Class	Register Number	Name	Calculator Model
Centre / Index Number	/		

南洋女子中学校
NANYANG GIRLS' HIGH SCHOOL

Preliminary Examination 2020
Secondary 4

MATHEMATICS **4048/01**
Paper 1 **2 hours**

Monday **24 August 2020** **0900 - 1100**

READ THESE INSTRUCTIONS FIRST

1. Write your name, register number, class, centre number, index number and calculator model on all the work you hand in.
2. Answer **all** questions.
3. Write your answers and working in the space provided.
4. Write in dark blue or black ink.
5. You may use an HB pencil for any diagrams or graphs.
6. Do not use staples, paper clips, glue or correction tape/fluid.
7. Omission of essential working will result in loss of marks.
8. The use of an electronic calculator is expected, where appropriate.
9. If the degree of accuracy is not specified in the question, and if the answer is not exact, give the answer to three significant figures. Give answers in degrees to one decimal place.

   For π, use either your calculator value or 3.142, unless the question requires the answer in terms of π.
10. The number of marks is given in brackets [ ] at the end of each question or part question.
11. The total number of marks for this paper is 80.

80

Setter: OLH	This document consists of **18** printed pages, including this cover page. **NANYANG GIRLS' HIGH SCHOOL**	**[Turn over**

Mathematical Formulae

Compound interest

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

Mensuration

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

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

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

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

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

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

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

Trigonometry

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

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

Statistics

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

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

Answer **all** the questions.

1. Calculate $\frac{\sqrt[3]{67.23}-1.89}{4.5^2 \div 0.7}$. Write down your answer correct to

(a) 5 decimal places,

Answer ..... [1]

(b) 3 significant figures.

Answer ..... [1]

---

2. Arrange the following numbers in order of size, starting with the **biggest**.

$$-3.\dot{1}\ ,\ -3.2\ ,\ -\pi\ ,\ -3\tfrac{1}{10}$$

Answer ....., ..., ..., ... [2]

---

3. The number of people attending a countdown concert is given as 21 600, correct to x significant figures.
Write down all possible values of x.

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

---

4. **(a)** Express 756 as a product of its prime factors.

Answer ..... [1]

(b) The number $756m$ is a perfect cube. What is the **smallest** integer value that m can be?

Answer $m =$ ..... [1]

---

5. One solution of the equation $2x^2 + bx - 10 = 0$ is $x = 2$.
Find

(a) the value of b,

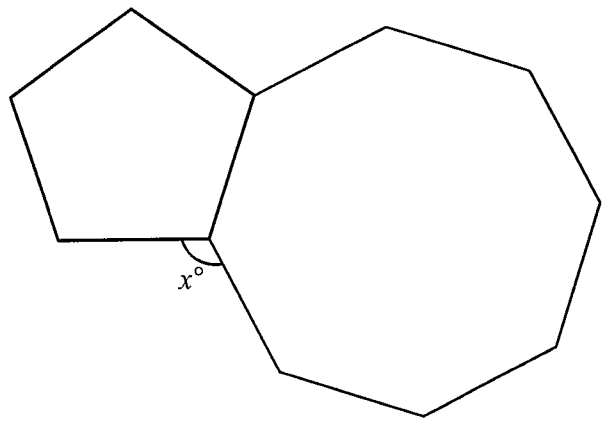
Answer $b =$ ..... [1]

(b) the other solution of the equation.

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

---

6. The diagram shows a regular pentagon joined to one side of a regular octagon.
Calculate the value of x.



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

---

7. The scale of a city map is 5 cm : 1 km.

(a) Write this scale in the form of 1 : n.

Answer 1 : ..... [1]

(b) An adventure park is represented by an area of 265 cm^2 on the map. Calculate the actual area of the park in square kilometres.

Answer ..... km^2 [2]

---

8. In 2019, the total population of *S* City was 5.2 millions.

(a) In the same year the population of *K* City was 3.9 millions. What is the ratio of the population of *K* City to the population of *S* City?

Answer ..... : ..... [1]

(b) The population of *S* City was increased by 271% between 1876 and 2019. Calculate the population in 1876. Give your answer in standard form, correct to 3 significant figures.

Answer ..... [2]

---

9. $\xi = \{\text{integers } x : 2 \leq x \leq 12\}$
$A = \{\text{factors of } 12\}$
$B = \{\text{prime numbers}\}$
List the elements in

(a) A',

Answer ..... [1]

(b) $A' \cap B$,

Answer ..... [1]

(c) $(A \cup B)'$.

Answer ..... [1]

---

10. **(a)** It takes 6 people to lay an area of tiles in 8 days. How long will it take if there are 16 people to do the same job?

Answer ..... [1]

(b) The intensity, I, of a light source on an object is inversely proportional to the square of distance, d, between the light source and the object.
If the distance between the light source and the object is decreased to 40% of the original distance, calculate the percentage increase in the intensity of the light source on the object.

Answer ..... [2]

---

11. **(a)** Solve the inequality $-5 \leq 2x + 1 < 3$.

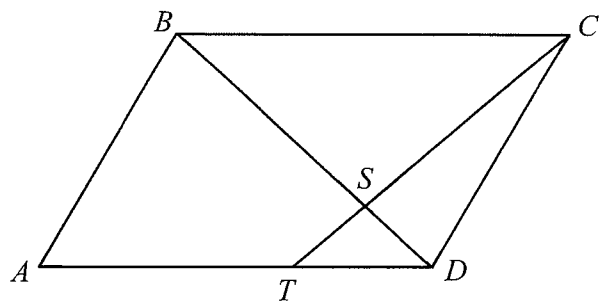
Answer ..... [2]

(b) Write down all possible values of x for which x is an integer.

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

---

12. $ABCD$ is a parallelogram, S is a point on BD and $BS = 3SD$.



(a) Name a triangle that is similar to triangle DST.

Answer ..... [1]

(b) Find

(i) $\frac{\text{Area of } \Delta BCS}{\text{Area of } \Delta BCD}$,

Answer ..... [1]

(ii) $\frac{\text{Area of } \Delta DST}{\text{Area of } \Delta BCS}$,

Answer ..... [1]

(iii) $\frac{\text{Area of } \Delta DST}{\text{Area of } \Delta BCD}$.

Answer ..... [1]

---

13. In a dice-rolling game, two dice are rolled and the two numbers facing up are noted.
These numbers will determine the prize that a participant will get.
If the two numbers are the same, a big prize will be awarded.
If the two numbers are different and the sum is even, a normal prize will be awarded.
The rest will be awarded a small token.

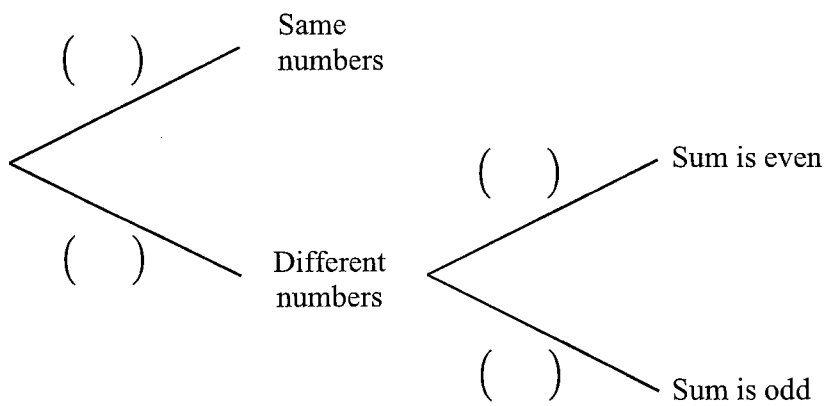
(a) Complete the possibility diagram.

First die

Second die	+	1	2	3	4	5	6
	1	2	3	4	5		7
	2	3	4	5	6	7	8
	3	4		6	7	8	9
	4	5	6	7		9	10
	5	6	7	8	9	10	11
	6	7	8		10	11	12

[1]

(b) By making use of the information in **(a)**, complete the tree diagram to show the above information.

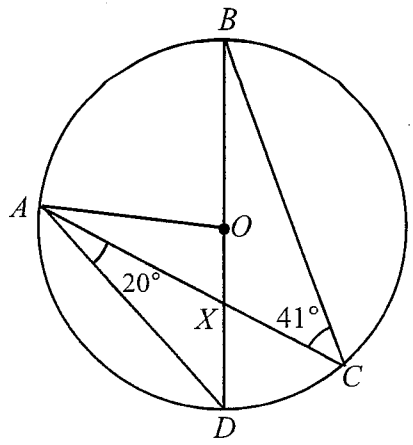


[2]

(c) Find the probability that a participant will get a normal prize.

Answer ..... [1]

14. In the diagram, A, B, C and D are on the circumference of the circle with centre O and diameter BD. AC and BD meet at X. Angle ACB is 41° and angle CAD is 20°.



Find

(a) angle AOB,

Answer ..... [1]

(b) angle BXC,

Answer ..... [1]

(c) angle XAO.

Answer ..... [1]

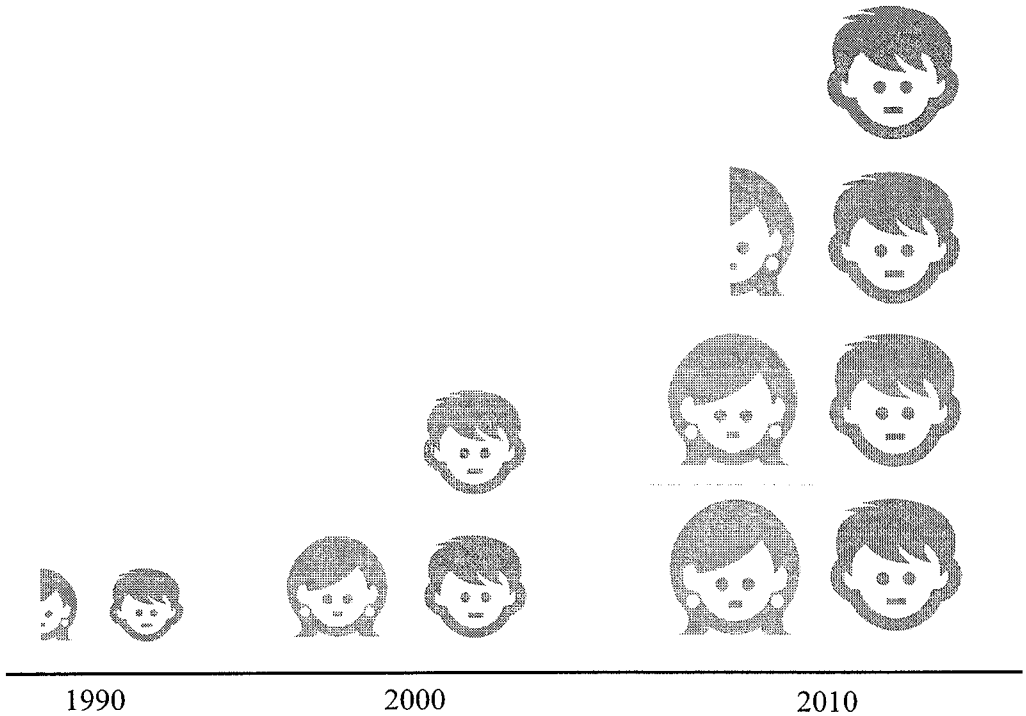
---

15. **(a)** The cash price of a refrigerator is $1200. The hire purchase price of the refrigerator is $1476. The hire purchase price is a deposit of 18% of the cash price plus 12 equal monthly payments. Find the amount of one monthly payment.

Answer $ ..... [2]

---

15. **(b)** In a village, the number of villagers who were literate from 1990 to 2010 are given as follows:



Key:  represents 2 males;  represents 2 females

Explain how this representation of data may lead to a misinterpretation of the data.

Answer .....

.....

.....

.....

.....

.....

..... [1]

16. The table shows the amount of time 32 students spent on social media daily.

Amount of time h (hr)	Frequency
$0 \leq h < 2$	5
$2 \leq h < 4$	12
$4 \leq h < 6$	11
$6 \leq h < 8$	4

Calculate an estimate for

(a) the mean amount of time spent on social media daily,

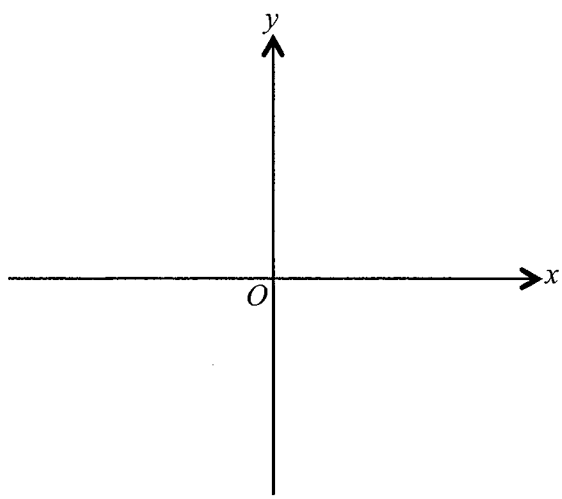
Answer .....hrs [2]

(b) the standard deviation of the amount of time.

Answer .....hrs [1]

---

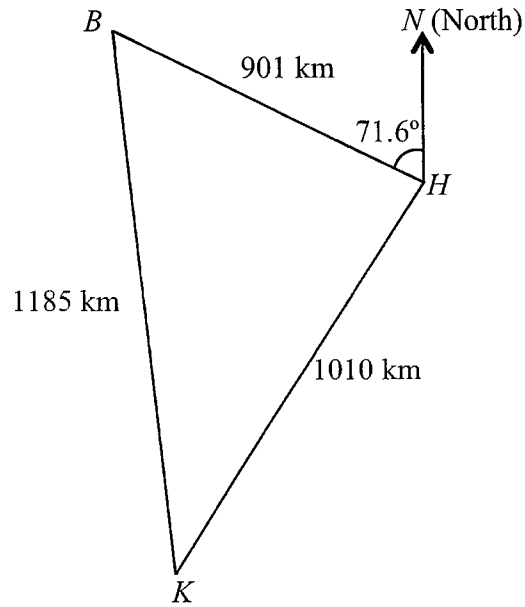
17. Sketch the graph of $y = (3 - x)(x + 2)$ and indicate on the graph, the coordinates of the turning point and the y-intercept.



[3]

[Turn over

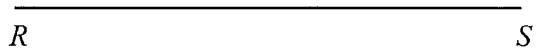
18. The diagram shows the positions of three cities, Bangkok (B), Ho Chi Minh City (H) and Kuala Lumpur (K).
Given that $BH = 901$ km, $HK = 1010$ km, $BK = 1185$ km and angle $BHN = 71.6°$, find the bearing of Kuala Lumpur from Ho Chi Minh City.



Answer ..... [3]

19. Three points R, S and T represent a restpoint, a signboard and a tree in a park respectively.

(a) Construct triangle RST such that $ST = 5$ cm, $\angle SRT = 26°$ and T is nearer to S than to R. RS has already been drawn. [1]



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

(c) A lamppost P is to be placed at a spot which is equidistant from the points R and S, and along the bisector of angle RTS. By constructing a suitable line, mark out the spot P where the lamppost is to be placed. [2]

---

20. **(a)** A Mind-reader asked her participant to think of 5 integers which are less than 20 and was given the following information:

- The mean of these numbers is 10, the median is 9 and the mode is 6.
- The smallest number is a third of the largest number.

What were the 5 integers the participant wrote?

Answer ....., ..., ..., ..., ... [2]

---

20. **(b)** Jay weighed the school bags of six classmates.
The mean weight of the school bags was 2.7 kg and the standard deviation of the weights of the school bags was 54 grams.
After a while, Jay realised that the weighing scale was not accurate. The correct weight of each bag was 250 grams more than what he recorded.
Write down the correct mean weight and the standard deviation (SD) of the six school bags.

Answer Mean = ... kg

SD = ... g [2]

---

21. The equation of a line is given as $\frac{x}{2} + \frac{y}{5} = 1$.

(a) Find the gradient and the y-intercept of the line.

Answer Gradient = ...

y-intercept = ... [2]

(b) Calculate the distance between the x- and y-intercepts of the line.

Answer ..... units [2]

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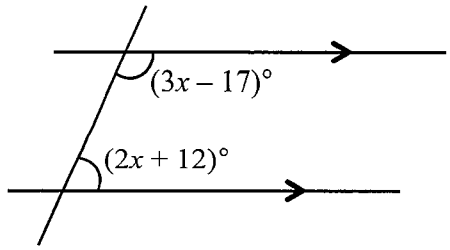
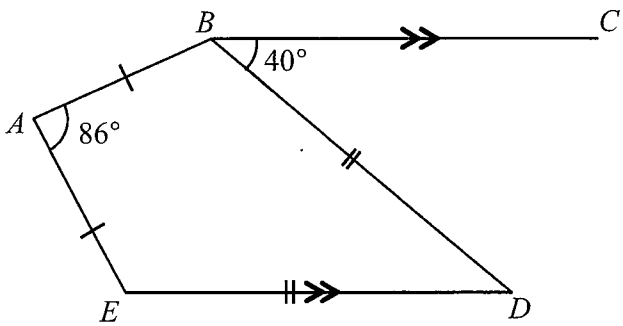
22. **(a)** Find the value of x.



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

(b) The diagram below is made up of a kite $ABDE$ and a line BC.
BC // ED, angle $BAE = 86°$ and angle $CBD = 40°$.



(i) Write down angle BDE.

Answer angle $BDE =$ ..... [1]

(ii) Calculate angle ABD.

Answer angle $ABD =$ ..... [2]

23. **(a)** Simplify $2(2x + 3y) - 5(x - 4y)$.

Answer ..... [2]

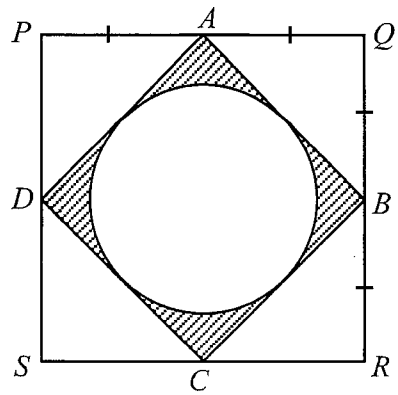
(b) Factorise completely $4am - 5bm - 16an + 20bn$.

Answer ..... [2]

(c) Write as a single fraction in its simplest form $\frac{x}{(x-1)^2} + \frac{2}{1-x}$.

Answer ..... [2]

24.



The diagram shows a circle of radius 4 cm inscribed in a square *ABCD*, which in turn is inscribed in a bigger square, *PQRS*. The vertices *A*, *B*, *C* and *D* bisect *PQ*, *QR*, *RS* and *SP* respectively.

(a) Find the area of the shaded region.

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

(b) Calculate the area of the bigger square, *PQRS*.

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

25. A company manufactures two sizes of the same brand of hand wash. The bottles are geometrically similar with the same thickness and the same materials are used.

$13.50

$4.95

(a) Show that the cost of the hand wash is not directly proportional to the quantity of the hand wash.

Answer

[2]

(b) The width of the 250 ml bottle is 6.2 cm. Calculate the width of the 700 ml bottle.

Answer ..... cm [2]

~ ~ End of Paper ~ ~

Answer key

1(a)	0.07523	7(a)	1 : 20 000
1(b)	0.0752	7(b)	10.6 km^2
2	$-3\frac{1}{10}, -3.\dot{1}, -\pi, -3.2$	8(a)	3 : 4
		8(b)	1.40×10^6
3	3, 4	9(a)	5, 7, 8, 9, 10, 11
		9(b)	5, 7, 11
		9(c)	8, 9, 10
4(a)	$2^2 \times 3^3 \times 7$	10(a)	3 days
4(b)	98	10(b)	525%
5(a)	1	11(a)	$-3 \leq x < 1$
5(b)	$x = -2\frac{1}{2}$	11(b)	$-3, -2, -1, 0$
6	$x = 117$	12(a)	Triangle *BSC*
		12(bi)	¾
		12(bii)	$\frac{1}{9}$
		12(biii)	$\frac{1}{12}$

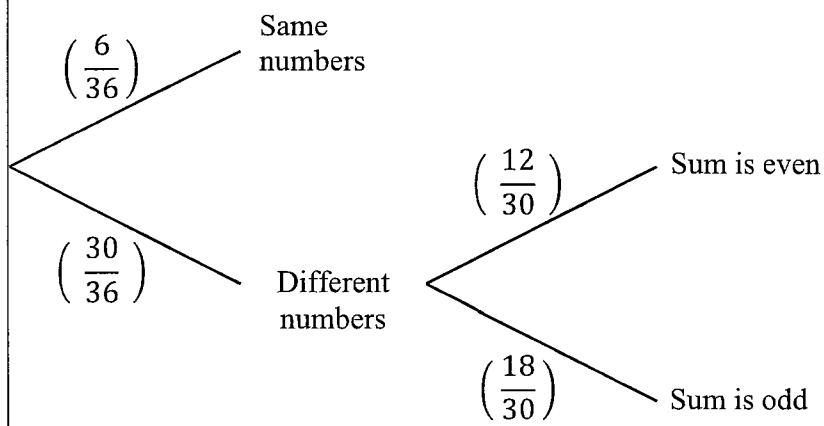
13(a)

First die

+	1	2	3	4	5	6
1	2	3	4	5	***6***	7
2	3	4	5	6	7	8
3	4	***5***	6	7	8	9
4	5	6	7	***8***	9	10
5	6	7	8	9	10	11
6	7	8	***9***	10	11	12

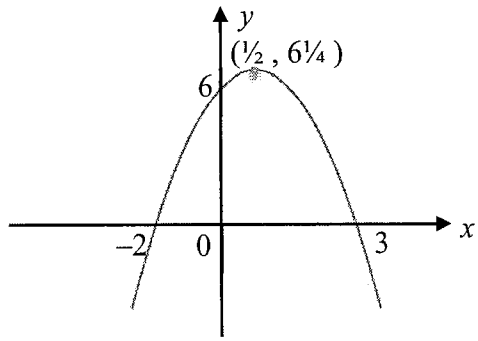
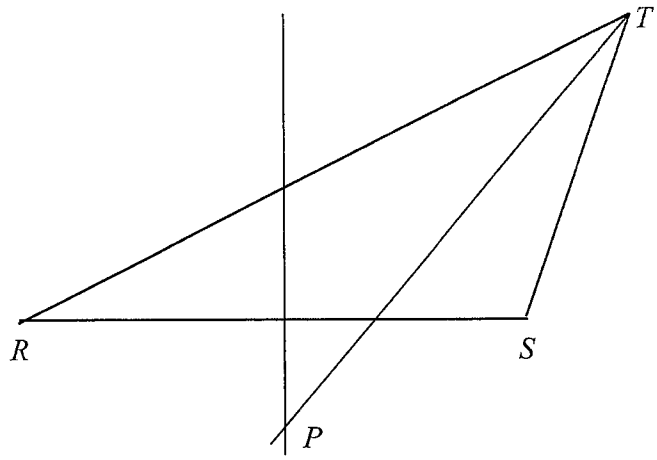
Second die

13(b)



13(c) $\frac{1}{3}$

14(a)	82°
14(b)	119°
14(c)	21°
15(a)	105
15(b)	The size of each picture is different over the years, which can lead one to think that a bigger picture represents more people.

16(a) 16(b)	3.875 hrs 1.80 hrs
17	
18	212.0°
19	
20(a) 20(b)	6, 6, 9, 11, 18 Mean = 2.95kg or 2950g SD = 54g
21(a) 21(b)	Gradient = $-\frac{5}{2}$, y-intercept = 5 $\sqrt{29}$ or 5.39 units
22(a) 22(b) 22(c)	$x = 37$ 40° 117°
23(a) 23(b) 23(c)	$-x + 26y$ $(4a - 5b)(m - 4n)$ $\frac{2 - x}{(x - 1)^2}$
24(a) 24(b)	13.7 cm^2 128 cm^2
25(a) 25(b)	Cost/ml for small bottle = 0.0198 Cost/ml for big bottle = 0.0192 Since the cost per ml is not constant, the cost of the hand wash is not directly proportional to the quantity of the hand wash. $w = 8.74$ (to 3sf)

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南洋女子中学校

NANYANG GIRLS' HIGH SCHOOL

Preliminary Examination 2020
Secondary 4

MATHEMATICS **4048/02**

Paper 2 **2 hour 30 minutes**

Tuesday **25 August 2020** **0900 – 1130**

READ THESE INSTRUCTIONS FIRST

1. Write your name, register number, class, centre number, index number and calculator model on the front page.
2. Answer **all** questions.
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   For π, use either your calculator value or 3.142, unless the question requires the answer in terms of π.
10. The number of marks is given in brackets [ ] at the end of each question or part question.
11. The total number of marks for this paper is 100.

Question Number	Marks Obtained
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	
Total Marks	/100

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Mathematical Formulae

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

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

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

1 **(a)** Simplify $\frac{2x^2y^3}{5z} \div \frac{4x^4z}{25y}$.

Answer ..... [2]

(b) Simplify $\frac{4p-2q}{12p^2-3q^2}$.

Answer ..... [2]

(c) $a = \frac{3+b^2}{2b^2-c}$

(i) Evaluate a when $b = 3$ and $c = -2$.

Answer $a =$ ..... [1]

(ii) Express b in terms of a and c.

Answer $b =$ ..... [2]

(d) Solve $\frac{2}{x+5} - \frac{1}{x-2} = \frac{5}{3}$, giving your answers correct to 1 decimal place.

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

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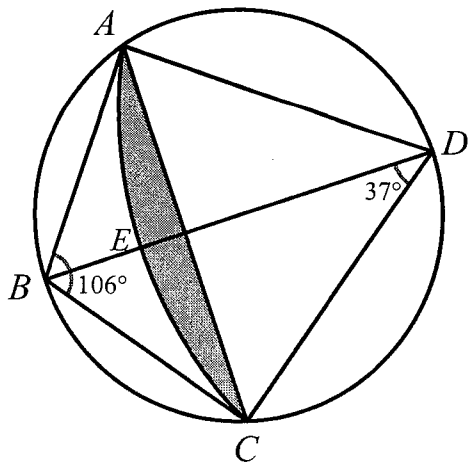


A, B, C and D are four points on a circle.
BD is a diameter and $BD = 8$ cm.
Angle $ABC = 106°$ and angle $BDC = 37°$.
A, E and C are points on another circle centre D.

(a) Show that triangle ABD and triangle CBD are congruent.
Give a reason for each statement you make.

Answer

[3]

(b) Calculate CD.

Answer ..... cm [2]

(c) Calculate the shaded area.

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

3 **(a)** The tuition fee of a 4-year undergraduate course is $152 800.
Alan applies for a government tuition grant that pays 75% of the tuition fee.
Calculate the amount of tuition fee payable by Alan.

Answer $ ..... [1]

(b) Alan decides to take up a study loan to pay off the remaining tuition fee.
There are 2 packages available, both commencing after course completion.

Package I: Compound interest of 4% per annum, repayment period of 5 years

Package II: Simple interest of 4.2% per annum, repayment period of 6 years

(i) Calculate the total amount of interest incurred for each package.

Answer I : $ .....

II : $ ..... [4]

(ii) Alan plans to repay a maximum of $700 per month after graduation.
Determine, with clear workings, which package he should choose.

Answer

.....

.....

..... [3]

(c) Alan decides to apply for a 2-month Global Internship Programme in Japan.
The exchange rate between Singapore dollars ($) and Japanese Yen (¥) is
$1 = ¥ 76.50.
The estimated expenditure is ¥ 154 000 per month.
Calculate the minimum amount of Singapore dollars Alan has to save for the trip.
Give your answer correct to the nearest dollar.

Answer $ ..... [2]

4 At a bazaar, Gopal makes prata during the morning shift (am) and afternoon shift (pm) for five days.
The matrix, **P**, shows the number of different types of prata that are made during each shift.

$$\mathbf{P} = \begin{array}{c} \begin{matrix} \text{Plain} & \text{Egg} & \text{Cheese} \end{matrix} \\ \begin{pmatrix} 60 & 90 & 50 \\ 70 & 80 & 30 \end{pmatrix} \end{array} \begin{matrix} \\ \text{am} \\ \text{pm} \end{matrix}$$

(a) Evaluate the matrix $\mathbf{N} = (5 \;\; 5)\,\mathbf{P}$.

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

(b) State what each of the elements of **N** represents.

Answer .....

.....

.....

.....

.....

..... [1]

(c) The selling price of a plain prata is \$1.50.
The selling price of an egg prata is \$2.
The selling price of a cheese prata is \$2.50.

Represent these amounts in a 3×1 column matrix **S**.

Answer $\mathbf{S} = \begin{pmatrix} \quad \\ \quad \\ \quad \end{pmatrix}$ [1]

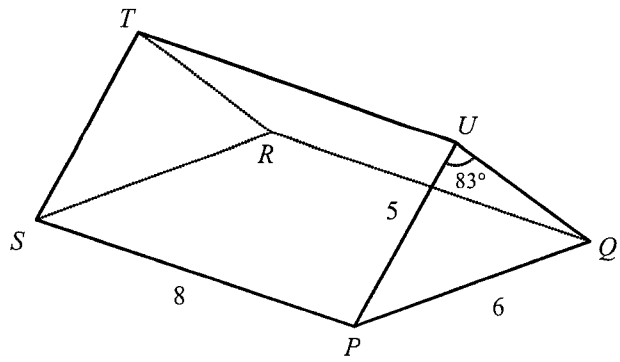
(d) On each of the five days, Gopal sells 90% of each type of prata he made. The remaining ones are given away.
The total sale for five days is given by the matrix **T.**
Using matrix multiplication, evaluate the matrix **T**.

Answer **T** = [3]

(e) The cost price of each type of prata is 20% of its selling price.
Find the total profit earned.

Answer $ ..... [2]

5



The diagram shows a solid wooden block in the shape of a triangular prism with three rectangular faces.
$PQ = 6$ cm, $PU = 5$ cm, $PS = 8$ cm and angle $PUQ = 83°$.

(a) Calculate angle PQU.

Answer ..... [2]

(b) Calculate the vertical distance of U above PQ.

Answer ..... cm [2]

(c) V is a point on RS directly below T. The angle of elevation of T from Q is 21.6°.
Calculate QV.

Answer ..... cm [2]

(d) Show that angle TRP is not 90°.

Answer

[2]

6 The first three terms in a sequence of numbers, T_1, T_2, T_3, ... are given below.

$$T_1 = 3 + 9 = 12 = 3 \times 2^2$$
$$T_2 = 3 + 9 + 15 = 27 = 3 \times 3^2$$
$$T_3 = 3 + 9 + 15 + 21 = 48 = 3 \times 4^2$$

(a) **(i)** Find T_4.

Answer ..... [1]

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

Answer ..... [1]

(iii) Given that $T_p = 3 + 9 + 15 + \cdots + q = 363$, find the value of p and the value of q.

Answer $p =$ .....

$q =$ ..... [3]

(iv) Explain why T_n is an odd number when n is even.

Answer .....

.....

.....

.....

.....

..... [1]

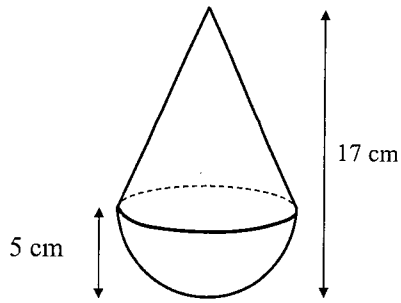
(b) The nth term of a different sequence is given by $P_n = 3n - 6$.

Siti is asked to find the difference between T_{50} and P_{50} and her answer is 7660.
Without any calculation of values, show that Siti's answer is wrong.

Answer

[2]

7



Design A

The diagram shows design A of a solid ornament made from a cone and a hemisphere.
The radius of the hemisphere is 5 cm and the height of the ornament is 17 cm.

(a) Calculate the slant height of the cone.

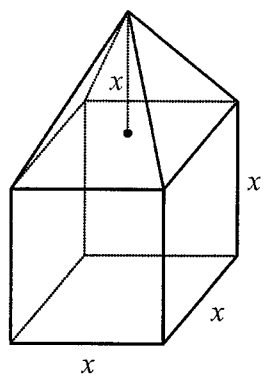
Answer ..... cm [1]

(b) Calculate the total surface area of the ornament.

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

(c) Calculate, in terms of π, the volume of the ornament.

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



Design B

The diagram shows design B of an ornament with the same volume and material as in design A. The solid is made from a pyramid and a cube.
The cube is of side x cm. The height of the pyramid is x cm.

(d) Show that $x = 7.56$.

Answer

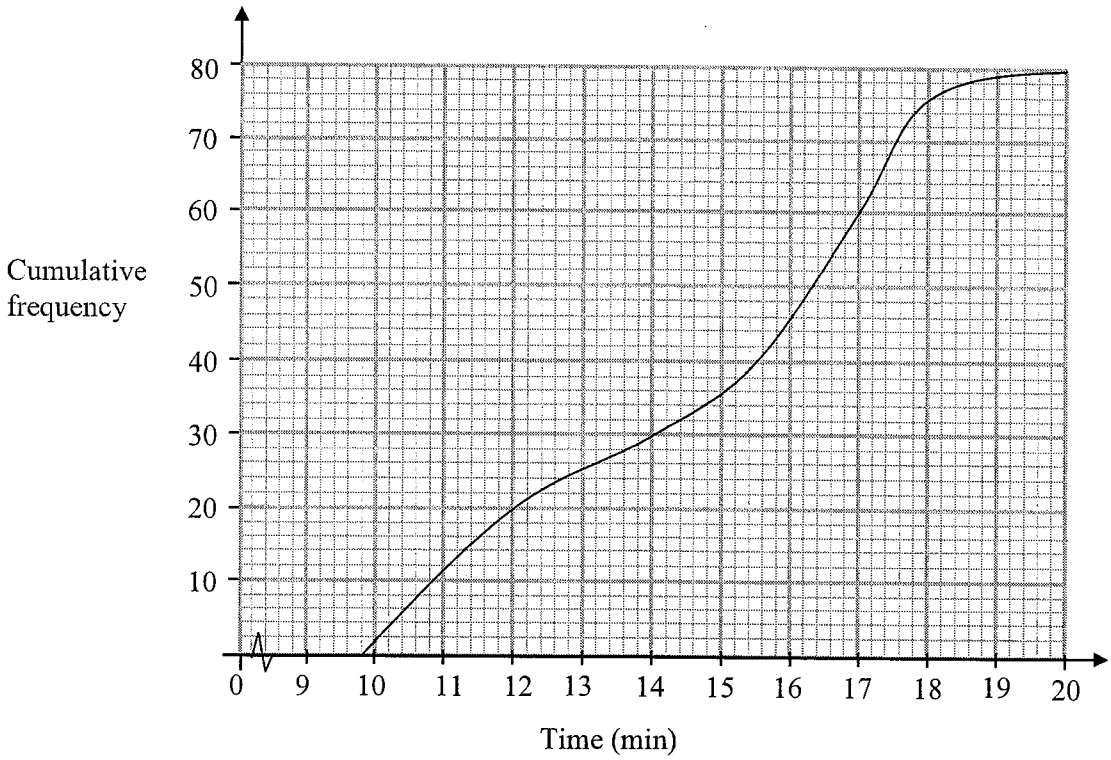
[3]

(e) Which design is more cost-saving to paint?
Justify your decision with clear calculations.

Answer

..... [4]

8 **(a)** A group of 80 female students completed a 2.4-km run for their NAPFA Test. The cumulative frequency curve below shows the distribution of their times.



(i) Use the curve to estimate

(a) the median time,

Answer ..... min [1]

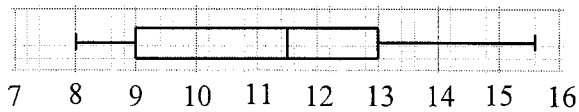
(b) the interquartile range of the times.

Answer ..... min [2]

(ii) The top 12.5% of the students ran h min or less.
Estimate the value of h.

Answer $h =$ ..... [1]

(iii) The times taken by 80 male students to complete the same 2.4-km run were also recorded. The box-and-whisker plot shows the distribution of their times.



Make two comparisons between the times for males and the times for females.

1 .....

.....

.....

.....

2 .....

.....

.....

..... [2]

(b) The table summarises the ages of the 160 students who completed the 2.4-km run.

Age (years)		13	14	15	16	17
Frequency	Male	10	16	24	21	9
	Female	18	22	19	14	7

(i) One of these students is selected at random.
Find, as a fraction in its lowest terms, the probability that the student is

(a) a female aged 14 or less,

Answer ..... [1]

(b) aged 15.

Answer ..... [1]

(ii) Two of the students are selected at random.
Find the probability that both of them are males aged 16 or more.

Answer ..... [2]

9 The variables x and y are connected by the equation $y = x^2 + \frac{2}{x} - 5$.

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

x	0.25	0.5	1	1.5	2	2.5	3	3.5	4
y	3.06	− 0.75	− 2	− 1.42	0	p	4.67	7.82	11.5

(a) Find the value of p.

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

(b) Using a scale of 4 cm to represent 1 unit, draw a horizontal x-axis for $0.25 \leq x \leq 4$.
Using a scale of 1 cm to represent 1 unit, draw a vertical y-axis for $-4 \leq y \leq 12$.
On your axes, plot the points given in the table and join them with a smooth curve.
[3]

(c) Use your graph to write down an inequality in x to describe the range of values where $-2 \leq y < 2$.

Answer ..... [1]

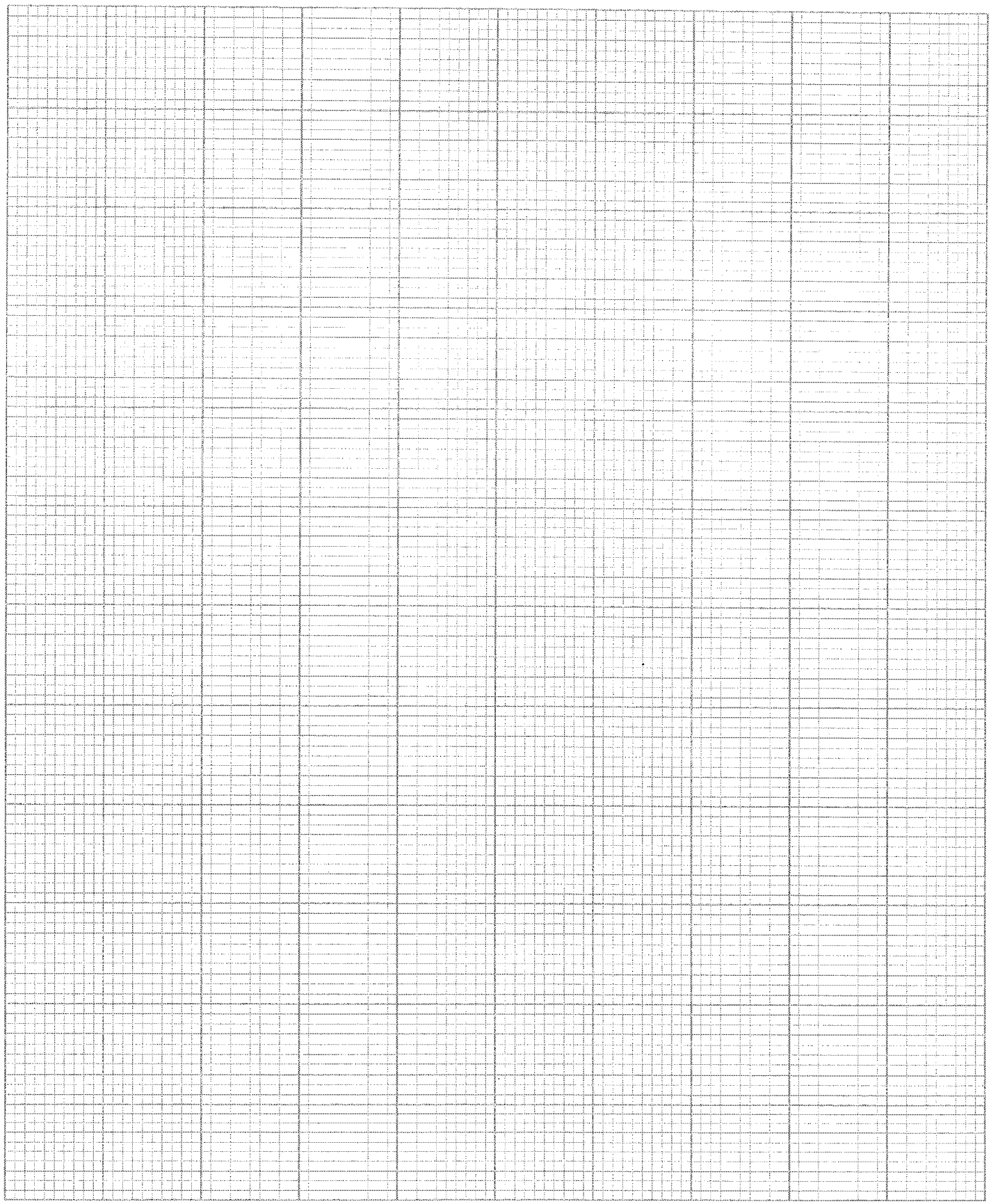
(d) By drawing a tangent, find the gradient of the curve at (0.5, − 0.75).

Answer ..... [2]

(e) **(i)** On the same axis, draw the line with gradient 2 that passes through the point (3, 4). [1]

(ii) Write down the equation of the line.

Answer ..... [1]



(iii) Write down the coordinates of the points where the line intersects the curve.

Answer (....., ...) and (....., ...) [2]

(iv) These values of x are two solutions of the equation $x^3 - 2x^2 + Ax + B = 0$.
Find the value of A and the value of B.

Answer $A =$ .....

$B =$ ..... [2]

10 Nalin is tasked to estimate the transportation cost for her family.
The tables below give information that Nalin can use to work out the transportation cost.

(Source: adapted from https://www.ptc.gov.sg/regulation/bus-rail/fare-structure)

Distance (km)	**Transport cost using Ezlink Card per ride (cent)**					
	Student *(applicable with a valid School Smartcard or ITE, Polytechnic & Diploma Student Concession Card)*		**Adult**		**Senior Citizens** *(aged 60 & above)*	
	Bus / MRT	Express Bus	Bus / MRT	Express Bus	Bus / MRT	Express Bus
Up to 3.2	42	72	92	152	59	104
3.3 – 4.2	47	77	102	162	66	111
4.3 – 5.2	52	82	112	172	73	118
5.3 – 6.2	57	87	122	182	80	125
6.3 – 7.2	60	90	131	191	86	131
7.3 – 8.2	63	93	138	198	92	137
8.3 – 9.2 9.3 – 10.2 ⋮ 17.3 – 18.2 18.3 – 19.2	63	93	144 148 ⋮ 180 184 *(4¢ increment per 1 km)*	204 208 ⋮ 240 244 *(4¢ increment per 1 km)*	92	137
19.3 – 20.2 ⋮ 22.3 – 23.2	63	93	187 ⋮ 196 *(3¢ increment per 1 km)*	247 ⋮ 256 *(3¢ increment per 1 km)*	92	137
23.3 – 24.2	63	93	198	258	92	137
24.3 – 25.2	63	93	200	260	92	137
25.3 – 26.2 26.3 – 27.2 ⋮ 39.3 – 40.2	63	93	202 203 ⋮ 216 *(1¢ increment per 1 km)*	262 263 ⋮ 276 *(1¢ increment per 1 km)*	92	137
Over 40.2	63	93	217	277	92	137

Monthly Transport Cost using Concession Pass or Travel Pass

	Cardholders	Bus (unlimited bus rides)	Train (unlimited train rides)	Hybrid (unlimited bus and train rides)
Concession Pass	Primary	$24	$21	$43.50
	Secondary	$29	$26.50	$54
	Polytechnic/ Diploma	$29	$26.50	$54
	University	$55.50	$48	$90.50
	Senior Citizen	---	---	$64
Travel Pass	Adult	---	---	$128

Travelling Patterns of Nalin's household per month

	Trips made for work or school			Trips made for other purposes
	Estimated Distance Travelled per trip (km) (× no. of trips)			Range of Estimated Expenditure ($)
Household member	Bus	MRT	Express Bus	Bus / MRT
Nalin (48 years old)		20.8 (× 20)		$24 – $28
Husband (50 years old)			25.7 (× 20)	$26 – $30
Daughter (Polytechnic Student)	10.6 (× 24)			$10 – $12
Son (Undergraduate)	2.4 (× 24)	37.5 (× 24)		$20 – $25

(a) Nalin plans to purchase the travel pass for herself for the month of May.
Calculate the minimum daily transport cost incurred by Nalin to justify the purchase.
Give your answer correct to the nearest cent.

Answer ..... cents [2]

(b) Nalin estimates that she should set aside a sum of approximately $380 if she were to purchase the concession or travel passes for everyone.

Show that Nalin is correct.

Answer

[2]

(c) Nalin wishes to tighten the purse strings. Suggest an amount of money she should set aside each month for her household, based on their travelling patterns.
Justify the decisions you make and show your calculations clearly.

Answer

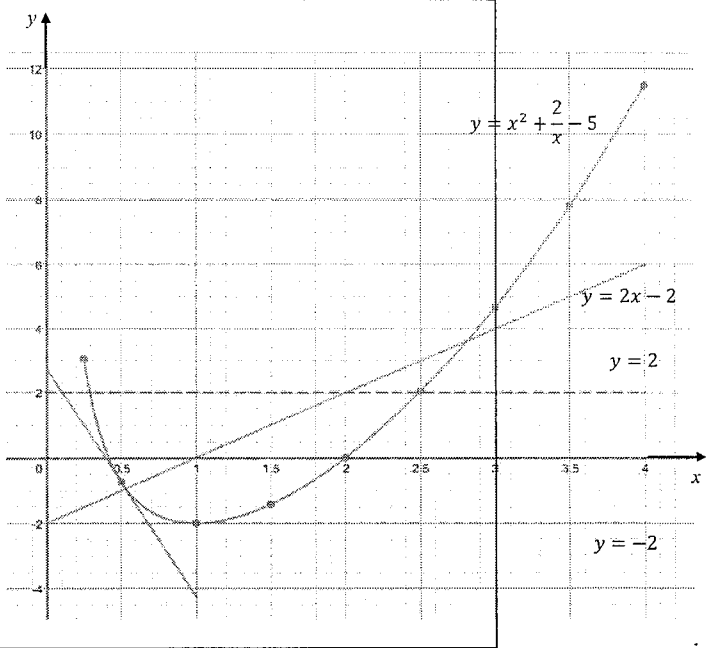
Answer $ ..... [7]

End of Paper

Answer Key

1(a)	$\frac{5y^4}{2x^2z^2}$
1(b)	$\frac{2}{3(2p+q)}$
1(c)(i)	$\frac{3}{5}$ (or 0.6)
1(c)(ii)	$\pm\sqrt{\frac{3+ac}{2a-1}}$
1(d)	$x = 1.3$ or -3.7 (1 d.p.)
2(a)	AAS Congruence Test or SAS Congruence Test or RHS Congruence Test
2(b)	6.39 cm (3 s.f.)
2(c)	6.74 cm^2 (3 s.f.)
3(a)	\$38 200
3(b)(i)	Package I: \$8276.14 (nearest cent) Package II: \$9626.40
3(b)(ii)	Package II
3(c)	\$4027 (nearest dollar)
4(a)	(650 850 400)
4(b)	The elements of **N** represent the total number of <u>each type</u> of prata made in <u>5 days,</u> namely 650 plain prata, 850 egg prata and 400 cheese prata respectively.
4(c)	$\mathbf{S} = \begin{pmatrix} 1.5 \\ 2 \\ 2.5 \end{pmatrix}$
4(d)	$\mathbf{T} = (3307.5)$
4(e)	\$2572.50

5(a)	55.8° (1 d.p.)
5(b)	3.29 cm (3 s.f.)
5(c)	8.32 cm (3 s.f.)
5(d)	Show $PT < PR$ to imply PT is not the longest length OR $TR^2 + PR^2 \neq PT^2$
6(a)(i)	75
6(a)(ii)	$3(n+1)^2$
6(a)(iii)	$p = 10, q = 63$
6(a)(iv)	$3(n+1)^2$ is an odd number as the <u>product of 3 odd</u> numbers is always an odd number.
6(b) OR	$T_n - P_n$ is a multiple of 3 Since 7660 is <u>not divisible by 3</u>, Siti's answer is wrong. $T_n - P_n$ must be odd. Since 7660 is not odd, Siti's answer is wrong.
7(a)	13 cm
7(b)	361 cm^2 (3 s.f.)
7(c)	$\frac{550}{3}\pi$ cm^3 $(183\frac{1}{3}\pi$ $cm^3)$
7(e)	Design A (smaller surface area of 361 cm^2 vs 414 cm^2 of design B)
8(a)(i)(a)	15.5 min (accept 15.6 min)
8(a)(i)(b)	5 min
8(a)(ii)	10.9 (accept 10.8)
8(a)(iii)	The males generally <u>ran faster</u> as their <u>median</u> time of 11.5 min is significantly <u>lower</u> than the 15.5 min of the females. The males had a <u>smaller spread of times</u> from the median as their <u>interquartile range</u> of 4 min is <u>lower</u> than the 5 min of the females.

8(b)(i)(a)	$\frac{1}{4}$
8(b)(i)(b)	$\frac{43}{160}$
8(b)(ii)	$\frac{29}{848}$
9(a)	$p = 2.05$
9(b)	
9(c)	$0.3 < x < 2.45$ (±0.05)
9(d)	gradient $= -7 \pm 0.5$
9(ei)	on the graph
9(e)(ii)	$y = 2x - 2$
9(e)(iii)	$(0.55 \pm 0.05, -0.9 \pm 0.2)$ and $(2.8 \pm 0.05,\ 3.6 \pm 0.2)$
9(f)	$A = -3, \quad B = 2$
10(a)	413 cents (nearest cent)
10(b)	Cost of 4 passes = \$375.50 Nalin is correct.
10(c)	Nalin: \$66 Husband: \$82.40 Daughter: \$27.12 Son: \$98.44 Budget = \$267 (nearest dollar)