ZHONGHUA SECONDARY SCHOOL

END-OF-YEAR EXAMINATION 2023
SECONDARY 1 NORMAL (ACADEMIC)

CANDIDATE NAME	CLASS	INDEX NUMBER

MATHEMATICS SYLLABUS A 4045

28 September 2023

Candidates answer on the Question Paper. 2 hours

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 fluid.

Answer **all** the 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 **70**.

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.

70

Answer **all** the questions.

1 The population of Singapore was 1 890 000 in 1965.
This value has been rounded to three significant figures.
What is the smallest possible value of the population of Singapore in 1965?

Answer ..... [1]

---

2 Fill in the box with '>' or '<'.

$-\frac{1}{4}$ ☐ $-\frac{1}{5}$ [1]

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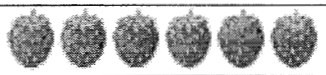
3 The pictogram illustrates the number of pieces of fruit Ivan ate last week.

Apple	
Orange	
Strawberry	

Each picture represents 2 pieces of fruit.

Do you agree with the statement "Ivan ate the most apples last week."?
Explain your answer.

Answer I ..... because .....

..... [1]

---

4 Evaluate the following by filling the boxes with an integer.

(a) $\square + (-3) = 7$ [1]

(b) $25 \div \square = -5$ [1]

---

5 The diagram shows a bar of chocolate that is 20 cm long.
It is a solid prism with uniform cross section of a triangle.

Calculate

(a) the area of the cross section in cm^2,

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

(b) its volume in cm^3.

Answer ..... cm^3 [1]

---

6 When written as the product of its prime factors,

$$3375 = 3^3 \times 5^3.$$

(a) Express 4500 as a product of its prime factors, leaving your answer in index notation.

Answer ..... [1]

(b) Hence, find

(i) the highest common factor of 3375 and 4500,

Answer ..... [1]

(ii) the lowest common multiple of 3375 and 4500.

Answer ..... [1]

(c) When 3375 is divided by h, the result is a perfect square.
Find the smallest possible value of h.

Answer ..... [1]

7 **(a)** Given that $10 : k = 5 : 4$, find the value of k.

Answer $k =$ ..... [1]

(b) Kenny had a sum of money.
The amount he spent on stationery, food and books was in the ratio 4 : 3 : 5.
If he spent \$80 more on books than on food, what was the original sum of money he had?

Answer \$ ..... [2]

---

8 **(a)** Given that $a = 2$ and $b = -3$, find the value of $4a^2 - b$.

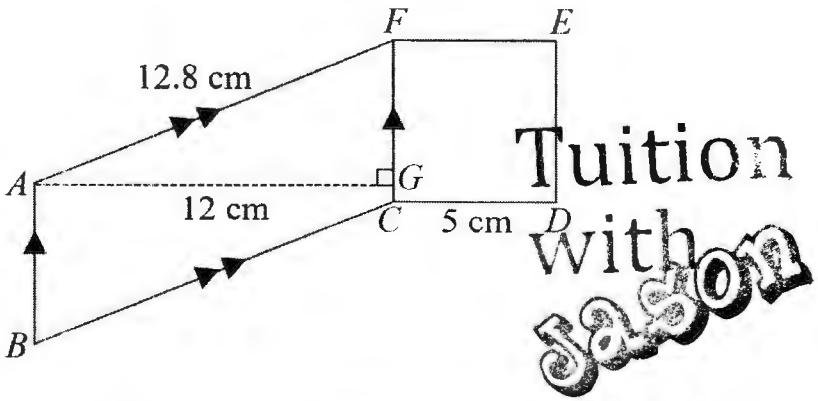
Answer ..... [2]

(b) Mrs. Lee bought 10 kg of prawns at \$$(x + 3)$ per kg and 8 kg of squids at \$$(2x - 8)$ per kg.
How much did she spend in total?
Leave your answer in terms of x.

Answer \$ ..... [2]

---

9 The figure is made up of a parallelogram *ABCF* and a square *CDEF*.



Given that $AG = 12$ cm, $AF = 12.8$ cm, $CD = 5$ cm and angle $AGF = 90°$, find

(a) the perimeter of the figure,

Answer ..... cm [2]

(b) the area of the parallelogram *ABCF*.

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

10 Consider the following number sequence:

9, 16, 23, 30, ...

(a) Write down the 6^{th} term of the sequence.

Answer ..... [1]

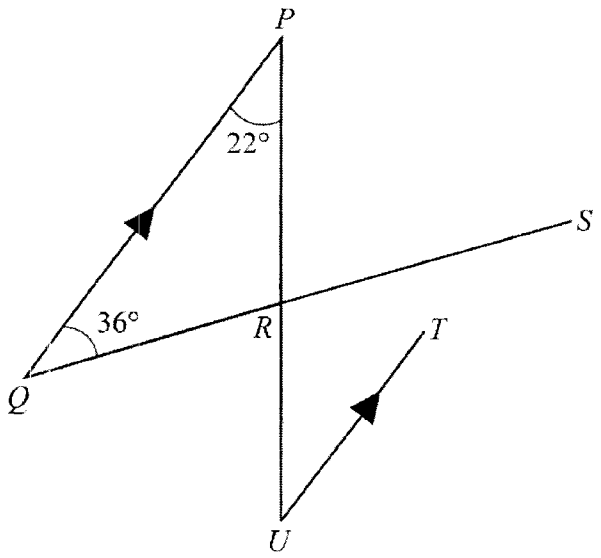
(b) Express the n^{th} term of the sequence in terms of n.

Answer ..... [1]

(c) The last term of the sequence is 352.
How many terms are there in the sequence?

Answer ..... [2]

11 In the figure, QRS and PRU are straight lines.
PQ is parallel to TU.
Angle $PQR = 36°$ and angle $QPR = 22°$.



(a) Find angle RUT, giving a reason for your answer.

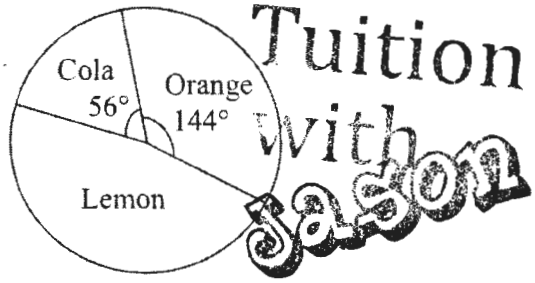
angle RUT = ... because .....

..... [2]

(b) Find angle SRU.

Answer ..... [2]

12 Each of the girls on a journey was asked to choose an orange drink or lemon or a cola. Their choices are represented in the given pie chart.



(a) Find the percentage of girls who chose cola, giving your answer correct to 2 decimal places.

Answer ..... % [2]

(b) Given that 120 girls chose orange, calculate the total number of girls on the journey.

Answer ..... girls [2]

13 Simplify the following algebraic expressions.

(a) $12mn + 5m + 3n - 8m - 4nm$

Answer ..... [1]

(b) $6 - 2(x + 2y)$

Answer ..... [1]

(c) $7p - (q - 2p)$

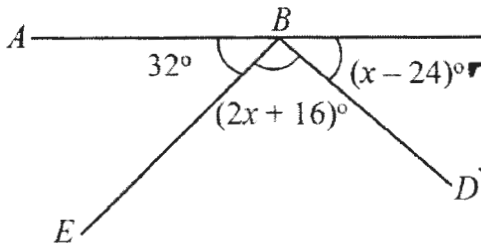
Answer ..... [2]

---

14 **(a)** Solve the equation $6x - 5 = 10 + 4x$.

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

(b) The diagram shows a straight line ABC.
Angle $ABE = 32°$, angle $DBE = (2x + 16)°$ and angle $CBD = (x - 24)°$.



(i) Form, without simplifying, an equation in x.

Answer ..... [1]

(ii) Solve the equation in **(b)(i)**.

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

15 Chen ran at an average speed of 4.8 km/h for the first 35 minutes and 6 km/h for the remaining 50 minutes.
Calculate

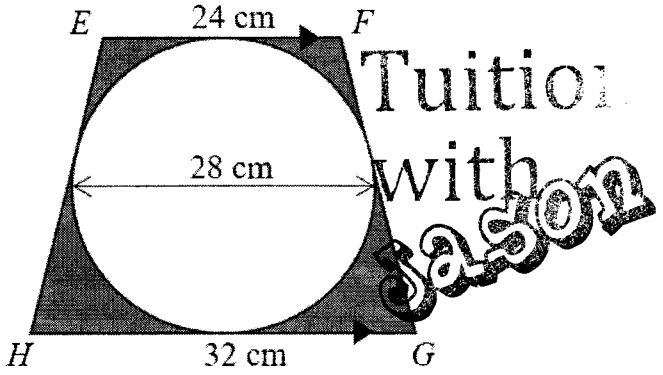
(a) the total distance Chen ran,

Answer ..... km [3]

(b) his average speed for the whole journey in km/h, giving your answer correct to 3 significant figures.

Answer ..... km/h [2]

16 In the diagram, *EFGH* is a trapezium which contains a circle of diameter 28 cm.



(a) State the height of trapezium *EFGH*.

Answer ..... cm [1]

(b) Find the area of trapezium *EFGH*.

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

(c) Find the area of the shaded region.

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

17 Vincent was planning to change his old car for a new one.
He was at the showroom where he saw a car that was to his liking.
The car was priced at $127 000.

(a) The salesman would make a profit of 25% if he sold the car to Vincent.
What was the cost price of the car?

Answer $ ..... [2]

(b) Vincent decided to buy the new car.
He traded in his old car which was priced at 23% the price of the new car.

(i) How much was the price of his old car?

Answer $ ..... [2]

(ii) How much more money would he need to buy the new car?

Answer $ ..... [1]

(c) All vehicles in Singapore require a Certificate of Entitlement (COE). To register a vehicle, one must first place a bid for a COE in the corresponding vehicle category.

The Vehicle Quota System (VQS) classifies vehicles into the following COE categories:

Category		**COE Price Aug 2023**
A	Non-fully electric cars with engines up to 1,600cc and Maximum Power Output up to 97kW (130bhp) **or** Fully electric cars with Maximum Power Output up to 110kW (147bhp)	$100 000
B	Non-fully electric cars with engines above 1,600cc or Maximum Power Output above 97kW (130bhp) **or** Fully electric cars with Maximum Power Output above 110kW (147bhp)	$129 890
C	Goods vehicle and bus	$82 801
D	Motorcycle	$11 402

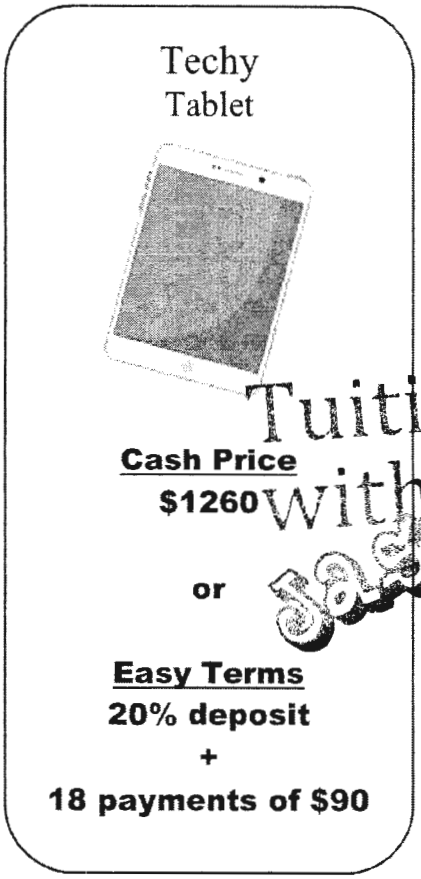
Vincent's new electric car has an engine of 1,699cc.
How much would Vincent need to pay for the COE?

Answer $ ..... [1]

(d) Vincent also decided to take a loan of the amount in **(c)** from a bank. The bank charges him simple interest at a rate of 2.8 %per annum. If he plans to repay his loan at the end of 7 years, find the amount of interest he has to pay.

Answer $ ..... [2]

18 **(a)** Hao sees this advertisement for a tablet.



How much more than the cash price will he pay if he chooses 'Easy Terms'?

Answer $ ..... [4]

(b) Caleb is travelling from Singapore to Japan.
In Singapore, the exchange rate is
1 Singapore Dollar (SGD) = 108 Japanese Yen (JPY).
In Japan, the exchange rate is 100 JPY = 1.03 SGD.
Caleb wants to change 800 Singapore Dollars into Japanese Yen.
How many more Japanese Yen will he get by changing his money in Singapore?
Give your answer to the nearest Yen.

Answer ..... Yen [3]

End Of Paper

Answer **all** the questions.

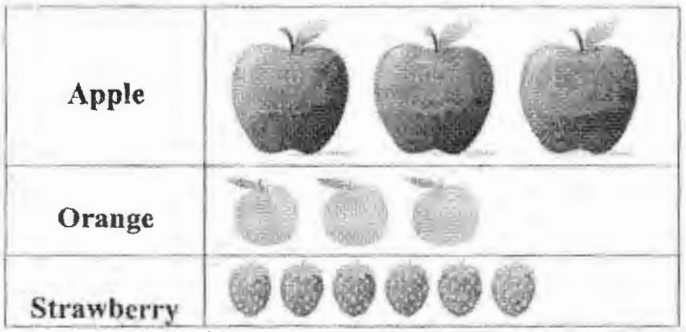
1 The population of Singapore was 1 890 000 in 1965.
This value has been rounded to three significant figures.
What is the smallest possible value of the population of Singapore in 1965?

Answer 1885 000 [1]

2 Fill in the box with '>' or '<'.

$-\frac{1}{4}$ [<] $-\frac{1}{5}$ [1]

3 The pictogram illustrates the number of pieces of fruit Ivan ate last week.



Each picture represents 2 pieces of fruit.

Do you agree with the statement "Ivan ate the most apples last week."?
Explain your answer.

Answer I disagree because he ate the most strawberries at 10 pieces and ~~he~~ ate only 6 apples [1]

(A1)

4 Evaluate the following by filling the boxes with an integer.

(a) | 10 | + (–3) = 7 [1]

(b) 25 ÷ | –5 | = –5 [1]

5 The diagram shows a bar of chocolate that is 20 cm long.
It is a solid prism with uniform cross section of a triangle.

Calculate

(a) the area of the cross section in cm^2,

$\frac{1}{2} \times \frac{40}{10} \times \frac{26}{10}$

Answer 5.2 cm^2 [2]

(b) its volume in cm^3.

Answer 104 cm^3 [1]

6 When written as the product of its prime factors,

$$3375 = 3^3 \times 5^3.$$

(a) Express 4500 as a product of its prime factors, leaving your answer in index notation.

Answer $2^2 \times 3^2 \times 5^3$ [1]

(b) Hence, find

(i) the highest common factor of 3375 and 1125,

Answer 1125 [1]

(ii) the lowest common multiple of 3375 and 4500.

Answer 13500 [1]

(c) When 3375 is divided by h, the result is a perfect square.
Find the smallest possible value of h.

Answer 15 [1]

7 (a) Given that $10 : k = 5 : 4$, find the value of k.

Answer $k =$ 8 [1]

(b) Kenny had a sum of money.
The amount he spent on stationery, food and books was in the ratio 4 : 3 : 5.
If he spent \$80 more on books than on food, what was the original sum of money he had?

2 units represents \$80
1 unit represents \$40 (M1)
12 units represents \$480 (A1)

Answer \$ ..... [2]

8 (a) Given that $a = 2$ and $b = -3$, find the value of $4a^2 - b$.

$4(2)^2 - (-3)$ (M1)
$= 19$ (A1)

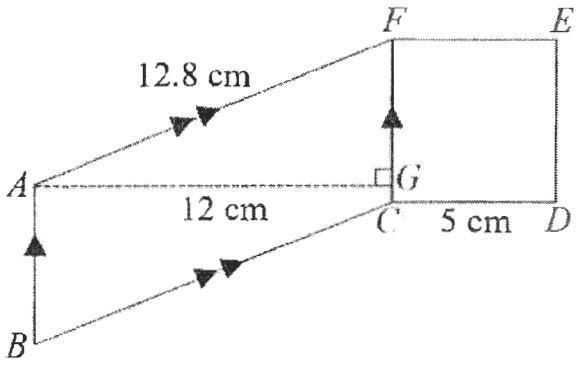
Answer ..... [2]

(b) Mrs. Lee bought 10 kg of prawns at $\$(x + 3)$ per kg and 8 kg of squids at $\$(2x - 8)$ per kg.
How much did she spend in total?
Leave your answer in terms of x.

$10(x+3) - 8(2x-8)$
$= 10x + 30 - 16x + 64$ (M1)
$= -6x + 94$ (A1)

Answer \$ ..... [2]

9 The figure is made up of a parallelogram $ABCF$ and a square $CDEF$.



Given that $AG = 12$ cm, $AF = 12.8$ cm, $CD = 5$ cm and angle $AGF = 90°$, find

(a) the perimeter of the figure,

$4(5) + 2(12.8)$ (m1)

$= 20 + 25.6$

$= 45.6$ (A1)

Answer ..... cm [2]

(b) the area of the parallelogram $ABCF$.

12×5 (m1)

Answer 60 ..... cm^2 [2]

10 Consider the following number sequence:

9, 16, 23, 30, ...

(a) Write down the 6^{th} term of the sequence.

Answer 44 [1]

(b) Express the n^{th} term of the sequence in terms of n.

$9 + 7(n-1)$

$= 7n + 2$ (A1)

Answer ..... [1]

(c) The last term of the sequence is 352.
How many terms are there in the sequence?

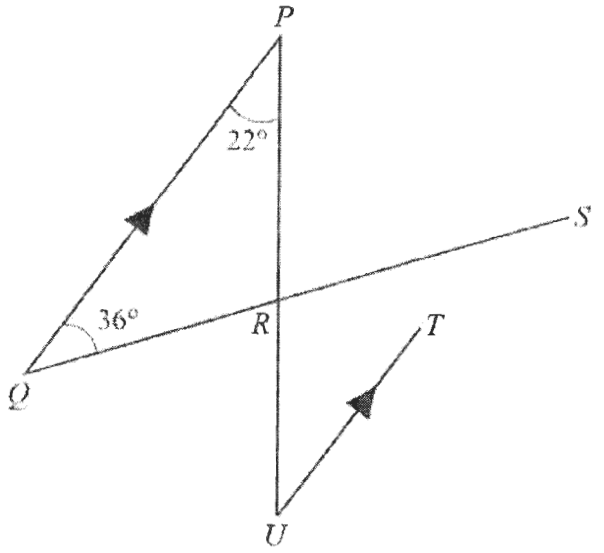
$352 = 7n + 2$ (M1)

$350 = 7n$

$n = 50$ (A1)

Answer ..... [2]

11 In the figure, QRS and PRU are straight lines.
PQ is parallel to TU.
Angle $PQR = 36°$ and angle $QPR = 22°$.



(a) Find angle RUT, giving a reason for your answer.

angle RUT = 22° because alternate angles with

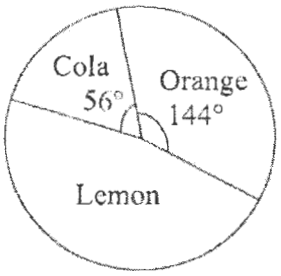
[2]

(b) Find angle SRU.

angle QRP = 180° − 22° − 36°
= 122° (angle sum of triangle)
(M1)
angle SRU = 122° (vertically opposite angles)

Answer ..... [2]

12 Each of the girls on a journey was asked to choose an orange drink or lemon or a cola. Their choices are represented in the given pie chart.



(a) Find the percentage of girls who chose cola, giving your answer correct to 2 decimal places.

$\frac{56°}{360°} \times 100\% = 15.56\%$ (A1)

(M1)

Answer ..... % [2]

(b) Given that 120 girls chose orange, calculate the total number of girls on the journey.

144° represents 120 girls

360° represents $\frac{360°}{144°} \times 120$ (M1)

$= 300$ girls (A1)

Answer ..... girls [2]

13 Simplify the following algebraic expressions.

(a) $12mn + 5m + 3n - 8m - 4nm$

Answer 8mn - 3n - 3m [1]

(b) $6 - 2(x + 2y)$

Answer 6 - 2x - 4y [1]

(c) $7p - (q - 2p)$

7p - q + 2p (m1)
= 9p - q

Answer ..... [2]

14 **(a)** Solve the equation $6x - 5 = 10 + 4x$.

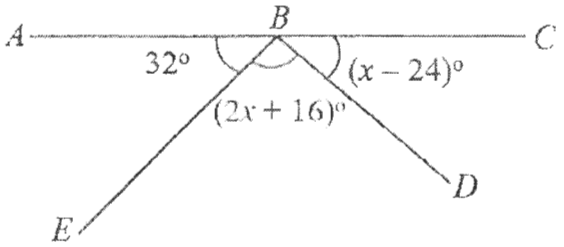
6x - 4x = 10 + 5
(m1) (m1)

2x = 15

x = 7.5

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

(b) The diagram shows a straight line ABC.
Angle $ABE = 32°$, angle $DBE = (2x + 16)°$ and angle $CBD = (x - 24)°$.



(i) Form, without simplifying, an equation in x.

Answer 32 + 2x + 16 + x – 24 = 180 [1]

(ii) Solve the equation in **(b)(i)**.

3x + 24 = 180 ~~(-24)~~ ~~(-24)~~

3x = 156

x = 52

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

15 Chen ran at an average speed of 4.8 km/h for the first 35 minutes and 6 km/h for the remaining 50 minutes.
Calculate

(a) the total distance Chen ran,

(M1)

$4.8 \times \frac{35}{60} + 6 \times \frac{50}{60}$ (M1)

$= 7.8$ km

(A1)

Answer ..... km [3]

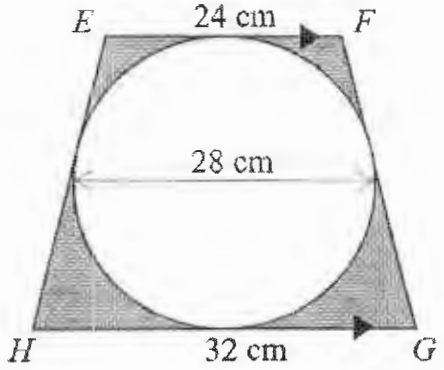
(b) his average speed for the whole journey in km/h, giving your answer correct to 3 significant figures.

$\frac{7.8}{\frac{85}{60}}$ } (M1)

$= 5.51$ km/h

Answer ..... km/h [2]

16 In the diagram, *EFGH* is a trapezium which contains a circle of diameter 28 cm.



(a) State the height of trapezium *EFGH*.

Answer 28 cm [1]

(b) Find the area of trapezium *EFGH*.

$\frac{1}{2} \times 28 \times (24 + 32)$ (M1)

$= 784$ (A1)

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

(c) Find the area of the shaded region. (M1)

$\text{area} = 784 - \pi(14)^2$

$= 168 \text{ (m}^2$ (A1)

(3 s.f.)

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

17 Vincent was planning to change his old car for a new one.
He was at the showroom where he saw a car that was to his liking.
The car was priced at $127 000.

(a) The salesman would make a profit of 25% if he sold the car to Vincent.
What was the cost price of the car?

$\frac{127\,000}{125} \times 100$ (m1)

Answer $ 101 600 [2]

(b) Vincent decided to buy the new car.
He traded in his old car which was priced at 23% the price of the new car.

(i) How much was the price of his old car?

$\frac{23}{100} \times 127\,000$ (m1)

=

Answer $ 29 210 [2]

(ii) How much more money would he need to buy the new car?

Answer $ 97790 [1]

(c) All vehicles in Singapore require a Certificate of Entitlement (COE). To register a vehicle, one must first place a bid for a COE in the corresponding vehicle category.

The Vehicle Quota System (VQS) classifies vehicles into the following COE categories:

Category		COE Price Aug 2023
A	Non-fully electric cars with engines up to 1,600cc and Maximum Power Output up to 97kW (130bhp) **or** Fully electric cars with Maximum Power Output up to 110kW (147bhp)	$100 000
B	Non-fully electric cars with engines above 1,600cc or Maximum Power Output above 97kW (130bhp) **or** Fully electric cars with Maximum Power Output above 110kW (147bhp)	$129 890
C	Goods vehicle and bus	$82 801
D	Motorcycle	$11 402

Vincent's new electric car has an engine of 1,699cc.
How much would Vincent need to pay for the COE?

Answer $ 129 890 [1]

(d) Vincent also decided to take a loan of the amount in (c) from a bank. The bank charges him simple interest at a rate of 2.8 %per annum. If he plans to repay his loan at the end of 7 years, find the amount of interest he has to pay.

$129\,890 \times \frac{2.8}{100} \times 7$ (M1)

$= \$25458.44$

Answer $ ..... [2]

18 (a) Hao sees this advertisement for a tablet.

How much more than the cash price will he pay if he chooses 'Easy Terms'?

"Easy Term"

~~$= \frac{20}{100} + 18(90)$ ///~~

$= \frac{20}{100} \times 1260 + 18 \times 90$ (m1)

$= 1872$

Tuition With

$1872 - 1260$ (m1)

$= \$612$ (A1)

Answer $ ..... [4]

(b) Caleb is travelling from Singapore to Japan.
In Singapore, the exchange rate is
1 Singapore Dollar (SGD) = 108 Japanese Yen (JPY).
In Japan, the exchange rate is 100 JPY = 1.03 SGD.
Caleb wants to change 800 Singapore Dollars into Japanese Yen.
How many more Japanese Yen will he get by changing his money in Singapore?
Give your answer to the nearest Yen.

1 SGD = 108 JPY
800 SGD = 86400 JPY (M1)

1.03 SGD = ± 100 JPY
800 SGD = 77669.90291 JPY
(M1)

difference
= 86400 − 77669.90291
= 8730 Yen (A1)

Answer ..... Yen [3]

End Of Paper