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KRANJI SECONDARY SCHOOL

2NT

END-OF-YEAR EXAMINATION 2018

**MATHEMATICS 4046
PAPER 1**

Level : Secondary Two

Date : 2 Oct 2018

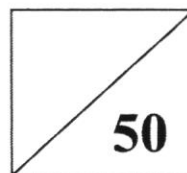
Stream : Normal Technical

Duration : 1 hr 30 min

Name : _____ ()

Marks :

Class : Secondary _____



READ THESE INSTRUCTIONS FIRST:

Write your class, index number and name 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** 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 with the answer.

Omission of essential working will result in loss of marks.

The total of the marks for this paper is 50.

The use of an approved scientific calculator is expected, where appropriate.

If the degree of accuracy is not specified in the question, and if the answer is not exact, give the answer to three significant figures. Give your answers in degrees to one decimal place.

For π , use either your calculator value or 3.142.

Mathematical Formulae*Compound Interest*

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

Quadratic equation $ax^2 + bx + c = 0$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

Geometry and Measurement

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

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

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

$$\text{Volume of pyramid} = \frac{1}{3} \times \text{base area} \times \text{height}$$

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

Answer all questions.

- 1 (a) Evaluate $1\frac{1}{3} \div (-4\frac{3}{5})$, leaving your answer as a fraction in its simplest form.
Show your workings clearly.

Answer _____ [2]

- (b) Calculate $-2^2 + \sqrt[3]{-729}$.

Answer _____ [1]

- (c) It is given that $T = c^3 - 2d$. Using your calculator, find T when c is 5 and d is 0.1.

Answer _____ [1]

-
- 2 Use $<$ or $>$ to complete each of the following statements: [2]

(a) $\frac{5}{7}$ $\frac{7}{9}$

(b) -0.78 $-\frac{4}{5}$

- 3 Solve the equation $4 = \frac{5}{x-2}$.

Answer _____ [3]

- 4 Simplify the following expressions, showing your workings clearly.

(a) $0.4(3j - 5)$,

Answer _____ [2]

(b) $-4(3m - 6) + 5$.

Answer _____ [2]

- 5 At a hive, it takes 30 days for bees to make 90 kg of honey.

Find the number of days it will take to make 120 kg of honey.

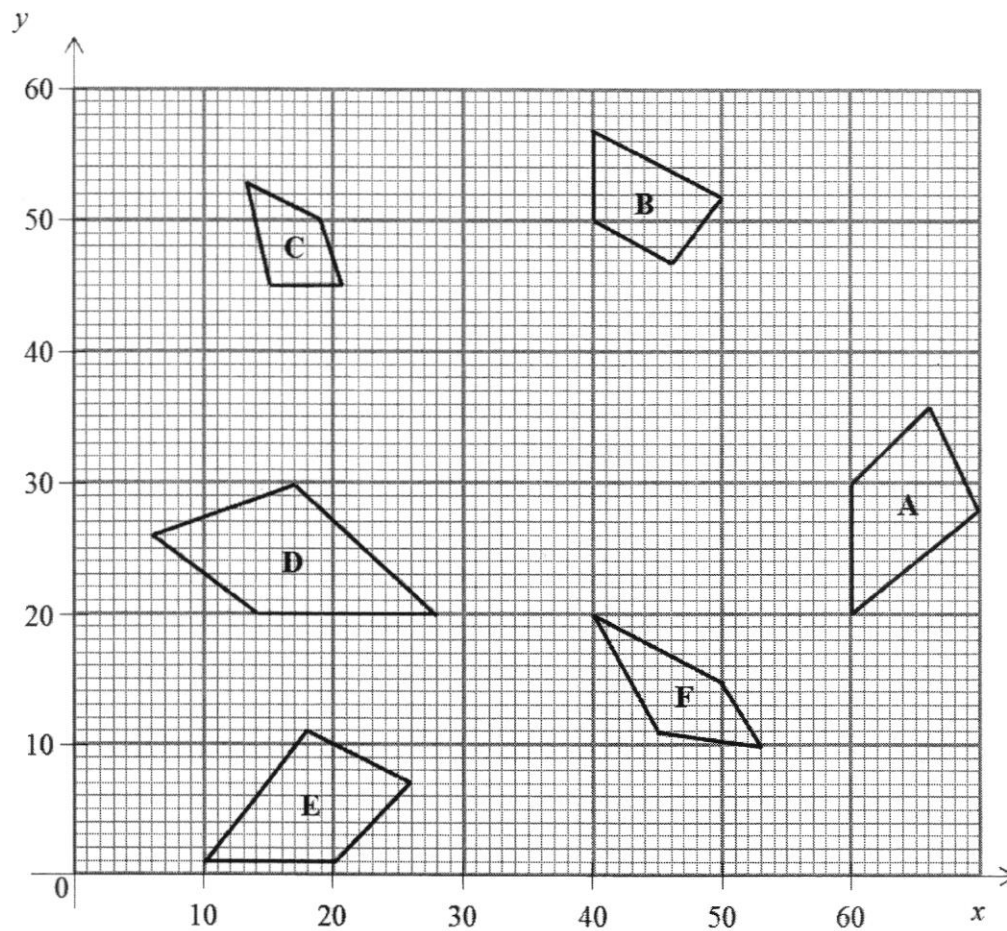
Answer _____ days [2]

- 6 During the recent Great Singapore Sale, a pair of Calvin Klein trousers cost \$40. Its original price before the sale was \$75.

Calculate the percentage decrease in the price of the trousers.

Answer _____ [2]

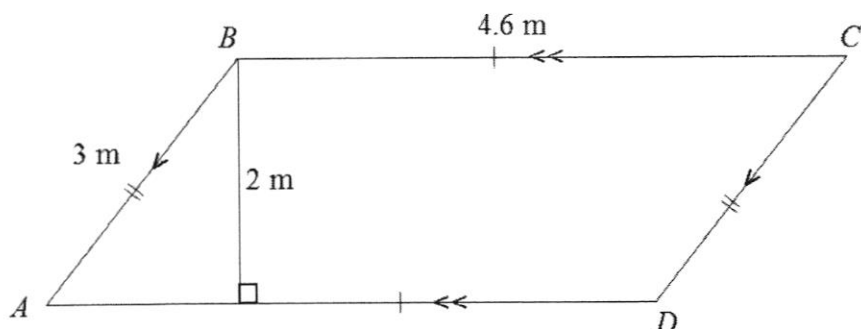
- 7 The grid below shows several quadrilaterals.



Identify the quadrilateral which is congruent to A.

Answer _____ [1]

- 8 The diagram below shows a parallelogram $ABCD$. AB is 3 m long, while BC is 4.6 m long.



Calculate

- (a) the perimeter of the parallelogram,

Answer _____ m [1]

- (b) the area of the parallelogram.

Answer _____ m^2 [1]

- 9 The top speed ever recorded of an F1 car was 372.6 km/h, by Juan Pablo Montoya of the McLaren-Mercedes team in 2005.

- (a) Express 372.6 km in m.

Answer _____ m [1]

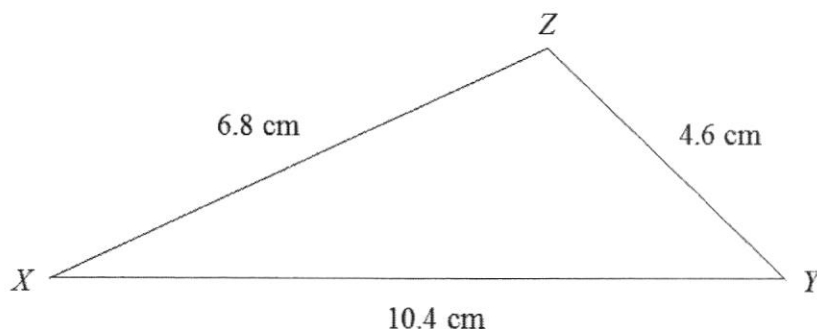
- (b) Express 1 h in s.

Answer _____ s [1]

- (c) Hence, express 372.6 km/h in m/s.

Answer _____ m/s [1]

- 10 The diagram below shows a sketch of triangle XYZ , not to scale.

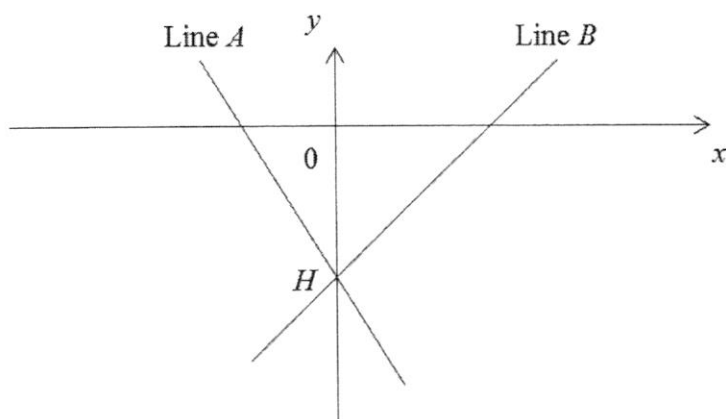


Using a ruler and a compass,

- (a) Draw triangle XYZ accurately in the space below. Label all points and lengths. [2]
- (b) On the same diagram, draw the
 - (i) perpendicular bisector of XY , [1]
 - (ii) angle bisector of angle XYZ . [1]
- (c) Label the intersection point of both bisectors with the letter " A ". Measure and record the distance of YA .

Answer $YA =$ _____ cm [1]

- 11 The sketch below shows two lines, $y = -\frac{4}{3}x - 4$ and $y = x - 4$.



- (a) Write down the equation of each line.

Answer A = _____ [1]

B = _____ [1]

- (b) The two lines meet each other at point H . State the coordinates of H .

Answer _____ [1]

- 12 The line EF is shown below.

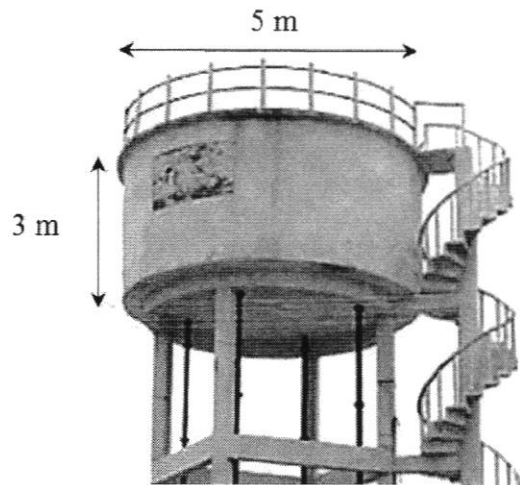


If the gradient of EF is 2, calculate the value of y .

Answer x = _____ [2]

13 The photograph below shows a cylindrical water tank of height 3 m and diameter 5 m.

(a) Find the total volume of the cylindrical tank, to three decimal places.



Answer _____ m^3 [2]

(b) Water leaks from the tank at 0.72 m^3 per hour.

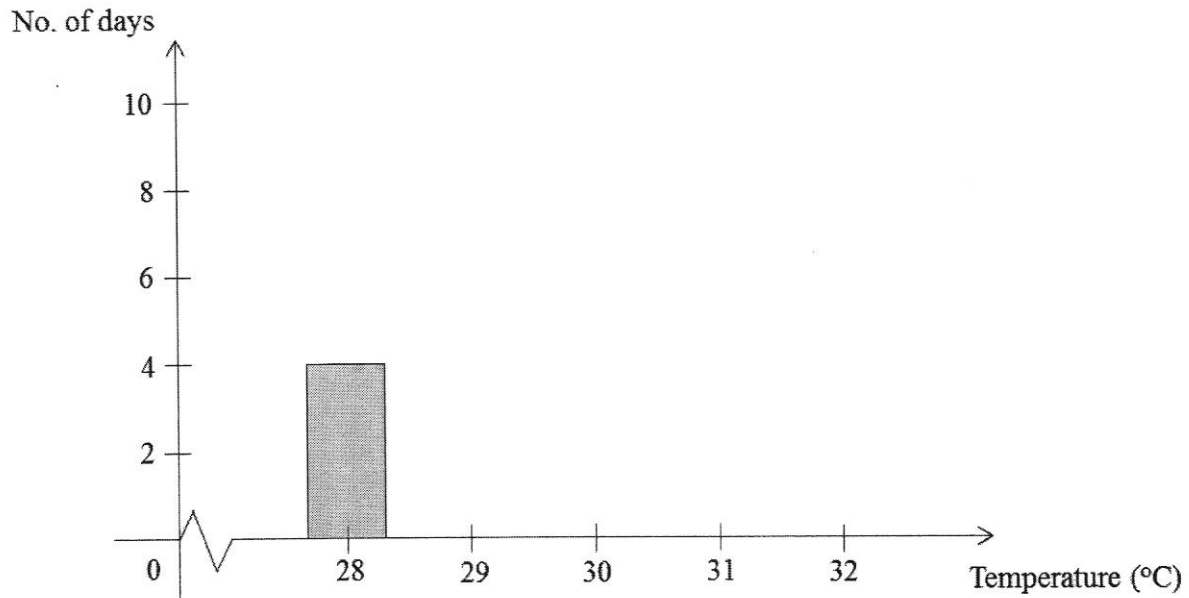
Find the time it would take for a fully-filled tank to become empty, correct to 4 significant figures.

Answer _____ hr [2]

- 14 The frequency table below shows the daily temperatures recorded in 2A1 classroom over the month of September.

Temperature ($^{\circ}\text{C}$)	28	29	30	31	32
No. of days (frequency)	4	6	10	5	5

- (a) In the grid below, complete the bar chart to represent the data. One bar has been drawn for you. [2]



- (b) Calculate the mean classroom temperature in the month.

Answer _____ $^{\circ}\text{C}$ [2]

- (c) State the mode classroom temperature in the month.

Answer _____ $^{\circ}\text{C}$ [1]

- 15 The ratio of Alan's weight to Bob's weight is 4 : 5, while that of Alan's weight to Charlie's weight is 3 : 7.

(a) Find the ratio of Alan's to Bob's to Charlie's weights.

Answer _____ : _____ : _____ [1]

(b) If Bob weighed 45 kg, find Alan's weight.

Answer _____ [2]

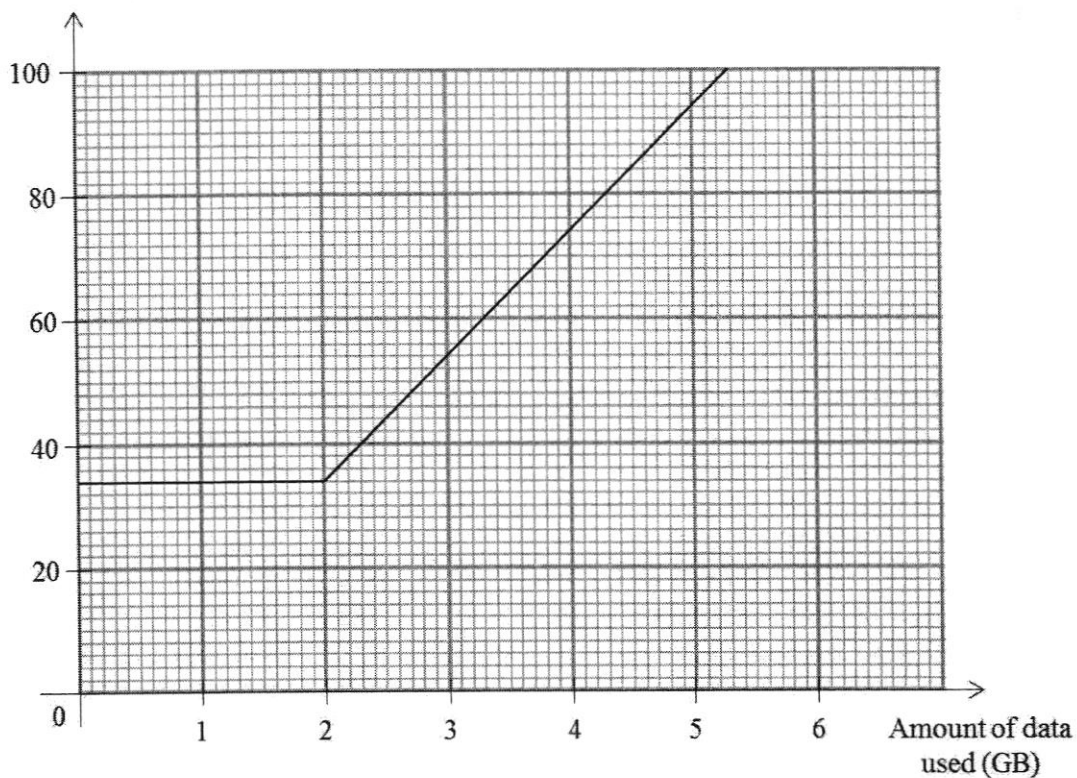
- 16 A bank loan charges a simple interest of 3.5% per annum.

Mrs Lee took a \$100 000 loan from the bank. Calculate the total amount she will need to pay at the end of 7 years, correct to the nearest cent.

Answer \$ _____ [2]

- 17 The graph below shows the monthly subscription fee of a mobile plan.

Monthly charge (\$)



- (a) State the minimum monthly cost of the plan.

Answer \$ _____ [1]

- (b) Monroe subscribes to this plan and uses 3.7 GB of data in February. State his mobile charges for that month.

Answer \$ _____ [1]

- (c) In March, Monroe paid \$40. State the amount of data he used.

Answer _____ GB [1]

END-OF-PAPER



KRANJI SECONDARY SCHOOL

2NT

END-OF-YEAR EXAMINATION 2018

MATHEMATICS 4046
PAPER 2

Level : Secondary Two

Date : 3 Oct 2018

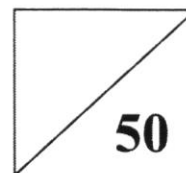
Stream : Normal Technical

Duration : 1 hr 30 min

Name : _____ ()

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

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

$$\text{Volume of pyramid} = \frac{1}{3} \times \text{base area} \times \text{height}$$

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

Answer all questions.

- 1 Simplify $\frac{2p}{5} - \frac{3-p}{4}$, showing your workings clearly.

Answer _____ [3]

- 2 Sally weighs c kg. Gopal is two times of Sally's weight. Jane weighs 7 kg less than Gopal.

- (a) Express Gopal's and Jane's weights in terms of c .

Answer Gopal's weight = _____ kg [1]

Jane's weight = _____ kg [1]

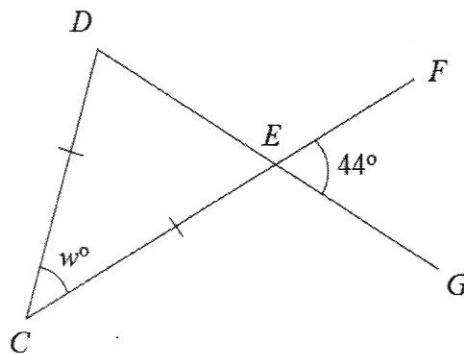
- (b) Form an equation in c to represent the total weight of the three people, if this is 189.5 kg. [1]

- (c) **Hence**, calculate Gopal's weight.

Answer Gopal's weight = _____ kg [3]

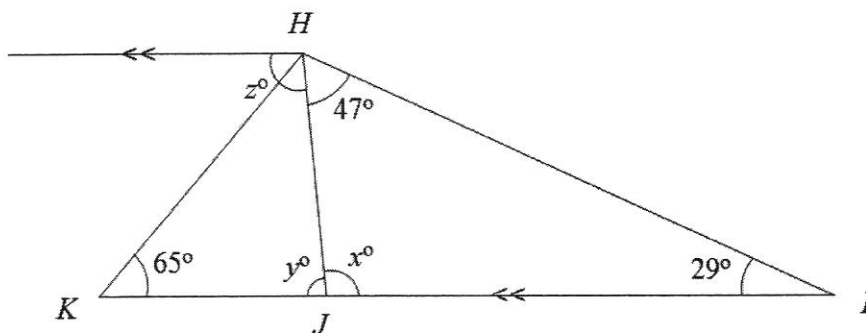
- 3 Find the values of the unknown angles in each of the following diagrams.

(a)



Answer $w =$ _____ [2]

(b)



Answer $x =$ _____ [1]

$y =$ _____ [1]

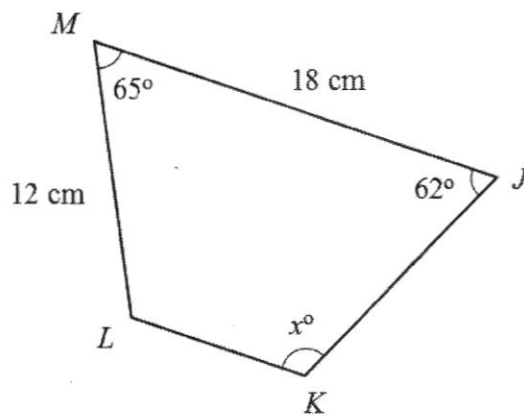
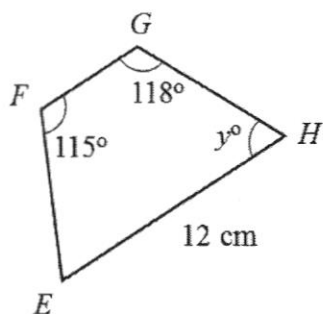
$z =$ _____ [1]

- 4 I am a quadrilateral with two pairs of equal, adjacent sides. My diagonals are perpendicular to each other, and I carry only one pair of equal, opposite angles.

What type of quadrilateral am I?

Answer _____ [1]

- 5 Two similar quadrilaterals $EFGH$ and $JKLM$ are shown below.



- (a) State the values of x and y .

Answer $x =$ _____ [1]

$y =$ _____ [1]

- (b) Calculate the length of GH , showing your workings clearly.

Answer $GH =$ _____ cm [2]

- 6 Samantha enters a lift in her HDB block. The height reached by the lift (h metres) after t seconds is given by $h = 3t$.

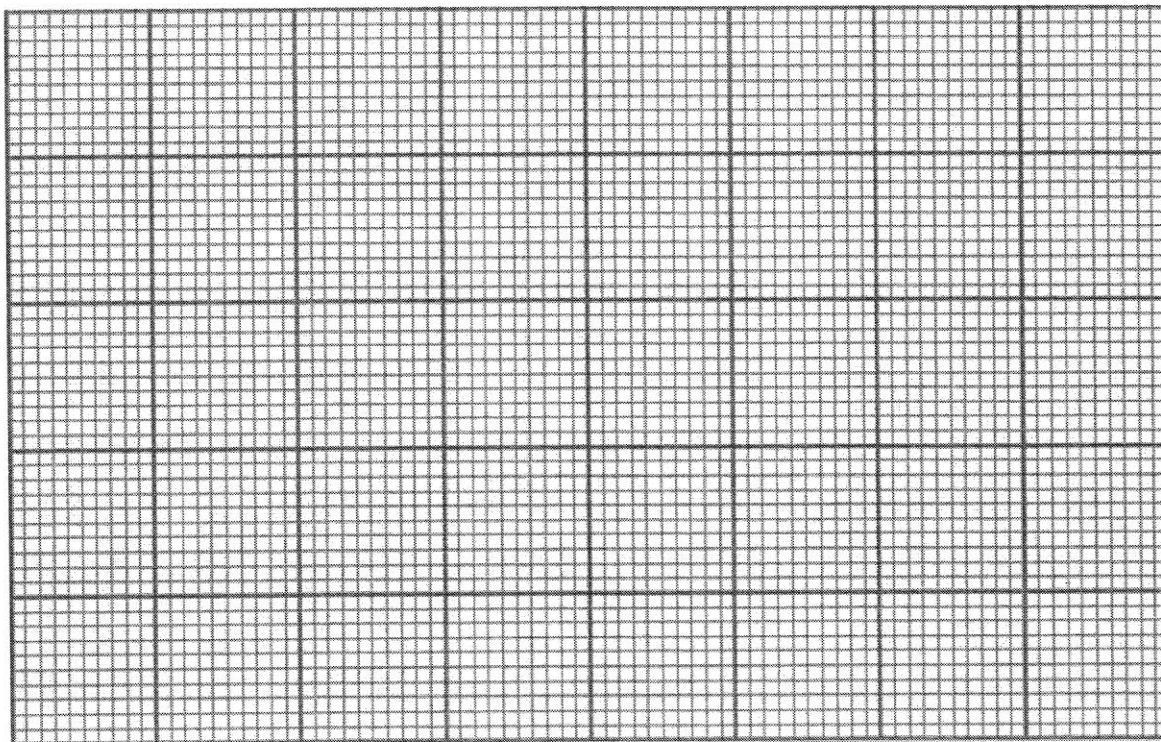
Some values of h and t are given below.

t (seconds)	0	2	4	6	8
h (metres)	0	p	12	18	24

- (a) State the value of p .

Answer $p =$ _____ [1]

- (b) Using a scale of 2 cm to 1 unit on the horizontal axis and 2 cm to 5 units on the vertical axis, plot the graph of $h = 3t$ in the grid below, for $0 \leq t \leq 8$. [3]



- 7 On the way to school, Alisyah cycled at 15 km/h for 10 minutes, stopped for 6 minutes to buy breakfast, and then continued cycling at 10 km/h for 3 minutes.

(a) Find the total distance travelled by Alisyah, in km.

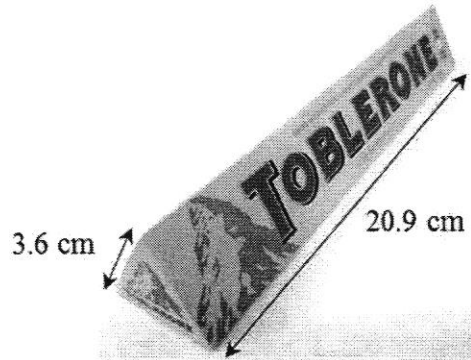
Answer _____ km [2]

(b) Hence, calculate Alisyah's average speed for the entire journey, in km/h.

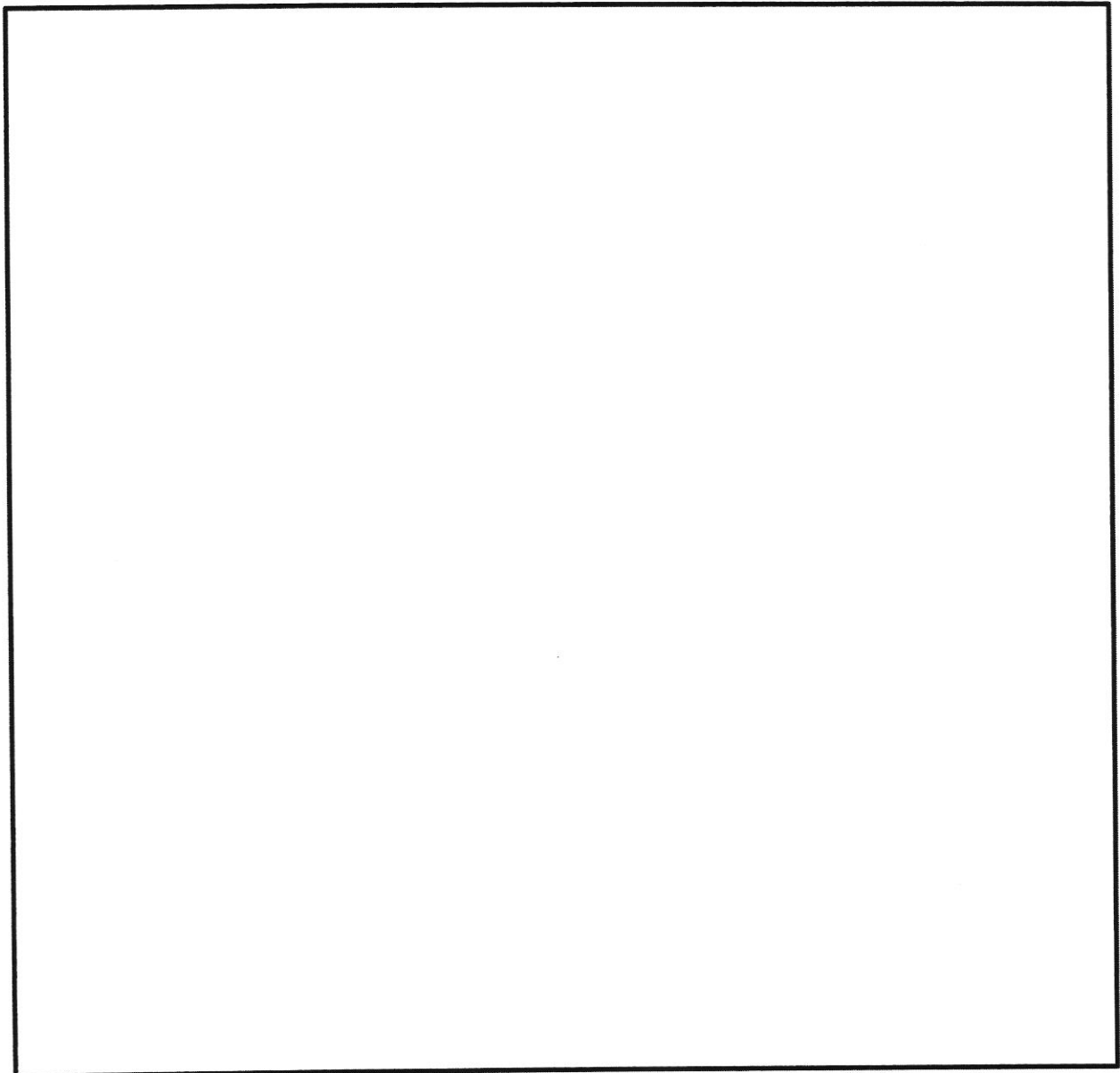
Answer _____ km/h [2]

- 8 Tim opened up the packaging of a Toblerone chocolate.

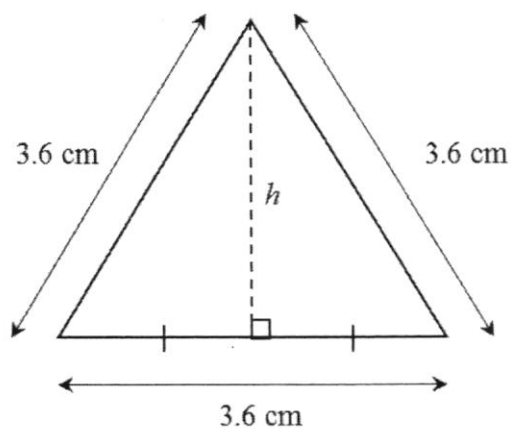
The packaging takes the form of a triangular prism, with an equilateral triangle base of side 3.6 cm.



- (a) *Using a ruler*, sketch a net that he will get in the box below. Your drawing *need not be to scale*. Indicate the lengths of 3.6 cm and 20.9 cm clearly. [2]



- (b) The triangular face of the packaging has a vertical height, h , as shown below.



Find h .

Answer $h =$ _____ cm [2]

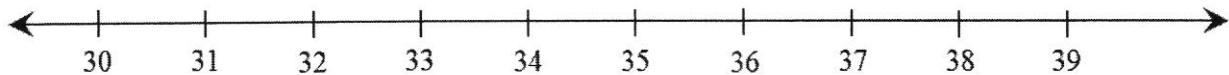
- (c) Hence, find the total surface area of the Toblerone packaging.

Answer _____ cm^2 [2]

- 9 The number of sit-ups done by 10 students in a NAPFA test was recorded as follows:

35, 33, 32, 36, 36, 37, 38, 36, 35, 35

In the space below, complete the dot diagram to represent this information. [1]



- 10 The following box shows the ages (in years) of trees found in a particular area of the Botanic Gardens.

30	29	28
32	405	33
27	30	32

- (a) Calculate
(i) the mean age of the trees,

Answer _____ years [2]

- (ii) the median age of the trees.

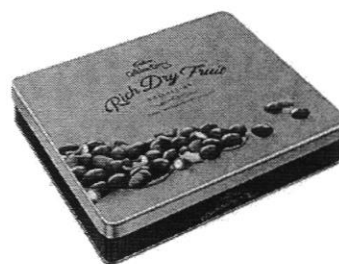
Answer _____ years [1]

- (b) Joanna states that the median represents the trees' ages better than the mean.

Do you agree with her, and why? [2]

- 11 A box of chocolates contains three flavours – raisin, almond, and walnut. The probability of choosing a raisin-flavoured one is $\frac{2}{5}$, while the probability of choosing a walnut-flavoured one is $\frac{17}{50}$.

Find the probability of choosing an almond-flavoured one.



Answer _____ [2]

- 12 A sequence of figures is shown below:

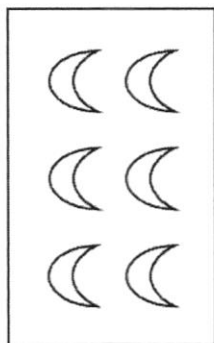


Fig. 1

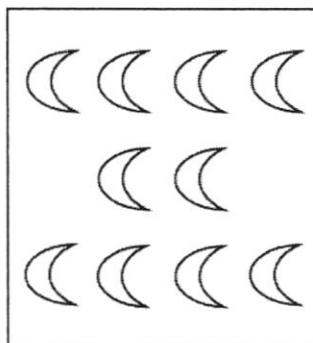


Fig. 2

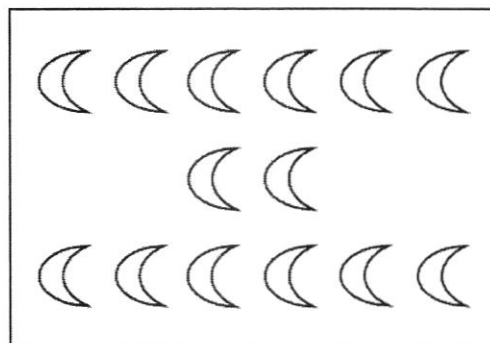


Fig. 3

- (a) Predict the number of  in Figs. 4 and 5.

Answer Fig. 4: _____ [1]

Fig. 5: _____ [1]

- (b) Write down an algebraic expression that describes the number of  in Fig. n .

Answer _____ [1]

- 13 Ms Goh's utilities bill for May 2018 is shown below:

May 2018 Bill Account No.			
Breakdown of Current Charges	Usage	Rate (\$)	Amount (\$)
Electricity Services			
Electricity Estimated on 18 May 2018	298 kWh	0.2215	66.01
Water Services by Public Utilities Board			
Water Estimated on 18 May 2018	14.5 Cu M	x	17.26
Waterborne Fee	14.5 Cu M	0.7800	y
Water Conservation Tax	\$17.26	35%	z
Refuse Removal by Colex Environmental P L	1 Qty	7.71	7.71

- (a) Write down the values of x to z . Express x to 4 decimal places, and y and z to the nearest cent.

Answer $x = \$$ _____ [1]

$y = \$$ _____ [1]

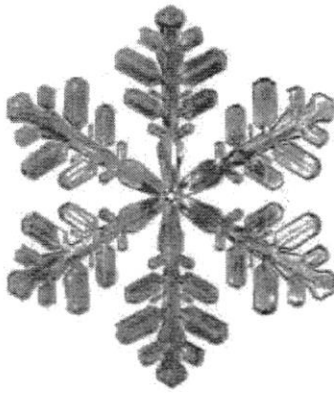
$z = \$$ _____ [1]

- (b) The subtotal is the sum of all values in the 'Amount (\$)' column of the bill. A GST of 7% is applied on the subtotal.

Using your rounded off answers for part (a), calculate the amount of GST that Ms Goh paid for her utilities bill in May 2018, to the nearest cent.

Answer \$ _____ [2]

- 14 The diagram below shows a snowflake. When viewed under a magnifying glass, a snowflake's shape can be intricate and beautiful.



State the order of rotational symmetry of the snowflake above.

Answer _____ [1]

END-OF-PAPER

KRANJI SECONDARY SCHOOL

2018 EOY Paper 1

SECONDARY 2 NORMAL TECHNICAL MATHEMATICS

MARKING SCHEME

Qn.	Working & Answers	
1	(a)	$1\frac{1}{3} \div (-4\frac{3}{5}) = \frac{4}{3} \div (-\frac{23}{5})$ $= \frac{4}{3} \times (-\frac{5}{23})$ $= -\frac{20}{69}$
	(b)	-13
	(c)	124.8
2	(a)	$\frac{5}{7} < \frac{7}{9}$
	(b)	$-0.78 > -\frac{4}{5}$
3		$4 = \frac{5}{x-2}$ $4x - 8 = 5$ $4x = 13$ $x = 3\frac{1}{4}$
4	(a)	$0.4(3j - 5)$ $= 1.2j - 2$
	(b)	$-4(3m - 6) + 5$ $= -12m + 24 + 5$ $= -12m + 29$
5		No. of days it will take to make 120 kg of honey $= \frac{30}{90} \times 120$ $= 40$
6		Percentage decrease in the price of trousers $= \frac{75 - 40}{75} \times 100\%$ $= 46.7\% \text{ or } 46\frac{2}{3}\%$
7		E
8	(a)	Perimeter = $(3 \text{ m} \times 2) + (4.6 \text{ m} \times 2)$ $= 15.2 \text{ m}$
	(b)	Area = 4.6×2 $= 9.2 \text{ m}^2$

9	(a)	372600 m
	(bi)	3600 s
	(bii)	103.5 m/s
10	(a)	- Triangle XYZ drawn with accurate lengths and compass markings shown. - All points and lengths labelled.
	(bi)	Perpendicular bisector drawn accurately, with compass markings shown.
	(bii)	Angle bisector drawn accurately, with compass markings shown.
	(c)	5.4 cm
11	(a)	$A: y = -\frac{4}{3}x - 4$ $B: y = x - 4$
	(b)	(0, -4)
12		Gradient of $EF = \frac{y_2 - y_1}{x_2 - x_1} = 2$ Therefore, $\frac{5 - y}{3 - 2} = 2$ $5 - y = 2$ $-y = 2 - 5$ $-y = -3$ $y = 3$
13	(a)	Vol. of the water tank = $\pi r^2 h$ $= \pi (2.5)^2 (3)$ $= 18.75 \pi \text{ m}^3$ $= 58.90486 \text{ m}^3$ $= 58.905 \text{ m}^3 \text{ (3 d.p.)}$
	(b)	Time taken for fully-filled tank to be empty $= 58.905 \div 0.72$ $= 81.8125 \text{ hrs}$ $= 81.81 \text{ hrs (4 s.f.)}$
14	(a)	All remaining bars drawn with accurate heights.
	(b)	Mean classroom temperature in Sep = $\frac{(28 \times 4) + (29 \times 6) + (30 \times 10) + (31 \times 5) + (32 \times 5)}{4 + 6 + 10 + 5 + 5}$ $= \frac{901}{30}$ $= 30.0333^\circ\text{C}$ $= 30.0^\circ\text{C (3 s.f.)}$
	(c)	30°C

15	(a)	12 : 15 : 28
	(b)	Alan's weight = $45 \text{ kg} \div 15 \times 12 = 36 \text{ kg}$
16	Total interest that she will need to pay $= \frac{PRT}{100}$ $= \frac{(100000)(3.5)(7)}{100}$ $= \$24500$ Total amount she will need to pay after 7 years $= \$100\,000 + \$24\,500$ $= \$124\,500$	
17	(a)	\$34
	(b)	\$68
	(c)	2.3 GB

KRANJI SECONDARY SCHOOL

2018 EOY Paper 2

SECONDARY 2 NORMAL TECHNICAL MATHEMATICS

MARKING SCHEME

Qn.	Working & Answers		Marks	Remarks
1	$\frac{2p}{5} - \frac{3-p}{4} = \frac{8p}{20} - \frac{15-5p}{20}$ $= \frac{8p-15+5p}{20}$ $= \frac{13p-15}{20}$		M1 M1 A1	Converting each fraction to denominator of 20. Combining both numerators, showing change of sign from $-5p$ to $+5p$ & $+15$ to -15 .
2	(a)	Gopal's weight = $2c$ kg Jane's weight = $2c - 7$ kg	B1 B1	
	(b)	$c + 2c + 2c - 7 = 189.5$	B1	E.c.f. available.
	(c)	$5c - 7 = 189.5$ $5c = 196.5$ $c = 39.3$ Gopal's weight = $2c$ $= 2(39.3)$ $= 78.6$ kg	M1 B1 A1	This M1 is for combining all like terms in the eqn. This B1 is for finding c .
3	(a)	$\angle DEC = 44^\circ$ (vert. opp. $\angle$ s) $w = 180^\circ - 44^\circ - 44^\circ$ (base $\angle$ s of isos. Δ) $= 92^\circ$	M1 A1	Accept if reasons are not included. If final ans. w/o workings, then no marks.
	(b)	$x = 180^\circ - 47^\circ - 29^\circ$ ($\angle$ sum of Δ) $= 104^\circ$ $y = 180^\circ - 104^\circ$ (adj. on a str. line) $= 76^\circ$ $z = x$ (alt. $\angle$ s, // lines) $= 104^\circ$	B1 B1 B1	Accept if reasons are not included. Allow e.c.f. from x .
4	Kite		B1	
5	(a)	$x = 115^\circ$ $y = 65^\circ$	B1 B1	

	(b)	$\frac{EH}{JM} = \frac{GH}{LM}$ $\frac{12}{18} = \frac{GH}{12}$ $18 GH = 144$ $GH = 8 \text{ cm}$	M1 A1	
6	(a)	$p = 6 \text{ m}$	B1	
	(b)	Axes labelled, together with axis markings using correct scale. All points plotted correctly. Straight line drawn through all points.	C1 C1 C1	
7	(a)	Total distance travelled by Alisyah $= (15)\left(\frac{10}{60}\right) + (10)\left(\frac{3}{60}\right)$ $= 3 \text{ km}$	M1 A1	
	(b)	Total time taken $= \frac{10}{60} + \frac{3}{60} + \frac{6}{60}$ $= \frac{19}{60} \text{ h}$ Therefore, average speed of Alisyah $= 3 \div \frac{19}{60}$ $= 9.47368 \text{ km/h or } 9\frac{9}{19} \text{ km/h}$ $= 9.47 \text{ km/h (3 s.f.) or } 9\frac{9}{19} \text{ km/h}$	M1 A1	Also accept total time calculation in mins.
8	(a)	Correct net drawn that can form the prism. 3.6 cm & 20.9 cm indicated (at least one each).	C1 C1	Net need not be drawn to scale. If ruler is not used, this B1 cannot be awarded.
	(b)	By Pythagoras' Theorem, $h^2 + 1.8^2 = 3.6^2$ $h^2 + 3.24 = 12.96$ $h^2 = 9.72$	M1	

		$h = \sqrt{9.72}$ $= 3.11769 \text{ cm}$ $= 3.12 \text{ cm (3 s.f.)}$	A1	
	(c)	Total surface area of packaging $= 2 \times \left(\frac{1}{2}\right)(\sqrt{9.72})(3.6) + 20.9 \times (3.6 \times 3)$ $= 236.944 \text{ cm}^2$ $= 237 \text{ cm}^2 \text{ (3 s.f.)}$	M1 A1	Award this M1 if prematurely rounded-off value of h (i.e. to 3 s.f. or fewer) is used, provided that the final answer is the same as that shown here.
9				B1
10	(ai)	Mean age of trees $= \frac{30 + 32 + 27 + 29 + 405 + 30 + 28 + 33 + 32}{9}$ $= 71.7778 \text{ years}$ $= 71.8 \text{ years (3 s.f.) or } 71\frac{7}{9} \text{ years}$	M1 A1	
	(aii)	30 years	B1	
	(b)	Yes. This is because there is an outlier / extreme value in the data set, which is 405 years old, and the value of the median is not easily affected by outliers.	B1 B1	Accept: Other reasonable synonyms of 'outlier'. Students need not quote '405' for this B1 to be given. Or Reverse Argument: e.g. and the value of the mean is easily affected by outliers.
11	Probability of choosing an almond-flavoured chocolate $= 1 - \frac{2}{5} - \frac{17}{50}$ $= \frac{13}{50}$		M1 A1	
12	(a)	Fig. 4: 18	B1	

		Fig. 5: 22	B1	
	(b)	$6 + (n - 1)(4)$	B1	Also accept alternative forms of the expression – e.g. $2 + 4n$
13	(a)	$x = \$1.1903$ $y = \$11.31$ $z = \$6.04$	B1 B1 B1	
	(b)	GST for utilities bill $= 7\% \times (66.01 + 17.26 + 11.31 + 6.04 + 7.71)$ $= \frac{7}{100} \times (108.33)$ $= \$7.58$	M1 A1	Allow M1 e.c.f. here (but not A1 e.c.f.). Students need not show addition workings for subtotal calculation, for this M1.
14	6		B1	