Name : _____

METHODIST GIRLS' SCHOOL

Founded in 1887

PRELIMINARY EXAMINATION
Secondary 4

Wednesday	**MATHEMATICS**	4048/01
05 August 2020	**Paper 1**	2 hours

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 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 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 your answer 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.
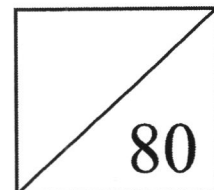
80

Mathematical Formulae

Compound Interest

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

Mensuration

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

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

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

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

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

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

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

Trigonometry

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

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

Statistics

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

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

Answer **all** the questions

1 **(a)** Arrange the following set of numbers in ascending order.

$$\frac{22}{50} \ , \ 0.\dot{4} \ , \ 0.409 \ , \ 44.5\% \ .$$

Answer .... , ... , ... , ... [1]

(b) State which of the following numbers are irrational.

$$\sqrt{2} \times \sqrt{8} \ , \ \frac{22}{7} \ , \ \pi \ , \ 2\sqrt{3} \ .$$

Answer .... [1]

2 **(a)** Express 5040 as a product of its prime factors in index notation.

Answer .... [1]

(b) Hence find the smallest integer value of x for which $\sqrt{5040x}$ is an integer.

Answer $x =$ .... [1]

3 Write as a fraction in its simplest form $\dfrac{2}{x-3} - \dfrac{x+3}{2x^2 - 5x - 3}$.

Answer .... [3]

4 **(a)** Factorise completely $2x^2 - \dfrac{1}{2}y^4$.

Answer .... [2]

(b) Factorise completely $16a^2 - 10ab - 8a + 5b$.

Answer .... [2]

5

Number of new infections in March and April 2020
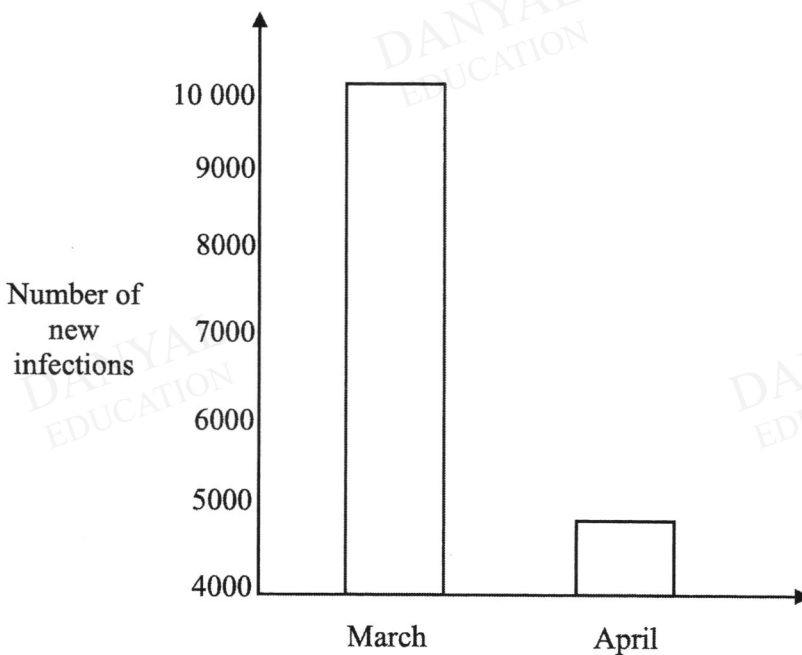
Explain how the bar chart above may be misleading.

………...............................…………………………………………………………………………

………...................................…………………………………………………………………………

………………………………………………………………………………………………… [1]

6 m is inversely proportional to the cube of n.

When n is halved, m changes by a factor of p.

Find the value of p.

Answer p = ... [3]

7   **(a)**   Express $y = -x^2 - 8x - 10$ in the form of $y = -(x-h)^2 + k$.

Answer .... [1]

(b)   **Hence**, solve $-x^2 - 8x - 10 = 0$, giving your answer to 2 decimal places.

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

8   Simplify $\left(\dfrac{81}{y^8}\right)^{-\frac{1}{4}} \times \left(3y^2\right)^3$.

Answer .... [2]

9 "Water demand in Singapore is currently about 430 million gallons a day. This figure could likely double by 2060 with the non-domestic sector accounting for about 70% of the future water demand." – *Taken from PUB website https://www.pub.gov.sg/savewater*

Calculate the future water demand in a day, in litres, for the non-domestic sector by 2060, leaving your answer in standard form, to 3 significant figures (1 gallon = 3.78541 litres).

Answer .... litres [2]

10 Connor has 6 litres of a 10% alcohol solution.
How much water must he add to reduce the concentration of alcohol to 8%?

Answer .... litres [2]

11 Jude and Kerk each have some marbles.
The ratio of Jude's marbles to Kerk's marbles is 9 : 5.
After they gave 11 marbles each to their youngest brother, the new ratio of Jude's marbles to Kerk's marbles becomes 4 : 1.

How many marbles has Kerk left?

Answer .... [2]

12 **(a)** A range of values for x is represented on the number line below.
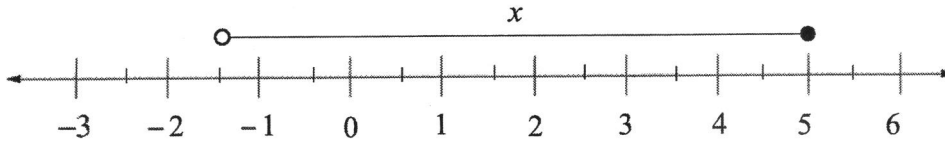
Write down inequalities that represent this range of values for x.

Answer .... [1]

(b) Solve the inequality $\dfrac{5x-9}{2}+1 \le \dfrac{4x+1}{3}$.

Answer .... [2]

13 The scale of a map is given as $1 : 50\ 000$.

(a) Find the length on the map between two buildings which are 2800 m apart.

Answer .... cm [1]

(b) On the map, a park has an area of 2.78 cm². What is the actual area in km²?

Answer .... km² [2]

14 A business owner operates two beauty salons at two different locations.

The table below shows the number of staff in these 2 salons.

	Facial therapist	Hair stylist	Nail technician
Glow@Clementi	7	3	5
Glow@Tampines	6	4	2

The staff monthly salary is made up of a basic wage component and fringe benefits.

The table below shows the basic wage and fringe benefits of the staff.

	Basic wage ($)	Fringe benefits ($)
Facial therapist	2500	200
Hair stylist	3500	300
Nail technician	2000	80

It is given that the matrix $\mathbf{P} = \begin{pmatrix} 7 & 3 & 5 \\ 6 & 4 & 2 \end{pmatrix}$ and the matrix $\mathbf{Q} = \begin{pmatrix} 2500 & 200 \\ 3500 & 300 \\ 2000 & 80 \end{pmatrix}$.

(a) Evaluate the matrix $\mathbf{R} = \mathbf{PQ}$.

Answer ………………..…….…..… [1]

(b) State what each of the elements of $\mathbf{R}$ represents.

Answer …………………………………………………………………………
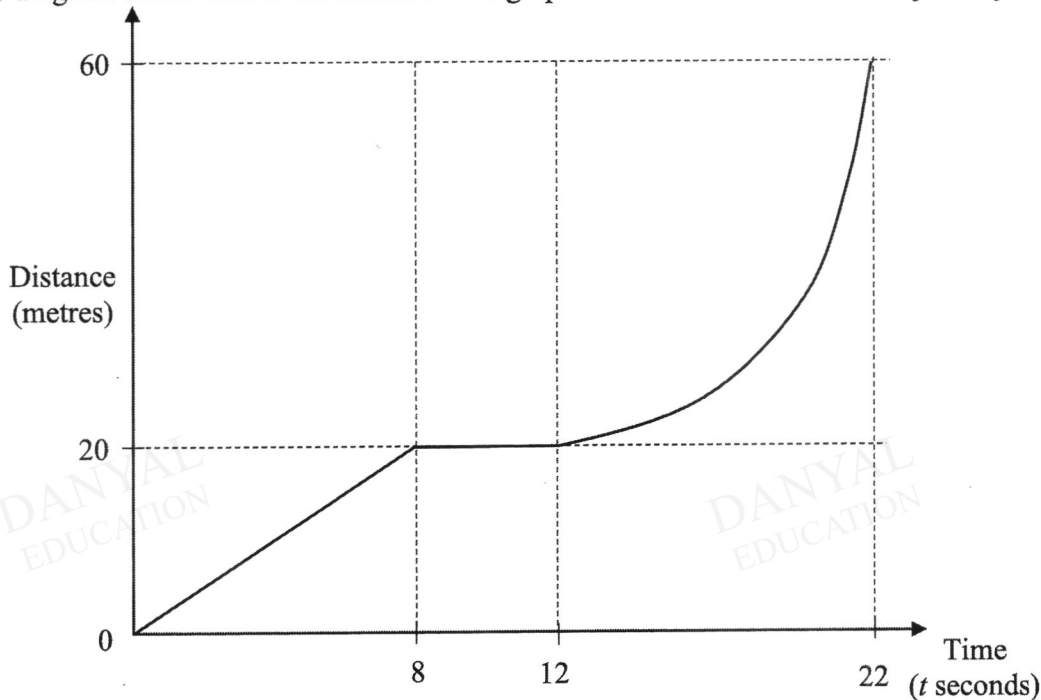………………………………………………………………………………………
…………………………………………………………………………………….... [1]

(c) The fringe benefits for each staff is increased by 10%. Using the matrix $\mathbf{R}$ found in part **(a)** and another matrix, find the new total monthly salary paid to all the staff at each salon respectively.

Answer Glow@Clementi $…………………..…….…..…
Glow@Tampines $……………….…….…..[3]

15 The diagram below shows the distance-time graph of the first 22 seconds of a journey.

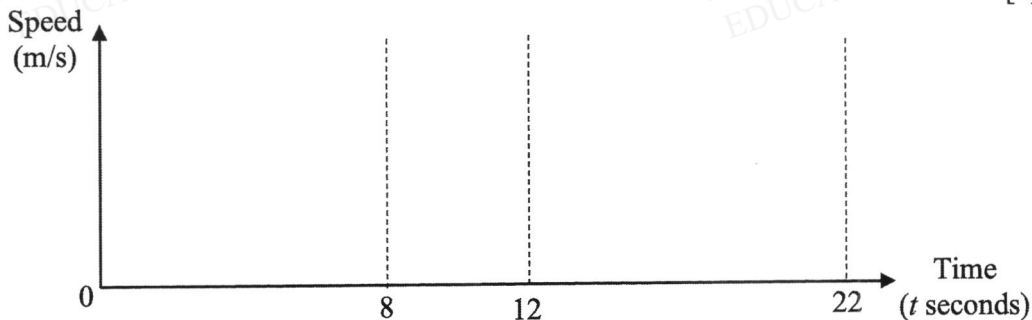**(a)** Find the speed during the first 8 seconds.

Answer ……………..………. m/s [1]

(b) What is the acceleration when $t = 4$?

Answer ……………..………. m/s^2 [1]

(c) It is given that the speed increases at a uniform rate between $t = 12$ and $t = 22$, and that the speed is 8 m/s when $t = 22$.

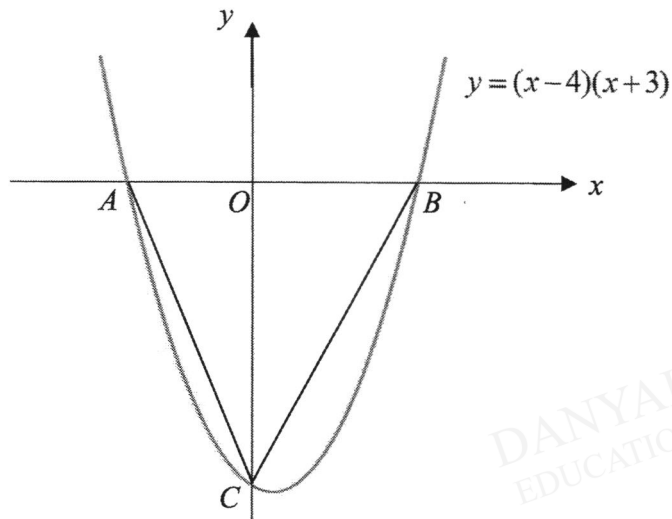Sketch the speed-time graph for the first 22 seconds in the axes below.

[2]

(d) Change 8 m/s into kilometres per hour.

Answer ……………..………. km/h [1]

16 The diagram below shows the graph of $y = (x-4)(x+3)$ which cuts the x-axis at A and B, and the y-axis at C.

(a) Find the coordinates of points A, B and C.

Answer A (.........., ...)

B (.........., ...)

C (.........., ...) [2]

(b) Find the length of line AC.

Answer .... units [1]

(c) Find the equation of line BC.

Answer .... [1]

(d) Find the coordinates of the minimum point.

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

(e) Explain why the equation $(x-4)(x+3) = k$ does not have solutions for some values of k.
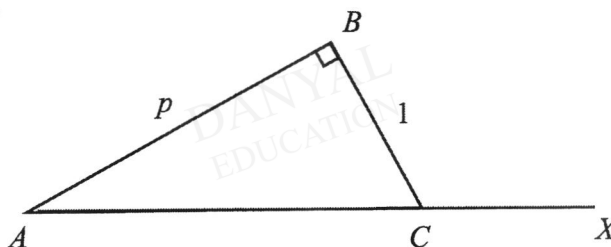
Answer ....

.... [1]

17   Solve the simultaneous equations

$$\frac{5}{6}p - \frac{q}{4} = 2\frac{3}{4},$$
$$2p + 3q - 3 = 0.$$

Answer p = ... *, q =* .... [3]

18   In the diagram, *ACX* is a straight line. *ABC* is a right-angled triangle with *AB = p* units and *BC* = 1 unit.

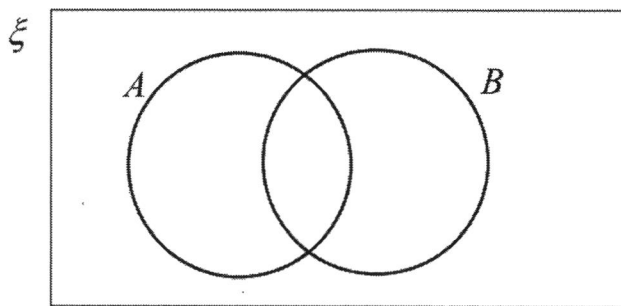Express each of the following as a fraction, in terms of *p*.

(a) $\cos \angle BAC$,

Answer .... [1]

(b) $\cos \angle BCX$.

Answer .... [1]

19 **(a)** On the Venn diagram, shade the region which represents $(A \cap B)' \cap B$.

[1]

(b) $\xi = \{\text{integers } x : 1 \le x < 16\}$

$A = \{\text{perfect squares}\}$

$B = \{\text{prime numbers}\}$

(i) List the elements in the set $A' \cap B$.

Answer .... [1]

(ii) A number y is chosen at random from ξ.

Find the probability that $y \in (A \cup B)$.

Answer .... [1]

(iii) Given that $C \subset A$, write down a possible set for C.
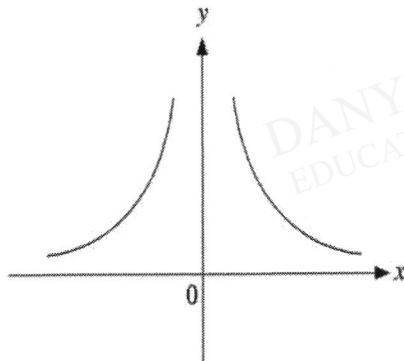
Answer $C = \{$ .... $\}$ [1]

20 The equation of each of the graphs is $y = ax^n$. For each of the following graphs, write down a possible value of a and of n, where a and n are constants.
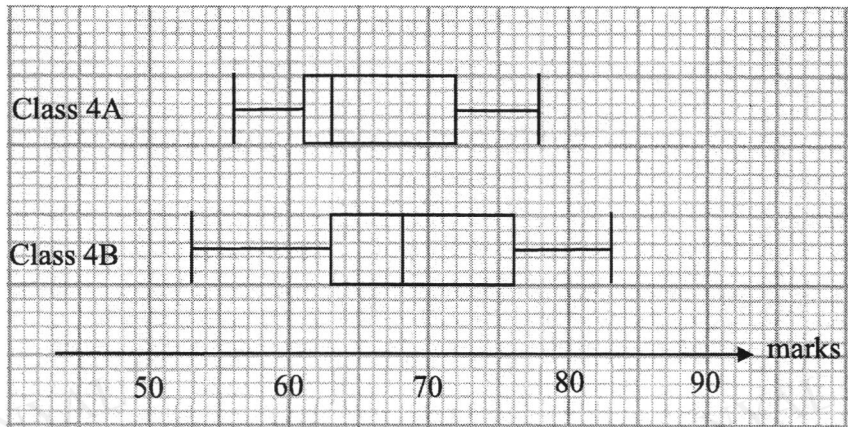
(a)
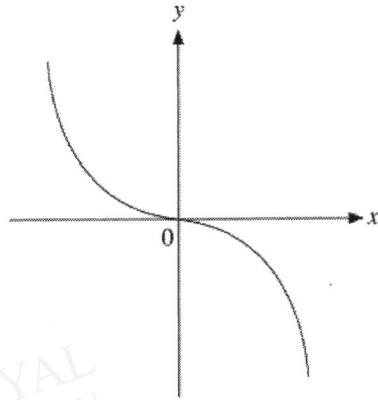
Answer $a = $ ………. , $n = $ ………. [1]

(b)

Answer $a = $ ………. , $n = $ ………. [1]

21   The graph below shows the box-and-whisker plots of the marks of a Mathematics quiz for Class 4A and Class 4B students.

(a)   Find the interquartile range for Class 4A.

Answer .... marks [1]

(b)   Find the range for Class 4B.

Answer .... marks [1]

(c)   Here are two statements comparing the marks of the two classes.
For each statement, state whether you agree or disagree.
Give a reason for each answer, stating clearly which statistic you used to make your decision.

(i)   On average, the marks of Class 4A are lower than those in 4B.
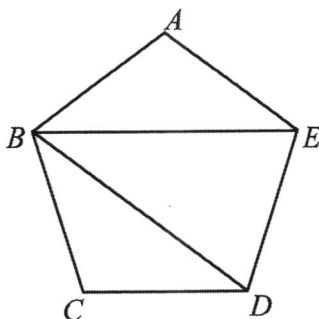
Answer _____ because _____

_____

_____ .   [1]

(ii)   A greater proportion of students in Class 4A than 4B scored more than 75 marks.

Answer _____ because _____

_____

_____ .   [1]

22 In the diagram, *ABCDE* is a regular pentagon.

(a) Calculate

    (i) angle *BAE*,

Answer ....° [1]

    (ii) angle *EBD*.

Answer ....° [1]

(b) Explain why *BE* is parallel to *CD*.

Answer ....

....

.... [1]

23 In the diagram, DF is the diameter of the circle $ABCD$, with centre O.
$DEFG$ and AEB are straight lines and GA is a tangent to the circle.
$\angle AGD = 30°$ and $\angle BCD = 110°$.
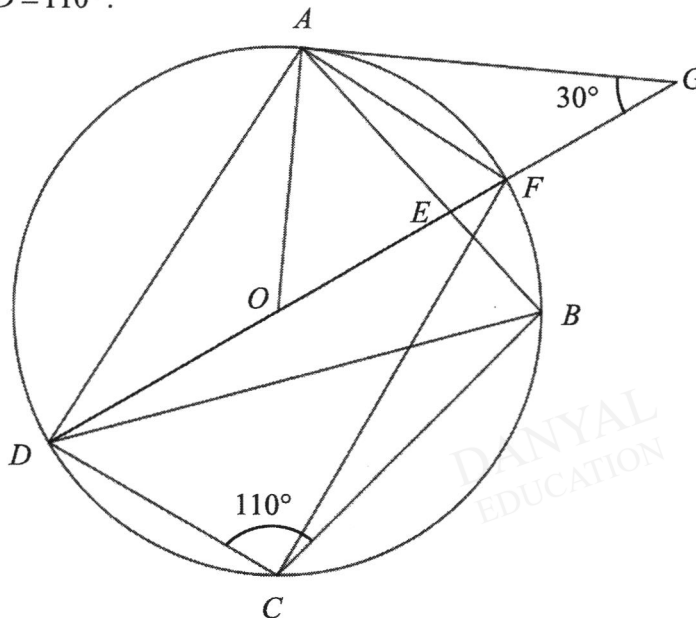
(a) Find, stating your reasons clearly,

(i) $\angle GOA$,

Answer ....° [1]

(ii) $\angle FDA$,

Answer ....° [1]

(iii) $\angle BAO$,

Answer ....° [2]

(iv) ∠BDF .

Answer ....° [1]

(b) Show that ΔGAO is congruent to ΔDAF .

Answer ....

....

....

....

.... [3]

24 The two pails shown in the diagram below are geometrically similar. The heights of the small and large pail are 20 cm and 30 cm respectively.
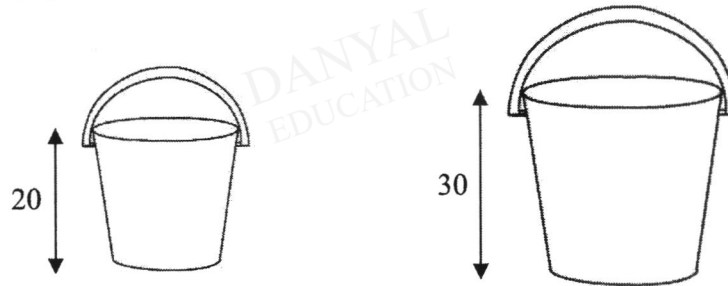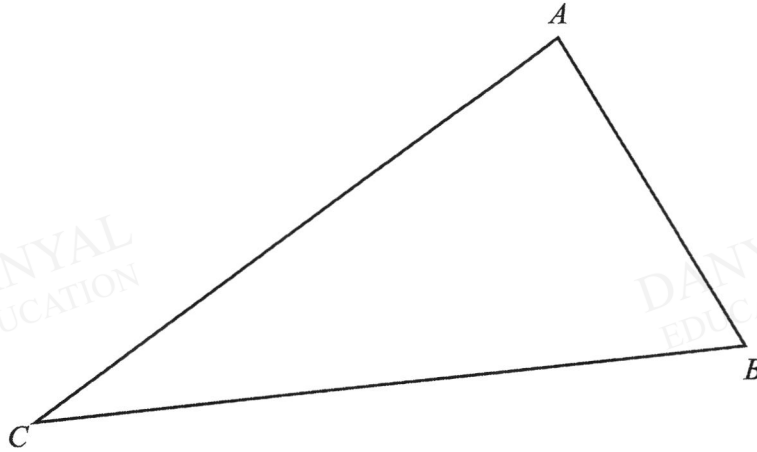

(a) The diameter of the base of the large pail is 15 cm.
Calculate the radius of the base of the small pail.

Answer .... cm [1]

(b) The pails are completely filled with sand.
Given that the small pail holds 2.4 kg of sand, find the mass of sand that the large pail holds.

Answer .... kg [2]

25   The diagram shows a triangular field *ABC*.

(a)   On the diagram, construct

    (i)   the perpendicular bisector of *AB*,   [1]

    (ii)   the bisector of angle *ABC*,   [1]

(b)   A tree, *T*, is to be planted in the triangular field *ABC*, such that it is nearer to *A* than *B*, and is nearer to *BC* than *BA*.

    Shade the region where *T* lies.   [1]

~ End of Paper ~

METHODIST GIRLS' SCHOOL

Founded in 1887

PRELIMINARY EXAMINATION 2020
Secondary 4

| Friday | **MATHEMATICS** | 4048/02 |
| 7 August 2020 | **Paper 2** | 2 h 30 min |

Candidates answer on the Question Paper.

READ THESE INSTRUCTIONS FIRST

Write your class, index number and name 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 staples, paper clips, glue or correction fluid.

Answer **all** questions in the spaces provided in 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.

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.

Mathematical Formulae

Compound Interest

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

Mensuration

Curved surface area of a cone $= \pi r l$

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

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

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

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

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

Sector area $= \frac{1}{2}r^2\theta$, where θ 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

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

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

1 **(a)** It is given that $(x-5)^2 + (y-4)^2 = r^2$.

       (i) Find the values of x when $y = 16$ and $r = 13$.

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

       (ii) Express y in terms of r and x.

Answer .... [2]

(b) Given that $\dfrac{3}{4}(2x-y) - \dfrac{1}{2}(x+5y) = 0$, find the value of $\dfrac{2x}{5y}$.

Answer .... [2]

(c) Given that $3^{4-k} \times 9^{1-k} = 1$, find the value of k.

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

2 **(a)** Alice bought a laptop online at a price of US$1799.
The exchange rate was S$1 = US$0.7078.
Calculate the price that she paid in Singapore Dollars, correct to the nearest dollar.

Answer S$ .... [2]

(b) Betty took a loan of $25 000 for 2 years from a bank to pay for her house renovation.
The bank charged a compound interest of 4% per annum compounded half yearly.
Calculate the total amount she had to pay for the loan at the end of 2 years, correct to the nearest dollar.

Answer $ .... [2]

**(c)** The cash price of a sofa set is $8600.

Caroline decided to pay by hire purchase with the following terms:

> A deposit of $500 and the balance amount at monthly instalments over a period of 3 years at a simple interest of 2.5% per annum.

Calculate the monthly instalment that Caroline has to pay.

Answer $ .... [3]

3   In the diagram below, the sector *CAB* has centre *C* and radius 8 cm.

CD bisects $\angle ACB$ and *O* is the midpoint of *CD*. An arc with centre *O*, is drawn to meet

CA and *CB* at *E* and *F* respectively. It is given that *OE* = 4 cm and $\angle EOF = \dfrac{5\pi}{12}$ radians.
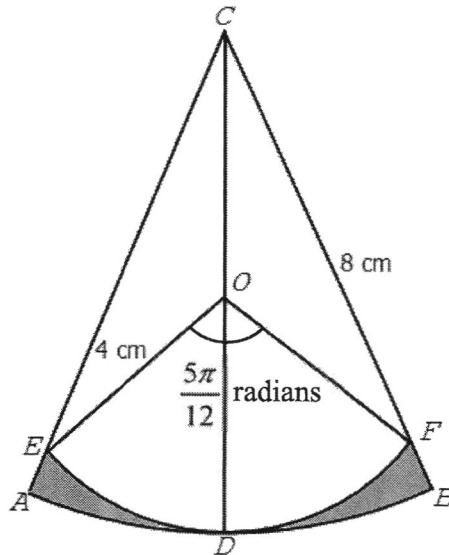
(a)   Find, **in terms of π**,

(i)   the angle *ACB*,

Answer ……………..… radians [1]

(ii)   the length of arc *ADB*,

Answer ………………..… cm [1]

(iii) the area of the sector *CAB*.

Answer ………………… cm² [1]

(b) Find the area of the shaded region *ADBFE,* correct to 2 significant figures.

Answer ………………… cm^2 [3]

4 **(a)** The heights of a group of 60 men were recorded.
The cumulative frequency curve below shows the distribution of their heights.
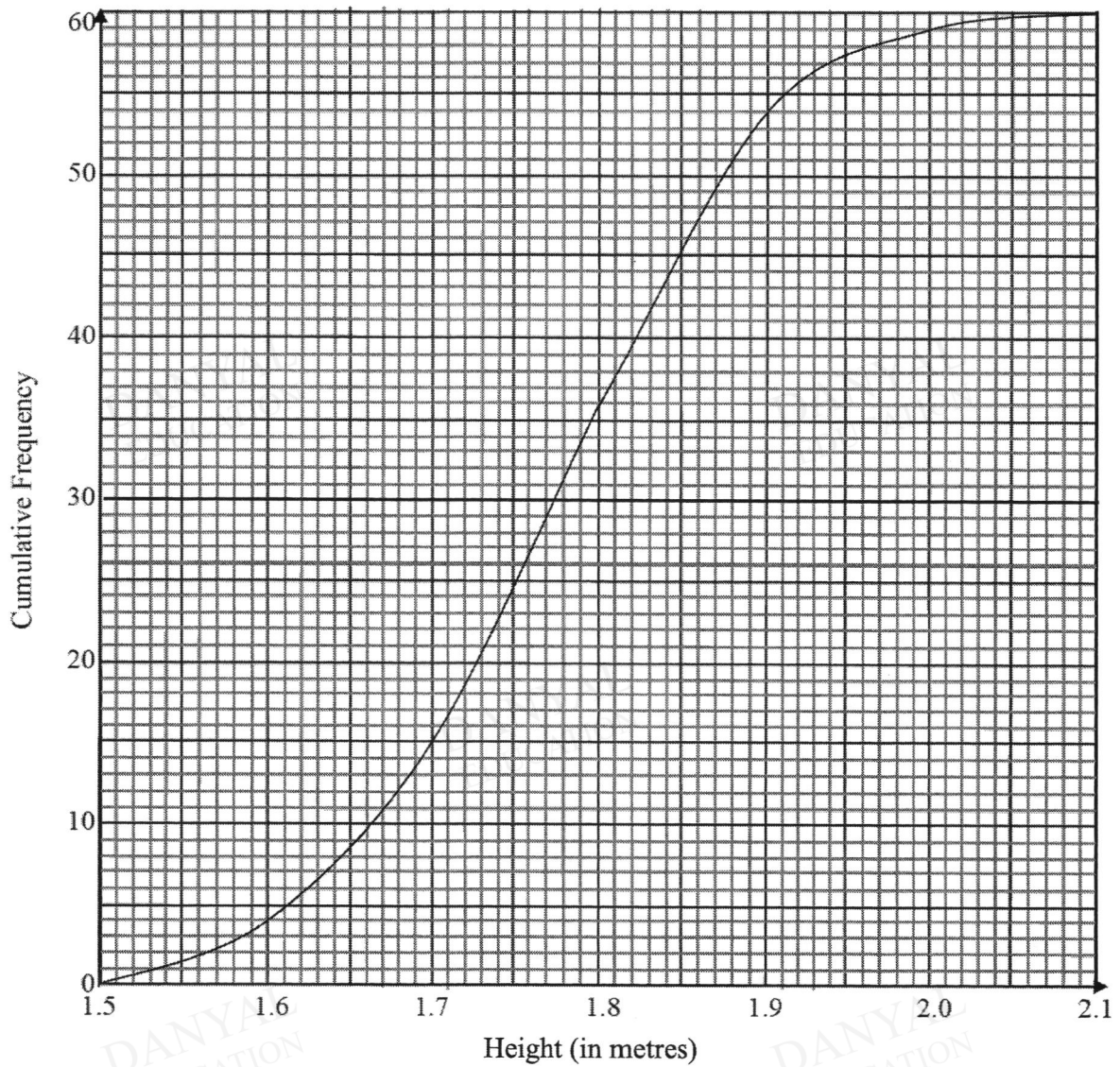
Using the cumulative frequency curve, find

(i) the median height,

Answer ……………..………… m [1]

(ii) the interquartile range,

Answer ……………..………… m [1]

(iii) the 85th percentile.

Answer ……………..………… m [1]

(b) The information from the cumulative curve above is tabulated in the frequency distribution table below.

Height (x m)	$1.5 < x \leq 1.6$	$1.6 < x \leq 1.7$	$1.7 < x \leq 1.8$	$1.8 < x \leq 1.9$	$1.9 < x \leq 2.0$	$2.0 < x \leq 2.1$
Number of men	h	11	21	k	5	1

Find the value of h and of k.　　　　Answer　$h =$ ……..…… $k =$ ………….… [2]

(c) Calculate

(i) the estimated mean height of the distribution.

Answer ……….………… m [2]

(ii) an estimate of the standard deviation of the distribution.
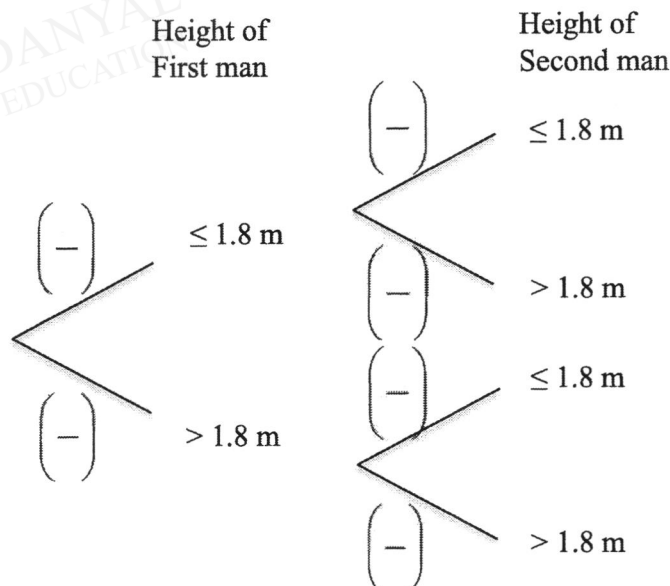
Answer ……..………… m [1]

(d) Another new man with a height of 1.77 m joined the group.
Explain how the standard deviation has been affected by the new recorded height.

The Standard deviation will …………………………………………………………… [1]

(e) Two men are chosen at random from the group of 60 men.
Complete the Probability Tree Diagram below.

Height of First man　　　　Height of Second man

$\left(\ -\ \right)$ ≤ 1.8 m

$\left(\ -\ \right)$ ≤ 1.8 m

$\left(\ -\ \right)$ > 1.8 m

$\left(\ -\ \right)$ > 1.8 m

$\left(\ -\ \right)$ ≤ 1.8 m

$\left(\ -\ \right)$ > 1.8 m

[2]

(f) Find the probability, as a fraction in its simplest form, that
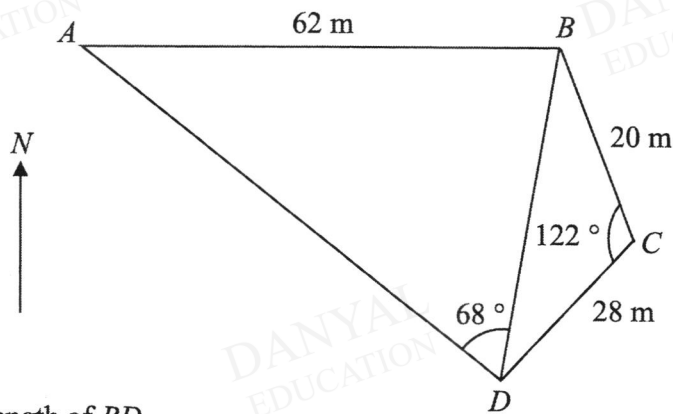
(i) both men's height are 1.8 m or less,

Answer ………………… [1]

(ii) at least one of the men's height is taller than 1.8 m.

Answer ………………… [1]

5 Points *A*, *B*, *C* and *D* are four corners of a flower plot of land on a level ground. The point *B* is due east of *A*. *AB* = 62 m, *BC* = 20 m, *CD* = 28 m, $\angle ADB = 68°$ and $\angle BCD = 122°$.

(a) Calculate

(i) the length of *BD*,

Answer ………………… m [2]

(ii) angle *ABD*.

Answer ………………… ° [3]

(b) Find the bearing of D from A.

Answer ……..…………..… ° [1]

(c) Calculate the area of triangle ABD.

Answer ……………..……… m^2 [2]

(d) A vertical flagpole, of height 12 m, is erected at point D.
A gardener walks along AB and looks up to the top of the flagpole. Find the greatest angle of elevation of the top of the flagpole when viewed from any point along AB.

Answer ……..…………..… ° [4]

6 A trader bought some oil for $1000.
He paid x for each litre of oil.

(a) Find an expression, in terms of x, for the number of litres of oil he bought.

Answer ……….……….…….. litres [1]

(b) 2 litres of oil had been lost due to a leakage.
He sold the remaining oil for $1 per litre more than that of the amount he paid for per litre. Write down an expression, in terms of x, for the total sum of money he received after selling all the remaining oil.

Answer $ ……….……………….…. [1]

(c) He made a profit of $100 from the sale of the oil.
Write down an equation to represent this information, and show that it simplifies to $x^2 + 51x - 500 = 0$.
Answer

[3]

(d) Solve the equation $x^2 + 51x - 500 = 0$, giving your answer correct to 2 decimal places.

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

(e) Find the number of litres of oil he bought, giving your answer correct to the nearest litre.

Answer ……….…….…..……. litres [1]

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

$$T_1 = 3^2 - 2 = 7$$
$$T_2 = 3^3 \qquad = 27$$
$$T_3 = 3^4 + 2 = 83$$
$$T_4 = 3^5 + 4 = 247$$

(a)   Write down an expression for T_5 and evaluate it.

Answer .... [1]

(b)   Find an expression, in terms of n, for T_n.

Answer .... [1]

(c)   Explain why $3T_{n-1} - T_n$ is always even where $n \geq 2$.

Answer

[3]

8 **Answer parts (a), (c), (d) and (e) in the spaces provided on this page.**

The variables x and y are connected by the equation $y = x^2 + \dfrac{30}{x}$.

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

x	1	2	3	4	5	6	7
y	31	19	19	23.5	p	41	53.3

(a) Find the value of p.

Answer p = ... [1]

(b) Using a scale of 2 cm to represent 1 unit on a horizontal axis and 2 cm to represent 5 units on a vertical axis, on the grid opposite, draw the graph of $y = x^2 + \dfrac{30}{x}$ for $1 \le x \le 7$. [3]

(c) Use your graph to write down an inequality in x, for the range of values of x, where $y \le 20$.

Answer .... $\le$ x $\le$ .... [1]

(d) By drawing a tangent, find the gradient of the graph at the point $x = 4$.

Answer .... [2]

(e) By drawing a suitable straight line to your graph on the same axes, find the values of x where $x^3 - 4x^2 - 15x + 30 = 0$ for $1 \le x \le 7$.

Answer x = ... or .... [3]
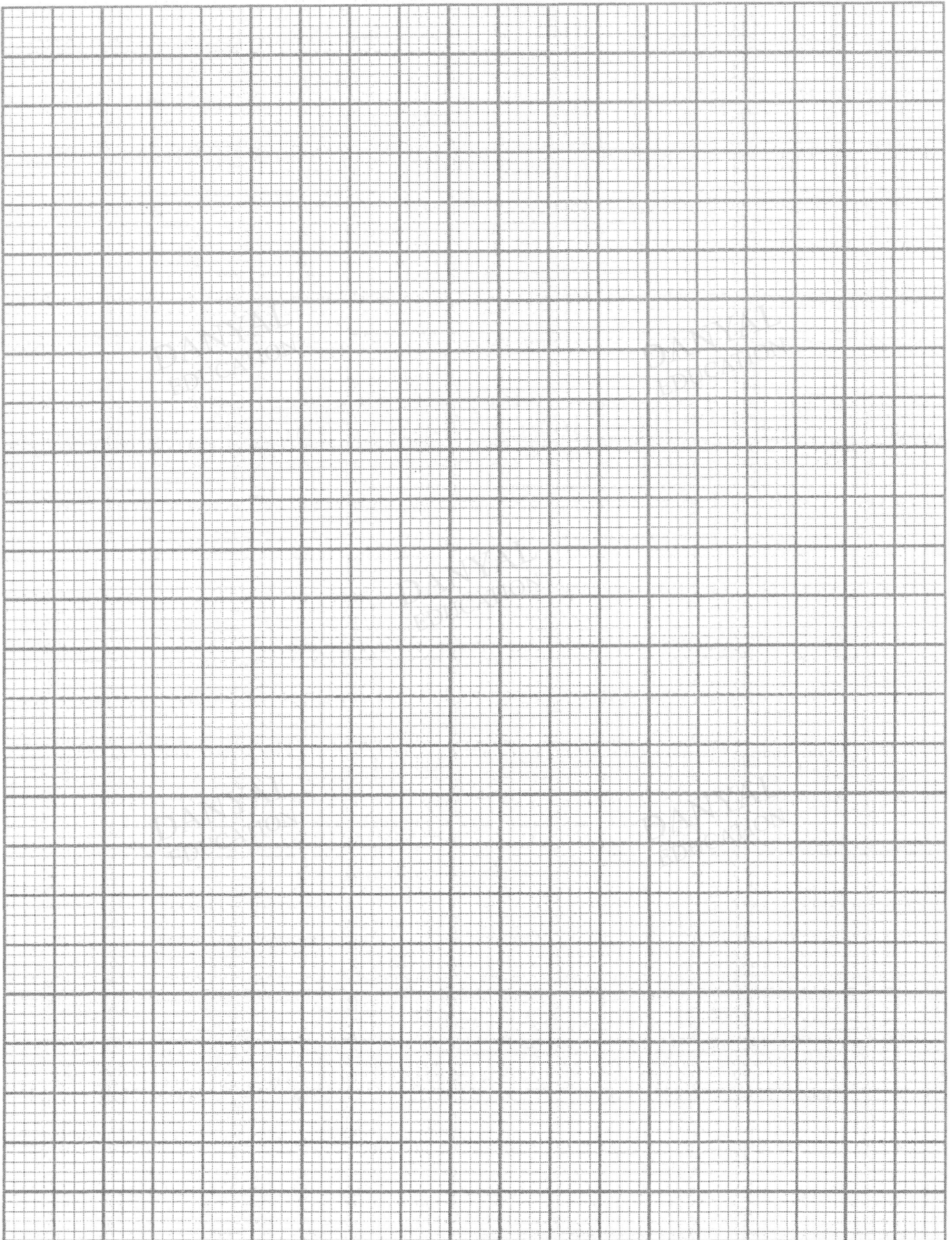
9 The diagram shows a hemispherical clay bowl with centre O.
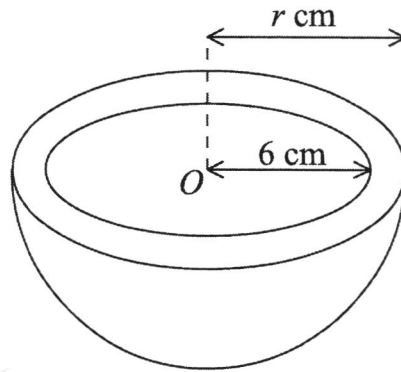The internal radius of the bowl is 6 cm and the outer radius is r cm.

Figure 1
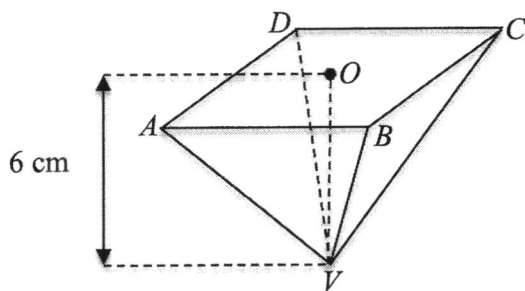
(a) Find the internal volume of the hemisphere with radius 6 cm.

Answer .... cm^3 [2]
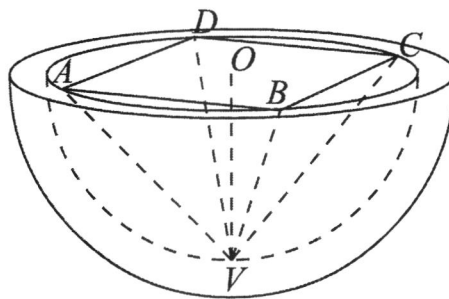
(b) Find the value of r if 408 cm^3 of clay is used to make the bowl.

Answer .... cm [3]

A solid pyramid with square base $ABCD$ and height OV, 6 cm, is placed in the bowl in **Figure 1**. The points V, A, B, C and D touch the inner surface of the hemispherical bowl.

Figure 2

Figure 3

(c) **(i)** Show that $AB = 8.4853$ cm, correct to 4 decimal places.

Answer

[2]

(ii) Calculate the volume of the pyramid.

Answer .... cm^3 [2]

Water is poured into the bowl to fill up the space between the pyramid and the clay bowl. The pyramid is subsequently removed from the bowl.

(d) Jenny said that the height of the water left in the bowl can also be found by comparing the volumes of similar solids.

Do you agree with Jenny?
Give a reason for your answer.

I .... with Jenny because ....

....

.... [1]

10 In the diagram below, two circles with centres O_1 and O_2 cut each other at points A and C.
The diameter of the first circle, BA produced intersects the second circle at E.
The line BC produced intersects the second circle at D. Angle $ABC = 35°$
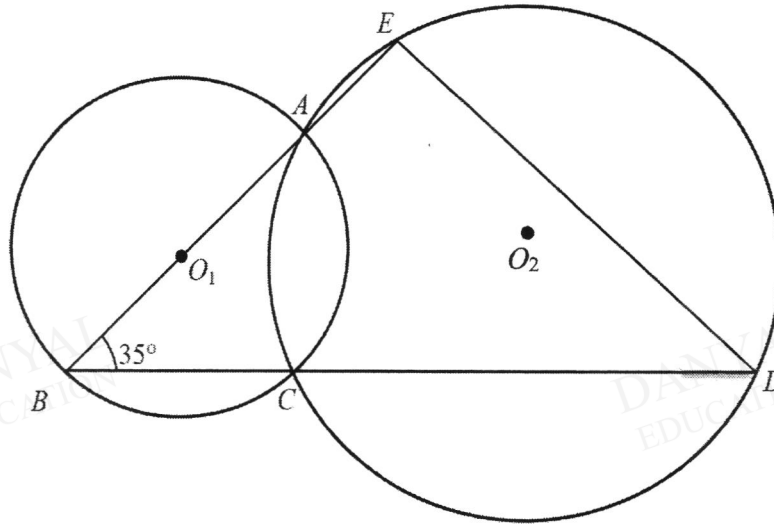
Find, giving reasons for each answer,

(a) **(i)** angle EAC,

Answer .... ° [2]

(ii) angle CDE,

Answer .... ° [1]

(iii) angle BO_1C,

Answer .... ° [1]

(iv) reflex angle EO_2C.

Answer .... ° [1]

(b) Show that $\triangle ABC$ is similar to $\triangle DBE$.

Answer ....

....

....

....

... [2]

(c) Given that the radius of the circle with centre O_1 is 4 cm, the length of BD is 20 cm, and the area of triangle ABC is 15 cm^2, calculate the area of the quadrilateral $ACDE$.

Answer .... cm^2 [3]

11   The diagram below shows a scissor lift. It consists of a platform attached to a mechanism that has a crisscross pattern which can extend and compress like multiple interconnected scissors. The mechanism can be manipulated to vertically elevate the platform to a desirable height.

Platform
6 cm
d
50 cm

Line Model
E   N   J
D   M   I
C   L   H   d
B   K   G   1 m
A   1 m   F
50 cm
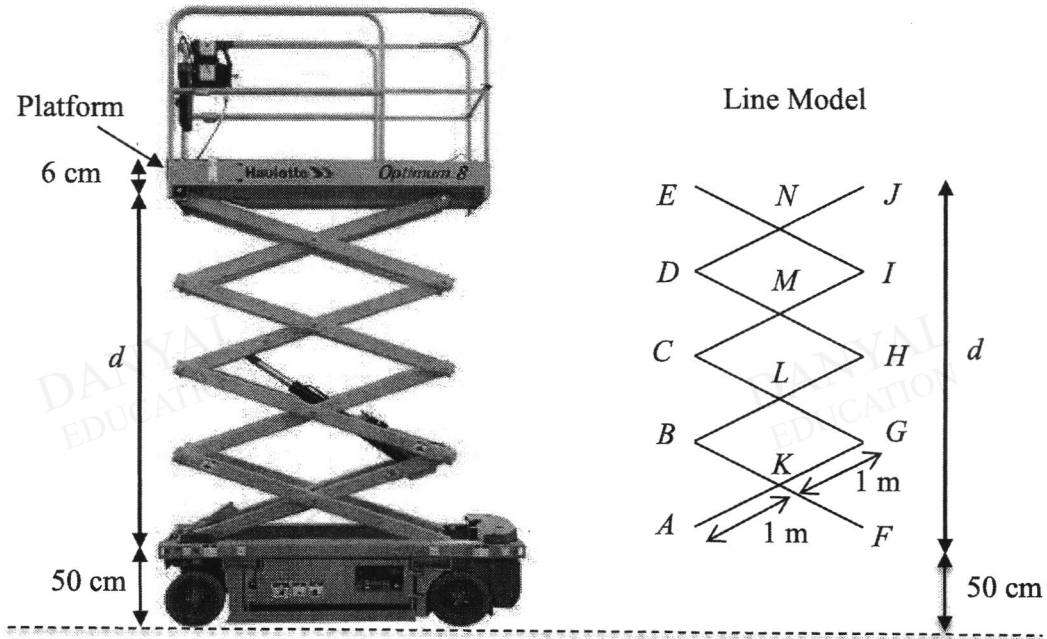
(a)   The scissor lift can be modelled into a line model shown above.
$AG = BH = CI = DJ = EI = DH = CG = BF = 2$ m and the length of each segment between two joints is 1 m. The safety limit for angle AKF is between 60° to 170° inclusive.

(i)   **Within safety limit**, find the greatest vertical height, h, in m, of point K from AF.

Answer $h =$ .... m   [2]

(ii)   Hence, calculate the greatest vertical distance, d, in m.

Answer $d =$ .... m   [2]

(iii) Peter is 1.85 m tall and stands on the platform of the scissor lift.
By considering the vertical distance, d, including the 6 cm platform and 50 cm base of the scissor lift, will Peter be able to save a cat at the top of a 9 m tall tree? Explain your answer with clear mathematical calculation.

Answer

[2]

(b)

> Useful information about the scissor lift is given as follows:
> - Area of platform: 1.5 m^2
> - Mass of Platform: 95 kg
> - 1000 kg is equivalent to 9810 N
> - Maximum load that the multiple interconnected scissors can support: 1880 N/m^2
>
> Assumption:
> - Average mass of each worker: 75 kg

Find the maximum number of workers that can stand safely on the platform of the scissor lift. Show clear mathematical calculation.

Answer

[4]

End of paper

Math Paper 1 Answer Key :

1(a) 0.409, $\dfrac{22}{50}$, $0.\dot{4}$, 44.5%

(b) π, $2\sqrt{3}$

2(a) $2^4 \times 3^2 \times 5 \times 7$

(b) 35

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

4(a) $\dfrac{1}{2}\left(2x-y^2\right)\left(2x+y^2\right)$ or $\dfrac{1}{2}\left(x-\dfrac{1}{2}y^2\right)\left(x+\dfrac{1}{2}y^2\right)$

(b) $(2a-1)(8a-5b)$

5. The number of new infections in March (10 000) is <u>twice</u> the number of new infections in April (5000). Due to the <u>vertical axis starting at 4000</u> and heights of the bars, the <u>differences are exaggerated</u>, making the numbers in March look more than twice that of April.

6. $p = 8$

7(a) $-(x+4)^2 + 6$

(b) $x = -1.55$ or -6.45

8. $9y^8$

9. 2.28×10^9 litres

10. 1.5 litres

11. 4 marbles

12(a) $-1.5 < x \le 5$

(b) $x \le 3\dfrac{2}{7}$

13(a) 5.6 cm

(b) $0.695 km^2$

14(a) $\begin{pmatrix} 38000 & 2700 \\ 33000 & 2560 \end{pmatrix}$

(b) The elements represent the total basic wages and total fringe benefits paid to the staff in the shops at Glow@Clementi and Glow@Tampines respectively.

(c) $40970 ; $35816

15(a) 2.5 m/s

(b) 0 m/s^2

(d) 28.8 km/h

16(a) $A(-3,0), B(4,0), C(0,-12)$
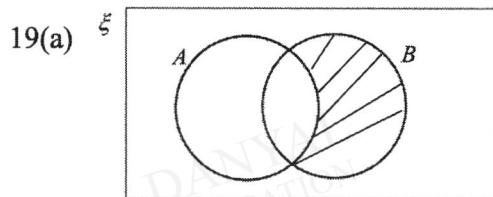
(b) 12.4 units

(c) $y = 3x - 12$

17. $p = 3, q = -1$

18(a) $\dfrac{p}{\sqrt{p^2+1}}$

(b) $-\dfrac{1}{\sqrt{p^2+1}}$

19(a)

(b)(i) {2, 3, 5, 7, 11, 13}

(ii) $\dfrac{3}{5}$

(iii) {1, 4} or {1} or {1, 9} or {4} or {4, 9} or {9}

20(a) $a < 0, n =$ positive odd integer ≥ 3

(b) $a > 0, n =$ negative even integer ≤ -2

21(a)   11 marks

(b)   30 marks

(c)   (i)   Agree because the <u>median</u> mark for Class 4A is 63, <u>lower</u> than the median mark for Class 4B which is 68.

(ii)   Answer <u>Disagree</u> because the <u>upper quartile</u> in 4B, 76 marks, is <u>higher</u> than that of 4A, 72 marks.

22(a)(i) $108\,°$

(ii) $36\,°$

23(a)(i) $60\,°$

(ii) $30\,°$

(iii) $40\,°$

(iv) $20\,°$

24(a)   5 cm

(b)   8.1 kg

Math Paper 2 Answer Key :

1(a)(i) $x = 0$ or 10

(ii) $y = 4 \pm \sqrt{r^2 - (x-5)^2}$

(b) $1\dfrac{3}{10}$ or 1.3

(c) $k = 2$

2(a)   S\$2542

(b)   \$27061

(c)   \$241.88

3(a)(i) $\dfrac{5\pi}{24}$ radians

(ii) $\dfrac{5\pi}{3}$ cm

(iii) $\dfrac{20\pi}{3}$ cm^2

3(b) 0.73 cm^2

4(a)(i) 1.775 m

(ii) 0.15 m

(iii) 1.88 m

(b) $h = 4, k = 8$

(c)(i) 1.77 m

(ii) 0.109 m

(d) decrease

(f)(i) $\dfrac{21}{59}$

(ii) $\dfrac{38}{59}$

5(a)(i) 42.2 m

(ii) $72.9°$

(iii) $129.1°$

(b) 1250 m^2

(d) $16.6°$

6(a) $\dfrac{1000}{x}$

(b) $\left(\dfrac{1000}{x} - 2\right)(x + 1)$

(d) 8.42 or -59.42

(e) 119 litres

7(a) $T_5 = 3^6 + 6 = 735$

(b) $T_n = 3^{n+1} - 2 + (n-1)2$ or $T_n = 3^{n+1} + 2n - 4$

8(a) $p = 31$

(c) $1.8 \leq x \leq 3.3$

(d) 5.7 to 6.5

(e)   1.6 , 5.7

9(a)   452 cm^3
(b)   7.43 cm
(c)(i)   8.4853 cm
(ii)   144 cm^3

10(a)(i) 125°
(ii)   55°
(iii)   110°
(iv)   250°
(c)   78.75 cm^2

11(a)(i)   0.866 m
(ii)   6.93 m
(b)   2 workers