Height = _____ cm [1]

Width = _____ cm [1]

Assumption : _____

_____

_____

_____ [1]

END OF PAPER

Answer Key:

1. Smallest = 35 000 Largest = 44 999 **2a.** $(x-3y+1)(x-3y-1)$ **2b.** $\dfrac{14-3x}{3(x-4)^2}$

3a. 2.5 **3b.** Sketch **4a.** 1 : 300 000 **4b.** 100 cm^2

5a. $x \geq 168$ **5b.** $x=2$ or $x=-1$ **6a.** $\dfrac{5y^2}{x^3}$ **6b.** $x=4$ **6c.** 2 solutions

7a. $(x-1)^2+2$ **7b.** 2 **7c.** $x=1$ **8a.** $13824 = 2^9 \times 3^3$

8b. Can write as cube of another no' **8c.** $a=2,\ b=3$ **9.** $x=\dfrac{1}{2}$ & $y=6$

10a. $y=-\dfrac{2}{7}x+\dfrac{6}{7}$ or $7y=-2x+6$ **10b.** 7.28 units

10c. Different gradient, one pt of intersection **11a.** $T_n = n^2-(2n+3)$ or $T_n = n^2-2n-3$

11b. 45 **12.** $y=\dfrac{7}{3}$ **13.** $\angle SQR = 37.8°$ **14a.** $v=48$ **14b.** 6 m/s^2 **14c.** 36

14d. Sketch **15a.**

$\angle QPC = \angle RPD$ (common $\angle$), $\angle RDP = 90^0$ (tan $\perp$ rad)

$\angle QCP = 90^0$ (tan $\perp$ rad), $\therefore \angle RDP = \angle QCP$

$PD = PC$ (tangents from an external point)

Hence by ASA test, it is shown that ΔPQC is congruent to ΔPRD.

15b.

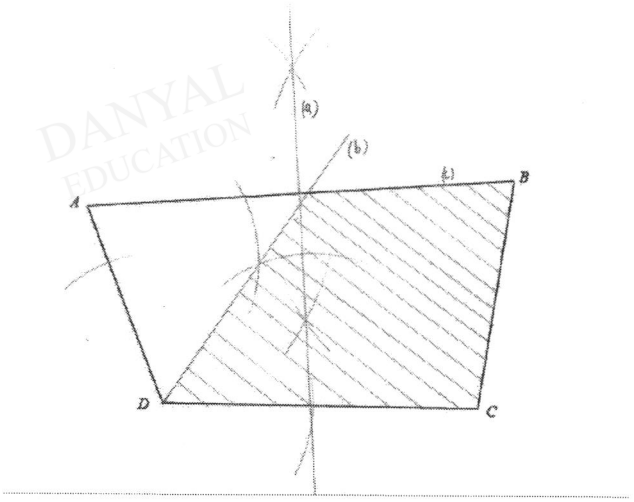
$\angle OCR = \angle PDR = 90°$ (tan $\perp$ rad) , $\angle ORC = \angle PRD$ (common $\angle$)

Hence, by AA test, it is shown that ΔOCR is similar to ΔPDR.

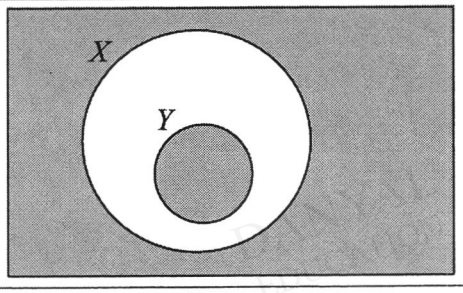
16. Area of the shaded square representing mortality rate is not in proportion to the percentage quoted or the number of confirmed cases quoted.(with specific data quoted)

17a. 1.378×10^6 km **17bi.** $y(y-2)(y-4)$ **17bii.** 0 **18a.** 71 **18b.** 19.5 **18c.** 68 **18d.** 40%

19.



MATHEMATICS PAPER 2 ANSWER KEY

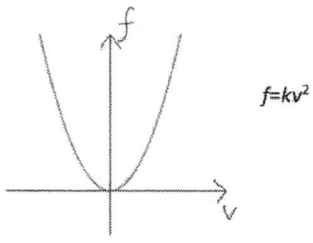
aQuestion		Solution
1	(a)(i)	*As shown*
	(a)(ii)	4
	(b)	$-\frac{1}{11a+7b}$
	(c)	5
2	(a)	$462000
	(b)	$62.50
	(c)	$14499.92 (to nearest cent)
3	(a)	*As shown*
	(b)	5.86 cm
	(c)	3.77 cm^2
4	(a) (i)	$B = \{12, 15, 18, 21, 24, 27, 30\}$
	(a)(ii)	$n(A' \cap B') = 11$
	(a)(iii)	$A \cap B = C$
	(b)(i)	$\mathcal{E}$ 
	(b)(ii)	P'
5	(a)	12.6 cm (to 3 s.f)
	(b)	71.0° (to 1 dp)
	(c)	2.88 cm
6	(a)	$\mathbf{Q} = \begin{pmatrix} 280 & 320 & 345 \\ 250 & 265 & 280 \\ 190 & 235 & 290 \end{pmatrix}$
	(b)(i)	$\mathbf{R} = \begin{pmatrix} 1 \\ 1 \\ 1 \end{pmatrix}$
	(b)(ii)	$\begin{pmatrix} 945 \\ 795 \\ 715 \end{pmatrix}$
	(c)	*As shown*
	(d)(i)	(2850.50)
	(d)(ii)	**T** represents the total amount of profit generated from the sales of AndClean hand sanitizers in all the 3 shops over the three months.

	(e)	$\begin{pmatrix} 483 \\ 392 \\ 406 \end{pmatrix}$
7	(a)	$p = -1.6$
	(c)	$x = 4.5$
	(d)	21
	(e)(ii)	$x = 2.9$
	(e)(iii)	$A = 10,\ B = -20$
8	(a)	35°
	(b)	290°
	(c)	15°
	(d)	105°
	(e)	30°
9	(a)(i)	The mean mark of class C was 75. Since the standard deviation of the class was zero, all students scored the same marks of 75.
	(a)(ii)	Class B had the best performance as the mean mark was the highest at 86.5. Class B also had the highest inconsistency in the scores at the standard deviation was the greatest at 2.128.
	(a)(iii)	$a = 84$ or $a = 66$
	(b)(i)	$\frac{7}{8}$
	b(ii)	$\left(\frac{7}{8}\right)^{n-1}\left(\frac{1}{8}\right)$
	b(iii)	$\left(\frac{7}{8}\right)^{n-1}$
	(c)	Not valid
10	(a)	1.53 cm
	(b)(i)	1.96 cm (to 3 sf)
	(b)(ii)	11.6% (to 3 sf)
	(c)(i)	6 cm
	(c)(ii)	5.20 cm (to 3 sf)
	(c)(iii)	9.46 cm
11	(a)	Defrosting required
	(b)	111 cm, 110 cm, 66 cm

4048/01 Mathematics Paper 1

Preliminary Examination 2020 Mark Scheme

Qn	Solution	Marks	Total Marks
1	Smallest = 35 000 Largest = 44 999	B1 B1	2
2a	$x^2+9y^2-6xy-1$ $=(x-3y)^2-1$ $=(x-3y+1)(x-3y-1)$	 M1 A1	2
2b	$\frac{2}{3(x-4)^2}+\frac{1}{4-x}=\frac{2}{3(x-4)^2}-\frac{1}{x-4}$ $\frac{2}{3(x-4)^2}-\frac{1}{x-4}=\frac{2-3(x-4)}{3(x-4)^2}$ $=\frac{14-3x}{3(x-4)^2}$ **Alternative Method:** $\frac{2}{3(x-4)^2}+\frac{1}{4-x}=\frac{2}{3(4-x)^2}+\frac{1}{4-x}$ $\frac{2}{3(4-x)^2}+\frac{1}{4-x}=\frac{2+3(4-x)}{3(4-x)^2}$ $=\frac{14-3x}{3(4-x)^2}$	 M1 A1 M1 M1 A1	2
3a	$v=\frac{k}{t^3}$ $v_{new}=\frac{k}{(2t)^3}$ $=\frac{k}{8t^3}$ $=\frac{1}{8}v$ $=\frac{1}{8}\times 20$ $=2.5$	 M1 M1 A1	3

3b		B1	1
4a	$4\ \text{cm}^2 : 36\ \text{km}^2$ $1\ \text{cm}^2 : 9\ \text{km}^2$ $1\ \text{cm} : 3\ \text{km}$ $1 : 300\ 000$	 M1 A1	2
4b	$1 : 60\ 000$ $1\ \text{cm} : 0.6\ \text{km}$ $1\ \text{cm}^2 : 0.36\ \text{km}^2$ $36 \div 0.36 = 100\ \text{cm}^2$ **Alternative Method:** Let x be the area of the town on the second map. $x : 36 = 1 : 0.6^2$ $\frac{x}{36} = \frac{1}{0.36}$ $x = \frac{36}{0.36}$ $x = 100$	 M1 A1 M1(for squaring the values) A1	2
5a	When $9 - 5x < 2 - \frac{x}{4}$, $9 - 5x < \frac{8 - x}{4}$ $36 - 20x < 8 - x$ $-19x < -28$ $x > 1\frac{9}{19}$	 M1	3

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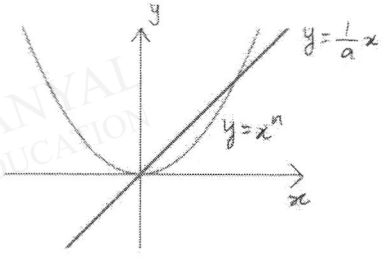
	When $2-\frac{x}{4} \le \frac{x}{3}-\frac{4x}{7}$, $\frac{8-x}{4} \le \frac{7x-12x}{21}$ $21(8-x) \le 4(-5x)$ $168-21x \le -20x$ $x \ge 168$ Hence, $x \ge 168$.	M1 A1	
5b	$\frac{3}{(2x-1)^2} = \frac{1}{3}$ $(2x-1)^2 = 9$ $2x-1=3$ or $2x-1=-3$ When $2x-1=3$, $2x=4$ $x=2$ When $2x-1=-3$, $2x=-2$ $x=-1$ Hence $x=2$ or $x=-1$.	M1 A1 (for both answers)	2
6a	$\left(\frac{x^6}{25y^4}\right)^{-\frac{1}{2}} = \left(\frac{25y^4}{x^6}\right)^{\frac{1}{2}}$ $= \frac{5y^2}{x^3}$ **Alternative Method:** $\left(\frac{x^6}{25y^4}\right)^{-\frac{1}{2}} = \frac{x^{-3}}{5^{-1}y^{-2}}$ $= \frac{5y^2}{x^3}$	M1 A1 M1 A1	2

6b	$9\sqrt[3]{3^{3x}} = \dfrac{1}{3^{3(2-x)}}$ $3^2 \times 3^x = \dfrac{1}{3^{6-3x}}$ $3^{2+x} = 3^{-6+3x}$ $2+x = -6+3x$ $-2x = -8$ $x = 4$	 M1 M1 A1	3
6c	$x(ax^{n-1}-1) = 0$ $x = 0$ or $ax^{n-1}-1 = 0$ When $ax^{n-1}-1 = 0$, $ax^{n-1} = 1$ If n is even, $n-1$ is odd. Hence, $ax^{n-1} = 1$ will have 1 solution. There will be a total of 2 solutions for the given equation. **Alternative Method:** $ax^n = x$ $x^n = \dfrac{1}{a}x$ When n is even, we will have a curve and a straight line as seen below.  Hence, there will be 2 solutions for the given equation.	M1 M1 A1 M1, M1 (1 mark for each sketch) A1	3
7a	$x^2-2x+3 = x^2-2x+3+(-1)^2-(-1)^2$ $=(x-1)^2+2$	M1 A1	2
7b	Minimum value= 2	B1	1
7c	$x=1$	B1	1

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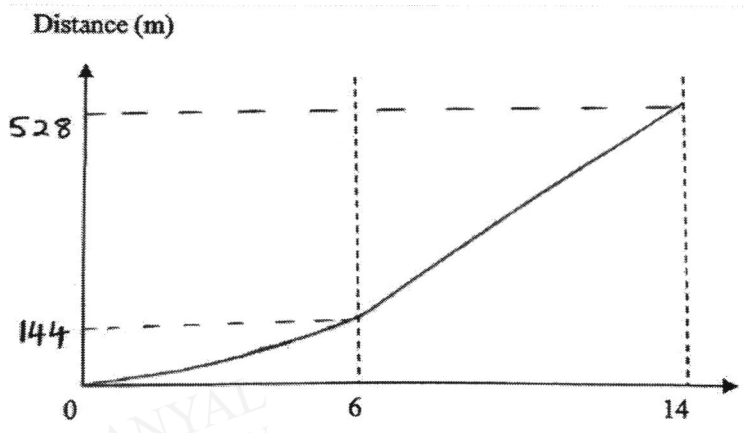
8a	$2\overline{\vert 13824}$ $2\overline{\vert 6912}$ $2\overline{\vert 3456}$ $2\overline{\vert 1728}$ $2\overline{\vert 864}$ $2\overline{\vert 432}$ $2\overline{\vert 216}$ $2\overline{\vert 108}$ $2\overline{\vert 54}$ $3\overline{\vert 27}$ $3\overline{\vert 9}$ $3\overline{\vert 3}$ 1 $13824 = 2^9 \times 3^3$	B1	1
8b	Since $13824 = (2^3 \times 3)^3$, 13824 can be written as a cube of another number.	B1	1
8c	$a = 2$, $b = 3$	B1 B1	2
9	$4x - y = -4$ ---------- (1) $\frac{1}{3}y + x = \frac{5}{2}$ ---------- (2) From (2), $x = \frac{5}{2} - \frac{1}{3}y$ ---------- (3) Sub (3) into (1): $4\left(\frac{5}{2} - \frac{1}{3}y\right) - y = -4$ $10 - \frac{4}{3}y - y = -4$ $-\frac{7}{3}y = -14$ $y = 6$ Sub $y = 6$ into (2): $x = \frac{5}{2} - \frac{1}{3} \times 6$ $= \frac{1}{2}$ Hence, $x = \frac{1}{2}$ & $y = 6$.	M1 M1 A1	3

DANYAL EDUCATION

10a	gradient $= \dfrac{2-0}{-4-3}$ $= -\dfrac{2}{7}$ $y-0=-\dfrac{2}{7}(x-3)$ $y=-\dfrac{2}{7}x+\dfrac{6}{7}$ or $7y=-2x+6$ **Alternative Method:** $\dfrac{y-0}{x-3}=\dfrac{2-0}{-4-3}$ $y=-\dfrac{2}{7}x+\dfrac{6}{7}$	M1 M1 A1 M1 A2	3
10b	length of $AB=\sqrt{(-4-3)^2+(2-0)^2}$ $=\sqrt{53}$ units $= 7.28$ units	M1 A1	2
10c	Since both the lines have a <u>different gradient</u>, they are not parallel. Hence, there will be <u>one point of intersection</u> between both the lines.	B2 (No marks for answers without reasoning)	2
11a	$T_n = n^2-(2n+3)$ or $T_n = n^2-2n-3$	B1	1
11b	$T_8 = 8^2-(2\times 8+3)$ $= 64\ -19$ $= 45$	B1	1

12	$\frac{l_1}{l_2} = \sqrt[3]{\frac{1}{8}}$ $= \frac{1}{2}$ $\frac{A_1}{A_2} = \left(\frac{1}{2}\right)^2$ $= \frac{1}{4}$ $\frac{y}{y+7} = \frac{1}{4}$ $4y = y+7$ $3y = 7$ $y = \frac{7}{3}$	M1 M1 A1	3
13	Area of $\Delta SQR = 2 \times$ Area of ΔPQS $\frac{\text{area of } \Delta SQR}{\text{area of } \Delta PQS} = \frac{1}{2}$ $\frac{\frac{1}{2} \times 12 \times QS \times \sin SQR}{\frac{1}{2} \times 22 \times QS \times \sin 42°} = \frac{1}{2}$ $12 \sin SQR = 11 \sin 42°$ $\angle SQR = 37.8°$	 M1 M1 A1	3
14a	Let v be maximum speed. $720 = \frac{1}{2} \times 6 \times v + 8 \times v + \frac{1}{2} \times (8 \times v)$ $= 3v + 8v + 4v$ $15v = 720$ $v = 48$	M1 A1	2
14b	deceleration $= \frac{48 \text{ m/s}}{8 \text{ s}}$ $= 6 \text{ m/s}^2$	 B1	1
14c	Let x be speed of car at $t = 16$. $6 = \frac{48 - x}{2}$ $12 = 48 - x$ $x = 36$	M1 A1	2

14d		B2 (award 1 mark if distance is not written and shape of graph is correct)	2
15a	$\angle QPC = \angle RPD$ (common $\angle$) $\angle RDP = 90^0$ (tan $\perp$ rad) $\angle QCP = 90^0$ (tan $\perp$ rad) $\therefore \angle RDP = \angle QCP$ $PD = PC$ (tangents from an external point) Hence by ASA test, it is shown that ΔPQC is congruent to ΔPRD. **Alternative Solution:** $CQ = DR$(sum of radius of circle) $\angle PCQ = \angle PDR = 90^0$ (tan $\perp$ rad) $PD = PC$ (tangents from an external point) Hence by SAS test, it is shown that ΔPQC is congruent to ΔPRD.	B1 B1 B1 B1 B1 (for both) B1	3
15b	$\angle OCR = \angle PDR = 90°$ (tan $\perp$ rad) $\angle ORC = \angle PRD$ (common $\angle$) Hence, by AA test, it is shown that ΔOCR is similar to ΔPDR.	B1 B1	2
16	Area of the shaded square representing mortality rate is not in proportion to the percentage quoted or the number of confirmed cases quoted. **Supporting reason (in terms of percentage):** The mortality rate for COVID-19 is 2% while the mortality rate for SARS is 10% but the area of the shaded square is smaller for SARS. **OR** The mortality rate for Ebola is 40% while the mortality rate for MERS is 34% yet, the area of the shaded square for MERS is so much smaller than that of the shaded square for Ebola. **Supporting reason (in terms of number of confirmed cases)**: The number of COVID-19 confirmed cases is 73,336 which is more than double the	B2 (Any one of the supporting reason is sufficient) Award B1 if no exact data is quoted	2

	number of Ebola cases. However, the area of the unshaded square for the case of COVID-19 is not double the area of the unshaded square for the case of Ebola.	from the infograph.	
17a	$(2\times 6.95\times 10^5)-(2\times 6\times 10^6\div 10^3)=1378000$ $=1.378\times 10^6$ km	M1 (for calculation) A1 for answer in standard form	2
17bi	$(y-2)^3-4(y-2)=(y-2)[(y-2)^2-4]$ $=(y-2)(y-2-2)(y-2+2)$ $=y(y-2)(y-4)$	M1 A1	2
17bii	Since $y\geq 4$, minimum value of $y(y-2)(y-4)$ will be 0.	B1	1
18a	Median = 71	B1	1
18b	Lower quartile = 63.5 Upper quartile = 83 Interquartile range $=83-63.5$ $=19.5$	M1 A1	2
18c	Modal score = 68	B1	1
18d	Percentage distinction $=\frac{10}{25}\times 100\%$ $=40\%$	B1	1
19a	Refer to diagram attached.		
19b	Refer to diagram attached.		
19c	Refer to diagram attached.		

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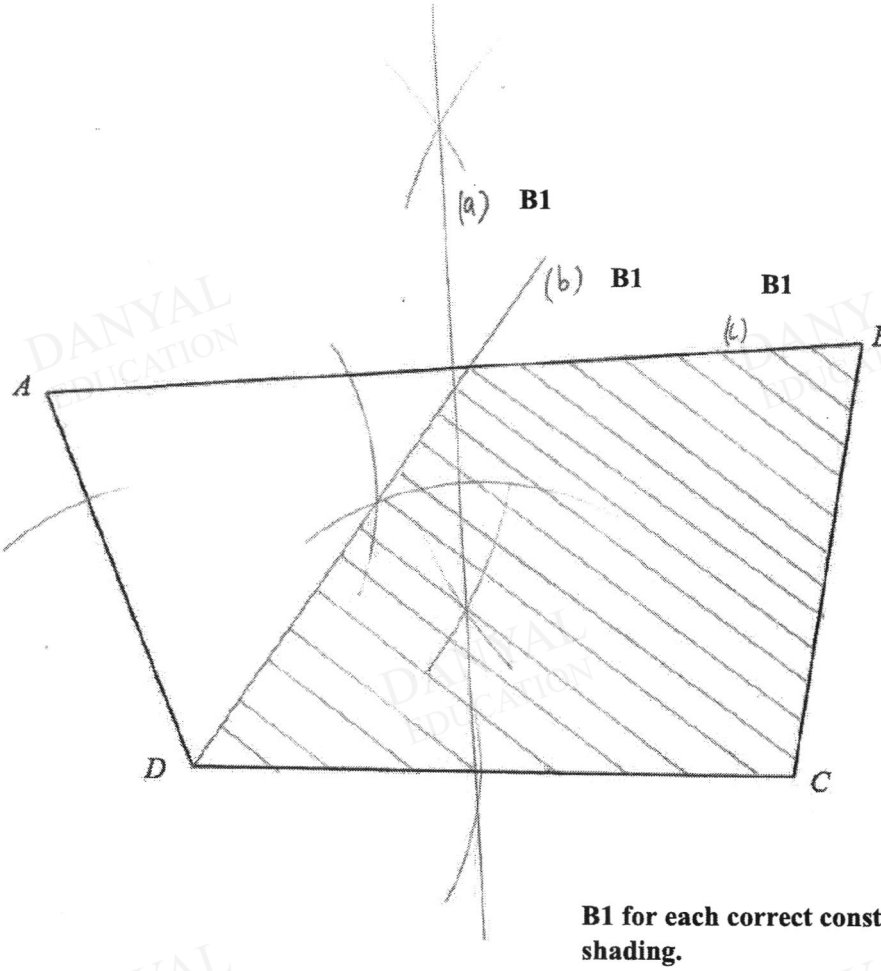
19 The diagram below shows a plot of farming land *ABCD*.



B1 for each correct construction / shading.

DANYAL EDUCATION

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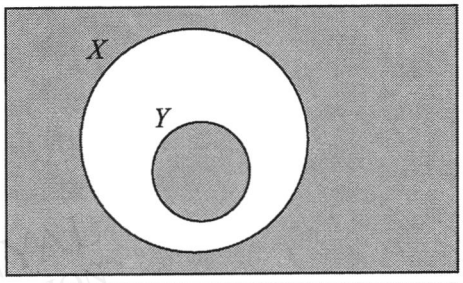
ANDERSON SECONDARY SCHOOL
Prelim Examination 2020
Secondary Four Express and Five Normal

Marking Scheme

MATHEMATICS **4048/02**

Question		Solution	Mark	Remarks
1	(a)(i)	$\frac{2px+9qy}{2py+qx}=3$ $2px+9qy=6py+3qx$ $2px-3qx=6py-9qy$ $x(2p-3q)=3y(2p-3q)$ Since $2p\neq 3q$, $2p-3q\neq 0$ $x=3y$ (shown)	[M1] [A1]	
	(a)(ii)	$\frac{x}{y}=3$ $\frac{x+y}{y}=\frac{x}{y}+1$ $=3+1$ $=4$	[M1] [A1]	
	(b)	$\frac{3a+7b}{16a^2-49(a+b)^2}=\frac{3a+7b}{[4a+7(a+b)][4a-7(a+b)]}$ $=\frac{3a+7b}{(11a+7b)(-3a-7b)}$ $=-\frac{1}{11a+7b}$	[M1] [M1] [A1]	
	(c)	$2^{x+3}=320-2^{x+1}$ $2^{x+1}+2^{x+3}=320$ $2^x\times 2+2^x\times 2^3=320$ $2^x(2+8)=320$ $2^x=32$ $=2^5$ $x=5$	[M1] [M1] [A1]	

2	(a)	Total tickets sold $= \frac{85}{100}(12000)$ $= 10200$ Total amount from sales $= 35(3200) + 50(10200 - 3200)$ $= \$462000$	[M1] [A1]	
	(b)	Cost of Dec 2019 show for an adult $= \frac{100}{80} \times 50$ $= \$62.50$	[M1] [A1]	
	(c)	Profit $= \frac{7}{15}(375000)$ $= \$175000$ Compound Interest $= 175000\left(1 + \frac{4/4}{100}\right)^{2\times4} - 175000$ $= \$14499.92$ (to nearest cent)	[M1] [M1] [A1]	
3	(a)	Let the radius of circle ABC be r cm. $OX^2 = OA^2 + AX^2$ $(6-r)^2 = r^2 + r^2$ $36 - 12r + r^2 = 2r^2$ $r^2 + 12r - 36 = 0$ $r = \frac{-12 \pm \sqrt{12^2 - 4(1)(-36)}}{2}$ $= \frac{-12 \pm \sqrt{288}}{2}$ Since $r \geq 0$, $r = 2.485$ Radius of circle ABC is 2.49 cm.	[M1] [M1] [A1]	
	(b)	Angle $AXC = \frac{1}{2}(360^\circ - 90^\circ) = 135^\circ$ Length of minor arc $AC = \frac{135^\circ}{360^\circ} \times 2\pi(2.485)$ $= 5.855$ $= 5.86$ cm	[M1] [M1] [A1]	
	(c)	Area of shaded region = Area of sector OCD – Area of minor sector AXC – Area of ΔOAX $= \frac{45^\circ}{360^\circ} \times \pi(6^2) - \frac{135^\circ}{360^\circ} \times \pi(2.485^2) - \frac{1}{2} \times 2.485^2$ $= 3.7745$ $= 3.77$ cm^2	[M2] [A1]	

4	(a) (i)	$B = \{12, 15, 18, 21, 24, 27, 30\}$	[B1]	
	(a)(ii)	$A' \cap B' = \{10, 11, 13, 14, 17, 19, 22, 23, 25, 26, 29\}$ $n(A' \cap B') = 11$	[B1]	
	(a)(iii)	$A \cap B = C$	[B1]	
	(b)(i)	$\mathcal{E}$  	[B1]	
	(b)(ii)	P'	[B1]	Award B1 if correct answer even if not simplified
5	(a)	$AB = \sqrt{7.9^2 + 6^2 - 2(7.9)(6)\cos 130^o}$ $= 12.62324306$ $= 12.6$ cm (to 3 s.f)	[M2] [A1]	
	(b)	$\frac{\sin\ (\text{angle } ADC)}{7.9} = \frac{\sin 50°}{6.4}$ angle $ADC = 71.011°$ $= 71.0°$ (to 1 dp)	[M1] [A1]	
	(c)	Area of triangle $ABC = \frac{1}{2}(7.9)(6)\sin 130°$ $= 18.155$ cm^2 Let the perpendicular distance from C to AB be d cm. $\frac{1}{2}AB(d) = 18.155$ $d = \frac{18.155}{0.5(12.623)}$ $= 2.876$ $= 2.88$ cm Shortest distance from C to AB $= 2.88$ cm	[M1] [M1] [A1]	

6	(a)	$\mathbf{Q} = \begin{pmatrix} 280 & 320 & 345 \\ 250 & 265 & 280 \\ 190 & 235 & 290 \end{pmatrix}$	[B1]	
	(b)(i)	$\mathbf{R} = \begin{pmatrix} 1 \\ 1 \\ 1 \end{pmatrix}$	[B1]	
	(b)(ii)	**QR** $= \begin{pmatrix} 280 & 320 & 345 \\ 250 & 265 & 280 \\ 190 & 235 & 290 \end{pmatrix} \begin{pmatrix} 1 \\ 1 \\ 1 \end{pmatrix}$ $= \begin{pmatrix} 945 \\ 795 \\ 715 \end{pmatrix}$	[B1]	
	(c)	$S = (3.80 \quad 3.50 \quad 4.00) - (2.60 \quad 2.60 \quad 2.60)$ $= (1.20 \quad 0.90 \quad 1.40)$ [shown]	[B1]	
	(d)(i)	**T = S(QR)** $= (1.20 \quad 0.90 \quad 1.40) \begin{pmatrix} 945 \\ 795 \\ 715 \end{pmatrix}$ $= (2850.50)$	[B1]	
	(d)(ii)	**T** represents the total amount of profit generated from the sales of AndClean hand sanitizers in all the 3 shops over the three months.	[B1]	
	(e)	$1.4 \begin{pmatrix} 345 \\ 280 \\ 290 \end{pmatrix}$ $= \begin{pmatrix} 483 \\ 392 \\ 406 \end{pmatrix}$	[M1] [A1]	Accept row matrix, Award 1M if scalar multiplication poorly expressed but used. Award 0 if matrix multiplication used
7	(a)	$p = -1.6$	[B1]	
	(b)	All points plotted correctly Smooth curve passing through all points Correct scale used with labels	[M1] [M1] [M1]	

	(c)	Draw line of $y = 2$ $x = 4.5$	[M1] [B1]	Allow +/- 0.1
	(d)	Correct tangent drawn Gradient of tangent $= \frac{2.6-(-3.5)}{4.8-2.9}$ $= 3.21$	[M1] [A1]	Allow +/- 0.1
	(e)(i)	Correct line drawn	[B1]	
	(e)(ii)	$x = 2.9$	[B1]	
	(e)(iii)	$\frac{1}{5}x^3 - \frac{4}{5}x^2 = 4 - 2x$ $\frac{1}{5}x^3 - \frac{4}{5}x^2 + 2x - 4 = 0$ $x^3 - 4x^2 + 10x - 20 = 0$ $A = 10,\ B = -20$	[M1] [A2]	
8	(a)	Angle $OEA = 35^\circ$ (Angles in the same segment)	[B1]	
	(b)	Angle $AOB = 35^\circ \times 2$ (angle at centre = 2 angles at circumference) $= 70^\circ$ Reflex $AOB = 360^\circ - 70^\circ$ (Angles at a point) $= 290^\circ$	[M1] [A1]	
	(c)	Angle $OAE = 35^\circ (OA = OE)$ Angle $BAC = 90^\circ - 35^\circ - 40^\circ$ (Right angle in semi-circle) $= 15^\circ$ **OR** Angle $BAO = \frac{180^\circ - 70^\circ}{2} (OA = OB)$ $= 55^\circ$ Angle $BAC = 55^\circ - 40^\circ$ $= 15^\circ$	[M1] [A1] [M1] [A1]	
	(d)	Angle $CDE = 180^\circ - 40^\circ - 35^\circ$ (angles in opposite segment) $= 105^\circ$ Angle $FEB = 105^\circ$ (Corresponding angles, BE parallel to CD)	[M1] [A1]	
	(e)	Angle $OED = 180^\circ - 105^\circ$ (adj angles on a straight line) $= 75^\circ$ Angle $DOE = 180^\circ - 75^\circ - 75^\circ (OD = OE)$ $= 30^\circ$	[M1] [A1]	
9	(a)(i)	The mean mark of class C was 75.	[B1]	

		Since the standard deviation of the class was zero, all students scored the same marks of 75.	[B1]	
	(a)(ii)	Class *B* had the best performance as the mean mark was the highest at 86.5. Class *B* also had the highest inconsistency in the scores at the standard deviation was the greatest at 2.128.	[B1] [B1]	
	(a)(iii)	Let the new student's score be *a*. $\text{New mean} = \dfrac{14\times 75 + a}{15}$ $= \dfrac{1050 + a}{15}$ $2.30^2 = \dfrac{14\times 75^2 + a^2}{15} - \left(\dfrac{1050+a}{15}\right)^2$ $1190.25 = 1181250 + 15a^2 - 1102500 - 2100a - a^2$ $14a^2 - 2100a + 77559.75 = 0$ $a = \dfrac{-(-2100) \pm \sqrt{(-2100)^2 - 4(14)(77559.75)}}{2(14)}$ $a = 84$ or $a = 66$ (to nearest whole number)	[M1] [M1] [M1] [A1]	
	(b)(i)	P(first draw not an '8') $= \dfrac{7}{8}$	[B1]	
	b(ii)	P(it will take exactly *n* draws) $= \left(\dfrac{7}{8}\right)^{n-1}\left(\dfrac{1}{8}\right)$	[B1]	
	b(iii)	P(it will take at least *n* draws) $= \left(\dfrac{7}{8}\right)^{n-1}$	[B1]	
	(c)	Statement is not valid. As the balls were **drawn with replacement**, her chances of getting an '8' in the draw is **independent** of her previous draws.	[A1] [M1]	No A1 if reason is invalid.
10	(a)	Radius of sphere $= \sqrt[3]{\dfrac{15}{\frac{4}{3}\pi}}$ $= 1.5299$ $= 1.53$ cm (to 3 sf)	[M1] [A1]	
	(b)(i)	Volume of cookie after baking $= \pi(3)^2(0.6)$ $= 16.964$ cm^3 Volume of trapped air $= 16.964 - 15$ $= 1.964$ $= 1.96$ cm (to 3 sf)	[M1] [A1]	

	(b)(ii)	% of trapped air $= \frac{1.964}{16.964} \times 100\%$ $= 11.577$ $= 11.6\%$ (to 3 sf)	[B1]	
	(c)(i)	Length of $OP = 6$ cm	[B1]	
	(c)(ii)	$OQ = \sqrt{6^2 - 3^2}$ $= 5.196$ $= 5.20$ cm (to 3 sf)	[M1] [A1]	
	(c)(iii)	$\frac{TS}{6} = \frac{5.196 + 3}{5.196}$ $TS = 9.464$ cm Length of one side of box = 9.46 cm (to 3 sf)	[M1] [A1]	
11	(a)	$(100 - 2x)(55 - 2x) = 105(50 - x)$ $2(50 - x)(55 - 2x) = 105(50 - x)$ $(50 - x)[2(55 - 2x) - 105] = 0$ $x = 50$ or $2(55 - 2x) = 105$ $55 - 2x = 52.5$ $x = 1.25$ Since $x \leq 27.5$, $x = 1.25$ Defrosting is required since the thickness of frost >1 cm.	[M1] [M1] [M1] [A1]	
	(b)	Length of box space = 100 + 2(2) + 2(3.5) = 111 cm Height of box space = 100 + 3 + 2(3.5) = 110 cm Width of box space = 55 + 2(2) + 2(3.5) = 66 cm Assumption: The height of the legs of the freezer is negligible.	[B1] [B1] [B1] [B1]	