CANDIDATE NAME			
CLASS		INDEX NUMBER	

MATHEMATICS

4048/02

Paper 2

11 October 2017

Total Marks: 50

1 Hours 15 Minutes

Additional Materials: Writing Paper (4 sheets) and Graph Paper (1 sheet)

READ THESE INSTRUCTIONS FIRST

Write your name, class and index number on all your answer sheets to be handed in.
Write in dark blue or black pen.
You may use a soft pencil for any diagrams, graphs or rough working.
Do not use staples, paper clips, highlighters, glue or correction fluid.

Answer **all** questions.

If working is needed for any question it must be shown with the answer.
Omission of essential working will result in loss of marks.
Calculators should be used where appropriate.
If the degree of accuracy is not specified in the question, and if the answer is not exact, give the answer to three significant figures. Give answers in degrees to one decimal place.
For π, use either your calculator value or 3.142, unless the question requires the answer in terms of π.

At the end of the examination, fasten all your work securely together.
The number of marks is given in brackets [ ] at the end of each question or part question.

For Examiner's Use

50

This paper consists of **6** printed pages (including the cover page)

Setter: Mdm Humairah

Mathematical Formulae

Compound interest

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

Mensuration

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

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

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

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

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

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

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

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 The cash price of a new car is $175 000.

(a) Sarah buys the car on hire purchase. She pays a deposit of one fifth of the cash price. She then pays $1300 monthly for 10 years. What is the total amount that Sarah pays for the car? [3]

(b) The original value of the car is its cash price of $175 000. Each year the value of the car decreases by 10% of its value at the start of the year. At the end of three years, Sarah decides to sell the car. Calculate the overall percentage reduction in the value of the car compared with its original value. [3]

2 Marcus, Ali and Tan shared a sum of money in the ratio 11 : 4 : 1.

(a) Given that Ali received $4.80 more than Tan, find the sum of money shared by the three of them. [2]

(b) Marcus distributed part of his money equally to Ali and Tan and was left with $2.60. Find the new ratio of Marcus's money to Ali's money to Tan's money. [3]

3   There are 16 adults and 10 children going to the Singapore Flyer. You are required to book taxis for them. Below is the taxi seating capacity given to you. At least one adult must accompany the children.

Our Products & Services > Seating Capacity

For Hyundai Sonatas, Hyundai i40s, Toyota Prius and LimoCab Taxis (4-seater)

Four adults   :

Three adults + Two children   :

Two adults + Three children   :

One adult + Four children   :

Six children   :

Source: https://www.cdgtaxi.com.sg/commuters_seating_capacity.mvn?cid=256

(a)   What is the minimum number of taxis you need? Show all your working clearly.   [3]

(b)   There is a change of number of people going to the Singapore Flyer. An additional 4 adults and 2 children would like to go too. How many more taxis do you need to book?   [2]

---

4   Two different sizes of cylindrical fruit cans are shown below. The small can has a diameter of 12 cm and a height of 13 cm. The prices of the fruit cans are given on the respective cans.

SMALL

$4.80

13 cm

12 cm

LARGE

$18.80

11 310 cm^3

(a)   Find the volume of the small can.   [2]

(b)   Which size of canned fruit gives the better value? Show all the working clearly of can.   [3]

(c)   What is the maximum number of small cans that can fit into a rectangular packaging of size 72 cm by 24 cm and height of 39 cm?   [3]

5 There are 2(*k* – 3) peaches in a box. There are 3 more apples than peaches and twice as many oranges as peaches in the same box.

    (a) Express the number of apples in term of *k*. [1]

    (b) Express the number of oranges in term of *k*. [1]

    (c) If there are a total of 35 fruits in the box, how many peaches are there in the box? [3]

    (d) If the cost of a peach, an apple and an orange is $1.10, $0.20 and $0.50 respectively, what is the cost of one box of fruits? [3]

    (e) How many numbers of boxes of fruits can May purchase with $42? [2]

6 An aeroplane travelled a distance of 1130 km from Singapore to Jakarta. For the first *x* hour of its journey, the aeroplane travelled at a constant speed of 350 km/h. The speed of the aeroplane was increased by 80 km/h for the remaining $\frac{x}{2}$ hour of its journey.

    (a) Write down the total distance travelled for the first *x* hour of its journey, in terms of *x*. [1]

    (b) Write down the distance travelled by the aeroplane in the remaining $\frac{x}{2}$ hour of its journey, in terms of *x*. [2]

    (c) Find the value of *x*. Hence, find the total time, in hours, taken for the whole journey. [3]

    (d) Find the average speed, in km/h, for the whole journey, correct to 2 decimal places. [2]

7   Answer the whole of this question on a sheet of graph paper.

The variables x and y are connected by the equation
$$y = 2 - 2x.$$
Some corresponding values of x and y, are given in the table below.

x	-2	-1	0	1	2
y	p	4	2	q	-2

(a)   Calculate the value of p and of q.   [2]

(b)   Using a scale of 2 cm to 1 unit for the y-axis and 4 cm to 1 unit for the x-axis, draw the graph $y = 2 - 2x$ for $-2 \leq x \leq 2$.   [3]

(c)   Using your graph, find the value of x when $y = 3.5$.   [1]

(d)   On the same axes, draw the line $x = -1.5$. Find the coordinates of the point of intersection of the two lines.   [2]

--- End of Paper ---

Answer **all** the questions.

1 **(a)** Consider the following numbers.

$$\sqrt{64}, \quad \frac{2}{5}, \quad 121, \quad -1.2, \quad 79, \quad \sqrt{2}$$

Write down the prime number.

Answer (*a*) ………**79**………… [1]

(b) By rounding each number to 1 significant figure, estimate the value of $\dfrac{251.76}{2.65+3.295}$.

You must show your working clearly.

$$\frac{300}{3+3} \quad [M1]$$

Answer (*b*) ………**50**………… [2]

2 The first four terms of a sequence are 12, 15, 18, 21 ……

(a) Write down the 6th term.

Answer (*a*) 6th term = ………**27**……… [1]

(b) Write down the general term, T_n for the sequence.

Answer (*b*) T_n = …………**3n + 9**……….. [1]

3   When written as the product of their prime factors,

$$p = 2^3 \times 3^n,$$

$$q = 5^2 \times 13^3,$$

$$r = 2^3 \times 5 \times 7^2.$$

Find

(a)   the value of the n if the cube root of p is 2×3^2,

Answer (*a*) $n =$ ....**6**............   [1]

(b)   the LCM of q and r, giving your answer as the product of its prime factors,

Answer (*b*) $2^3 \times 5^2 \times 7^2 \times 13^3$ ....   [1]

(c)   the greatest number that will divide q and r exactly.

Answer (*c*)   ....**5**...............   [1]

4 **(a)** Jordan took two tests.

In a second test, Jordan scored 18 marks.

The second test mark is an improvement of 20% of the first test mark.

Find Jordan's first test mark.

$$\frac{18}{1.2} \quad [M1]$$

Answer (*a*) ……………**15**…… marks [2]

(b) Convert 56 m/s to km/h.

Answer (*b*) ……………**201.6**…… km/h [1]

(c) Given that the rate of exchange between Euro and Singapore dollars is €1 = S$1.59.

Find the amount of Euro dollars one can receive from S$300.

Give your answer to 2 decimal places.

Answer (*c*) ……………**188.70**…… Euros [1]

5 Given that $x = \dfrac{-b + \sqrt{b^2 - 4ac}}{2a}$,

find the value of x when $a = 4$, $b = -2$ and $c = -3$. Give your answer to 3 decimal places.

$$x = \frac{-(-2) + \sqrt{(-2)^2 - 4(4)(-3)}}{2(4)} \quad [M1]$$

$= \dots Answerr.x = \underline{\qquad}$ **1.151** [2]

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6 In the diagram below, $AB // CD // EF$. $\angle ABC = 42°$ and $\angle CEF = 136°$.

Find

(a) $\angle BCD$,

Answer (*a*) $\angle BCD = \dots$ **42°** $\dots$ [1]

(b) $\angle DCE$,

Answer (*b*) $\angle DCE = \dots$ **44°** $\dots$ [1]

(c) the reflex $\angle BCE$.

Answer (*c*) reflex $\angle BCE$ $\dots$ **274°** $\dots$ [1]

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7 In the trapezium *ABCD*, *AB // DC*, *AD* is perpendicular to *DC*, *AB* = 14 cm, *BC* = 18 cm, *CD* = 26 cm and *AD* = 15 cm.
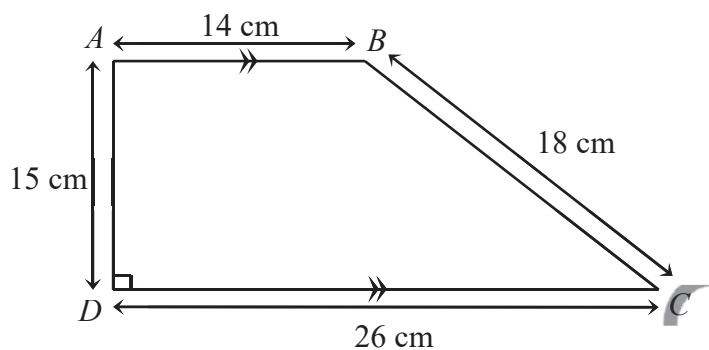
Find the area of trapezium *ABCD*.
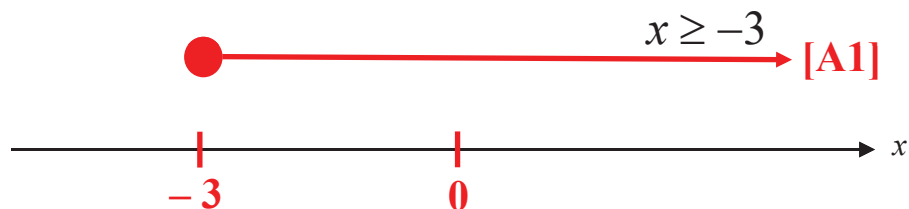
$$\frac{1}{2}(14+26)(15) \quad [M1]$$

Answer .... **300** .... cm² [2]

8 Solve $-2x-10 \le -4$ and show the solution on a number line.

$$-2x \le 6$$
$$-x \le 3 \quad [M1]$$
$$x \ge -3 \quad [M1]$$

$x \ge -3$ [A1]

[3]

9 **(a)** Using the line segment given below, *AC*, construct a triangle *ABC*, such that

$BC = 10$ cm and $\angle BAC = 40°$.

A   C   [2]

On the same diagram,

(b) construct the angle bisector of $\angle ACB$.   [1]

(c) construct the perpendicular bisector of *AC*.   [1]

10 **(a)** Factorise $8cd - 2cd^2$ completely.

Answer (a) ..…………**2cd (4 − d)**……………….. [1]

(b) Simplify $3 - 3(2x - 3)$.

$3 - 6x + 9$ $[M1]$

Answer (b) ..……………**12 − 6x**……………….. [2]

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

$\dfrac{4x - 2 - 3x - 9}{6}$ $[M1]$

Answer (c) ..………… $\dfrac{x-11}{6}$ ……………….. [2]

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11 **(a)** Simplify $\dfrac{(x-2)(x+5)}{2x^2(x-4)} \times \dfrac{4(x-4)^2}{(x+5)^2}$ completely.

$\dfrac{(x-2)}{x^2} \times \dfrac{2(x-4)}{(x+5)}$ $[M1]$

Answer (a) ..…………… $\dfrac{2(x-2)(x-4)}{x^2(x+5)}$ ……………….. [2]

(b) Simplify $\dfrac{8x^2}{5(x-7)} \div \dfrac{2x^2}{(x-7)^2(x+7)}$ completely.

$$\dfrac{8x^2}{5(x-7)} \times \dfrac{(x-7)^2(x+7)}{2x^2} \quad [M1]$$

Answer (b) $\dfrac{4(x-7)(x+7)}{5}$.……………....……………….. [2]

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12 (a) Express 35 m^2 in cm^2.

Answer (a) .…………….....……………… **350 000** cm^2 [1]

(b) The ratios of $a:b$ and $a:c$ are given below.

$a:b = 2:3$

$a:c = 3:5$

Find the ratio of $a:b:c$.

6 : 9 : 10 **[B2]**

Answer (b) ...……… : ..………… : ..…….… [2]

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13 The diagram below shows a straight line.
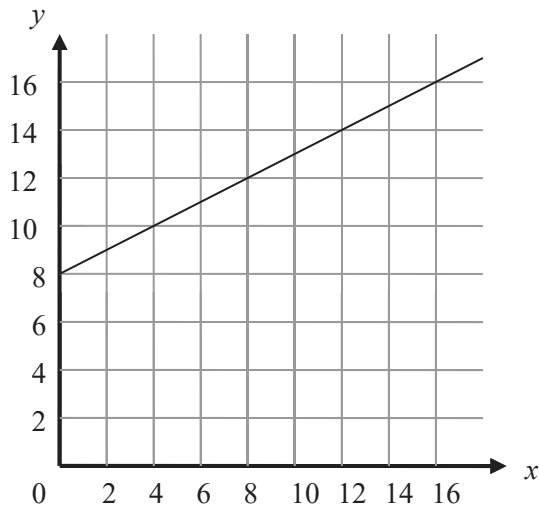
(a) Find the gradient of this straight line.

Answer (a) gradient = ...……**0.5**………….. [1]

(b) Write down the equation of this straight line in the form $y = mx + c$, where m is the gradient of the line, and c is its y-intercept.

Answer (b) $y = $ ...……**0.5x + 8**.........…….. [1]

End of Paper

CANDIDATE NAME	**MARKING SCHEME**			
CLASS		**INDEX NUMBER**		

MATHEMATICS	**4048/02**
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(b) The original value of the car is its cash price of $175 000. Each year the value of the car decreases by 10% of its value at the start of the year. At the end of three years, Sarah decides to sell the car. Calculate the overall percentage reduction in the value of the car compared with its original value.   [3]

S/N	Answer	Mark	Marker Report
1(a)	Deposit = $175000 \times \dfrac{1}{5} = $35000	[M1]	
	Total monthly for 10 years = $1300 \times 12 \times 10 = $156000	[M1]	
	Total amount that Sarah pays for the car $35000 + $156000 = $191000	[A1]	
1(b)	At first year = $175000 At second year = $175000 \times 0.9 = $157500 At third year = $157500 \times 0.9 = $141750	[M1]	
	Reduction price = $175000 - $141750 = $33250	[M1]	
	Percentage reduction = $\dfrac{33250}{175000} \times 100\% = 19\%$	[A1]	

2 Marcus, Ali and Tan shared a sum of money in the ratio 11 : 4 : 1.

(a) Given that Ali received $4.80 more than Tan, find the sum of money shared by the three of them. [2]

(b) Marcus distributed part of his money equally to Ali and Tan and was left with $2.60. Find the new ratio of Marcus's money to Ali's money to Tan's money. [3]

S/N	Answer	Mark	Marker Report
2(a)	Marcus : Ali : Tan 11 : 4 : 1 4-1 = 3 3 units = $4.80 1 unit = $4.80 ÷ 3 = $1.60 11+4+1 = 16 16 units = $1.60 × 16 = $25.60 The sum of money shared by the three of them is $25.60	[M1] [A1]	
2(b)	At first, Marcus = $1.60 × 11 = $17.60 $17.60 – $2.60 = $15.00 $15.00 ÷ 2 = $7.50 Ali and Tan received $7.50 each.	[M1]	
	Ali = ($1.60 × 4) + $7.50 = $13.90 Tan = $1.60 + $7.50 = $9.10	[M1]	
	Marcus : Ali : Tan 2.60 : 13.90 : 9.10 26 : 139 : 91	[A1]	

3 There are 16 adults and 10 children going to the Singapore Flyer. You are required to book taxis for them. Below is the taxi seating capacity given to you. At least one adult must accompany the children.

(a) What is the minimum number of taxis you need? Show all your working clearly. [3]

(b) There is a change of number of people going to the Singapore Flyer. 4 adults and 2 children would like to go too. How many more taxis do you need to book? [2]

S/N	Answer	Mark	Marker Report
3(a)	Note: We cannot take one child only as we do not know how the seating capacity for one child to how many adults. Child cannot go alone must be accompany by an adult.		

Child	Adult	Taxi
4	1	1
4	1	1
2	3	1
0	4	1
0	4	1
0	3	1
10	16	6

[B3]

or

6 is the minimum number of taxi needed.

Child	Adult	Taxi
2	3	1
2	3	1
2	3	1
2	3	1
2	3	1
0	1	1
10	16	6

6 is the minimum number of taxi needed.

or

Child	Adult	Taxi
2	3	1
2	3	1
2	3	1
2	3	1
1	2	1
1	2	1
10	16	6

6 is the minimum number of taxi needed.

3(b)

Child	Adult	Taxi
4	1	1
4	1	1
2	3	1
0	4	1
0	4	1
0	4	1
2	3	1
12	20	7

[B2]

$7 - 6 = 1$
1 more taxi needed.

or

Child	Adult	Taxi
2	3	1
2	3	1
2	3	1
2	3	1
2	3	1
2	3	1
0	2	1
12	20	7

$7 - 6 = 1$

1 more taxi needed.

or

Child	Adult	Taxi
2	3	1
2	3	1
2	3	1
2	3	1
2	3	1
2	3	1
0	2	1
12	20	7

$7 - 6 = 1$
1 more taxi needed.

4 Two different sizes of cylindrical fruit cans are shown below. The small can has a diameter of 12 cm and a height of 13 cm. The prices of the fruit cans are given on the respective cans.

SMALL

$4.80

13 cm

12 cm

LARGE

$18.80

11 310 cm³

(a) Find the volume of the small can. [2]

(b) Which size of canned fruit gives the better value? Show all the working clearly of can. [3]

(c) What is the maximum number of small cans that can fit into a rectangular packaging of size 72 cm by 24 cm and height of 39 cm? [3]

S/N	Answer	Mark	Marker Report
4(a)	Volume of the small can = $\pi \times r^2 \times h$ $= \pi \times (6)^2 \times 13$ $= 1470.265 \text{ cm}^3$ $= 1470 \text{ cm}^3$	[M1] [A1]	
4(b)	Small can per cm³ = \$4.80 ÷ 1470.265 = \$0.003264717 Large can per cm³ = \$18.80 ÷ 11310 = \$0.001662245 Large can gives the better value based on per cm³.	[M1] [M1] [A1]	
4(c)	$72 \div 12 = 6$ $24 \div 12 = 2$ $39 \div 13 = 3$ $6 \times 2 \times 3 = 36$ 36 cans is the maximum number to fit into a rectangular packaging.	[B2] [A1]	

5 There are $2(k-3)$ peaches in a box. There are 3 more apples than peaches and twice as many oranges as peaches in the same box.

    (a) Express the number of apples in term of k. [1]

    (b) Express the number of oranges in term of k. [1]

    (c) If there are a total of 35 fruits in the box, how many peaches are there in the box? [3]

    (d) If the cost of a peach, an apple and an orange is $1.10, $0.20 and $0.50 respectively, what is the cost of one box of fruits? [3]

    (e) How many numbers of boxes of fruits can May purchase with $42? [2]

S/N	Answer	Mark	Marker Report
5(a)	peaches = $2(k-3) = 2k-6$ apples = $2(k-3)+3 = 2k-6+3 = 2k-3$	[B1]	
5(b)	oranges = $2(2k-6) = 4k-12$	[B1]	
5(c)	$(2k-6)+(2k-3)+(4k-12) = 35$ $2k-6+2k-3+4k-12 = 35$ $8k-21 = 35$ $8k = 35+21$ $8k = 56$ $k = 56 \div 8$ $k = 7$ peaches = $2k-6 = 2(7)-6 = 8$	[M1] [M1] [A1]	
5(d)	apples = $2k-3 = 2(7)-3 = 11$ oranges = $4k-12 = 4(7)-12 = 16$ total cost for one box $= 8(1.10)+11(0.20)+16(0.50) = \$19.00$	[M1] [M1] [A1]	
5(e)	$\$42.00 \div \$19.00 = 2\dfrac{4}{19}$ 2 number of boxes that May is able to purchase with $42.	[M1] [A1]	

6 An aeroplane travelled a distance of 1130 km from Singapore to Jakarta. For the first x hour of its journey, the aeroplane travelled at a constant speed of 350 km/h. The speed of the aeroplane was increased by 80 km/h for the remaining $\dfrac{x}{2}$ hour of its journey.

    (a) Write down the total distance travelled for the first x hour of its journey, in terms of x. [1]

    (b) Write down the distance travelled by the aeroplane in the $\dfrac{x}{2}$ hour of its journey, in terms of x. [2]

    (c) Find the value of x. Hence, find the total time, in hours, taken for the whole journey. [3]

    (d) Find the average speed, in km/h, for the whole journey, correct to 2 decimal places. [2]

S/N	Answer	Mark	Marker Report
6(a)	First part of journey Speed = 350 km/h Time taken = x hour Total distance travelled = 350x km	[B1]	
6(b)	Second part of journey Speed = 350 + 80 = 430 km/h Time taken = $x/2$ hour Total distance travelled = $430 \times \dfrac{1}{2}x = 215x$ km	[M1] [A1]	
6(c)	$350x + 215x = 1130$ $565x = 1130$ $x = 2$ $x + \dfrac{1}{2}x = 2 + \dfrac{1}{2}(2) = 3$ Total time taken for the whole journey = 3 hours	[M1] [M1] [A1]	
6(d)	Average speed for the whole journey $= \dfrac{1130}{3}$ $= 376\dfrac{2}{3}$ km/h $= 376.67$ km/h	[M1] [A1]	

7 **Answer the whole of this question on a sheet of graph paper.**

The variables x and y are connected by the equation
$$y = 2 - 2x.$$
Some corresponding values of x and y, are given in the table below.

x	-2	-1	0	1	2
y	p	4	2	q	-2

(a) Calculate the value of p and of q. [2]

(b) Using a scale of 2 cm to 1 unit for the y-axis and 4 cm to 1 unit for the x-axis, draw the graph $y = 2 - 2x$ for $-2 \le x \le 2$. [3]

(c) Using your graph, find the value of x when $y = 3.5$. [1]

(d) On the same axes, draw the line $x = -1.5$. Find the coordinates of the point of intersection of the two lines. [2]

--- End of Paper ---