CAMBRIDGE ASSESSMENT INTERNATIONAL EDUCATION
General Certificate of Education Ordinary Level

CANDIDATE NAME

CENTRE NUMBER | S | | | | |

INDEX NUMBER | | | | |

MATHEMATICS

Paper 1

October/November 2021

2 hours

Candidates answer on the Question Paper.

READ THESE INSTRUCTIONS FIRST

Write your Centre number, 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.
DO **NOT** WRITE ON ANY BARCODES.

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 your calculator value or 3.142, unless the question requires the answer in terms of π.

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

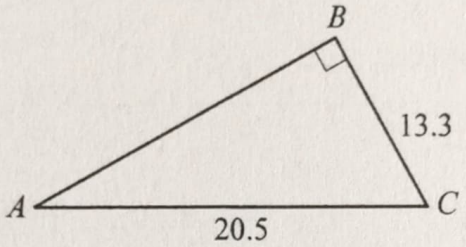
Answer **all** the questions.

1 Sima invests \$2500 at a simple interest rate of 1.6% per year for 3 years.

Calculate the total value of her investment at the end of 3 years.

Answer \$..... [2]

2



In the triangle, $AC = 20.5$ cm, $BC = 13.3$ cm and angle $ABC = 90°$.

Calculate AB.

Answer $AB =$ ..... cm [2]

---

3 A car travels at an average speed of 82.5 km/h for 3.35 hours.

(a) By rounding these numbers correct to 1 significant figure, find an estimate of the distance travelled by the car.
Show the numbers you use.

Answer ..... km [1]

(b) Without doing any further calculation, explain why the actual distance travelled by the car is greater than the answer to **part (a)**.

Answer .....

..... [1]

4 A bag contains some red marbles, some white marbles and some yellow marbles.
The probability of picking a red marble at random is 0.44 .
The probability of picking a white marble at random is 0.24 .

(a) Find the probability of picking a yellow marble at random.

Answer ..... [1]

(b) There are 175 marbles in the bag.

Find the number of white marbles in the bag.

Answer ..... [1]

---

5 Write as a single fraction in its simplest form $\frac{3x}{4} - \frac{2(x-4)}{3}$.

Answer ..... [2]

---

6 Five positive integers have a mean of 12, a median of 15 and a mode of 21.

Find the five numbers.

Answer .... [2]

---

7 The volume of a cuboid is $1200\,cm^3$.
The area of the **largest** face is $150\,cm^2$.
The dimensions of the cuboid have integer values.

Find the dimensions of the cuboid.

Answer .....cm by .....cm by .....cm [2]

---

8 In 2000, the number of international visitor arrivals in Singapore was 7690000, correct to the nearest ten thousand.
By 2018, this number had increased by 140.6%.

Calculate the number of international visitor arrivals in 2018.

Answer ..... [2]

---

9 **(a)** Solve $6x+7=-8$.

Answer $x=$ ..... [1]

(b) Simplify $8a-5b-3(2a+3b)$.

Answer ..... [2]

---

10 The table shows how a group of students travel to school.

	Frequency	Sector angle
Walk	24	
Bus	21	
Cycle	9	

A pie chart is to be drawn to show this information.

Calculate the angle of each sector of the pie chart.
Write your answers in the table.

[3]

---

11 In a regular polygon, the ratio interior angle : exterior angle = 7 : 1 .

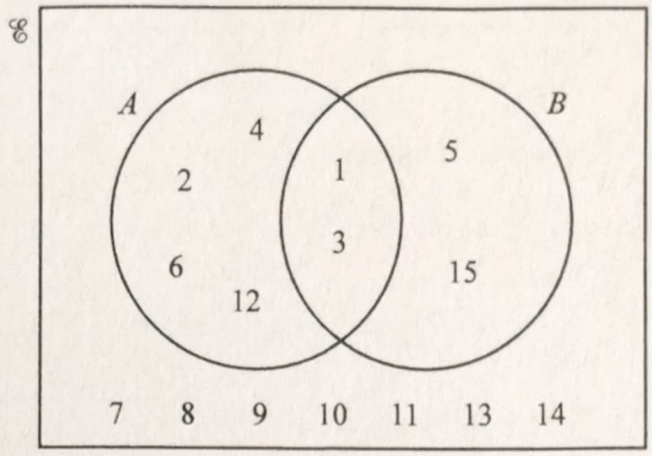
Calculate the number of sides of the polygon.

Answer ..... [3]

---

12 $\mathscr{E} = \{\text{integers } x : 1 \leqslant x \leqslant 15\}$
$A = \{1, 2, 3, 4, 6, 12\}$
$B = \{1, 3, 5, 15\}$

This information is shown on the Venn diagram.



(a) Describe the elements of set A.

..... [1]

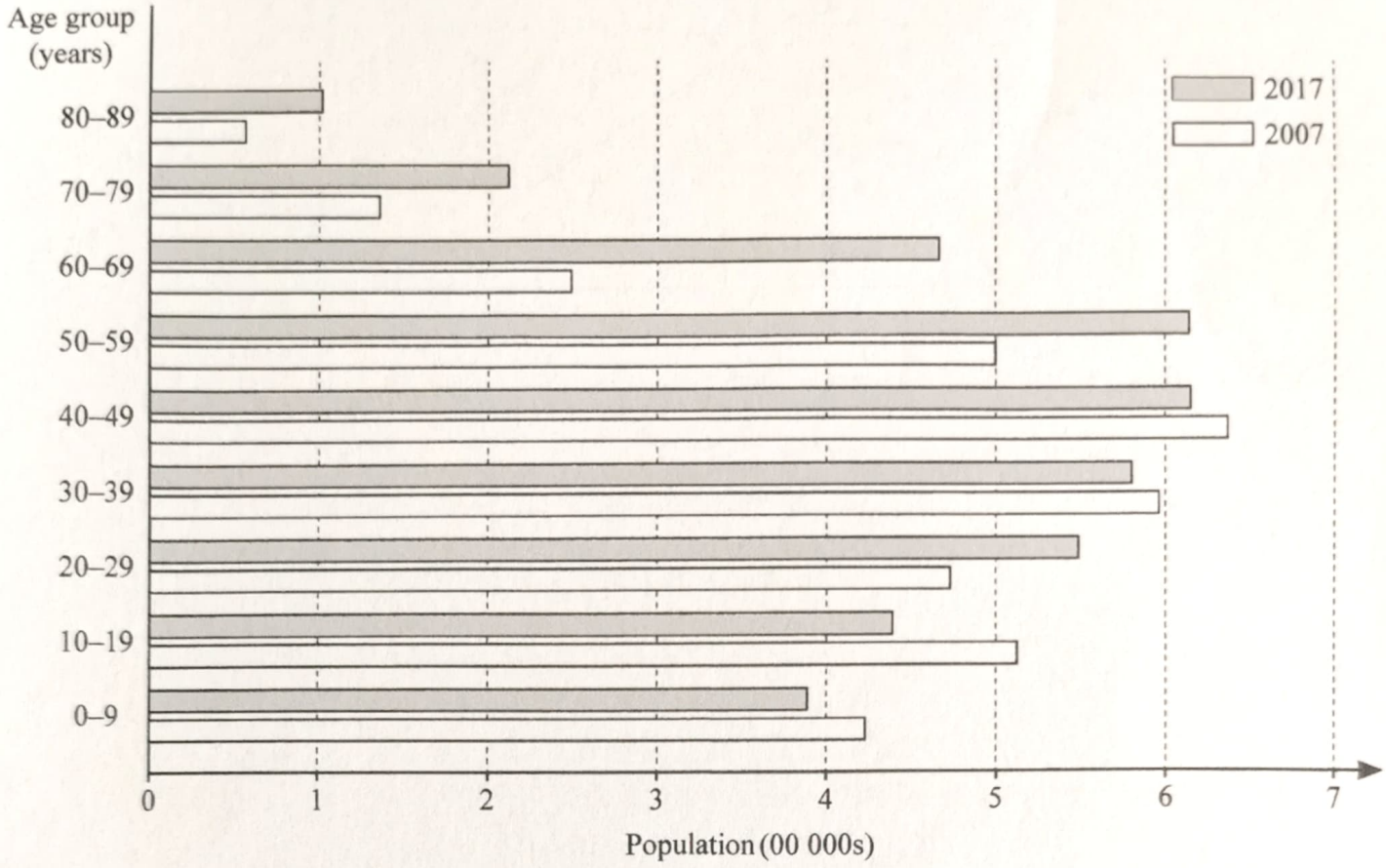
(b) List the elements contained in the set $A' \cap B'$.

Answer ..... [1]

(c) Find the number of elements in $(A \cap B') \cup (A' \cap B)$.

Answer ..... [1]

13 The graph shows information about the ages of the resident population of Singapore in 2007 and 2017.



(a) Estimate the number of people in 2017 that were aged 60–69.

Answer ..... [1]

(b) What feature of the graph supports the fact that the birth rate has fallen in Singapore between 2007 and 2017?

Answer .....

..... [1]

(c) Explain what the graph shows about the change in the mean age of the resident population of Singapore in 2007 and 2017.
Justify your answer with references to the graph.

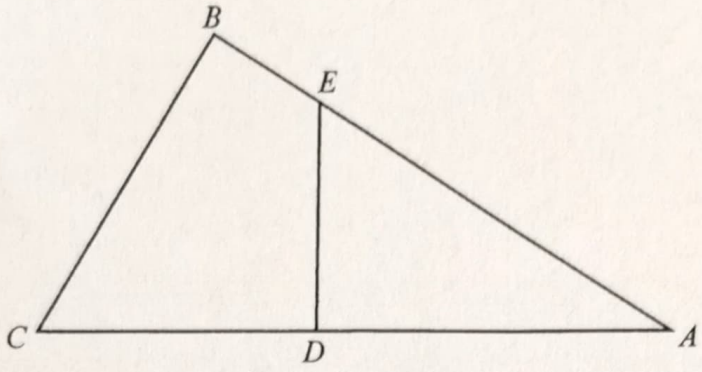
Answer .....

.....

.....

..... [2]

14



In the diagram, ABC and ADE are triangles such that angle ABC = angle ADE.

(a) Show that the two triangles are similar.

Answer

[2]

(b) Given that $AC = 12\,\text{cm}$, $AB = 10\,\text{cm}$ and $AE = 9\,\text{cm}$, show that $CD = 4.5\,\text{cm}$.
Show all your working.

Answer

[2]

15 **(a)** Expand and simplify $(2x+3p)^2$.

Answer ..... [2]

(b) Given that $(2x+3p)^2 = 4x^2 - 36x + 81$, find the value of p.

Answer $p =$ ..... [1]

---

16 **(a)** The formula $s = 3.5(t-2)^2$ can be used to calculate the distance, s metres, travelled by a cyclist in a time of t seconds, where $t > 2$.

Find t when $s = 14$.

Answer $t =$ ..... seconds [1]

(b) The kinetic energy, E joules, of a moving object is directly proportional to the square of its speed, v m/s. The kinetic energy of a particular object is reduced by 75% of its original value.

Calculate the percentage reduction in the speed of this object.

Answer .....% [2]

---

17 Simplify $\left(\frac{64x^6}{y^3}\right)^{\frac{2}{3}}$.

Answer ..... [2]

---

18 (a) A cruise ship has an average fuel consumption of 0.000 925 kilometres per litre.

Write this consumption in litres per kilometre.

Answer ..... litres/km [1]

(b) Another cruise ship has a length of 330 m.
The capacity of the fuel tanks is 1.228×10^6 litres.

A model of the ship is made to a scale of 1 : 60.

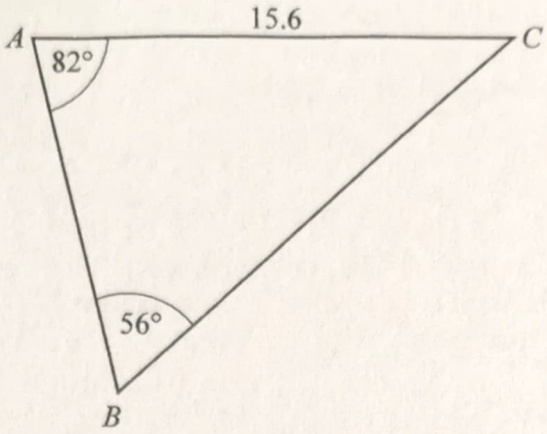
(i) Find the length of the model.

Answer ..... m [1]

(ii) Find the capacity of the fuel tanks of the model.

Answer ..... litres [2]

19



In the triangle, $AC = 15.6$ cm, angle $CAB = 82°$ and angle $ABC = 56°$.

Calculate the area of the triangle.

Answer ..... cm^2 [4]

20 **(a)** Written as a product of its prime factors, $12 = 2^2 \times 3$.

(i) Write 144 as a product of its prime factors.

Answer ..... [1]

(ii) The highest common factor (HCF) of two numbers is 12.
The lowest common multiple (LCM) of the two numbers is 144.
Both numbers are greater than 20.

Find the two numbers.

Answer ..... and ..... [2]

(b) Written as a product of its prime factors, $784 = 2^4 \times 7^2$.

The number $784 \div \frac{p}{q}$ is a perfect cube where p and q are prime numbers.

Find the value of p and the value of q.

Answer $p =$ .....

$q =$ ..... [2]

21 **(a)** Factorise completely $6x^2 - y + 3xy - 2x$.

Answer ..... [2]

(b) Using factorisation, solve $8x^2 - 6x - 9 = 0$.

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

22 In garden centre A, a bag of soil costs \$36, a trough costs \$40 and a pot costs \$68.
The same items can be bought in garden centre B.
In garden centre B the soil costs \$$x$, the trough \$39 and the pot \$65.

This information can be represented by the matrix $\mathbf{N} = \begin{matrix} \\ \text{S} \\ \text{T} \\ \text{P} \end{matrix}\begin{matrix} \begin{matrix} \text{A} & \text{B} \end{matrix} \\ \begin{pmatrix} 36 & x \\ 40 & 39 \\ 68 & 65 \end{pmatrix} \end{matrix}$

(a) Tom buys 5 bags of soil, 4 troughs and 2 pots.
Lim buys 6 bags of soil, 3 troughs and y pots.

Represent this information in a 2×3 matrix **M**.

Answer $\mathbf{M} = \begin{pmatrix} & & \\ & & \end{pmatrix}$ [1]

(b) Find, in terms of x and y, the matrix $\mathbf{P} = \mathbf{MN}$.

Answer $\mathbf{P} =$ [2]

(c) State what the first element of matrix **P** represents.

Answer ..... [1]

(d) The total cost of Tom's purchases would be the same in both garden centres.

Find the value of x.

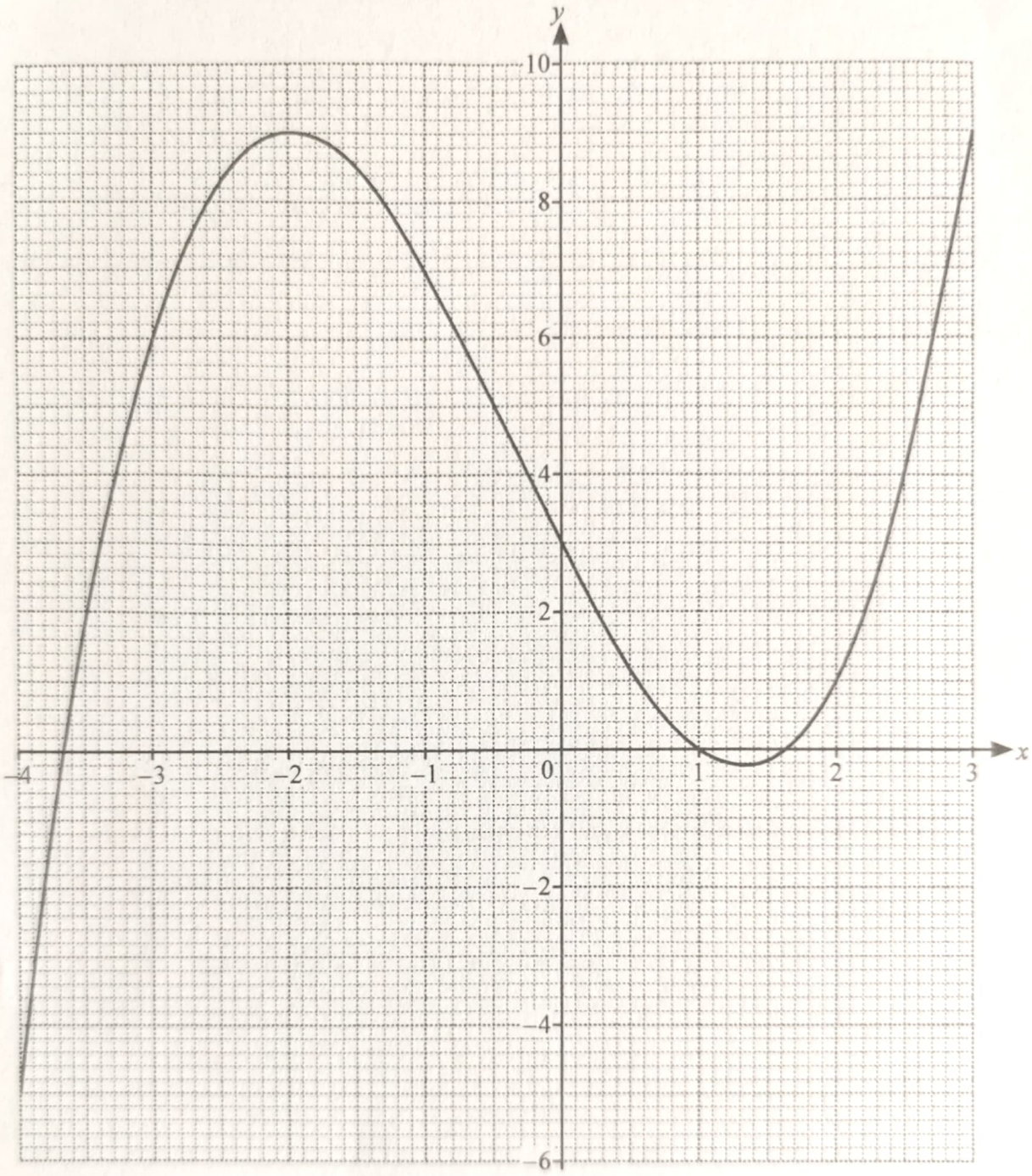
Answer $x =$ ..... [1]

(e) Lim would save \$3 by buying her purchases in garden centre B.

Find the value of y.

Answer $y =$ ..... [1]

23 The graph of $y = \frac{1}{2}(x^3 + x^2) - 4x + 3$ is drawn on the grid.



(a) By drawing a tangent, find the gradient of the curve at (2, 1).

Answer ..... [2]

(b) The equation $x^3 + x^2 - 6x = 0$ can be solved by drawing a suitable straight line on the grid.

(i) Find the equation of the straight line.

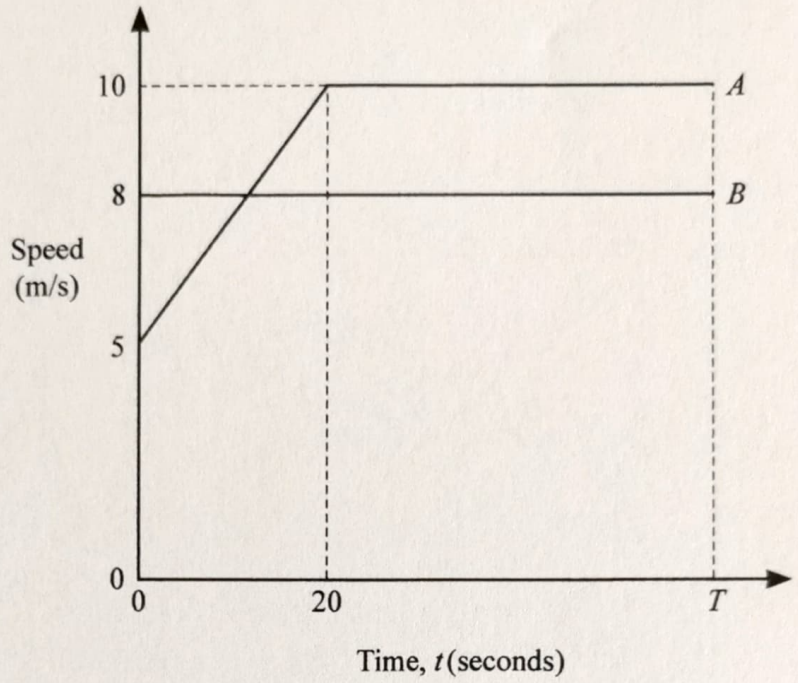
Answer ..... [2]

(ii) By drawing this straight line, solve the equation $x^3 + x^2 - 6x = 0$.

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

24 The diagram shows speed–time graphs for two cyclists, A and B, travelling along the same road in the same direction.

A accelerates for 20 seconds and then travels at a constant speed of 10 m/s.
B travels at a constant speed of 8 m/s.



(a) Calculate the acceleration of A for the first 20 seconds.

Answer ..... m/s^2 [1]

(b) The area beneath each speed–time graph represents the distance travelled by each cyclist.

(i) Find an expression, in terms of T, for the distance travelled by B in the T seconds.

Answer ..... m [1]

(ii) When $t = 0$, A is 90 m behind B.
When $t = T$, A passes B.

Find the value of T.

Answer ..... [4]