

聖嬰中學

HOLY INNOCENTS' HIGH SCHOOL



Candidate Name

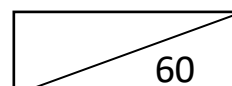
Class

Index Number

END OF YEAR EXAMINATION 2021

SECONDARY 2

MATHEMATICS PAPER 1



4045/01

Date: 11 October

Duration: 1 h 30 min

Candidates answer on the Question Paper.
No Additional Materials are required.

READ THESE INSTRUCTIONS FIRST

Write your name, class and index number 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 paper clips, glue or correction tape/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 **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 π , use either your calculator value or 3.142.

For Examiner's use

You need to improve on your:

• **PRESENTATION**

• **ACCURACY**

Marks (max 5%)

Set by: Mr Zoel Ng

Vetted by: Mr Lin Weiding

Mathematical Formulae*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 = $\frac{4}{3}\pi r^3$

- 1 (a) Written as a product of its prime factors, $180 = 2^x \times 3^2 \times 5^y$.
Find the values of x and y .

Answer $x = \dots\dots\dots$

$y = \dots\dots\dots$ [1]

- (b) Find the greatest number that will divide 180 and 36 exactly.

Answer $\dots\dots\dots$ [1]

- 2 On a particular day, the ratio of time spent by Dan on sleeping and studying is $\frac{7}{3} : 1$.
The ratio of time spent on studying and playing is $2 : 1$.

If Dan spent a total of 11.5 hours sleeping, studying and playing, calculate the amount of time he spends on studying on this day.

Answer $\dots\dots\dots$ hours [2]

- 3 (a) Calculate $\frac{(3.56 - \pi)^2 + 8}{\sqrt[3]{614.59}}$.
Correct your answer to 2 significant figures.

Answer [1]

- (b) Cara says that 2.50 m is as accurate as 2.5 m.
Justify if Cara is correct in saying this.

.....
.....
.....
..... [1]

- 4 It is given that $(a + b)^2 = 16$ and $ab = -2$.

- (a) Show that $a^2 + b^2 = 20$.
Answer

[1]

- (b) Hence find the value of $(a - b)^2$.

Answer [1]

- 5 (a) Convert 0.64 m^3 to cm^3 .

Answer cm^3 [1]

- (b) Convert 60 m/s to km/h .

Answer km/h [1]

- 6 A triangle ABC has sides $AB = 20 \text{ cm}$, $BC = 21 \text{ cm}$ and $AC = 29 \text{ cm}$.
Determine whether this triangle is a right-angled triangle.
Show your working clearly.

.....

 [2]

- 7 (a) Factorise $4x^2 - 9$.

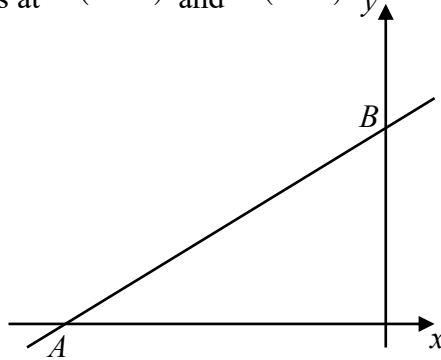
Answer [1]

- (b) Factorise fully $6px + 3qx - 8py - 4qy$.

Answer [2]

- 8 The diagram shows a sketch of the graph of $y = ax + b$.

The line crosses the axes at $A(-5, 0)$ and $B(0, 15)$.



- (a) Find the gradient of the line AB .

Answer [1]

- (b) Write down the equation of the line AB .

Answer [1]

- (c) Hence find the value of y when $x = -2$.

Answer $y =$ [1]

- 9 It is given that $v^2 = u^2 + 2as$.

- (a) Find v when $u = 19$, $a = 9$ and $s = 1800$, where $v > 0$.

Answer $v =$ [1]

- (b) Express u in terms of v , a and s .

Answer [2]

- 10 The heights of 20 students were measured and shown in the table below.

123	134	157	176	176	142	134	168	127	172
121	137	155	164	170	132	163	129	130	133

- (a) Use the data above to complete this frequency table.

Height, x centimetres	Frequency
$120 < x \leq 130$	
$130 < x \leq 140$	
$140 < x \leq 150$	
$150 < x \leq 160$	
$160 < x \leq 170$	
$170 < x \leq 180$	

[2]

- (b) It is discovered that the heights had been measured incorrectly.
The correct heights were all 2 cm less than those recorded.

State how the mean of the heights have been affected by this error.

.....

 [1]

- 11 (a) (i) Solve the inequality $2(2x-5) \geq 3(x+3)$.

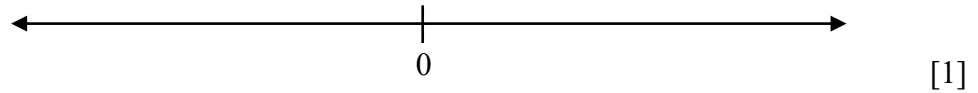
Answer [2]

- (ii) Hence write down the smallest prime number that satisfies the inequality.

Answer [1]

- (b) Represent $x < -2$ on the number line.

Answer



12 (a) Solve the simultaneous equations

$$2x + 3y = 1,$$

$$\frac{1}{5}x - y = 4.$$

Answer $x = \dots\dots\dots$

$y = \dots\dots\dots$ [3]

(b) Explain how you can check whether the two solutions in part **(a)** are correct.

.....

 [1]

- 13** A closed cylindrical container, completely filled with water, has radius 5 cm and height 18 cm.

(a) Calculate the external surface area of the cylindrical container.

Answer cm^2 [2]

- (b)** All the water is poured into identical conical cups.
Each conical cup has radius 2.5 cm and height 9 cm.

Adriel claims that a maximum of 8 full cups can be filled, while Ben claims that a maximum of 24 full cups can be filled.

Justify, showing your calculations, which of the boys is correct in their claims.

..... [2]

- 14 (a)** A regular polygon has interior angles of 160° each.
Find the number of sides of the polygon.

Answer [2]

- (b)** An n -sided polygon has 6 exterior angles measuring 30° each.
The remaining exterior angles all measure x° each.
Find an expression for x in terms of n .

Answer [2]

- 15 (a)** The volume, V , of a given mass of gas is inversely proportional to the pressure, P .
- (i)** When $V = 4 \text{ m}^3$, $P = 150 \text{ N/m}^2$.
Find the formula connecting V and P .

Answer [2]

- (ii)** Find the pressure when the volume is 10 m^3 .

Answer N/m^2 [1]

- (b) y is proportional to x^n , where n is an integer.

Write down the value of n when

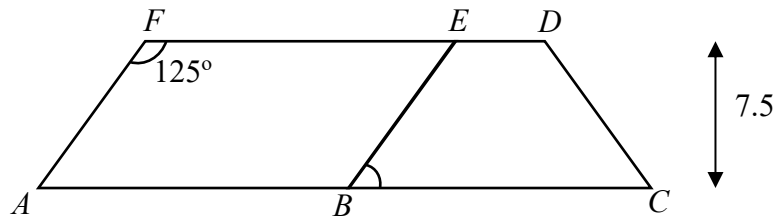
- (i) y km is the distance travelled by a train traveling at x km/h for 2 hours,

Answer $n = \dots\dots\dots$ [1]

- (ii) $y \text{ cm}^3$ is the volume of a hemisphere of radius x cm.

Answer $n = \dots\dots\dots$ [1]

16



The diagram shows a trapezium $ACDF$.

It is made up of a parallelogram $ABEF$, and a smaller trapezium $BCDE$.

$AB = BC = FE = (3x - 6)$ m, $AF = CD = (2x - 5)$ m, $DE = (x - 2)$ m and angle $AFE = 125^\circ$.

The height of trapezium $ACDF$ is 7.5 m and its area is 187.5 m^2 .

- (a) Find the value of x .

Answer $x = \dots\dots\dots$ [3]

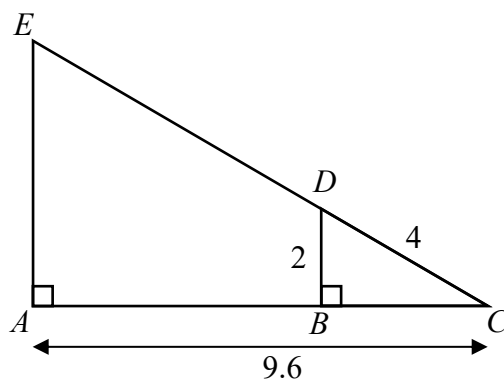
- (b) Hence find the perimeter of trapezium $ACDF$.

Answer $\dots\dots\dots$ m [1]

- (c) Calculate angle CBE .

Answer $\dots\dots\dots^\circ$ [1]

17



Triangle ACE is an enlargement of triangle BCD .

$CD = 4$ cm, $BD = 2$ cm, $AC = 9.6$ cm

(a) Calculate the length of BC .

Answer cm [2]

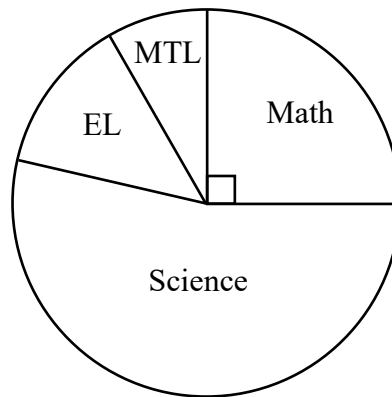
(b) Find the scale factor of the enlargement.

Answer [1]

(c) Hence, calculate the length of DE .

Answer cm [2]

- 18** 120 primary school students were surveyed on their favourite subject, English Language (EL), Mother Tongue Language (MTL), Mathematics (Math), or Science.
The results are represented using a pie chart.



- (a)** Calculate the number of students whose favourite subject is Mathematics.

Answer [1]

- (b)** 15 students' favourite subject is English Language.
Calculate the angle that represents EL on the pie chart.

Answer ° [1]

- (c)** The number of students whose favourite subject is Science is 6.5 times that of MTL.
Calculate the number of students whose favourite subject is Science.

Answer [2]

- (d)** Suggest an advantage of representing this data using a pie chart.

.....
..... [1]

End of Paper

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