NAME ________________________________ (   ) CLASS: SEC 4A (_____)

HOUGANG SECONDARY SCHOOL

PRELIMINARY EXAMINATION 2 2020

MATHEMATICS SYLLABUS A (4045/01)
PAPER 1

SECONDARY FOUR NORMAL ACADEMIC

Friday, 14 August 2020 **2 hours**

MAKE THE DIFFERENCE RESPECT OURSELVES RESPECT OTHERS MAKE THE DIFFERENCE RESPECT OURSELVES RESPECT OTHERS MAKE THE DIFFERENCE
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Instructions to pupils

- Write your name, register number, class and calculator model in the space provided on this page.
- Write in dark blue or black pen in the spaces provided on the question paper.
- You may use a pencil for any diagrams or graphs.
- 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.
- 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 π, use either the calculator value or 3.142, unless the question requires the answer in terms of π.

Information for pupils

- The number of marks is given in brackets [ ] at the end of each question or part question.
- The total number of marks for this paper is 80.

CALCULATOR MODEL : ________________________

/ 80

This question paper consists of 20 printed pages (including this cover page).

Mathematical Formulae

Compound Interest

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

Mensuration

Curved surface area of a cone = πrl

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

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

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

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

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

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

Trigonometry

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

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

Statistics

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

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

1(a) Express $1\frac{4}{5}$ as a percentage.

Answer …….% [1]

(b) Express 0.000032 in standard form.

Answer …….[1]

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2 The table below shows part of the tax rate for the Year of Assessment 2019.

Chargeable Income	Income Tax Rate (%)	Gross Tax Payable ($)
First $20 000 Next $10 000	0 2	0 200
First $30 000 Next $10 000	- 3.50	200 350

How much is the income tax payable if the chargeable income is $38 000 for the year 2019?

Answer $ …….[2]

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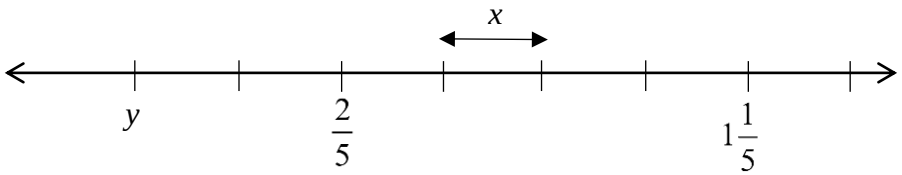
3 On this number line, the numbers are placed at an equal interval of x apart.



Find the value of x and y.

Answer x = …….

y = ……..[2]

4(a) Solve the inequality $-2x > 7$.

Answer……[1]

(b) Hence, find the largest integer that satisfies $-2x > 7$.

Answer ……[1]

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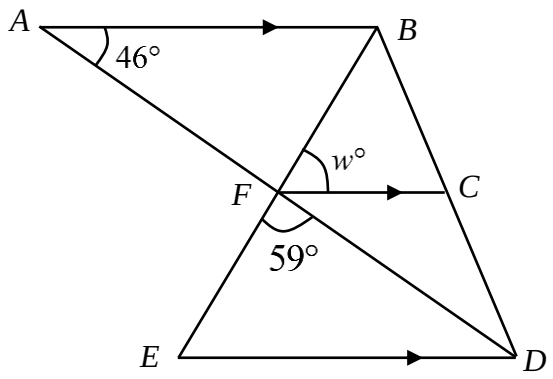
5 *AFD*, *EFB* and *BCD* are straight lines. *AB* is parallel to *FC* and *ED*.



Given that $\angle BAF = 46°$ and $\angle EFD = 59°$, calculate the value of w, stating your reasons clearly.

Answer w = ……[2]

6 m is directly proportional to the square of n.

When $m = 56$, $n = 4$.

Find the value of m when $n = 12$.

Answer m = …….[2]

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7 Write down the value of p if

(a) $\dfrac{a^5 \times a^6}{a^{-3}} = a^p$

Answer p = ……..[1]

(b) $\sqrt[5]{a^3} = a^p$

Answer p = ……..[1]

8 (a) Express 120 as a product of its prime factors.

Answer 120 = …….[1]

(b) Find the smallest positive integer value of n such that $\frac{120}{n}$ is a perfect cube.

Answer n = …….[1]

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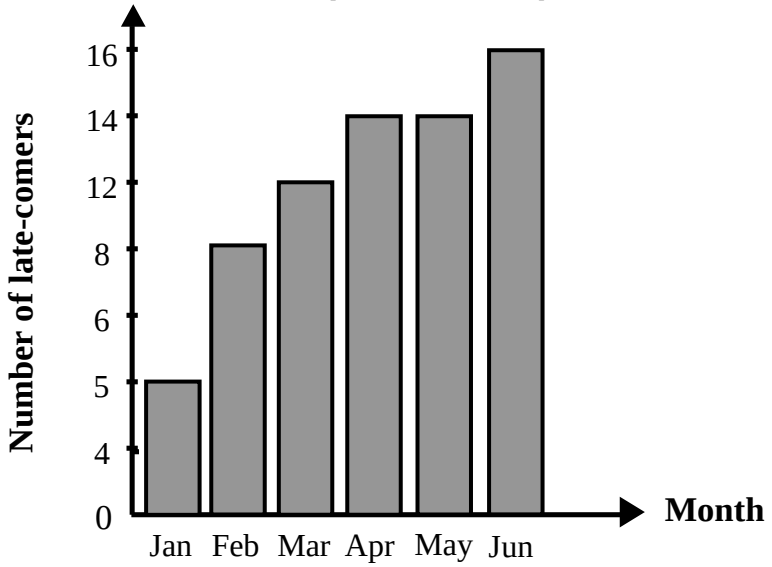
9 The bar chart shows the number of late-comers in ACE secondary school.

Huge increase in number of late-comers from Jan to Feb!



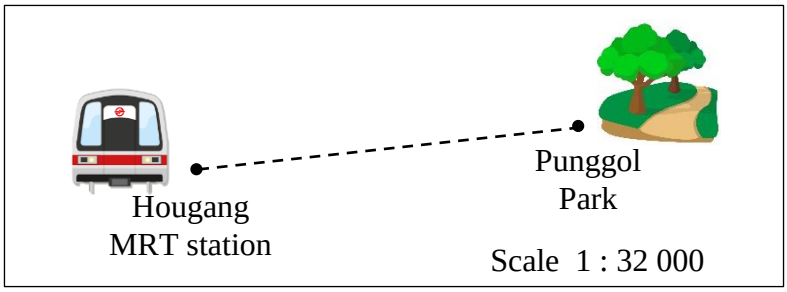
State one aspect of the graph that may be misleading and explain how this may lead to a misinterpretation of the graph. Explain your reasons clearly.

…….

…….

……..[1]

10 The scale drawing shows the position of Hougang MRT station and Punggol Park.



(a) Find the actual distance between Hougang MRT station and Punggol Park in km.

Answer ……...km [2]

(b) The area of Punggol park is 0.8 km^2.

Calculate the area of Punggol park in the map in cm^2.

Answer ……..cm^2 [2]

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11 A bag consists of letters of the word "*COMPASSIONATE*".

Keith picks a letter from the bag.

Find the probability that Keith

(a) picked a vowel,

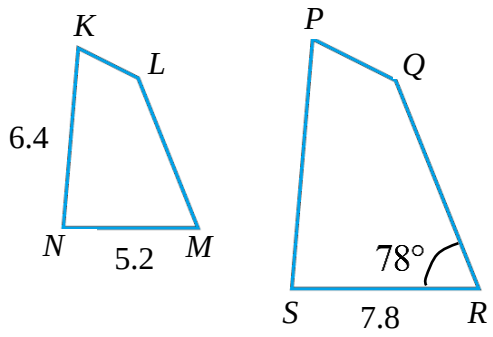
Answer ……[1]

(b) picked a letter "*A" or "S"*

Answer ……[1]

12 Quadrilateral *KLMN* is similar to quadrilateral *PQRS*.

$KN = 6.4$ cm, $MN = 5.2$ cm, $RS = 7.8$ cm and $\angle QRS = 78°$.



Calculate

(a) the ratio of $LM : QR$,

Answer …….[1]

(b) $\angle LMN$,

Answer ……..°[1]

(c) the length of *PS*.

Answer ……...cm [2]

13 The equation of the line l_1 is $2y + x = 5$.

(a) Write down the gradient of the line.

Answer …….[1]

(b) Write down the coordinates of the point where the line l_1 crosses the *x*-axis.

Answer (…….. , ……..) [2]

(c) It is said that another line l_2 which passes through $(-1, 4)$ and $(3, 2)$ is parallel to line l_1. Do you agree? Explain your reasons with workings. [2]

Answer

14 Solve these simultaneous equations.

$$5x - y = -15$$
$$x + 4y = 18$$

Answer x = ……..

y = ……[3]

15 (a) Find the equation of the line of symmetry of $y = (x-5)(x+3)$.

Answer …….[2]

(b) Find the coordinates of the minimum or maximum point of $y = (x-5)(x+3)$.

.

Answer (…….. , ……..) [1]

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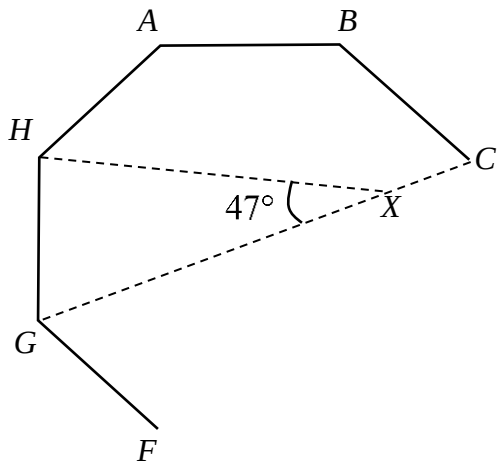
16 Express as a single fraction, in its simplest form, $\frac{2}{x^2-9} + \frac{1}{x-3}$.

Answer …….[2]

17 The diagram shows triangle GXH inside a regular octagon. GC is a line of symmetry of the regular octagon and $\angle GXH = 47°$.



Calculate the size of

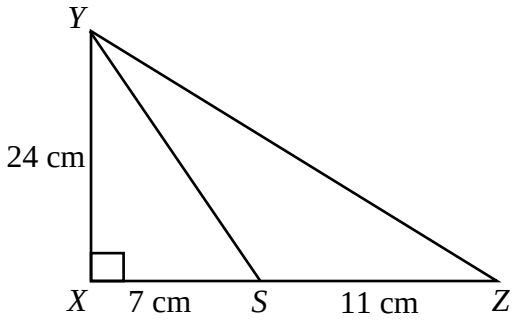
(a) $\angle AHG$,

Answer …….° [2]

(b) $\angle GHX$.

Answer …….° [2]

18 XYZ is a right-angled triangle such that XY = 24 cm. S is a point on XZ such that XS = 7 cm and SZ = 11 cm.



(a) Giving your answers as fraction, find

(i) $\sin \angle XSY$,

Answer …….[2]

(ii) $\tan \angle XYZ$.

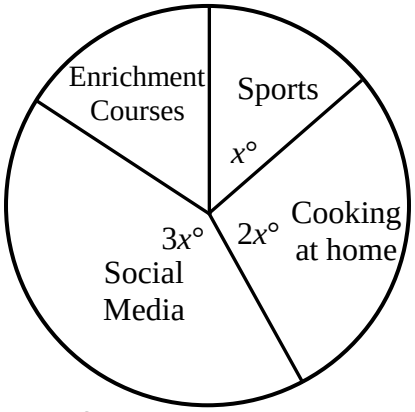
Answer …….[1]

(b) Calculate $\angle YSZ$.

Answer ……° [2]

19 The survey shows the activities that secondary 3 students have engaged in during school holidays.

The results are represented in the pie chart below. $\frac{1}{5}$ of secondary 3 students attended enrichment courses during their school holidays. [Pie chart is not drawn to scale]



(a) Show that the value of x is 48.

Answer [2]

(b) Given that 80 secondary 3 students spent their time on cooking at home during school holidays, how many secondary 3 students are there in total?

Answer ……...students [2]

(c) In a separate survey, secondary 3 students can list any activities they have engaged in during school holidays. A total of 20 activities were named in the survey.
Explain why a pie chart is NOT suitable for representing the data of this survey.

…….

…….

……

…….....[1]

20 (a) Express $x^2 - 8x + 5$ in the form of $(x + p)^2 + q$. Find the value of p and q.

Answer p = ……

q = …… [2]

(b) Hence, solve the equation $x^2 - 8x + 5 = 0$, giving your answers to 2 decimal places.

Answer ……[2]

21 The *n*th term of a sequence is given by the expression $3n-100$.

(a) Find the 1st term of the sequence.

Answer …….[1]

(b) Show that -55 is a term in the sequence. [2]

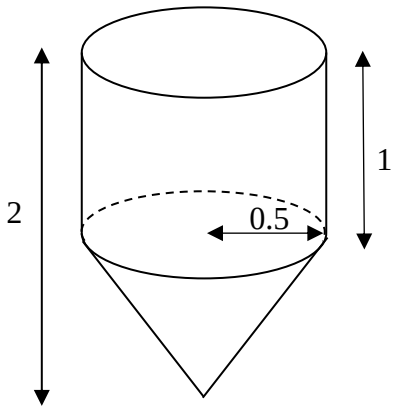
(c) Find the smallest positive number in the sequence.

Answer ……[1]

22 The diagram shows a gold ornament comprising a cylinder and a cone.

The height of the cylinder is 1 cm. Both the cylinder and the cone have a base radius of 0.5 cm.

The vertical height of the ornament is 2 cm.



The mass of 1 cubic centimeter of gold is 19.3 grams.

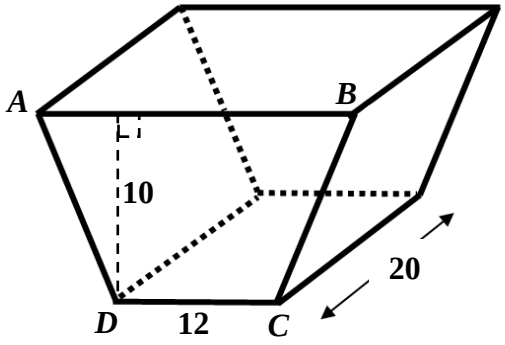
The price of 1 gram of the gold is $69.65.

Calculate the value of the gold in the pendant.

Give your answer to the nearest dollar.

Answer $.....[4]

23 A prism has a cross-section of trapezium *ABCD*, which has a perpendicular height of 10 cm and *DC* = 12 cm. The prism has a length of 20 cm and the area of the cross-section *ABCD* is 135 cm^2.



(a) Calculate the length of *AB*.

Answer ……...cm [2]

(b) Calculate the volume of the prism.

Answer ……..cm^3 [2]

(c) Convert 135 cm^2 into m^2.

Answer ……m^2 [1]

24 Three points are *P*, *Q*, *R* are shown below.

(a) Construct a perpendicular bisector of *QR*. [1]

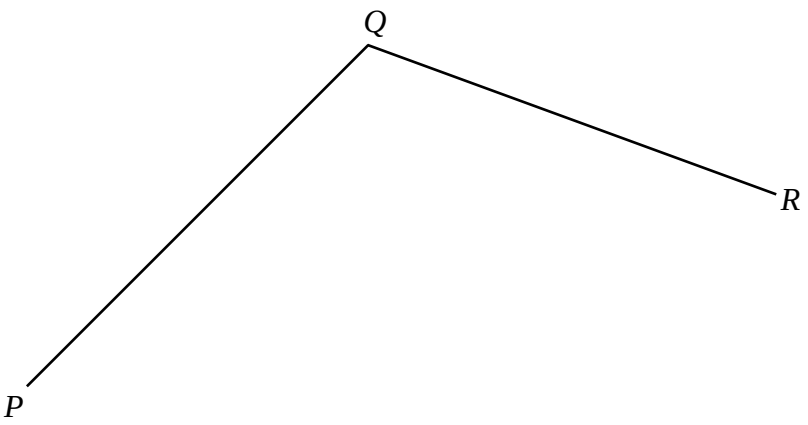
(b) Construct the angle bisector of *PQR*. [1]

(c) The two bisectors intersect one another at point *T*.
Measure the length of *QT*.

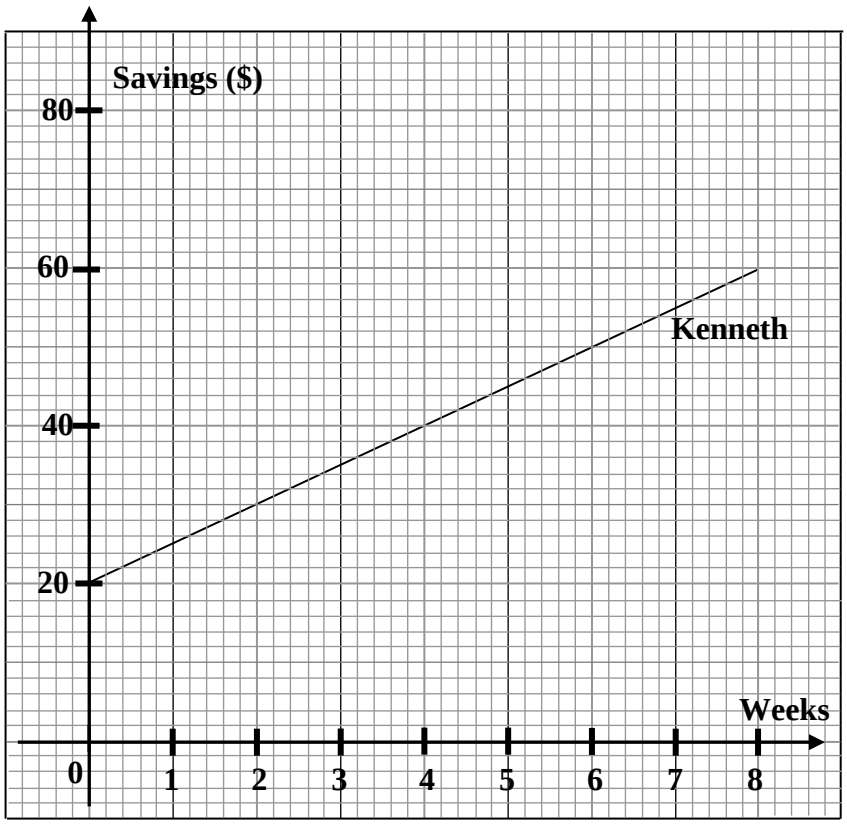
Answer : *QT* = ……cm [1]

(d) The point *Z* is equidistant from the points *Q* and *R* and nearer to the line *QR* than the line *PQ*. Label a possible point *Z* on the diagram. [1]

Answer *(a), (b), (d)*



25. The graph shows the savings of Kenneth over 8 weeks.



(a) How much is Kenneth's savings at week 6?

Answer $.....[1]

(b) How much is Kenneth's savings at week 25?

Answer $.....[2]

(c) Jordan has no savings and he decided to save a fixed rate of $10 per week.
On the above grid paper, draw the graph of Jordan's savings. [1]

(d) Hence, determine at which week will Jordan and Kenneth have the same amount of savings?

Answer Week …….[1]

End of Paper