Name:	Index No.:	Class:	

### PRESBYTERIAN HIGH SCHOOL



#### **MATHEMATICS** PAPER ONE

4048/01

20 August 2021

Friday

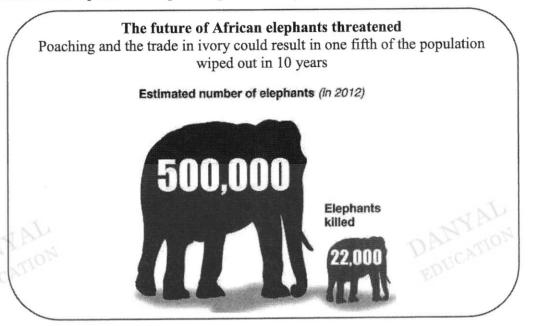
2 hours

PRESBYTERIAN HIGH SCHOOL PRESBYTERIAN HIGH SCHOOL

#### SECONDARY FOUR EXPRESS/ FIVE NORMAL (ACADEMIC) PRELIMINARY EXAMINATIONS

1 The number of people who are fully vaccinated in Singapore is given as 2420800, correct to t nearest hundred. Write down the minimum number of people who are fully vaccinated.						
			Answer	2420750		[1]
2	(a)	Express $(\sqrt[3]{x})^2$ in index notation	on.	8		
	(b)	Find the integer $n$ such that $2^n$	Answer $= \frac{1}{32}.$		DANYAL	[1]
			Answer	n =		[1]
3	(a)	Express 378 as the product of it	s prime factors.			
			Answer	2×3 <sup>3</sup> ×7		[1]
	(b)	Find the smallest positive integ	er k such that 378k	is a perfect c	ube.	
			Answer	k =		[1]

4 A website shows a poster of the poaching statistics of African elephants.



Adapted from: https://www.allcreaturespod.com/episodes/episode-2-elephant/poaching-stats/

Explain how the poster above may be misleading.

The sizes of the two elephants are not in proportion which will mislead readers into thinking that the number of elephants killed is larger than the actual number.

or

If 22 000 elephants are killed each year, in 10 years' time,  $22\ 000\ x\ 10 = 220\ 000$  will be killed. But 220 000 is 44% of the population and not 1/5 as stated in the headline. This will mislead readers into thinking that only 20% of the population will be wiped out.

Г1

On 1<sup>st</sup> January 2018, Mrs Yeo invests \$15000 in an account which pays at a rate of compound interest of *R*% per year. On 1<sup>st</sup> January 2021, she earned a total interest of \$988.45. Find the value of *R*.

Answer R = [2]

6	There	were 1120 vot	ters and the votes for	s school election for the Pre the 3 candidates were divi hest number and lowest number	ded in the ratio of 11:7	
	DAN	MAL		Answer	DANYAL	. [2]
7	There (a)		nd 9 boys in a group. simplest form, the p	probability of selecting a b	poy randomly from the	
				Answer		[1]
	(b)		nore boys are neede	d to join the group so that the limit of the description of the group is $\frac{4}{5}$ ?		
					DANYA	
				Answer	boys	[1]

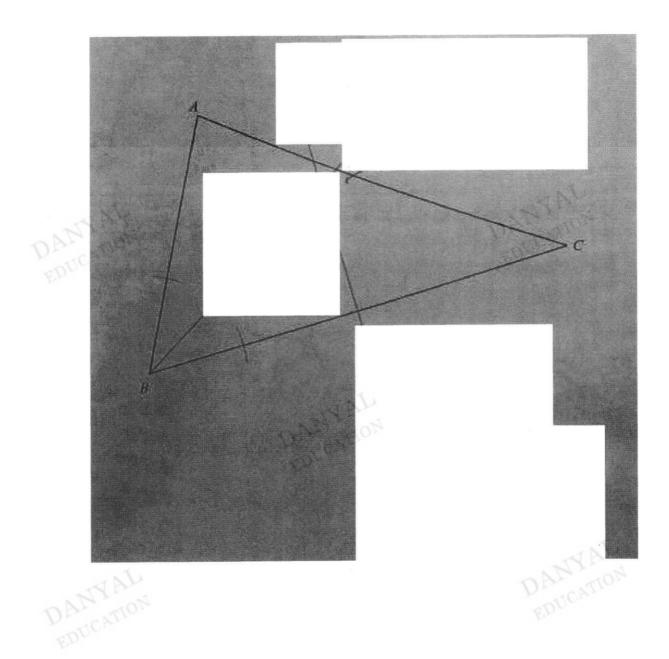
			5			
8	(a)	Factorise $x^2 + 5x - 6$ .				
			Answer			[1]
	(b)	Hence, solve $(p-1)^2 + 5(p-1)$	-6 = 0.			
			Answer	p =	MAN	[2]
9	(a)	Simplify $2(3x+5)-2(1-2x)$ .	2		EDUCATION	
		μ	Answer	2(5x+4)		[1]
	(b)	Given $\frac{2y}{3} - \frac{y-4}{4} \le 5$ , find the large				

Answer

[2]

10	(a)	6 men take 10 days to paint an apartment. Calculate the number of men required to paint the same apartment in 3 days.
		Answer [1]
	(b)	The braking distance, $d$ of a car is directly proportional to the square of its speed, $v$ . When the speed of the car is increased by 200%, find the percentage increase in its braking distance.
		Answer % [2]

#### 11 The diagram shows a triangle ABC.



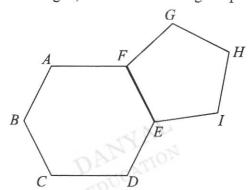
On the diagram,

(a) construct the bisector of angle ABC,
(b) construct the perpendicular bisector of BC,
(c) label the point P that is equidistant from B and C, and also equidistant from AB and BC.

12 A straight line with equation 2y = kx + h passes through the points (-2, 6) and (1, -9). Find the values of k and h.

Answer k = [3]

13 The diagram shows a regular hexagon, ABCDEF and a regular pentagon, EFGHI.



Find ∠EDI.

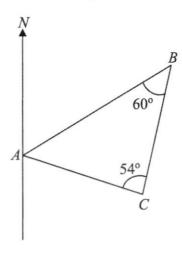
DANYAL

DAN

Answer \_\_\_\_

[3]

14 The diagram shows the positions of points A, B and C.  $\angle ABC = 60^{\circ}$ ,  $\angle BCA = 54^{\circ}$  and the bearing of B from A is 078°.



Find the bearing of

(a) C from A,

DALANA	Inswer	 [1]

**(b)** B from C.



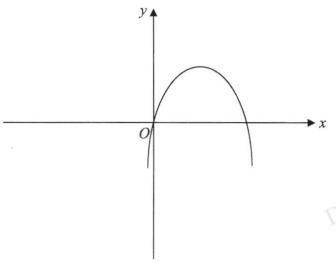


Answer		[2	2	
	***************************************	L		-

**Sketch** the graph of  $y = -(x-2)^2 + 4$  on the axes below.

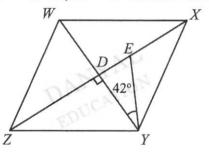
Indicate clearly the coordinates of the points where the graph crosses the axes and the maximum point on the curve.

point on the curve.



[3]

The diagram shows a rhombus WXYZ, where the diagonals intersect at D. ZDEX lies on a straight line. EY = 4.7 cm, XZ = 15 cm and  $\angle DYE = 42^{\circ}$ .



Find the length EX.

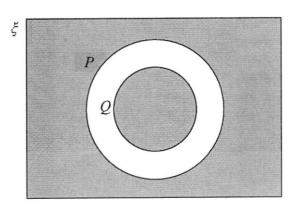
DANYAL

DANYAL

Answer

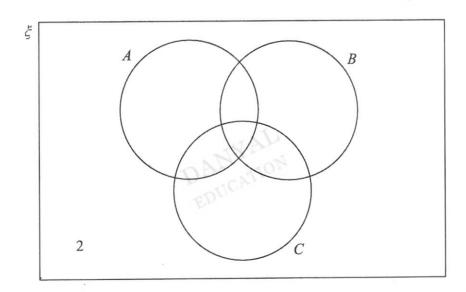
[3]

17 (a) On the Venn diagram, shade the region which represents  $Q \cup P'$ .



[1]

(b)  $\xi = \{\text{integers } x : 1 \le x \le 9\}$ The Venn diagram shows the elements of  $\xi$  and three sets A, B and C.



Use one of the symbols below to complete each statement.

$$\emptyset \subset \not\subset \notin \in \xi$$

(i) 
$$\{4, 8\} \subset B$$

(ii) 
$$9 \in C$$
 [1]

(iii) 
$$B \cap C = \emptyset$$
 [1]

11.0000.000

18 The following diagram shows 2 geometrically similar boxes of cereals of the same brand.

Box A 20g \$0.80



Box *B* 160g \$3.40



(a) Show that the cost of the cereal is **not** directly proportional to the quantity of the cereal. Explain with clear calculation.

[1]

**(b)** Find  $\frac{\text{height of Box } A}{\text{height of Box } B}$ 

Answer

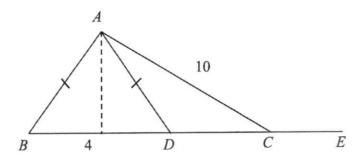
[1]

(c) It is given that the surface area of Box A is 454 cm<sup>2</sup>. Calculate the surface area of Box B.

Answer

[2]

19 In the diagram, BDCE is a straight line. BD = 4 cm, AC = 10 cm and AB = AD.



(a) Given that the area of triangle ABD is 16 cm<sup>2</sup>, show that the vertical height of triangle ABD is 8 cm.

[1]

- (b) Write down, as a fraction, the value of
  - (i)  $\sin \angle ACE$ .

Answer	[1

(ii)  $\tan \angle ACD$ ,

Answer	[2

COD .....

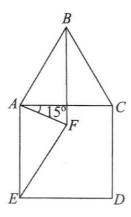
20	Α	man	has	a	scale	of	1	:	150	000.
	4 7	HILL	LLUD	ш	Source	O.			100	vov.

(a)	The length of a road on the map is 6.4 cm.
	Calculate the actual length, in kilometres, of the road.

	Answer	[2]
(b)	The area of a park is 10.125 km <sup>2</sup> .  Calculate, the area, in square centimetres, of the park on the map.	
	Answer	[2]

21	(a)	The li	ne <i>l</i> has equation $4x+2y+7=0$ .		
		(i)	Find the gradient of line <i>l</i> .		
			Answer		[1]
		(ii)	Find the coordinates of the point where $l$ cuts the $y$ -axis.		
					[1]
	(b)	Anotl	her line k is parallel to $y = \frac{1}{2}x + 5$ and it passes through the	e point (8,3).	
			the equation of line $k$ .		
			Answer	EDUC	[2]

22 In the diagram, ABC is an equilateral triangle, ACDE is a square and angle  $FAC = 15^{\circ}$ .



(a) Show that triangle *EAF* and triangle *BAF* are congruent. Give a reason for each statement you make.



[3]

(b) If the line BF bisects angle ABC, prove that triangle FAE is an isosceles triangle.



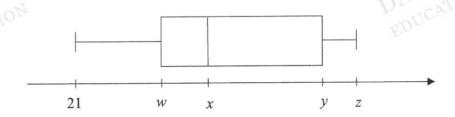


[2]

23 (a) The table shows the scores of 10 students in a Mathematics test.

Test score	Frequency
21	2
49	3
55	1
65	1
80	1
95	2

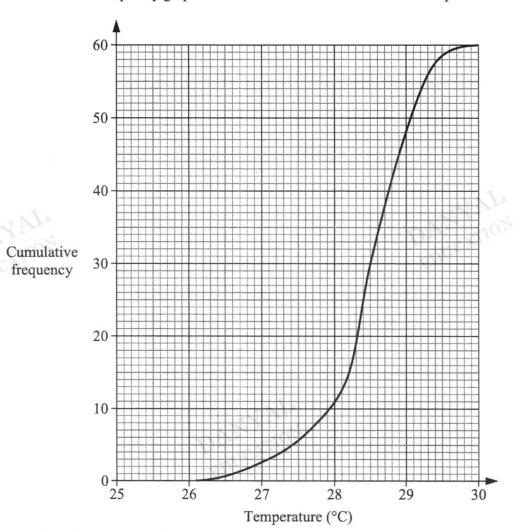
The test scores are also represented in the box-and-whisker plot below.



Write down the values of w, x, y and z.

	 w =	Answer	
	 $\chi =$		
	 <i>y</i> =		
[2	z =		

**(b)** The temperature at Ang Mo Kio was recorded every day for 60 days. The cumulative frequency graph below shows the distribution of the temperatures.



(i) Use the graph to estimate

(a) the number of days that had temperatures above 29°C.

Answer [1]

(b) the interquartile range of the temperatures.

Answer [1]

(ii) The temperature at Jurong was recorded every day for the same period.

The interquartile range of the temperatures at Jurong is 1.5°C.

Explain what this tell us about the temperature at Jurong compared with the temperature at Ang Mo Kio.

[1]

	.,
24	On every weekday, a bakery delivers chicken pies and apple pies to four cafes.  On every weekend, it delivers double the number of chicken pies and apple pies to each of the cafe.
	The matrix <b>E</b> shows the number of chicken and apple pies delivered to each cafe on each weekday and each weekend

	Chicken	App	ole
	pies	pies	3
107	(38	50	Weekday
<u>r.</u> =	$=$ $\begin{pmatrix} 38 \\ 76 \end{pmatrix}$	100	Weekend

(a) Evaluate the matrix M = 4E.

Answer	$\mathbf{M} =$	[1]

**(b)** Evaluate the matrix  $C = (5 \ 2)M$ .

Answer 
$$C = [1]$$

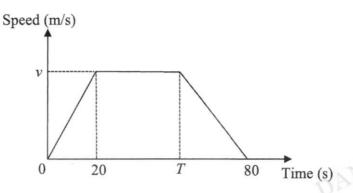
(c) State what the elements of C represent.

(d) The price of each chicken pie is \$1.80 and the price of an apple pie is \$1.50. By matrix multiplication, calculate the total amount of money the bakery collects per week from the sale of the pies to the four cafes.

25 The diagram below shows the speed-time graph of a bus journey.

The bus accelerated from rest at  $1.25 \text{ m/s}^2$  to a speed of v m/s in 20 seconds, and travelled at this speed until T seconds before it came to a stop at 80 seconds.

The total distance travelled for the whole journey was 1450 m.



- (a) Find the values of
  - (i) v,

Answer	 [1]

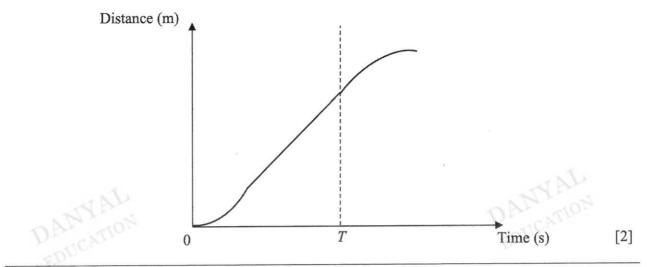
(ii) T.

$$Answer \quad T =$$
 [2]

**(b)** Describe the motion of the bus between 20 seconds and T seconds.

[1]

(c) On the axes below, draw the distance-time graph of the bus journey, marking and stating the distance travelled for each time duration clearly on the vertical axis.



#### **END OF PAPER**

DANYAL

DANYAL

Name:	Register Number:	Class:

#### PRESBYTERIAN HIGH SCHOOL



## MATHEMATICS PAPER TWO

4048/02

19 August 2021

Thursday

2 hours 30 minutes

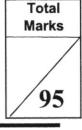
PRESBYTERIAN HIGH SCHOOL PRESBYTERIAN HIGH SCH

# SECONDARY FOUR EXPRESS / FIVE NORMAL (ACADEMIC) PRELIMINARY EXAMINATION

DANYAL

DANYAL

					For	Exami	ner's	Use			
Qn	1	2	3	4	5	6	7	8	9	10	Marks Deducted
Marks											
Catego	ory	Accur	acy	Unit	s	Symbo	ols	Other	s		
Questi	on										



#### Mathematical Formulae

Compound Interest

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

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

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

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

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

1	(a)	(i)	Express $x^2 - 6x - 2$ in the form $(x - a)^2 + b$ where a and b as constants.	re
			Answer[2	2]
		(ii)	Hence, state the minimum value of $y = x^2 - 6x - 2$ .	
A	CATT	ON	-11 DAM EDUCATION	
			Answer [	1]
	(b)	(i)	Simplify $\frac{2x^2 - 18}{3x^2 + 11x + 6}$ .	
			DANYAL	
			WAL	
	M	AL	Answer[	[3]
EL DE	UCA	(ii)	Hence, or otherwise, express $1 - \frac{2x^2 - 18}{3x^2 + 11x + 6}$ as a single fraction	on
			in its simplest form.	-
			Answer[	2]

	(c)	Giver	that $R^2 = h(\pi p - q)^2$ .		
		(i)	Find the value of R when $h = 20$ , $p = 10$	and $q = 5$ .	
	W P	T		Answer	[2]
DAJ	CAT	(ii)	Express $q$ in terms of $h$ , $p$ and $R$ .		EDUCATE
En					
			DANYAL		
				Answer	[2]

The diagram shows a field ABCD on horizontal ground. Angle  $\overrightarrow{ABC} = 115^{\circ}$ , Angle  $\overrightarrow{CAD} = 58^{\circ}$ ,  $\overrightarrow{AB} = 9$  m,  $\overrightarrow{BC} = 6$  m and  $\overrightarrow{CD} = 11$  m. 9 m 58 115 11 Calculate AC, obtuse angle ADC, (b) the area of triangle ACD, (c) Answer ..... m<sup>2</sup> [2]

(	d)	the shortest distance from $D$ to $AC$ .
	Į P	Answer m [2]

DAIN DAIN DAIN EDUCATION

DANYAL

DANYAL

3	(a)	The approximate mass of the earth is $5.97 \times 10^{24}$ kg is the earth heavier than a sumo wrestler who weigh Give your answer in standard form correct to 3 significant significant correct to 3 significant correct correc	s 125 kg?
			Answer[2]
	(b)	A mobile phone can be bought online at a price of U.  The same type of mobile phone is sold in Singapore	at S\$600.
AN	CATI	A local shop owner decides to sell the same type of such that its price is equivalent to what a buyer pays Given that US\$1 = S\$1.36, calculate the percentage	online.
		VAL	
		DAMATION	
		Answe	er%[3]
	(c)	A train travels for 68 km at an average speed of 51 It then traveled for another 20 km at an average speed its destination. Calculate the average speed for the v	ed of 40 km/h before reaching
OB	OCY	ION	DANYAL
ED	OCA		
		An	swerkm/h [3]

(d	1)	In the year 2020, there are 250 male employees and 300 female employees in an office.  In the year 2019, the number of male employees was 130% of the current male employees. In the year 2019, the number of female employees was 65% of the current female employees.  Find the difference in the number of male and female employees in the year 2019 as a percentage of the number of female employees in that year.
DATO	A	DANYAL DANYAL EDUCATION
		Answer % [3]

		Answer the whole of this question on a piece of graph paper. The variables x and y are related by the equation $y = x^3 - 3x^2 + 1$ .										
	Some	me corresponding values of $x$ and $y$ are given in the following table.										
	)	ĸ	-2	-1	0	1	2	3	4			
	J	v	-19	-3	1	-1	p	1	17			
	(a)	Find	the value	of <b>p</b> .								
	VA	ANY D										
BI	CATT	Answer $p = \dots [1]$										
	(b)	Using a scale of 2 cm to 1 unit, draw a horizontal x-axis for $-2 \le x \le 4$ . Using a scale of 1 cm to 2 units, draw a vertical y-axis for $-20 \le y \le 20$ . On your axes, plot the points given in the table and join them with a smooth curve.										
	(c)	Use your graph to find the value(s) of $x$ for which										
		(i) $x^3 - 3x^2 + 1 = 0$ ,										
		Answer $x = \dots $										
_ \	M	YE				DE DICATIO.						
ED.	OCA"	(ii) $x^3 - 3x^2 + 1 = -4x$ .										
		Answer $x = \dots [1]$										
						Answ	ver x =			[1		
	(d)	By d	rawing a	suitable ta	ngent, find	190000011000000000000000000000000000000	ent of the			[3		

	Answer [2	2]
(e)	The line $y = k$ , where $k$ is a constant, meets the curve $y = x^3 - 3x^2 + 1$ at two points. Draw this line and hence find a possible value of $k$ .	
	$Answer k = \dots [2]$	2]
DANY	TION EDUCATION	

DANYAL

5	(a)	Consi	der the sequence:	
		$T_1 = 1$		
		$T_2 = 1$	+2 = 3	
		$T_3 = 1$	+2+3=6	
		$T_4 = 1$	+2+3+4=10	
		525	+2+3+4+5=15	
		(i)	Write down $T_6$ of the sequence in the	similar form.
				,
				MAL
	MA	T		DANTON
DAS	7	02/		Answer[1]
EDI	Cr			11101101
-				
		(ii)	The <i>n</i> th term of the sequence is given	below.
			$T = 1 + 2 + 2 + 4 + \dots = n(n+1)$	
			$T_n = 1 + 2 + 3 + 4 + \dots + n = \frac{n(n+1)}{2}$	
			Use the formula to find	
			(a) $T_{100}$ ,	
			Drock!	
				E .
				JAL
	J	AL		Answer[1]
00	24,	MON		EDUCA
EI	OUC A	3.	<b>(b)</b> the value of $3+6+9+12+$	+300.
				Answer[2]

(b	(b) Consider the number sequence: 1, 4, 7, 10, 13, 16,							
	(i)	Write down the <i>n</i> th term of the sequence.						
		Answer[1]						
	(ii)	Find the 80 <sup>th</sup> term of the sequence.						
MAD	J.	DAMAL						
EDUCAT	10>	Answer[1]						
	(iii)	Write down the smallest and largest four-digit number of the sequence.						
		DANYAL						
		Answer						

6	(a)	In the diagram, AB is a tangent to the circle with centre O, $\angle CAB = 58^{\circ}$
		and CDE is a straight line.
		E
		A
		58°
. 7	MA	B
DB)	CATT	ON DAL BUICATION
EDI		
		Find, st ∠ ating your reasons clearly,
		(i) ∠BDE,
		(i) ZBDE,
		DANYAL EDUCATION
		DECATION
		Answer° [2]
		(ii) obtuse $\angle BOE$ ,
		AL DANYAL EDUCATION
		DALCATION
DP		LION
- 61	200	
		[-]
		(iii) ∠EBO,
		Answer° [1]

		(* ) / IDE
		(iv) $\angle ABE$ .
		<i>Answer</i> ° [2]
	(b)	The figure shows arcs, AB and CD, of two concentric circles with centre at O.
		Their radii, OB and OC, are x cm and y cm respectively, and $\angle AOB = 0.5$ radians.
EDU	CATT	O 0.5 radians
		C
		Tild Cd 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
		(i) Find the area of the shaded region in terms of $x$ and $y$ .
	M	DANYAL DANYAL EDUCATION
DA	CAT	ION EDICE
ED	00	
		Answer cm <sup>2</sup> [2]
		(2) If the newignest are of the cheded region ADCD is 120 are show that
		(ii) If the perimeter of the shaded region <i>ABCD</i> is 120 cm, show that $y = \frac{1}{5} (240 + 3x)$ .

is .		
		v
		4

DANYAL

DANYAL

DANYAL

7	(a)	The po	sition vector of A is $\begin{pmatrix} 3 \\ 4 \end{pmatrix}$ and the position vector	for of B is $\binom{7}{10}$ .
		(i)	Find the column vector $\overrightarrow{AB}$ .	
				Answer[1]
AT	CATT	(ii)	Find $ \overrightarrow{AB} $ .	DALTION
EDE				
				Answer[1]
		(iii)	Given that $\overrightarrow{AB} = 3\overrightarrow{BC}$ , find the coordinates of	of point C.
			DALYTON	
DA DA	NY CAT	IL TON		DANYAL
E)				Answer[1]
	(b)	Given	$\overrightarrow{PQ} = \begin{pmatrix} 2 \\ 1 \end{pmatrix}$ , $\overrightarrow{PR} = \begin{pmatrix} -1 \\ -\frac{1}{2} \end{pmatrix}$ and the point $Q$ has constant.	pordinates (–2, 4).
		(i)	Deduce the gradient of the line PQ and hence	e, find the equation of the line
			PQ.	

			Answer	[1]
		(ii)	Write down 2 facts about $P$ , $Q$ and $R$ .	
A	CATA	D ON		DANYAL
EDI	Car			ED

DANYAL

DANYAL

8	A mo	odel consists of a solid hemisphere attached to a solid cy am1.	linder as shown in
	The h	neight of the cylinder is 26 cm and the base area is 198 c	$m^2$ .
EDU	CATT	26 cm Diagram 1 Diagram	26 cm
	(0)	Calculate, giving your answers to the nearest whole nu	mher the volume of
	(a)	(i) the cylinder,	iniber, the volume of
		Volume of cylinder = $26 \times 198 = 5148  cm^3$	
		Ansv	ver[1]
DA	ZZ.	(ii) the hemisphere.	EDUCKI
ET			
		Ansv	wer[3]

	(b)		f the cylinder in the shape of a right circular cone is removed as in the diagram 2.
		(i)	Given that the volume of the cone removed from the model is 630 cm <sup>3</sup> , calculate the height of the cone.
	27		
. 7	SIP	T	Answer
EDI	CAT	(ii)	Calculate the total surface area of the model as shown in diagram 2, giving the answer to the nearest whole number.
			DANYAL
0	777	AL	DANYAL
	DUC!	11	Answer $cm^2$ [4]

9	(a)	Th in a cl	te following stem lass test that has a	-and-leaf a total ma	diag rk of	ram s	show	s the	mar	ks o	btained by 20 pupils
				1   0 2   3 3   2 4   1 5   0	2 3 5 6	4 5 7	7 5 8	7 6 8	7	9	
		(i)	State the media	an score.							DAMAT
EDU	CATT	014									EDUCATION
								A	nswe	r.	[1]
		(ii)	Find the standa	ard deviat	ion.				<u> </u>		
				DAT							
	M	V.						1	nswe	· ·	[3]
DA	SCA"	10%	TC 1'- 4' 4' '		1 +0 -0	unila	who				st 80%, find the
ET		(iii)	percentage of	pupils in	the cl	ass v	who s	core	d dis	tinc	tion.
								An	swer	٠	% [2]

	(b)	1	has six 10-cent coins and two 50-cent coins. She takes 2 coins at m from her purse, one after the other.
		(i)	Complete the probability tree diagram shown in the answer space, giving the answers in fraction in the simplest form.
DAT	CAT	J.	
		(ii)	Find the probability that the total value of the two coins is 60 cents.
			PALCATION
	74.4	AL	Answer[2]
E	OGC P	(iii)	If a third coin is taken out, calculate the probability that the total amount is 30 cents.
			Answer[2]

Peter is deciding between two models of air conditioner.								
Monday to Thursday 6 hours each day  Friday 7 hours 15 minutes  Saturday & Sunday 8 hours each day  Show that the mean length of time that she would use the air con is 6 hours 45 minutes.  Answer	iditioner each day							
Friday 7 hours 15 minutes  Saturday & Sunday 8 hours each day  Show that the mean length of time that she would use the air con is 6 hours 45 minutes.  Answer	iditioner each day							
Saturday & Sunday  Show that the mean length of time that she would use the air con is 6 hours 45 minutes.  Answer  Peter is deciding between two models of air conditioner.	nditioner each day							
Show that the mean length of time that she would use the air con is 6 hours 45 minutes.  Answer  Peter is deciding between two models of air conditioner.	iditioner each day							
Peter is deciding between two models of air conditioner.	nditioner each day							
Peter is deciding between two models of air conditioner.	ditioner each day							
Answer  Peter is deciding between two models of air conditioner.	DUCATION							
Peter is deciding between two models of air conditioner.								
Peter is deciding between two models of air conditioner.								
Peter is deciding between two models of air conditioner.								
Peter is deciding between two models of air conditioner.								
Peter is deciding between two models of air conditioner.								
Peter is deciding between two models of air conditioner.								
Peter is deciding between two models of air conditioner.								
Peter is deciding between two models of air conditioner.								
Peter is deciding between two models of air conditioner.								
Peter is deciding between two models of air conditioner.								
Peter is deciding between two models of air conditioner.								
Peter is deciding between two models of air conditioner.	N Cont							
	Answer[2]							
	EDUCA							
	Peter is deciding between two models of air conditioner.							
Page 25 shows the information that he needs, including the electricity consumptions of								
the two models.								
(b) Based on his usage, Peter estimates that the electricity consumpt	Based on his usage, Peter estimates that the electricity consumptions in one year							
will be 1755 kWh for Model S and 1066.5 kWh for Model E.								
Show with workings how he come up with these estimates.								

	consumes and the cost of servicing Electricity costs 25.3 cents per kWl Peter would like the air conditioner Based on his usage, which model si conditioner for 7 years?  Justify your decision with calculation	h, including GST.  to be serviced once every 4 months.  hould he choose if he intends to use the air
DAY	YAL	DANYAL
	DAN	
DAT	MAL	DANYAL

END OF PAPER

Name:	Index No.:	Class:

## PRESBYTERIAN HIGH SCHOOL



MATHEMATICS PAPER ONE

4048/01

20 August 2021

Friday

2 hours

PRESBYTERIAN HIGH SCHOOL PRESBYTERIAN HIGH SCHOOL PRESBYTERIAN HIGH SCHOOL PRESBYTERIAN HIGH SCHOOL

PRESBYTERIAN HIGH SCHOOL PRESBYTERIAN HIGH SCHOOL PRESBYTERIAN HIGH SCHOOL PRESBYTERIAN HIGH SCHOOL PRESBYTERIAN HIGH SCHOOL PRESBYTERIAN HIGH SCHOOL PRESBYTERIAN HIGH SCHOOL PRESBYTERIAN HIGH SCHOOL PRESBYTERIAN HIGH SCHOOL PRESBYTERIAN HIGH SCHOOL PRESBYTERIAN HIGH SCHOOL PRESBYTERIAN HIGH SCHOOL

PRESBYTERIAN HIGH SCHOOL PRESBYTERIAN HIGH SCHOOL PRESBYTERIAN HIGH SCHOOL PRESBYTERIAN HIGH SCHOOL

SECONDARY FOUR EXPRESS/ FIVE NORMAL (ACADEMIC) PRELIMINARY EXAMINATIONS

# SUGGESTE ANSWERS

1	neare	number of people who are fully vaccinated is st hundred.			to the
			Answer	2420750	[1]
2	(a)	Express $(\sqrt[3]{x})^2$ in index notation.			
	(b)	$(\sqrt[3]{x})^2 = x^{\frac{2}{3}}$ Find the integer <i>n</i> such that $2^n = \frac{1}{32}$ .	Answer	$\frac{2}{x^3}$	[1]
	(2)	$2^{n} = \frac{1}{32}$ $2^{n} = 2^{-5}$	Answer	n = -5	[1]
3	(a)	Express 378 as the product of its prime fa	ctors.		
	(b)	Find the smallest positive integer $k$ such t $k = 2^2 \times 7^2 = 196$		$2 \times 3^3 \times 7$ is a perfect cube.	(J)

4

Presbyterian High School

Answer k = 196

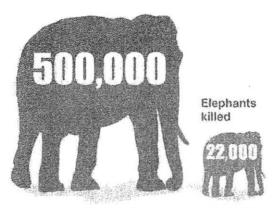
[1]

4 A website shows a poster of the poaching statistics of African elephants.

### The future of African elephants threatened

Poaching and the trade in ivory could result in one fifth of the population wiped out in 10 years

Estimated number of elephants (in 2012)



Adapted from: https://www.allcreaturespod.com/episodes/episode-2-elephant/poaching-stats/

Explain how the poster above may be misleading.

The sizes of the two elephants are not in proportion which will mislead readers into thinking that the number of elephants killed is larger than the actual number.

or

If 22 000 elephants are killed each year, in 10 years' time, 22 000 x 10 = 220 000 will be killed. But 220 000 is 44% of the population and not 1/5 as stated in the headline. This will mislead readers into thinking that only 20% of the population will be wiped out.

[1]

On 1<sup>st</sup> January 2018, Mrs Yeo invests \$15000 in an account which pays at a rate of compound interest of *R*% per year. On 1<sup>st</sup> January 2021, she earned a total interest of \$988.45. Find the value of *R*.

$$15000 + 988.45 = 15000 \left( 1 + \frac{R}{100} \right)^{3}$$

$$R = 100 \left( \sqrt[3]{\frac{15988.45}{15000}} - 1 \right)$$

$$= 2.14999$$

$$= 2.15$$

Answer R = 2.15

[2]

There were 3 candidates A, B, and C in a school election for the President of Student Council. There were 1120 voters and the votes for the 3 candidates were divided in the ratio of 11:7:2. Calculate the difference between the highest number and lowest number of votes.

highest number of votes = 
$$\frac{11}{20} \times 1120$$
  
= 616  
lowest number of votes =  $\frac{2}{20} \times 1120$   
= 112  
difference = 616-112  
= 504

Answer 504 votes [2

7 There are 12 girls and 9 boys in a group.

Find, in its simplest form, the probability of selecting a boy randomly from the

(a) group.

$$\frac{9}{12+9} = \frac{3}{7}$$

Answer  $\frac{3}{7}$  [1]

(b) How many more boys are needed to join the group so that the probability of selecting a boy randomly from the group will be  $\frac{4}{5}$ ?

Let the number of boys be b.

$$\frac{9+b}{21+b} = \frac{4}{5}$$

$$84+4b = 45+5b$$

$$b = 39$$

Answer 39 boys [1]

8 (a) Factorise  $x^2 + 5x - 6$ .

Answer (x+6)(x-1) [1]

(b) Hence, solve  $(p-1)^2 + 5(p-1) - 6 = 0$ .

$$(p-1+6)=0$$
 or  $(p-1-1)=0$   
 $p=-5$   $p=2$ 

Answer p = -5 or 2 [2]

9 (a) Simplify 2(3x+5)-2(1-2x).

$$2(3x+5)-2(1-2x)$$

$$= 6x+10-2+4x$$

$$= 10x+8$$

$$= 2(5x+4)$$

Answer 
$$2(5x+4)$$
 [1]

(b) Given  $\frac{2y}{3} - \frac{y-4}{4} \le 5$ , find the largest rational value of y.

$$\frac{2y}{3} - \frac{y-4}{4} \le 5$$

$$\frac{8y-3y+12}{12} \le 5$$

$$5y+12 \le 60$$

$$y \le 9\frac{3}{5}$$

Answer 
$$9\frac{3}{5}$$
 [2]

10		6 men take 10 days to paint an apartment.
	3 5	Calculate the number of men required to paint the same apartment in 3 days.

1 man takes  $6 \times 10 = 60$  days No of men required =  $60 \div 3 = 20$ 

Answer 20 men [1]

(b) The braking distance, d of a car is directly proportional to the square of its speed, v. When the speed of the car is increased by 200%, find the percentage increase in its braking distance.

$$d = kv^2$$

When v increased by 200%,  $d = k(3v)^2$ 

$$=k(9v^2)$$

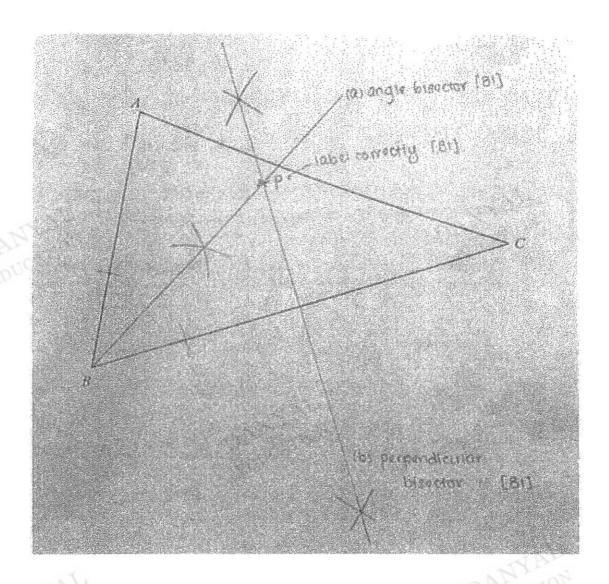
% increase = 
$$\frac{9v^2 - v^2}{v^2} \times 100\%$$
  
= 800%

Answer 800 % [2]

DANYAL

DANYAL

### 11 The diagram shows a triangle ABC.



On the diagram,

(a) construct the bisector of angle ABC, [1]

(b) construct the perpendicular bisector of BC, [1]

(c) label the point P that is equidistant from B and C, and also equidistant from AB and [1] BC.

A straight line with equation 2y = kx + h passes through the points (-2, 6) and (1, -9). 12 Find the values of k and h.

$$12 = -2k + h -(1)$$

$$-18 = k + h -(2)$$

$$(1)-(2):$$

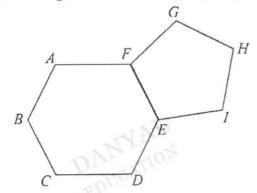
$$30 = -3k$$

$$k = -10$$
Subs  $k = -10$  into eqn (2)
$$-18 = -10 + h$$

$$h = -8$$

Answer 
$$k = -10$$
,  $h = -8$  [3]

The diagram shows a regular hexagon, ABCDEF and a regular pentagon, EFGHI. 13



Find ∠EDI.

one int 
$$\angle$$
 of hexagon =  $\frac{(6-2)180}{6} = 120^{\circ}$ 

one int 
$$\angle$$
 of pentagon =  $\frac{(5-2)180}{5}$  =  $108^{\circ}$ 

$$\angle DEI = 360^{\circ} - 120^{\circ} - 108^{\circ}$$

$$= 132^{\circ}$$

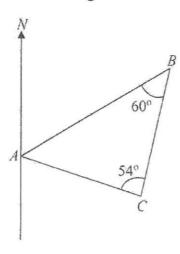
$$\angle DEI = \frac{180^{\circ} - 132^{\circ}}{2}$$

$$= 24^{\circ}$$

$$\angle DEI = \frac{180^{\circ} - 132^{\circ}}{2}$$
$$= 24^{\circ}$$



14 The diagram shows the positions of points A, B and C.  $\angle ABC = 60^{\circ}$ ,  $\angle BCA = 54^{\circ}$  and the bearing of B from A is 078°.



Find the bearing of

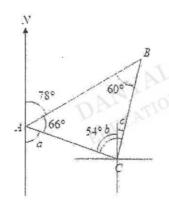
C from A, (a)

$$\angle BAC = 180^{\circ} - 60^{\circ} - 54^{\circ}$$
  
= 66°  
bearing = 78° + 66°  
= 144°

[1]

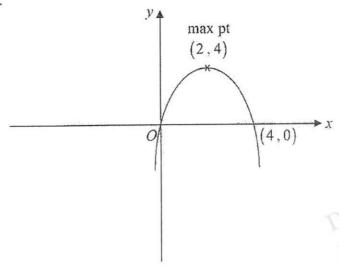
B from C. (b)

$$\angle a = 180^{\circ} - 78^{\circ} - 66^{\circ}$$
 (adj  $\angle$  on a st line)  
= 36°  
 $\angle b = 36^{\circ}$  (alt  $\angle$ )  
 $\angle c = 54^{\circ} - 36^{\circ}$   
= 18°



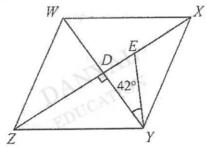
Answer 018° [2] 15 Sketch the graph of  $y = -(x-2)^2 + 4$  on the axes below.

Indicate clearly the coordinates of the points where the graph crosses the axes and the maximum point on the curve.



[3]

The diagram shows a rhombus WXYZ, where the diagonals intersect at D. ZDEX lies on a straight line. EY = 4.7 cm, XZ = 15 cm and  $\angle DYE = 42^{\circ}$ .



Find the length EX.

$$\sin 42^{\circ} = \frac{DE}{4.7}$$

$$DE = 4.7 \sin 42^{\circ}$$

$$= 3.1449 \text{ cm}$$

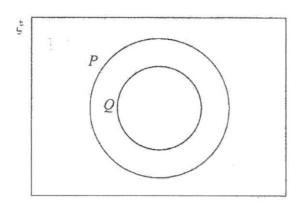
$$EX = 7.5 - 3.1449$$

DANYAL

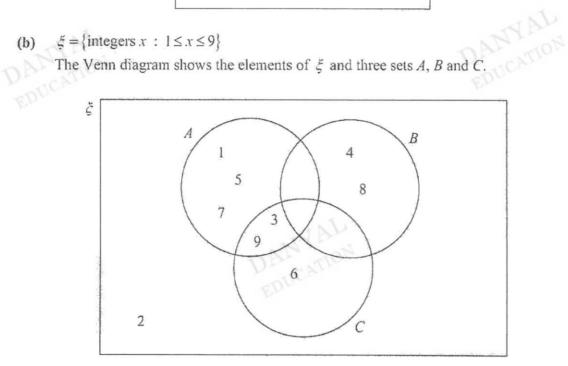
Answer 4.36 cm

[3]

On the Venn diagram, shade the region which represents  $Q \cup P'$ . 17 (a)



[1]



Use one of the symbols below to complete each statement.

$$\emptyset \subset \not\subset \notin \in \xi$$

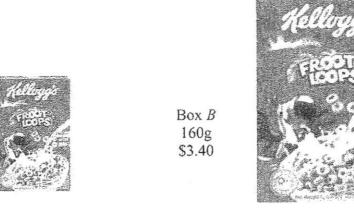
(i) 
$$\{4, 8\} \subset B$$

(ii) 
$$9 \in C$$

(iii) 
$$B \cap C = \emptyset$$
 [1]

Presbyterian High School

The following diagram shows 2 geometrically similar boxes of cereals of the same brand. 18



Box A 20g \$0.80

Show that the cost of the cereal is not directly proportional to the quantity of the cereal. Explain with clear calculation.

Answer

Cost of per gram for Box 
$$A = \frac{0.80}{20} = $0.04$$

Cost of per gram for Box 
$$B = \frac{3.40}{160} = \$0.02125$$

Since cost per gram is not a constant, the cost of the cereal is not directly proportional to the quantity of the cereal.

[1]

Find  $\frac{\text{height of Box } A}{\text{height of Box } B}$ .

$$\frac{\text{height of Box } A}{\text{height of Box } B} = \sqrt[3]{\frac{20}{160}}$$
$$= \frac{1}{2}$$

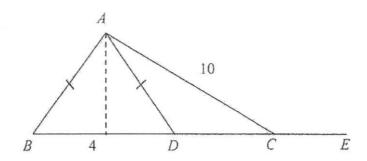
Answer 
$$\frac{1}{2}$$
 [1]

It is given that the surface area of Box A is 454 cm<sup>2</sup>. Calculate the surface area of Box B.

$$\left(\frac{1}{2}\right)^2 = \frac{454}{\text{surface area of Box } B}$$

surface area of Box 
$$B = 2^2 \times 454$$
  
= 1816

Answer 1816 cm<sup>2</sup> [2] 19 In the diagram, BDCE is a straight line. BD = 4 cm, AC = 10 cm and AB = AD.



(a) Given that the area of triangle ABD is 16 cm<sup>2</sup>, show that the vertical height of triangle ABD is 8 cm.

Answer

$$\frac{1}{2} \times 4 \times h = 16$$

$$h = 8 \quad \text{(shown)}$$

[1]

- (b) Write down, as a fraction, the value of
  - (i)  $\sin \angle ACE$ .

$$\sin \angle ACE = \frac{8}{10} = \frac{4}{5}$$

Answer  $\frac{4}{5}$  [1]

(ii)  $\tan \angle ACD$ ,

$$MC = \sqrt{10^2 - 8^2} = 6$$

$$\tan \angle ACD = \frac{8}{6} = \frac{4}{3}$$

nswer  $\frac{4}{3}$ 

[2]

- 20 A map has a scale of 1:150 000.
  - (a) The length of a road on the map is 6.4 cm.
    Calculate the actual length, in kilometres, of the road.

length = 
$$6.4 \times 150000$$
  
=  $960000$  cm  
=  $9.6$  km

*Answer* 9.6 km [2]

(b) The area of a park is 10.125 km².
Calculate, the area, in square centimetres, of the park on the map.

area scale is  $(1 \text{ cm})^2$ :  $(1.5 \text{ km})^2$ area on map =  $\frac{10.125}{2.25}$ =  $4.5 \text{ cm}^2$ 

Answer  $4.5 \text{ cm}^2$  [2]

DANYAL

		mit 1		1		1 . 7		
21	(a)	The	me /	nas	equation	4x + 2	1+1	=0.

(i) Find the gradient of line 1.

$$4x+2y+7=0$$

$$2y=-4x-7$$

$$y=-2x-\frac{7}{2}$$

Answer 
$$-2$$
 [1]

(ii) Find the coordinates of the point where / cuts the y-axis.

 $\left(0, -\frac{7}{2}\right) \tag{1}$ 

(b) Another line k is parallel to  $y = \frac{1}{2}x + 5$  and it passes through the point (8, 3). Find the equation of line k.

$$y = \frac{1}{2}x + 5 \implies m = \frac{1}{2}$$
subs (8,3) into  $y = \frac{1}{2}x + c$ 

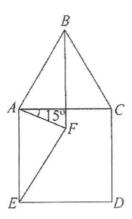
$$3 = \frac{1}{2}(8) + c$$

$$c = -1$$

$$y = \frac{1}{2}x - 1$$

Answer 
$$y = \frac{1}{2}x - 1$$
 [2]

In the diagram, ABC is an equilateral triangle, ACDE is a square and angle  $FAC = 15^{\circ}$ .



(a) Show that triangle *EAF* and triangle *BAF* are congruent. Give a reason for each statement you make.

Answer

Since triangle ABC is equilateral, AC = AB and  $\angle CAB = 60^{\circ}$ Since ACDE is a square, AE = AC and  $\angle EAC = 90^{\circ}$ 

$$AE = AB$$

$$\angle BAF = 60^{\circ} + 15^{\circ} = 75^{\circ}$$

$$\angle EAF = 90^{\circ} - 15^{\circ} = 75^{\circ}$$

$$\therefore \angle BAF = \angle EAF$$

FA is a common side.

[3]

(b) If the line BF bisects angle ABC, prove that triangle FAE is an isosceles triangle.

Answer

$$\angle ABF = \angle FBC = 30^{\circ}$$
 (BF bisects  $\angle ABF$ )  
 $\angle AEF = \angle ABF = 30^{\circ}$  (corr  $\angle s$  of congruent  $\triangle$ )  
 $\angle EFA = 180^{\circ} - 30^{\circ} - 75^{\circ}$   
 $= 75^{\circ}$   
 $= \angle EAF$ 

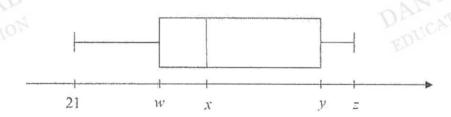
Since  $\angle EFA = \angle EAF$ , triangle FAE is an isosceles triangle.

[2]

23 (a) The table shows the scores of 10 students in a Mathematics test.

Test score 21 49 55 65 80	Frequency		
21	2		
49	3		
55	1		
65	1		
80	1		
95	2		

The test scores are also represented in the box-and-whisker plot below.



Write down the values of w, x, y and z.

Answer 
$$w = 49$$

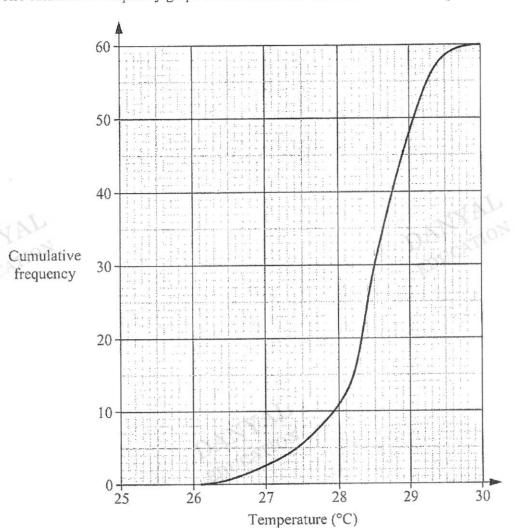
$$x = 52$$

$$y = 80$$

$$z = 95$$



(b) The temperature at Ang Mo Kio was recorded every day for 60 days. The cumulative frequency graph below shows the distribution of the temperatures.



(i) Use the graph to estimate

(a) the number of days that had temperatures above 29°C. 60-48=12

Answer 12 days [1

(b) the interquartile range of the temperatures. Q3 = 28.9, Q1 = 28.2

Answer 0.7°C [1]

(ii) The temperature at Jurong was recorded every day for the same period.

The interquartile range of the temperatures at Jurong is 1.5°C.

Explain what this tell us about the temperature at Jurong compared with the temperature at Ang Mo Kio.

The temperatures at Jurong have a <u>larger spread</u> than the temperatures at Ang Mo Kio.

[1]

24 On every weekday, a bakery delivers chicken pies and apple pies to four cafes.

On every weekend, it delivers double the number of chicken pies and apple pies to each of the cafe.

The matrix E shows the number of chicken and apple pies delivered to each cafe on each weekday and each weekend

Chicken Apple
pies pies
$$\mathbf{E} = \begin{pmatrix} 38 & 50 \\ 76 & 100 \end{pmatrix}$$
Weekday
Weekend

(a) Evaluate the matrix M = 4E.

$$\mathbf{M} = 4 \begin{pmatrix} 38 & 50 \\ 76 & 100 \end{pmatrix} = \begin{pmatrix} 152 & 200 \\ 304 & 400 \end{pmatrix}$$

Answer 
$$\mathbf{M} = \begin{pmatrix} 152 & 200 \\ 304 & 400 \end{pmatrix}$$
 [1]

(b) Evaluate the matrix  $C = (5 \ 2)M$ .

Evaluate the matrix 
$$C = (5 \ 2)M$$
. 
$$C = (5 \ 2) \begin{pmatrix} 152 & 200 \\ 304 & 400 \end{pmatrix} = (1368 \ 1800)$$
Answer  $C = \begin{pmatrix} 1368 & 1800 \end{pmatrix}$  [1]
State what the elements of  $C$  represent.

Answer 
$$C = (1368 \ 1800)$$
 [1]

(c)

The bakery delivers 1368 chicken pies and 1800 apple pies to the four cafes per week respectively.

(d) The price of each chicken pie is \$1.80 and the price of an apple pie is \$1.50. By matrix multiplication, calculate the total amount of money the bakery collects per week from the sale of the pies to the four cafes.

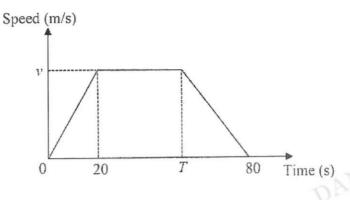
total amount of money = 
$$(1368 \ 1800) \begin{pmatrix} 1.80 \\ 1.50 \end{pmatrix}$$
  
=  $(5162.40)$ 

Answer \$ 5162.40

25 The diagram below shows the speed-time graph of a bus journey.

The bus accelerated from rest at  $1.25 \text{ m/s}^2$  to a speed of v m/s in 20 seconds, and travelled at this speed until T seconds before it came to a stop at 80 seconds.

The total distance travelled for the whole journey was 1450 m.



- (a) Find the values of
  - (i) v

$$\frac{v}{20} = 1.25$$

$$v = 25$$

Answer 
$$v = 25$$
 [1]

(ii) T.

$$\frac{1}{2}(80+T-20)(25) = 1450$$
 [M1]  

$$(60+T)(25) = 2900$$
  

$$60+T=116$$
  

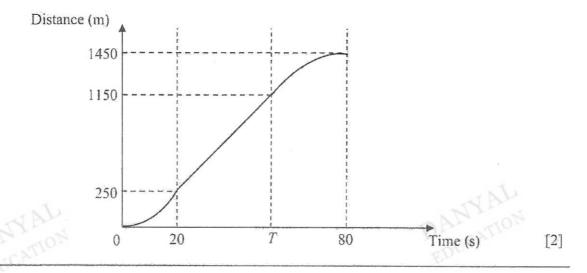
$$T=56$$

Answer 
$$T = 56$$
 [2]

(b) Describe the motion of the bus between 20 seconds and T seconds.

The bus is travelling at a constant speed of 25 m/s. [1]

(c) On the axes below, draw the distance-time graph of the bus journey, marking and stating the distance travelled for each time duration clearly on the vertical axis.



END OF PAPER

DANYAL

DANYAL

Name:	Register Number:	Class:

### PRESBYTERIAN HIGH SCHOOL



MATHEMATICS PAPER TWO 4048/02

19 August 2021

Thursday

2 hours 30 minutes

PRESBYTERIAN HIGH SCHOOL PRESBYTERIAN HIGH SCH

SECONDARY FOUR EXPRESS / FIVE NORMAL (ACADEMIC)
PRELIMINARY EXAMINATION

## SUGGESTED ANSWERS

For Examiner's Use Marks 7 9 10 8 1 2 3 4 5 6 Qn Deducted Marks Others Units Symbols Category Accuracy

Category Accuracy Units Symbols Others
Question

Total Marks

95

### Mathematical Formulae

Compound Interest

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

Mensuration

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

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

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

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

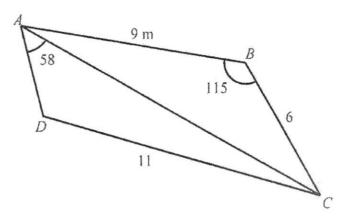
Trigonometry

$$\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$$
$$a^2 = b^2 + c^2 - 2bc \cos A$$

Statistics

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

2	The diagram shows a field ABCD on horizontal ground.
	Angle $ABC = 115^\circ$ , Angle $CAD = 58^\circ$ , $AB = 9$ m, $BC = 6$ m and $CD = 11$ m.



Calculate

$$(AC)^{2} = 9^{2} + 6^{2} - 2(9)(6)\cos 150^{\circ}$$
$$= 162.64277$$
$$AC = 12.753 \approx 12.8 m$$

(b) obtuse angle ADC,

$$\frac{\sin \angle ADC}{12.753} = \frac{\sin 58^{\circ}}{11}$$

$$\sin \angle ADC = 0.983196$$

$$Obtuse \angle ADC = 180^{\circ} - 79.48^{\circ}$$

$$\approx 100.5^{\circ}$$

(c) the area of triangle ACD,

$$\angle ACD = 180^{\circ} - 58^{\circ} - 100.52^{\circ} = 21.48^{\circ}$$

$$Area of \Delta ACD = \frac{1}{2}(11)(12.573)\sin 21.48^{\circ}$$

$$= 25.68 \approx 25.7m^{2}$$

*Answer* ..... m<sup>2</sup> [2

(g)	the shortest distance from $D$ to $AC$ .	
	Let the shortest distance be $h$ . Area of $\triangle ACD = 25.68$ $\frac{1}{2}(12.573)h = 25.68$ $h = 4.027 \approx 4.03m$	принципри
DANGAT	Answern	n [

DANYAL

DANYAL

3	(a)	The approximate mass of the earth is $5.97 \times 10^{24}$ kg. How many times is the earth heavier than a sumo wrestler who weighs 125 kg? Give your answer in standard form correct to 3 significant figures.							
		$\frac{5.97 \times 10^{24}}{125} = 4.776 \times 10^{22} \approx 4.78 \times 10^{22}$							
<u> </u>		Answer[2]							
A	(b)	A mobile phone can be bought online at a price of US\$350.  The same type of mobile phone is sold in Singapore at S\$600.  A local shop owner decides to sell the same type of mobile phone at a discount such that its price is equivalent to what a buyer pays online.  Given that US\$1 = S\$1.36, calculate the percentage of discount he has to offer.							
		Price online = $350 \times 1.36 = S\$476$ % discount = $\frac{600 - 476}{600} \times 100$ = $20.667 \approx 20.7$ or $20\frac{2}{3}$							
		Answer% [3]							
	(c)	A train travels for 68 km at an average speed of 51 km/h.  It then traveled for another 20 km at an average speed of 40 km/h before reaching its destination. Calculate the average speed for the whole journey.							
DA	DCW.	Time taken for 68 km = $\frac{68}{51} = 1\frac{1}{3}h$ Time taken for 20 km = $\frac{20}{40} = \frac{1}{2}h$ Average speed = $\frac{68 + 20}{1\frac{1}{3} + \frac{1}{2}} = 48  \text{km/h}$							
		Answerkm/h [3]							

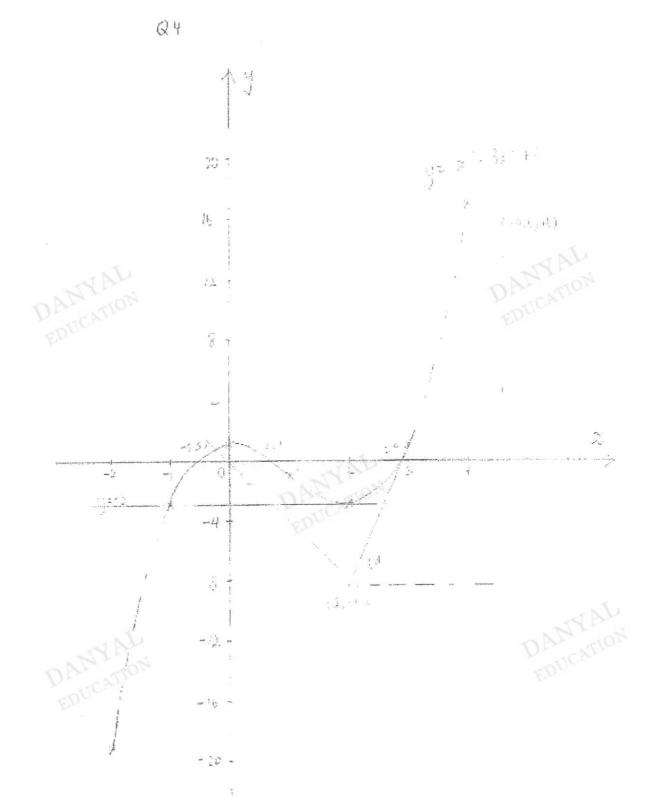
(d)	In the year 2020, there are 250 male employees and 300 female employees in an office.  In the year 2019, the number of male employees was 130% of the current male employees. In the year 2019, the number of female employees was 65% of the current female employees.  Find the difference in the number of male and female employees in the year 2019 as a percentage of the number of female employees in that year.				
PANCAT	Number of male = $250 \times \frac{130}{100} = 325$ Number of female = $300 \times \frac{65}{100} = 195$ % difference = $\frac{325 - 195}{195} \times 100$ = $\frac{130}{195} \times 100 = 66.7$ or $66\frac{2}{3}$	DANYAL			
the state of the s	Z A	Answer % [3]			

DANYAL

4	Ansv	ver th	ne whole o	f this que	stion on a	piece of g	graph pap	er.			
	The variables x and y are related by the equation $y = x^3 - 3x^2 + 1$ .										
an ann an Aireann an A	Some corresponding values of $x$ and $y$ are given in the following table.										
	(	c	-2	-1	0	I	2	3	4		
	J	,	-19	-3	1	-1	p	1	17		
	(a)	Fine	l the value	of <i>p</i> .	***************************************						
		p =	-3						MAL		
AN		24					Answ	er p =	TONT!	[1]	
EDU	(b)	Using a scale of 2 cm to 1 unit, draw a horizontal x-axis for $-2 \le x \le 4$ . Using a scale of 1 cm to 2 units, draw a vertical y-axis for $-20 \le y \le 20$ . On your axes, plot the points given in the table and join them with a smooth curve.									
	(c)	Use your graph to find the value(s) of x for which									
	(i) $x^3 - 3x^2 + 1 = 0$ ,										
From the graph, $x = -0.55, 0.7, 2.9$							1640				
	-T P	Answe						$er  x = \dots [2]$			
OA ED	CAL	(ii) $x^3 - 3x^2 + 1 = -4x$ .									
		From the graph, $x = -0.22$ Answer $x =$									
	(4)	So the base of the complete the company of y = 2									
	(d) By drawing a suitable tangent, find the gradient of the curve at $x = 1$										
	Draw a correct tangent line on graph										
		Gra	adient = $\frac{16}{1}$	$\frac{6 - (-8.4)}{4.6 - 2}$	≈ 9.38						
	1					3					

	Answer	
(e)		
	Draw the line $y = 1$ or $y = -3$ Possible value of $k = 1$ Possible value of $k = -3$	
		er k = [2]
ANYP	TON	DAL

DANYAL



		$T_1 = 1 = 1$					
		$T_2 = 1 + 2 = 3$					
		$T_3 = 1 + 2 + 3 = 6$					
		$T_4 = 1 + 2 + 3 + 4 = 10$					
		$T_5 = 1 + 2 + 3 + 4 + 5 = 15$					
		(i) Write down $T_6$ of the sequence in the	e similar form.				
	MA	$T_6 = 1 + 2 + 3 + 4 + 5 + 6 = 21$	DANTAL				
EDI	CX		Answer[1]				
		(ii) The <i>n</i> th term of the sequence is give	n below.				
		$T_n = 1 + 2 + 3 + 4 + \dots + n = \frac{n(n+1)}{2}$					
		Use the formula to find					
		(a) $T_{100}$ ,					
		EDIT					
		7 100(101)					
		$T_{100} = \frac{100(101)}{2}$					
		= 5050					
			Answer[1]				
and the second s	ACS VAS	(b) the value of $3+6+9+12+$	+300.				
A second		3(1+2+3+4++100) = 3(5050) = 15150					
		-3(3030)-13130					
			Answer[2]				

	(b	Consider the number sequence: 1, 4, 7, 10, 13, 16,
		(i) Write down the <i>n</i> th term of the sequence.
		$T_n = 3n - 2$
		Answer[1]
	annan da	(ii) Find the 80 <sup>th</sup> term of the sequence.
	VA.	$T_{80} = 3(80) - 2 = 238$
DAY	CATT	Answer[1]
EDI		(iii) Write down the smallest and largest four-digit number of the sequence.
		Smallest = 1000 Largest = 9997
		Answer and [2]



6	(a)	In the diagram, AB is a tangent to the circle with centre O, $\angle CAB = 58^{\circ}$			
		and CDE is a straight line.	and CDE is a straight line.		
adiportant de proposation de la constitución de la					
and District Annual Control		F.			
		A			
		58°			
			1		
	VB.	C	AMYRON		
DAD	CATT	024	DAL ATTO		
EDI	0.		V		
		Find, st ∠ ating your reasons clearly,			
	(i) $\angle BDE$ ,				
		con con the same			
		$\angle CDB = \angle CAB = 58^{\circ}$ ( $\angle s$ in the same segment) $\angle BDE = 180^{\circ} - 58^{\circ} = 122^{\circ}$			
			wer° [2]		
		(ii) obtuse ∠BOE,	[2]		
		(II) Obluse ZBOE,			
		Reflex $\angle BOE = 122^{\circ} \times 2 = 244^{\circ}$	DANYAL		
9	N	( $\angle$ at centre = $2\angle$ at circumference)	DALCATION		
DF	OCA	Obtuse $\angle BOE = 360^{\circ} - 244^{\circ} = 116^{\circ}$	EDC		
			wer° [2]		
		(iii) ∠EBO,			
		$\angle EBO = \frac{180^{\circ} - 116^{\circ}}{32^{\circ}} = 32^{\circ}$			
		Ans	wer° [1]		

	(iv) $\angle ABE$ .	
	$\angle ABO = 90^{\circ} \text{ (radius } \bot \text{ tangent)}$ $\angle ABE = 90^{\circ} - 32^{\circ} = 58^{\circ}$	
	A	nswer° [2]
(b)	The figure shows arcs, $AB$ and $CD$ , of two concentrice. Their radii, $OB$ and $OC$ , are $x$ cm and $y$ cm respective.	e circles with centre at $O$ . ely, and $\angle AOB = 0.5$ radians.
ANYA	O 0.5 radians	D C
	(i) Find the area of the shaded region in terms of	f x and y.
DAM	Area of shaded region $= \frac{1}{2} y^{2}(0.5) - \frac{1}{2} x^{2}(0.5)$ $= \frac{1}{4} (y^{2} - x^{2}) \text{ or } \frac{1}{4} (y - x)(y + x)$ or $0.25(y^{2} - x^{2})$	DANYAL
		s 120 cm, show that
	AB = 0.5x $DC = 0.5y$	

Perimeter of $ABCD = 120$ 0.5x + 0.5y + 2(y - x) = 120	
$\begin{vmatrix} \frac{1}{2}x + \frac{1}{2}y + 2y - 2x = 120 \\ 5 & 3 \end{vmatrix}$	
$\frac{5}{2}y = \frac{3}{2}x + 120$ $y = \frac{1}{5}(240 + 3x)$	
5	

DANYAL

DANYAL

DANYAL

7	(a)	The position vector of A is $\begin{pmatrix} 3 \\ 4 \end{pmatrix}$ and the position vector of B is $\begin{pmatrix} 7 \\ 10 \end{pmatrix}$ .		
		(i) Find the column vector $\overrightarrow{AB}$ .		
	The state of the s	$\overline{AB} = \overline{OB} - \overline{OA} = \begin{pmatrix} 7 \\ 10 \end{pmatrix} - \begin{pmatrix} 3 \\ 4 \end{pmatrix} = \begin{pmatrix} 4 \\ 6 \end{pmatrix}$		
			Answer[1]	
A	MA	(ii) Find $\overline{AB}$ .	DANY	
EDI		$ \overline{AB}  = \sqrt{4^2 + 6^2} = 7.21 \text{ units}$	En	
			Answer[1]	
		(iii) Given that $\overrightarrow{AB} = 3\overrightarrow{BC}$ , find the coordinates of	of point C.	
		$\overrightarrow{BC} = \frac{1}{3} \overrightarrow{AB} = \begin{pmatrix} \frac{4}{3} \\ 2 \end{pmatrix}$		
		$\overline{OC} = \overline{OB} + \overline{BC} = \begin{pmatrix} 7 \\ 10 \end{pmatrix} + \begin{pmatrix} \frac{4}{3} \\ 2 \end{pmatrix} = \begin{pmatrix} 8\frac{1}{3} \\ 12 \end{pmatrix}$	ZAL	
OA	M	Coordinates of C is $\left(8\frac{1}{3}, 12\right)$	DANIZATION	
EI	log y		Answer[1]	
	(b)	Given $\overrightarrow{PQ} = \begin{pmatrix} 2 \\ 1 \end{pmatrix}$ , $\overrightarrow{PR} = \begin{pmatrix} -1 \\ -\frac{1}{2} \end{pmatrix}$ and the point $Q$ has constant.	oordinates (–2, 4).	
		(i) Deduce the gradient of the line PQ and hence	e, find the equation of the line	
		PQ.		
and the state of t		Gradient of $PQ = \frac{1}{2}$		

$y = \frac{1}{2}x + c$ $4 = \frac{1}{2}(-2) + c$ $c = 5$ Therefore the equation of line $PQ$ is $y = \frac{1}{2}x + 5$ Answer  (ii) Write down 2 facts about $P$ , $Q$ and $R$ . $\overline{PQ} = \begin{pmatrix} 2 \\ 1 \end{pmatrix} \qquad \overline{PR} = \begin{pmatrix} -1 \\ -\frac{1}{2} \end{pmatrix} = -\frac{1}{2}\begin{pmatrix} 2 \\ 1 \end{pmatrix}$ $P$ , $Q$ and $R$ lie on the same straight line. $\frac{PR}{PQ} = \frac{1}{2}$			
(ii) Write down 2 facts about $P$ , $Q$ and $R$ . $\overline{PQ} = \begin{pmatrix} 2 \\ 1 \end{pmatrix} \qquad \overline{PR} = \begin{pmatrix} -1 \\ -\frac{1}{2} \end{pmatrix} = -\frac{1}{2} \begin{pmatrix} 2 \\ 1 \end{pmatrix}$ $P$ , $Q$ and $R$ lie on the same straight line.		c = 5	
$\overline{PQ} = \begin{pmatrix} 2 \\ 1 \end{pmatrix} \qquad \overline{PR} = \begin{pmatrix} -1 \\ -\frac{1}{2} \end{pmatrix} = -\frac{1}{2} \begin{pmatrix} 2 \\ 1 \end{pmatrix}$ $P, Q \text{ and } R \text{ lie on the same straight line.}$ $PR = 1$		Answer	[1]
P, Q and R lie on the same straight line.		(ii) Write down 2 facts about P, Q and R.	
PR 1	DANTA	$\overline{PQ} = \begin{pmatrix} 2 \\ 1 \end{pmatrix} \qquad \overline{PR} = \begin{pmatrix} -1 \\ -\frac{1}{2} \end{pmatrix} = -\frac{1}{2} \begin{pmatrix} 2 \\ 1 \end{pmatrix}$	DANTON
$\frac{PR}{PQ} = \frac{1}{2}$		P. Q and R lie on the same straight line.	
		$\frac{PR}{PQ} = \frac{1}{2}$	

DANYAL

8	A model consists of a solid hemisphere attached to a solid cylinder as shown in diagram 1.				
	The height of the cylinder is 26 cm and the base area is 198 cm <sup>2</sup> .				
AA	YAJ	26 cm Diagram 1 Diagram 2			
	(a)	Calculate, giving your answers to the nearest whole number, the volume of (i) the cylinder,			
		Volume of cylinder = $26 \times 198 = 5148  cm^3$			
		Answer[1]			
OB	MI	(ii) the hemisphere.			
ED	500	Let the radius be $r$ cm $\pi r^{2} = 198$ $r = \sqrt{\frac{198}{\pi}} = 7.93885$ Volume of hemisphere $= \frac{2}{3}\pi (7.93885)^{2}$ $= 1047.93 \approx 1048  cm^{3}$			
-		Answer[3]			

	(b)	Part of the cylinder in the shape of a right circular cone is shown in the diagram 2.	removed as
		(i) Given that the volume of the cone removed from to 630 cm <sup>3</sup> , calculate the height of the cone.	the model is
		$\frac{1}{3}\pi r^2 h = 630$ $\frac{1}{3}(198)h = 630$	
		$h = 9.545 \approx 9.55  cm$	
	YA	Answer	cm [1]
EDV	CATI	(ii) Calculate the total surface area of the model as shi giving the answer to the nearest whole number.	own in diagram 2,
		Curved surface area of cone = $\pi rl = \pi (7.939) \left[ \sqrt{7.939^2 + 9.545^2} \right] = 309.65$	
and the state of t		Surface area of cylinder = $2\pi r(26) = 2\pi (7.939)(26) = 1296.94$	
And the second second second		Surface area of hemisphere $= 2\pi r^2 = 2\pi (7.939)^2 = 396.01$	
ha man mining on the control of the control		Total surface area of model $= 2002.6 \approx 2003  cm^2$	
	N		DANYATION
DE ED	OCA	Answer	cm <sup>2</sup> [4]

9	(a)	The following stem-and-leaf diagram shows the marks obtained by 20 pupils in a class test that has a total mark of 50.		
		1   0   2 2   3   3   4   7   7 3   2   5   5   5   6   7   9 4   1   6   7   8   8 5   0		
		(i) State the median score.		
AN	CAUL	The median score is 35		
		Answer[1]		
		(ii) Find the standard deviation.		
		$\sum fx^2 = 25335$ $\sum fx = 675$ Standard deviation = $\sqrt{\frac{25335}{20} - \left(\frac{675}{20}\right)^2}$ $= \sqrt{1266.75 - 33.75^2} \approx 11.3$		
	-1	Answer[3]		
DA ED	CON	(iii) If distinction is awarded to pupils who scored at least 80%, find the percentage of pupils in the class who scored distinction.		
		80% is 40 marks.  Percentage who scored distinction $= \frac{6}{20} \times 100\% = 30\%$		
		Answer		

	(b)	Bell has six 10-cent coins and two 50-cent coins. She takes 2 coins at		
		random from her purse, one after the other.		
		And the second s		
		(i)	Complete the probability tree diagram shown in the	ne answer space, giving
	the answers in fraction in the simplest form.			
		[		
		nama de desarramentos de la composição d	(5)	
		and the state of t	$\left  \left( \frac{5}{7} \right) \right  $	0-cent
		Area manuscript Area (Area (Ar		
		ammanda and constraints	$\frac{3}{4}$ 10-cent $\left(\frac{2}{2}\right)$	
		ensis manusampy g		
		a de la proposación de la prop	(	-cent
	KA B	and the same of the	0 10	)-cent
P D	77	demands on the control		
mi	Car		$\left(\frac{1}{4}\right)$ 50-cent	
Er				
			$\left  \left( \frac{1}{7} \right) \right  $ 50.	.cent
	(7) 50-cent			
	(ii) Find the probability that the total value of the two coins is 60 cents.			
-				agina ia 60 ganta
		(11)	ring the probability that the total value of the two	coms is ou cents.
		Distant		
			value of 2 coins is 60 cents)	
and the second second		$=\left(\frac{3}{4}\times\right)$	$\left(\frac{2}{7}\right) + \left(\frac{1}{4} \times \frac{6}{7}\right)$	
		4	7) (4 1)	
Partition and the same of the		$=\frac{3}{1}+$	$\frac{3}{1} = \frac{3}{1}$	
A the state of the		14	14 7	VAL
	<u> </u>			
and the second	12	MO	Answer	[2]
	L.C.A	Mr.	Attition	
EJ	10	(iii)	If a third coin is taken out, calculate the probability	y that the total
ing the character of th			amount is 30 cents.	· ·
- Annahar de				
and the same of th	-	P(total	amount is 30 cents when third coin is taken)	
Section 2		_3 5	2	
and the same of th		$=\frac{3}{4}\times\frac{5}{7}$	7^3	
Open product		_ 5		
		= 14		
To a second				
			Answer	
	:	<u> </u>	22	

Peter is shopping for an air conditioner.					
(a)	Peter writes down the duration he would use the air conditioner in the following table.				
Processors Address Vi's to a very		7 hours 15 minutes			
-1 N	Saturday & Sunday	8 hours each day			
	Show that the mean length of time that she would use the air conditioner each of is 6 hours 45 minutes.				
VII.	) P		DIVICATI		
	Mean length of time				
	/				
	$=6h45 \min$				
Answer					
Peter is deciding between two models of air conditioner.  Page 25 shows the information that he needs, including the electricity consumptions of the two models.					
(b)	Based on his usage, Peter estimates that the electricity consumptions in one year				
will be 1755 kWh for Model S and 1066.5 kWh for Model E.					
	Show with workings how he come up with these estimates.				
	Model S  Electricity consumption = 6	$\frac{6.75}{8} \times 2080 = 1755  kWh$			
	Page the tv	Show that the mean length of is 6 hours 45 minutes.  Mean length of time $= \frac{(6 \times 4) + 7\frac{1}{4} + (8 \times 2)}{7}$ $= 6.75 h$ $= 6 h 45 min$ Peter is deciding between two models.  (b) Based on his usage, Peter estwill be 1755 kWh for Model Show with workings how held the second of t	Monday to Thursday  Friday  7 hours 15 minutes  Saturday & Sunday  8 hours each day  Show that the mean length of time that she would use the is 6 hours 45 minutes.  Mean length of time  \[ \frac{(6 \times 4) + 7\frac{1}{4} + (8 \times 2)}{7} \]  \[ = 6.75 \ h \]  \[ = 6.75 \ h \]  \[ = 6 \ h \ 45 \ min  \]  Answer  Peter is deciding between two models of air conditioner.  Page 25 shows the information that he needs, including the electric trace of the two models.  (b) Based on his usage, Peter estimates that the electricity of will be 1755 kWh for Model S and 1066.5 kWh for Model S how with workings how he come up with these estimates that the electricity of the content of the two models.		

	T		Albert Albert Albert Annie medit der Annie met verstelle der			
	(c)	The total cost of an air conditioner includes its price, the cost of the electricity it				
		consumes and the cost of servicing it.				
		Electricity costs 25.3 cents per kWh, including GST.				
		Peter would like the air conditioner to be serviced once every 4 months.				
		Based on his usage, which model should he choose if he intends to use the air				
		conditioner for 7 years?				
		Justify your decision with calculations.				
er en		(You should assume that the costs of electricity and servicing remain the same.)				
		Model S (7 years)	DANYAL			
	NA	Total cost of electricity	DANTON			
DAS	TAT	$=1755 \times \frac{25.3}{100} \times 7 = \$3108.11$	EDUCAL			
EDI	Cr	100	E			
		Total cost of servicing				
		$=35\times3\times1.07\times0.6\times7=\$471.87$				
ajanjaran primatakan p	made continue continu	Total cost for Model S = 3108.11+471.87+650				
		64220.00				
		Model E (7 years)  Total cost of electricity				
No.		DANTON				
		Model E (7 years)				
	8	$=1066.5 \times \frac{25.3}{100} \times 7 = \$1888.77$				
in a second and a second and a second and a second as second as second as second as second as second as second		Total cost of servicing = $35 \times 3 \times 1.07 \times 7 = $786.45$	DANYAL			
	V	Total cost for Model S	DAMATION			
	ZI,	= 1888.77 + 786.45 + 1300	EDUCA			
E	MC3	= \$3975.22				
		Conclusion				
		Since Model S cost more than Model E (\$4229.98 vs				
		\$3975.22) over a period of 7 years, Peter should				
to de la constante de la const		choose Model E.				

## END OF PAPER