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# FAIRFIELD METHODIST SCHOOL (SECONDARY)

PRELIMINARY EXAMINATION 2021 SECONDARY 4 NORMAL (ACADEMIC)

## MATHEMATICS SYLLABUS A

4045/01

Paper 1

Date: 27 July 2021

Duration: 2 hours

Candidates answer on the Question Paper.

## READ THESE INSTRUCTIONS FIRST

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

Answer all the questions.

The number of marks is given in brackets [ ] at the end of each question or part question.

If working is needed for any question it must be shown in the space below that question. Omission of essential working will result in loss of marks. The total number of marks for this paper is 80.

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  $\pi$ , use either your calculator value or 3.142.

For Examiner's Use				
Table of Penalties		Question Number		
Presentation	□2		]	
Rounding Off	□ 1	ZI AZ	Parent's/Guardian's Signature	80

#### Setter: Mr Alester Tan

This question paper consists of <u>21</u> printed pages and <u>0</u> blank pages.

#### ( )

#### Mathematical Formulae

Compound interest

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

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

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

P Your T

1.24.34

Name		()
		Answer all the questions.
1	By wi	iting each number correct to 1 significant figure, estimate the value of
	$\frac{\sqrt{494}}{0}$	$\frac{9 \div 2.45}{.512}$ . Show your working.
		Answer
2	Find	the largest integer x satisfying $-4x > 7$ .
	×	
		Answer $x =$
3	(a)	The line $2x - 5y = 20$ crosses the x-axis at A. Find the coordinates of point A.
		Answer ()[1]
	(b)	Show that the line $2x - 5y = 20$ is not parallel to another line with a gradient of $-\frac{2}{5}$ .
		Answer
		[1]

N	а	m	ne	•
	-		$\sim$	

(b)

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4 Travis, Scot and Rina shared a sum of money between them in the ratio 4 : 7 : 9.

(a) Express the sum of money Travis had as a fraction of the total sum the three of them had altogether.

Scot had \$48 more than Travis. How much money did Rina have?

Answer \$......[1]

5 Simplify  $\frac{18mn}{25} \div \frac{28m}{15n^2}$ .

Give your answer as a single fraction in its simplest form.

Name:	Clasu	( )	Class:	. ams/l
6	The coordinates of $A$ , $B$ and $C$ are $(-1,9)$ ,	(3,6) and (7,k) re	Tuiti espectively.	on
	Given that a line passes through $A$ , $B$ and $C$	C, find the value of	*With	NO.
			SAR	

7 *M* and *N* are the midpoints of the adjacent sides of the rectangle *ABCD*. A point is selected at random in the rectangle *ABCD*. Given that AB = 2AD, find the probability that the point lies in the triangle *MBN*.



645(S) See 4M(A) Prehamany Examination 202 Mediternation Propert

Name:	
runic.	-

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8 The diagram below shows a sector of a circle, radius 12 cm and angle 109°. Calculate the shaded area.



9 (a) Given that  $0^{\circ} \le x \le 180^{\circ}$ , find the possible value(s) of angle A such that  $\sin A^{\circ} = 0.839$ .

Answer  $A = \dots$ [1]

**(b)** 7.6  $\frac{\pi}{4}$  7.65%  $\frac{23}{3}$ 

Write these numbers in order, starting with the largest.

The pictogram shows the number of pairs of sneakers sold on an online store in the 10 first 5 months of a particular year.



Name:	() Class:	



# 11 (a) On the grid below, draw a reduction of the figure T using a scale factor of 0.5.



*ABC* and *EFG* are similar triangles. *EFG* is an enlargement of *ABC*. Find the scale factor.

FMS(S) Sec 4N(A) Preliminary Examination 2021 Mathematics Paper 1

Answer ......[1]

( ) Class: Name: 12 Simplify 8x - 12y - 4x - 5y. (a) Answer ..... 2pp+3(b) Simplify 8 13 Alan wants to find out how much time students spend on playing mobile games. He uses this question on a questionnaire.



Give 2 reasons why the data obtained from this question might be unreliable.

## Answer

Nar	me:	37 <sup>-1</sup> -1-1	( )	<sub>Class:</sub>
14	Mr and Mrs years old, to The table b	s Tan who are both 4 o the Changi Experie elow shows the pron	4 years old, brought thei ence Studio. notion on the ticket price	r two children, aged 10 and 13
			<b>Ticket Price</b>	Contraction of the second seco
	Adult (13 -	- 59 years old)	Child (5 – 12 years old	d) / Senior (60 + years old)
C	<b>Driginal Price</b>	<b>Discounted Price</b>	Original Price	Discounted Price
	\$22	\$18	\$15	\$12

Find the savings the Tan family made if they bought at the discounted price.

Answer \$.....[2]

15 Jamie walks for 15 minutes at an average speed of 71 metres per minute to reach the bus stop. She then takes the bus to school. The bus travels at an average speed of 45 km/h and the bus journey takes 50 minutes to reach her school. Calculate the average speed of Jamie's total journey. Give your answer in km/h.





These triangles are similar.

16

(a) Calculate the value of a.

(b) Find p in terms of q, x and y.

Real and the second s

N	2	m	•	
1.4	α		٠	

17 Solve  $\frac{5}{x+2} = x+3$ , giving your answers correct to 2 decimal places.

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Show your working.

FMS(S) Sec 4N(A) Preliminary Examination 2021 Mathematics Paper 1

N	2	m	Δ	•
1.4	α		C	

- 18 In June 2021, the rate of exchange between Singapore dollars (S\$) and United States dollars (US\$) was S\$1 = US\$0.74 and the rate of exchange between Singapore dollars (S\$) and euros ( $\notin$ ) was S\$1 =  $\notin$ 0.62. Steve bought a pair of shoes online at US\$120.
  - Calculate the amount Steve spent in Singapore dollars. (a)

Answer \$\$......[2]

(b) Steve then resold this pair of shoes to a buyer in Europe for a profit of S\$120. Find the amount in euros at which Steve sold the shoes.

Nar	ne:	() Class:
19	(a)	Write 5600 as a product of its prime factors.
		i ugnutivo, eu papi ofertes Schiller (J. 1812) apie 128 apie 128 st. endul scarte.

(b) 5600n is the smallest perfect cube that is a multiple of 5600.Find the value of integer n.

n de systemet skinnen die oorteeling te kernen die de kaar die de skinder oorteeling. Die seeling waarde bestere die bestere gewonen waar waar die die skinder skinder.

(c)  $250 = 2 \times 5^3$ 

Write down the highest common factor (HCF) of 250 and 5600. Give your answer as a product of its prime factors.

FMS(S) Sec 4N(A) Preliminary Examination 2021 Mathematics Paper 1



*ABC* is a triangle with  $\angle BAC = 32^{\circ}$ . *D* is a point on *AC* and *E* is a point on *BC* such that *DE* is parallel to *AB*. *DE* = *CE*. Find (a)  $\angle ADE$ ,

Answer  $\angle ADE = \dots^{\circ}[1]$ 

(b)  $\angle ABC$ .

(b) Using Sateringting when s<sup>2</sup> + 43--60 - 0 in fiel No length of one using of the coal resolution is

Answer  $\angle ABC = \dots^{\circ} [2]$ 

HUILC.	N	a	m	ne	:
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- 21 A piece of wire of length 60 cm is cut into parts. One part, 4x cm long, is bent to form a square and the other part is bent into an equilateral triangle. The numerical value of the area of the square is equal to the numerical value of the perimeter of the triangle.
  - (a) Show that  $x^2 + 4x 60 = 0$ . Answer

[2]

(b) Using factorisation, solve  $x^2 + 4x - 60 = 0$  to find the length of one side of the equilateral triangle.

Answer ......cm [3]

22 A chocolate factory manufactured spherical chocolates and packed them into a package such that two chocolates are fitted snugly inside the cylindrical package as shown in the diagram below.

Given that the volume of each chocolate is  $\frac{9\pi}{2}$  cm<sup>3</sup>, calculate the curved surface area of the explicit produced between the curved surface area of



[2] and the second seco

All during selected of the

Cleffer and a more than the second se

(a) 180 D is consultations with 18 and 19 being to o al D sides.

(dves that D is the point (0.7), field (1)



Answer ...... units [2]

(c) ABCD is a parallelogram, with AB and AD being two of its sides. Given that D is the point (6,7), find C.

Answer (.....) [1]

Name:	()	Class:	197 (194) 1
-			

23	(d)	Vivien claims t	at another name for ABCD is	a kite.	
		Is she correct?	live a reason for your answer		
	Answ	ver	an ngenu kalenanggan nyenti. U serendadi di Kalendini ta U Mili tarene minerati ni Madaga di ni	n order to order to a f	
		<u>, 8 (</u>	because		
					[1]

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물날 밖에 다 두 날 다들을 하는 것 않아? 가까? 가장 아님에 잘 알 했다.

lies our and he headst in bases cach containing 12 Gles.

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What is the total error of the nexts of the nextsel to the floref. Show your work in...





The diagram shows the plan of a floor.

All the measurements are given in metres.

The floor is to be tiled using square tiles of side 20 cm.

Tiles can only be bought in boxes each containing 12 tiles.

Each box costs \$17.

What is the total cost of the boxes of tiles needed to tile the floor? Show your working.

Answer \$.....[5]

Name:	1260 ( )	( ) Class:	



No.	Answer Kev	No.	Answer Kev
1	100	16	av
~		the second	$p = \frac{p}{r}$
2	Largest integer $x = 2$	17	x = -0.21  or  x = -4.79 (2 dp)
3a	A(10.0)		
3h	Since the 2 gradients are not the same.		
	they are not parallel.	de la	
4a	1	18a	\$162.16
	5		9
4b	\$144	18b	\$174.94
5	$27n^3$	19a	$5600 = 2^5 \times 5^2 \times 7$
	$\overline{70}$		
6	k=3	19b	n = 490
7	1	19c	$HCF = 2 \times 5^2$
	8		
8	$68.9cm^2(3sf)$	20a	148°
9a	57.0° or 123.0°(1 <i>dp</i> )	20b	116°
9b	$23 \pi 6 \pi 7 659$	21a	$x^2 = 60 - 4x$
	$\frac{1}{3}$ , 7.8, $\frac{1}{4}$ , 7.85%		$x^2 + 4x - 60 = 0(shown)$
10a	February	21b	12cm
10b	30	22	$18\pi \text{ cm}^2$
10c	9 68% (3sf)	239	v = -r + 4
11a	7.0070 (331)	23h	5.66(3sf)units
IIu		250	5.00(55) junus
11b	4	23c	(10,3)
	3		
12a	4x - 17y	23d	No, because the ABCD has 2 pairs
			of adjacent sides with same length
			and one pair of opposite angles are
12h	3-2n	24	\$1309
120	$\frac{3-2p}{12}$	21	
13	1. There are no option for 0 hour	25a	U sin g Pythagoras' Theorem,
	2. There is no timeline (per month,		$x^2 = 6^2 + 8^2$
	per day)		$r = \sqrt{100}$
	5. It did not specific whether the intervals are on a daily basis or		$\lambda = \sqrt{100}$
	weekly basis		x = 10 (Shown)
14	\$15	25b	$96cm^3$
15	35.6 km / h(3sf)	25c	$144cm^2$
		La contraction of the second	

Answer Key Sec 4NA Prelim Exam 2021 Paper 1



FAIRFIELD METHODIST SCHOOL (SECONDARY)

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PRELIMINARY EXAMINATION 2021 SECONDARY 4 NORMAL (ACADEMIC)

## MATHEMATICS SYLLABUS A

4045/02

**Duration: 2 hours** 

Paper 2

Date: 29 July 2021

Candidates answer on the Question Paper.

## READ THESE INSTRUCTIONS FIRST

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

#### Section A

Answer all the questions.

#### Section B

Answer one question.

The number of marks is given in brackets [ ] at the end of each question or part question.

If working is needed for any question it must be shown in the space below that question. Omission of essential working will result in loss of marks. The total number of marks for this paper is 60.

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  $\pi$ , use either your calculator value or 3.142.

# For Examiner's Use Table of Penalties Question Number Presentation 2 Rounding off 1 Parent's/Guardian's Signature 60

#### Setter: Mdm Haliza

This question paper consists of 18 printed pages

#### \_( )

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

FMS(S) Sec 4N(A) Preliminary Examination 2021 Mathematics Paper 2

## Section A (52 marks)

Answer all the questions in this section.

1 Given that  $3.58 \times 10^{-9} = a \times 10^{-7}$ , find the value of a. (a)

Answer  $a = \dots$ [1]

**(b)** The thickness of a pack of 500 sheets of paper is 9 cm. Find the thickness of one sheet of paper, giving your answer in millimetres.

2. 25 students sat for a Science test. The mean mark was 18.2 and the median mark was 15. Another student sat for the same test at a later date. The new mean mark was 19. (a) What mark did this student get?

**(b**) Describe how the student's mark will affect the median.

> Answer The new median ..... .....[1]

\_\_\_\_\_( Name: ) Class: Simplify  $\sqrt{\frac{4a^8}{a^2}}$ . 3 (a) Simplify  $\frac{9xy^5}{6x^2y^2}$ . **(b)** Factorise the expression  $y^2 - 2(5y - 12)$ . 4 (a)



Answer ...... % [2]

Name:	
	where the party of

6 (a) Triangle *ABC* is isosceles with angle  $A = 50^{\circ}$ . One possible value of angle *B* is 50°. Find the two other possible values of angle *B*.

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Answer  $x^{\circ} = \dots \circ [3]$ 



Answer ..... m/s [3]

	-	-		
IN	а	п	ю	
•••	-	•••		٠

) Class: \_\_\_\_\_

8 (a) Complete the table of values for  $y = 2^x - 3$ .

renilli)

x	-1	-0.5	0	0.5	1	1.5	2	2.5
y	-2.5	-2.3	4.	-1.6	-1	- 0.2	1	2.7

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(b) On the grid below, plot the graph of  $y = 2^x - 3$  for  $-1 \le x \le 2.5$ .



[1]

Name:	Clares		( )	Class:	
(1n)					
8 (c)	Use your gra	aph to find			
	(i) the v	value of x when $y = 1.5$	,		
	R.C.		Answer $x = \dots$		[1]
	(ii) the g	radient of the curve at	x=1.		
			Answer		[1]
(d)	On the same	e grid, draw the graph of	of $y=2-x$ .		[1]
(e)	Hence, find	the solution to the equ	ation $2^x - 3 = 2 - x$	¢.	
			Answer $x = \dots$		[1]

	that he perpendicular is earn of the	
A inter all most installingers		
n taug all mort traditieps are fil		
udi lan X meni teti in saino 191		

Name	verg 1 <sup>°</sup>	(	)	Class:
9	<i>KLMN</i> is a parallelogram. Two obelow.	of its sides and the	direction	Tuition of North has been drawn With
				Der
			an a ta ta ang	<i>M</i>
	ĸ			

(a)	Complete the construction of the parallelogram KLMN and label the po	int N
	clearly.	[2]
(b)	Construct the bisector of angle KLM.	[1]
(c)	Construct the perpendicular bisector of LM.	[1]
(d)	These two bisectors meet at the point $P$ .	
	Label the point $P$ and state two points which are equidistant from the point	t <i>P</i> .
	Answer Points and are equidistant from the po	int P.
		[1]
(e)	Construct the line KT such that T has a bearing of $150^{\circ}$ from K and	that
	KT = 3 cm. Label point T clearly.	[2]

er al artistik säi re	in as no smith and	Ju Accour	ine 2020 Bill It No. 72XXXXXX
Breakdown of charge	es Usage	Rate (\$)	Amount (\$)
Electricity Services	381 kWh	0.2463	(A)
Water Services	13.5 CuM	1.2100	16.34
Waterborne Fee	13.5 CuM	0.9200	12.42
Water Conservation T	ax \$16.34	50%	8.17
Refuse Removal	1 Quantity	7.71	7.71
Şubtotal			(B)
GST	(B)	7 %	(C)
Total Payable Charges	S		(D)

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10 (a) The table below shows Mr Chue's utility bill for June 2020.

Using the information in the utility bill above, calculate

(i) the amount charged for electricity services (A),

Answer (A) = [1] the total payable charges for June 2020 (D). (ii)

By considering the formoris partial of Jampey 2020 to have 2020, composition estimations to determine which price plan would save Mr. Chue more money on the absorbalty frifts

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FMS(S) Sec 4N(A) Preliminary Examination 2021 Mathematics Paper 2

N	ame.	
	a	

10 (b) From May 2019, an initiative by the Energy Market Authority allowed all households to switch to an electricity retailer of their choice in the Open Electricity Market. This allows consumers like Mr Chue to benefit from competitive pricing which will help him save on his electricity bill.

Table 1 shows two different price plans offered in the Open Electricity Market.

Gemsenco	Sundialco
Fixed Rate Plan – 6 Months	Discount – 6 Months
17.56 cents/ kWh	21% off regulated tariff
Table 1	

Table 2 shows the historical regulated tariff rate from January 2020 to June 2020.

	Jan – Mar 2020	Apr – Jun 2020
Monthly regulated tariff rate (cents/kWh)	25.94	24.63
Table 2	<u> </u>	

Table 3 shows Mr Chue's average electricity consumption from January 2020 to June 2020.

	Jan – Mar 2020	Apr – Jun 2020
Average electricity consumption (kWh) per month	378	395
	L	L

Table 3

By considering the 6 month period of January 2020 to June 2020, carry out calculations to determine which price plan would save Mr Chue more money on his electricity bill.

Show working to support your answer.



## 10 (b) Answer

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(1) State of States (1) = 44

[5]

### Section B (8 marks)

Answer one question from this section. Each question carries 8 marks.

11 (a) An aircraft flies horizontally from X to Y directly above a man on level ground

The angles of elevation of X and Y from the man are  $45^{\circ}$  and  $70^{\circ}$  respectively. The aircraft is flying at 150 m/s.

The time it takes to get from X to Y is 1 minute.

(i) Show that the distance XY is 9000 m. Answer

[1]

(ii) Calculate the distance XZ.

*Answer XZ* = ..... m [2]

at Z. Tuition

The points A, B, C and D lie on the circumference of a circle, centre O. The 11 (b) lines AC and BD are the diameters of the circle. EF is a tangent to the circle at D and  $\angle ABD = 1.13$  radians.



(

- Explain why  $\angle ODE = \frac{\pi}{2}$  radians. (i) Answer  $\angle ODE = \frac{\pi}{2}$  because .....
- (ii) Calculate the size of the following angles in radians. Give a reason for each answer.
  - (a)  $\angle CDE$ ,

Answer  $\angle CDE = \dots \text{ rad } [2]$ 

Name:	_( )	Class:	
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**11 (b) (ii) (b)**  $\angle ADF$ .

Answer  $\angle ADF = \dots$  rad [2]

1	)	
	· · · · · · · · · · · · · · · · · · ·	
- \		

Class:

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1 1	ank	5.

12	<b>(a)</b>	The table summarises the marks of the 120 students of school $S$ in a particular			
		examination.	the structure for plane at the	Tuition	

Marks obtained by pupils, x	No. of pupils	
$0 \le x < 10$	<sup>4</sup> With	)
$10 \le x < 20$	11	1
$20 \le x < 30$	24	
$30 \le x < 40$	43	
$40 \le x < 50$	30	
$50 \le x < 60$	8	

(i) Find estimates for the mean and the standard deviation of these marks.

I am a manager and an I I I I I

may shale to shop a bina wide score a which sales (ii)

(ii) Students in another school T takes the same examination. The mean mark obtained was 35.6 and the standard deviation was 12.1.

(a) Which school had the better marks?Give a reason for your answer.

Answer School ...... had the better marks because

12 (a) (ii) (b)Which school had the more consistent marks?Give a reason for your answer.

Answer School ...... had the more consistent marks because
[1]

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- (b) David has 3 blue shirts, 4 green shirts, 5 yellow shirts, 2 pairs of black pants and 1 pair of grey pants in his wardrobe.
   Find the probability that
  - (i) he picks a blue shirt,

(ii) he picks a green shirt and a pair of black pants.

~ End of Paper ~

		- 1 <sup>-</sup>	A
No.	Solution	No.	Solution
1(a)	<i>a</i> = 0.0358	8(c)(i)	When $y = 1.5, x = 2.15$
1(b)	0.18 mm	8(c)(ii)	Gradient at $x = 1$ is 1.39
2(a)	39 marks	8(e)	x = 1.7
2(b)	The new median might be equal or bigger than 15.	10(a)(i)	\$93.84 (to 2 d.p.)
3(a)	$2a^3$	10(a)(ii)	\$234.72 (to 2 d.p.)
3(b)	$\frac{3y^3}{2x}$ fioitic	10(b)	Gemsenco = \$407.22 Sundialco = \$463.00 Gemsenco's price plan would have saved Mr Chue more money on his electricity bill.
4(a)	(y-4)(y-6)	<del>11(a)(i)</del>	<del>9000 m</del>
4(b)	$c = \pm \sqrt{\frac{a - 3b}{2}}$	<del>11(a) (ii)</del>	XZ = 9330  m (to 3 s.f.)
5(a)	\$1041.60	<del>11(b)(i)</del>	$\frac{\angle ODE = \frac{\pi}{2}}{2} \frac{\text{because the}}{\text{radius OD is perpendicular to}}$
			the tangent EF at D.
5(b)	0.0396 % (to 3 s.f.)	<del>11(b)(ii)(a)</del>	$- \angle CDE = 0.441 \text{ rad. (to 3 s.f.)}$
6(a)	$\angle B = 80^\circ \text{ or } 65^\circ$	<del>11(b)(ii)(b)</del>	$\angle ADF = 1.13 \text{ rad. (to 3 s.f.)}$
6(b)	$x^{\circ} = 162^{\circ}$	12(a)(i)	Mean = 34, S.D. = 11.7 (to 3 s.f.)
7(a)	The athlete accelerated to a speed of 10 m/s in the first 4 seconds. For the next 6 seconds, he <u>maintains a</u> <u>constant speed of 10 m/s.</u> He <u>slowed down / decelerated</u> over the last <u>3</u> seconds when he suffered muscle cramps in his leg. He crossed the 100 m finish line after 13 seconds.	12(a)(ii)(a) 12(a)(ii)(b)	School <u>T</u> had the better marks because <u>its mean mark is</u> <u>higher school S.</u> School <u>S</u> had the more consistent marks because <u>its</u> <u>standard deviation is smaller</u> <u>than school T.</u>
7(b)	2.5 m/s <sup>2</sup>	12(b)(i)	$\frac{1}{\epsilon}$
			5
7(c)	$h = 3\frac{1}{3}$ or 3.33 m/s (to 3 s.f.)	12(b)(ii)	$\frac{8}{105}$
8(a)	When $x = 0, y = -2$		

Answer Key Sec 4NA Prelim. Exam 2021 Paper 2

## Name: \_\_\_\_\_ (

## ( ) Class: \_\_\_\_\_



10	Solution	Marks allocation
	$\frac{\sqrt{5000 \div 2}}{0.5}$	M1 – when all correct to
	$=\frac{\sqrt{2500}}{0.5}$	1 sf
	$=\frac{30}{0.5}$ = 100	A1 – when all working steps are shown
	$-4x > 7$ $x < \frac{7}{-4}$ $x < -1.75$ largest integer x = -2	M1 – show change inequality sign to <
а	2x - 5y = 20	
	sub y = 0	8-x
	2x = 20 $x = 10$	$B(n = h - \xi)$
h	<i>A</i> (10,0)	B1
b	2x - 5y = 20	MB = MA = BM
	$y = \frac{1}{5}x - 4$	35 - 80
	gradient = $\frac{2}{5}$ Tuition	B1 – show
	since the two gradients are not the same, they are not parallel.	gradient = $\frac{-}{5}$
3	$\frac{4}{20} = \frac{1}{5}$ With	B1
0	3units - \$48	
	1unit - \$16	B1
	<i>9umus</i> - 10 × 9 - \$1 <del>11</del>	

·-- · ·

No	Solution And and and and an	Marks
5	18mn 28m	anocation
	$\frac{1}{25} \frac{1}{15n^2}$	dampa, b
	$=\frac{18mn}{15n^2}$	1000
	25 28m	
	$=\frac{270mn^3}{700m}$	M1 -
	$27n^3$	$27 \text{ or } p^3$
	$=\frac{277}{70}$	$\frac{1}{70}$ or $n$
6	9-6	A1 / B2
	$gradient = \frac{-1-3}{-1-3}$	
	3	
	$\frac{9-k}{1-7} = -\frac{3}{4}$	M1 – form
1	$\begin{vmatrix} -1 - 7 & 4 \\ 9 - k & 3 \end{vmatrix}$	terms of k.
	$\frac{3-\kappa}{-8} = -\frac{3}{4}$	
	$0  k = \frac{3}{2}$	
	$9-k=\times-8$	
	9-k=6	
	<i>k</i> = 3	A1
7	$MB = MB = \frac{1}{2}AB$	M1 - show
	2	
	$NB = \frac{1}{2}BC$	$MB = \frac{-AB}{2}$
	Area of Rectangle ABCD = AB x BC	or
	Area of Triangle $MBN = \frac{1}{2} \times MB \times BN$	$NB = \frac{1}{2}BC$
	$=\frac{1}{AB}\times\frac{1}{BC}$	
	$=\frac{1}{8} \times AB \times BC$	
	$\frac{-2 \times AD \times DC}{8}$	
	Probability of point in triangle MBN = $AB \times BC$	
	$=\frac{1}{8}$	A1



anne. Norseach

No	Solution	Marks
10c	$\frac{1.5}{15.5} \times 100$ = 9.677419355 = 9.68%(3sf)	B1
	OR	
	$\frac{30}{465} \times 100$	
	=9.677419355	
	=9.68%(3sf)	B1
11a		B2 – deduct 1 for 1 wrong side
11b	$\frac{20}{15} = \frac{4}{3}$	B1
12a	8x - 12y - 4x - 5y	D1
124	=4x-17y	BI
120	$\frac{p+3}{12} - \frac{2p}{8} = \frac{2(p+3)}{2(12)} - \frac{3(2p)}{3(8)}$	
	$= \frac{2p + 6 - 6p}{24}$ = $\frac{6 - 4p}{24}$ = $\frac{3 - 2p}{12}$	M1 – common denominator A1

No	Solution State	Marks allocation
13	<ol> <li>There are no option for 0 hour</li> <li>There is no timeline (per month, per day)</li> <li>Tuition</li> <li>It did not specific whether the intervals are on a daily basis or weekly basis.</li> </ol>	B1 for each statement
14	Discounted $Price = (18 \times 3) + 12 = $66$ WithoutOriginal $Price = (22 \times 3) + 15 = $81$ Solution	M1 – show either total discounted or original price
	Savings = 81 - 66 = \$15	A1
15	Total distance from home to bus stop	
	$=15 \times 71$	H. Harri
	=1065 m	f = f = f = f = f = f
	=1.065 km	M1 – either
	Total distance from bus stop to school	total distance
	$=45\times\frac{50}{60}$	
	= 37.5  km	1.561 - <u>661</u> 1.5.0
	$Averagespeed = \frac{1.065 km + 37.5 km}{15 L_{10} 50 L_{10}}$	M1 – add up
	$\frac{1}{60}n + \frac{1}{60}n$	hour
	$=\frac{38.565  km}{65}$	oni muonite. Thierana juga
	$\frac{1}{60}h$	1.17174
	= 35.59846154	FO 17 12 -
	= 35.6 km / h(3sf)	A1
16a	a = 180 - 82 - 25	
	= 73	B1
16b	$\frac{p}{y} = \frac{q}{x}$	M1 - $\frac{q}{x}$
	$p = \frac{q}{x} \times y$	n = 2 c 1 c 2 n = 196
	$p = \frac{qy}{x}$	A1

| *HCVE* = 2515° 20a [ 3176 m 136, - 33 ( new-off fill encore 253) | 51 [ 58 -

No	Solution	Marks allocation
17	$\frac{5}{x+3} = x+3$	
	x+2	
	5 = (x+3)(x+2)	
	$5 = x^2 + 2x + 3x + 6$	M1 - expand
	$x^2 + 5x + 1 = 0$	
	$r = -5 \pm \sqrt{5^2 - 4(1)(1)}$	
	$x = \frac{1}{2(1)}$	<b>M</b> 1
	$-5 \pm \sqrt{21}$	$-5\pm\sqrt{21}$
	$x = \frac{1}{2}$	2
	x = -0.20871  or  -4.7913	
	x = -0.21 or x = -4.79 (2dp)	A2
18a	120	
100	$\frac{120}{0.74} = 162.162$	M1
	=\$162.16	
106	$T_{\text{otd}} = 0$	A1
100	$f_{0101} setting price = $102.102 + 120$	IVIT
	= 5282.162	n þög sé
	Amount in euros = $282.162 \times 0.62$	
	= \$174.94044	Δ1
102	= \$174.94	P2 doduct 1
194	$5600 = 2^{\circ} \times 5^{\circ} \times 7$	m for any
		mistake made
19b	$5600 = 2^5 \times 5^2 \times 7$	
	$5600n = 2^5 \times 5^2 \times 7 \times (2 \times 5 \times 7^2)$	
	$n = 2 \times 5 \times 7^2$	
	n = 490	B1
19c	$250 = 2 \times 5^3$	
	$5600 = 2^5 \times 5^2 \times 7$	
	$HCF = 2 \times 5^2$	B1
20a	$\angle ADE = 180 - 32 (sum of int erior \ \angle s)$	
	= 148°	B1

No	Solution	Marks allocation
20b	$\angle EDC = 32^{\circ} (corresponding angles, AB / /DE)$ $\angle ACB = \angle EDC (base angles of isosceles triangle)$ $= 32^{\circ}$ $\angle ABC = 180 - 32 - 32$ $= 116^{\circ}$	M1 – show $\angle ACB$
21a	$\frac{-110}{area of square = x^2}$	
	perimeter of triangle = $60 - 4x$ $x^{2} = 60 - 4x$ $x^{2} + 4x - 60 = 0(shown)$	M1 A1
21b	$x^2 + 4x - 60 = 0$	art : 명하니 [
	(x-6)(x+10) = 0 x = 6  or  x = -10(rejected) Barimeter = 60 - 4(6) = 26 Thit is 0 10	M1
	$length of equilateral \square = 36 \div 3 = 12cm$	M1 A1
22	volume of sphere = $\frac{9\pi}{2}$ Without $\frac{4}{3} \times \pi \times r^3 = \frac{9\pi}{2}$ $r^3 = \frac{27}{8}$	$\frac{\text{Volume}}{\text{M1 - show}}$ $r^{3} = \frac{27}{8}$ A1 r = 1.5
	$r = 1.5cm$ $curved SA = 2\pi r \times 4r$ $= 2\pi \times 1.5 \times 4(1.5)$ $= 18\pi cm^{2}$	$\frac{\text{Surface Area}}{\text{M1} - \text{show}}$ SA formula A1 in $\pi$
23a i	$gradient = \frac{0-4}{4-0} = -1$	M1 – find gradient
22h	y = -x + 4	A1
230	$length = \sqrt{(4-0)^2 + (0-4)^2}$ = $\sqrt{32}$ = 5.65685	
	= 5.66(3sf)units	A1
23c	(10,3)	B1

No	Solution	Marks allocation
23d	NO, because the ABCD has 2 pairs of adjacent sides with same length and one pair of opposite angles are equal.	B1
24	total number of tiles needed in a 5m by 9m room	
	$900 \div 20 = 45$	
	$500 \div 20 = 25$	162 Calif.
	$25 \times 45 = 1125  tiles$	M1
	number of tiles needed in 1.2m by 7m space	an farin an
	$120 \div 20 = 6$	
	$700 \div 20 = 35$	
	$6 \times 35 = 210$ tiles	M1
	tiles needed for the floor $=1125-210$	1. A. M. 1.
	= 915 tiles	
		M1
	number of boxes of tiles needed = $915 \div 12$	IVIT
	= 76.25 boxes $\approx 77 boxes$	n ya tada
	$total cost = 77 \times $ \$17	M1 – 77
	= \$1309	boxes
	- \$1509	A1
5a	Usin g Pythagoras'Theorem,	1. A.
	$x^2 = 6^2 + 8^2$	
	$x = \sqrt{100}$	
	x = 10 (Shown)	AG1
25b	$Volume = cross \sec tional area \times height$	
	$=(\frac{1}{2}\times 8\times 6)\times 4$	M1 – show cross
	$=96cm^3$	A1
25c	$2(\frac{1}{2} \times 6 \times 8) + (4 \times 10) + (6 \times 4) + (8 \times 4)$	Any 2 correct working
	$=144cm^2$	up to 2 M A1

No.	Solution	Marks	<b>Partial Marks</b>
1(a)	$3.58 \times 10^{-9} = a \times 10^{-7}$ a = 0.0358	B1	
1(b)	$\frac{90}{500}$ = 0.18 mm	B2	M1 (convert 9 cm to 90 mm) A1
2(a)	= 39  marks	M1 A1	-201 × 1
2(b)	The new median might be equal or bigger than 15.	B1	A Pr
3(a)	$\sqrt{\frac{4a^8}{a^2}} = 2a^3$	B2	B1 (for 2) B1 (for <i>a</i> )
3(b)	$\frac{9xy^{5}}{6x^{2}y^{2}} = \frac{3y^{3}}{2x}$	B2	B1 (for <i>x</i> or <i>y</i> )
4(a)	$y^{2} - 2(5y - 12)$ = $y^{2} - 10y + 24$	M1	11
	=(y-4)(y-6)	A1	4 14 2 5 19 5 1
4(b)	$3b = a - 2c^{2}$ $c^{2} = \frac{a - 3b}{2}$ $c = \pm \sqrt{\frac{a - 3b}{2}}$	M1 A1	- (91 m b ( - 1 5 51 - 110 - 105 51 - 100 - 105 51 - 100 - 10 51 - 100 - 10
5(a)	$\frac{86.8}{100} \times 1200$ = \$1041.60	M1 A1	h Hera a se h Hera a se h
5(b)	$\frac{0.00211}{5.32789} \times 100\%$ = 0.0396 % (to 3 s.f.)	M1 A1	B1 (for getting correct difference)

Fairfield Methodist School (Secondary) Sec 4 NA 2021 Preliminary Examinations Math Paper 2 Marking Scheme

No.	Solution	Marks	<b>Partial Marks</b>
6(a)	$\angle B = 180 - 2(50) = 80^{\circ}$	B1	and 1005 가기 1
	or		na plak jawa
	180-50	DI	A second second
	$ZB = \frac{2}{2} = 65^{\circ}$	DI	
9			PRODUCT N
6(b)	Interior angle of pentagon		
	$=\frac{(5-2)180}{2}$		Einda siza of
	5		each interior
	$=\frac{540}{1000}$		angle of
	5	B1	pentagon
	=108°		1 0
	-9-260 109 00	M1	Subtracts
	$x^{2} = 360 - 108 - 90$	A 1	interior angle
	=162°	AI	and square
			from 360 <sup>o</sup>
7(a)	The athlete accelerated to a speed of 10 m/s in the		
	first 4 seconds. For the next 6 seconds, she		
	maintains a constant speed of 10 m/s. She slowed	B1	
	$\frac{\text{down}}{\text{decelerated}}$ over the last <u>3</u> seconds when she	B1	
	suffered muscle cramps in her leg. She crossed the		
	100 m minsh mic after 15 seconds.		
7(b)	10		
	4		
	$= 2.5 \text{ m/s}^2$	B1	
	Tuition		
7(c)	$\frac{1}{4}(4)(10) + (6)(10) + \frac{1}{4}(k+10)(3) = 100$		M1 (for
		M2	triangle and
	20+60+15+1.5 <i>h</i> =100		square or
	1.5 <i>h</i> = 5		M1 (for next
		A1	trapezium)
	n = 3 -  or  3.33  m/s (to  3  s.i.)		
			40.1× [1]
3(a)	When $x = 0, y = -2$	B1	Section 1
R(h)	$Craph of u = 2^x - 2$	P2	P1 for any 4
.(0)	See last page	CI	points plotted
	see last page.		correctly
3(c)	When $y = 1.5$ , $x = 2.15$	B1	Accept
i)			x = 2.1 to 2.2
		Dí	
5(c)	1 angent drawn at $x = 1$ . Gradient at $x = 1$ is 1.39	BI	Accept 1.3 to
n) S(d)	Graph of $y = -r + 2$	B2	1.5
~~	y = x + 2	102	

No.	Solution		Marks	Partial Marks
	See last page.			
8(e)	x = 1.7		B1	Accept 1.6 to 1.8
9(a)	See last page.	94. S. 203	B1, B1	No need for construction lines.
	να 2 β. μ.	98.70 (99.4577) 19.4577 19. 19.4577		1m for KN parallel to LM and 1m for MN parallel to LK.
		NOR	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	Minus Im for not labelling point N.
		ARCHARD AM	a d mit h	<u>i thinted I</u>
9(b)	See last page.		BI	
9(c)	See last page.	( ANALINA DE	BI	148 82 8 8
9(d)	L and $M$		BI	
9(e)	See last page.		B1, B1	Im for constructing bearing 150°.
	en e		nd soud no seat	Im for constructing arc 3cm and labelling point
	nician action of the statement of the distance		(marca	T a v02.1
10(a)	381×0.2463		B1	
(i)	= \$93.8403			
	= \$93.84 (to 2 d.p.)		(d) 	sta "Victila" Santa
10(a) (ii)	\$138.48 + \$9.6936 = \$148.17 (to 2 d.p.)		M1 A1	B1 for GST
10(b)	If Mr Chue chooses C	Gemsenco,	18.21014	
	Electricity bill for 6 n = $(378 \times 3 + 395 \times 3) \times$	nonths 17.56	M1	1
	= 2319×17.56		4. J. A.A.	Reading 2017-1
karatan di di	= 40721.64			
10	=\$407.22 (to 2d.p.)	in the sciencist renal) 13 (hase reghts of facts.) <sup>11</sup>	A1	13 - C X . C
1.214	a summitte			A management
	1		man kürile	
	an va 1 Ali – reasoning fa 1 Ali – reasoning		s) Eur D	
t Doorsteame to	If Mr Chue chooses	Sundialco,	and a second	an a

lo.	Solution			Marks	<b>Partial Marks</b>
	0.1 10000	Jan - Mar 2020	Apr – Jun 2020		
	Regulated tariff rate (cents/kW h)	25.94	24.63		04.2 ft 2 400.7
	Discount rates (21% off)	20.4926	19.4577		
	Average electricity consumpti on (kWh)	378	395		
	Electricity bi = $(3 \times 378 \times 2)$	■ Il for 6 months 0.4926) + (3×395	<b>Fuitio</b>	<b>1</b> M1	: · The strengt
	= 23238.608 = 46295.982	4 + 23057.3745 9	with	A	
	=\$462.96 (to	o 2 d.p.)	S	A1	enyela <sub>y</sub> 174 ek 1764
	Gemsenco's more money	price plan would on his electricity l	have saved Mr C pill.	hue A1	1
(a)	Distance XY				Show method
	$=150 \times 60$ = 9000 m (Sh	nown)		M1 AG	of obtaining the distance XY
(a)	$\frac{XZ}{\sin 70^\circ} = \frac{90}{\sin 30^\circ}$	$\frac{000}{65^{\circ}}$ X	5° 70	Y	0018 kv2 u 1018 kv2 u
	$XZ = \frac{9000}{\sin 65^{\circ}}$	$\times \sin 70^{\circ}$	45° 65° 70°	M1	e sustain a
	= 9331.3 = 9330 n	n (to 3 s.f.)	Z	A1	and di k
(b)	$\angle ODE = \frac{\pi}{2}$ to the tangent	because <u>the radius</u> t <i>EF</i> at <i>D</i> .	s OD is perpendicu	ilar B1	Key words: Radius, perpendicular
			~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~		to tangent
(b) (a)	$\angle ACD = 1.12$ $\angle OCD = \angle O$	ODC = 1.13 (base)	me segment) angles of isos. $\Box$ )	MI	MI (for any correct method supported by at
	$\angle CDE = \frac{\pi}{2}$	-1.13 (tan $\perp$ rad)			least one correct
	=0.44	41 rad. (to 3 s.f.)		A1	reasoning for the angle

No.	Solution	Marks	Partial Marks
	123		property of circle)
	name of Life is points i No. 1990 B. FH (1990 Patential States of	n bad iv	Minus overall of 1 mark from Q11(b) for missing/ incorrect reason/s
11(b) (ii)(b)	$\angle BAD = \frac{\pi}{2} \ (\angle \text{ in semicircle})$ $\angle BDA = \pi - \frac{\pi}{2} - 1.13 \ (\angle \text{ sum of } \Box)$ = 0.4407963268 $\angle ADF = \frac{\pi}{2} - 0.4407963268 \ (\text{tan } \bot \text{ rad})$ $= 1.13 \ \text{rad. (to 3 s.f.)}$	М1 А1	M1 (for any correct method supported by at least one correct reasoning for the angle property of circle)
	OR $\angle AOD = 1.13 \times 2 \ (\angle \text{ at centre is twice } \angle \text{ at circumference})$ = 2.26 $\angle ADO = \frac{\pi - 2.26}{2} \ (\text{base angle of isos.} \square)$ = 0.4407963268 $\angle ADF = \frac{\pi}{2} - 0.4407963268 \ (\text{tan } \bot \text{ rad})$ $= 1.13 \text{ rad.} \ (\text{to } 3 \text{ s.f.})$	M1 A1	8
12(a) (i)	Mean = 34, Std Dev. = 11.7 (to 3 s.f.)	B1 B2	M1 for substituting into formula
12(a) (ii)(a)	School $\underline{T}$ had the better marks because <u>its mean mark</u> is higher school S.	B1	1
12(a) (ii)(b)	School <u>S</u> had the more consistent marks because <u>its</u> <u>standard deviation is smaller than school T.</u>	B1	

No.	Solution	Marks	Partial Marks
12(b) (i)	P(a blue shirt) = $\frac{3}{15} = \frac{1}{5}$	B1	
12(b) (ii)	P(a green shirt and a pair of black pants) = $\frac{4}{15} \times \frac{2}{14} \times 2$ 8	M1	B1 if get 1 <sup>st</sup> pair correct
	$=\frac{0}{105}$	Al	





Q9

