AHMAD IBRAHIM SECONDARY SCHOOL
GCE O-LEVEL PRELIMINARY EXAMINATION 2025

SECONDARY 4 EXPRESS /5 NORMAL ACADEMIC

Name:	Class:	Register No.:

MATHEMATICS **4052/01**
Paper 1 **05 Aug 2025**
2 hours 15 minutes

Candidates answer on the Question Paper.

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 staples, paper clips, glue or correction fluid.

Answer **all** questions.
If working is needed for any questions 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.

At the end of the examination, fasten all your work securely together.
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 90.

For Examiner's Use
/90

This document consists of **20** printed pages.

Mathematical Formulae

Compound Interest

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

Mensuration

Curved surface area of a cone $= \pi rl$

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

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

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

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

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

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

Trigonometry

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

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

Statistics

$$\text{Mean} = \frac{\Sigma fx}{\Sigma f}$$

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

Answer **all** the questions.

1 Expand $(2p+5q)(3p^2-q+5r)$.

Answer ..... [2]

---

2 Lee has two pieces of string.
Their lengths are in the ratio 5 : 3 and the total length of the two pieces of string is $8x$ cm.
Lee cuts 6 cm from each piece of string.
The ratio of their lengths is now 9 : 5
Find the value of x.

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

---

3 A salesperson earns a fixed weekly salary of \$1000 plus 8% commission on the total value of items he sells.

(a) In one week, he sold items worth \$1750.
Calculate the total amount the salesperson earned that week.

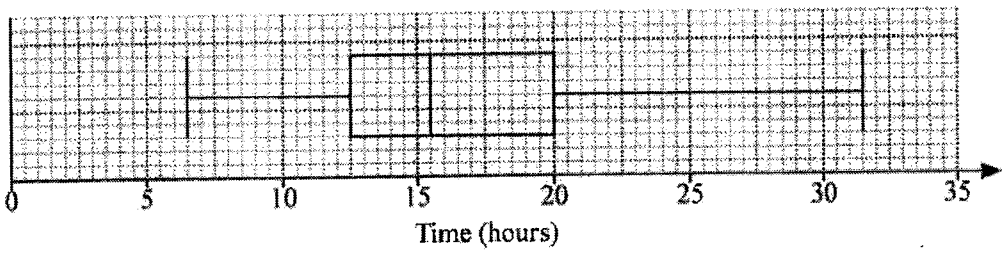
Answer \$..... [1]

(b) The following week, the salesperson earned a total of \$1450.
Calculate the total value of items he sold that week.

Answer \$..... [2]

---

4 The box-and-whisker-plot gives information about the time, in hours, that 120 adults spent on social media in one week.



(a) State the median time.

Answer .....hours [1]

(b) State the range.

Answer .....hours [1]

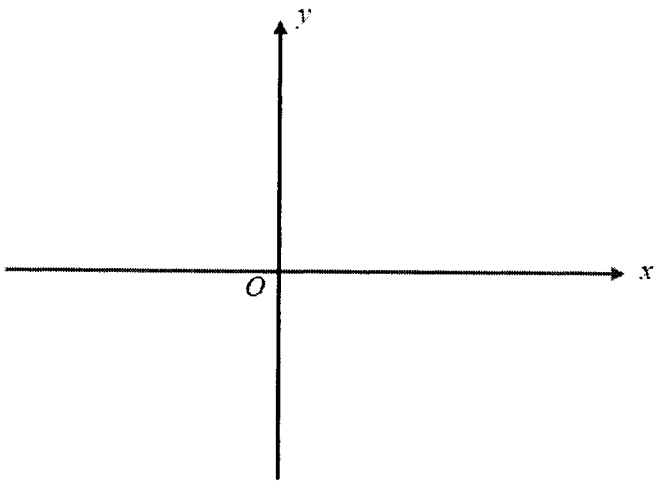
(c) There was an error in the collection of data.
Every adult spent 2 hours less on social media in one week.
Describe the effect this change would have on the box-and-whisker plot.

.....

..... [1]

5 Sketch the graph of $y=-(x-8)(x+3)$ on the axes below.

Indicate clearly the values where the graph crosses the x- and y- axes and its turning point.



[3]

---

6 Express as a single fraction in its simplest form $\frac{4}{3-2y}-\frac{5}{y+3}$.

Answer ..... [2]

---

7 **(a)** A map has a scale of 1 : 2 500 000.
The distance between Singapore and Phuket is 1314 km.
Calculate the distance, in centimetres, between Singapore and Phuket on the map.

Answer .....cm [2]

(b) When a ball is dropped, the distance, d metres, it falls is directly proportional to the square of the time, t seconds, from when the ball is released.
The distance from which the ball is dropped is increased by 44%.
Calculate the percentage change in the time taken for the ball to reach the ground.

Answer ..... % [2]

---

8 Simplify $\frac{x^2-9}{3x^2-9x}$.

Answer ..... [3]

---

9 Factorise $6x^2y^2 + xy - 3x^2y - 2xy^2$.

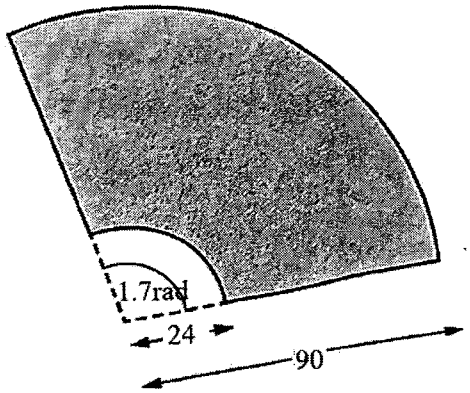
Answer ..... [3]

---

10 Five positive integers have a mean of 6, a median of 7 and a mode of 10.
Find the five numbers.

Answer ....., ..., ..., ..., ... [2]

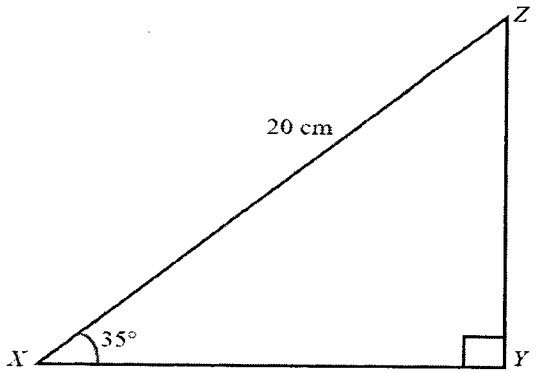
11



Calculate the perimeter of the shaded area.
All lengths are in centimetres.

Answer ..... cm [2]

12



X, Y and Z are three points on horizontal ground.
Angle $ZXY = 35°$, angle $XYZ = 90°$ and $XZ = 20$ cm.

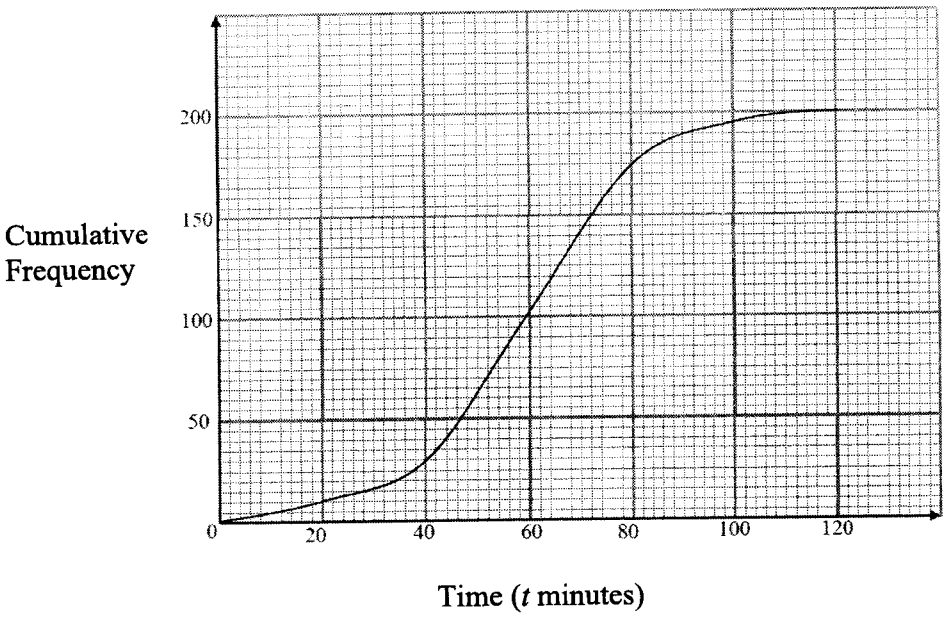
(a) Calculate the distance YZ.

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

(b) Calculate the area of triangle XYZ.

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

13 A group of 200 people estimated the time, t minutes, they spent at an exhibition. The cumulative frequency diagram represents their estimates.



(a) Use the diagram to find the estimated interquartile range of the estimated times.

Answer .....minutes [2]

(b) One of these people is chosen at random.

The probability that the person's estimate is greater than t minutes is $\frac{4}{5}$.

Find the value of t.

Answer $t =$ ..... [2]

14 $n = \dfrac{m\left(x - y^2\right)}{p}$, where $p \neq 0$.

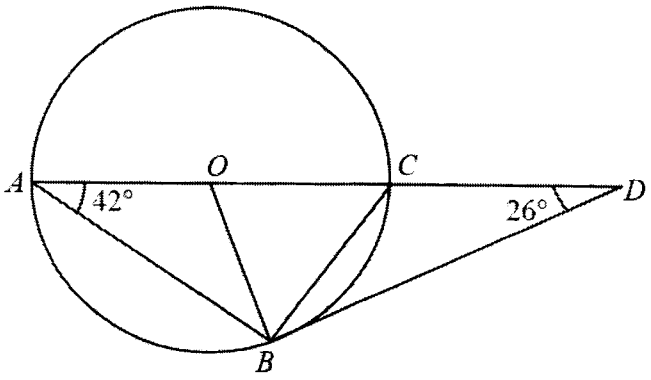
(a) Find n when $m = 14$, $p = 9$, $x = 2$ and $y = -3$.

Answer $n =$ ..... [1]

(b) Rearrange the formula to make y the subject.

Answer $y =$ ..... [3]

15



A, B and C are points on a circle, centre O.
ACD is a straight line, angle $BDC = 26°$ and angle $BAO = 42°$.

(a) Find angle OBC.
Give a reason for each step of your working.

.....

.....

..... [2]

(b) Explain why BD is **not** a tangent to the circle.

.....

.....

..... [2]

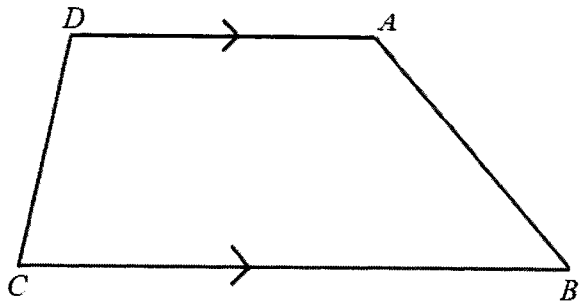
16 Solve these simultaneous equations.

$$3x+5y+8=0$$
$$4x+13y-2=0$$

You must show your working.

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

17



ABCD is a trapezium.
The ratio angle *CDA* : angle *DCB* : angle *CBA* = 18 : 6 : 2.
Find angle *DAB*.

Answer Angle *DAB* = ... [3]

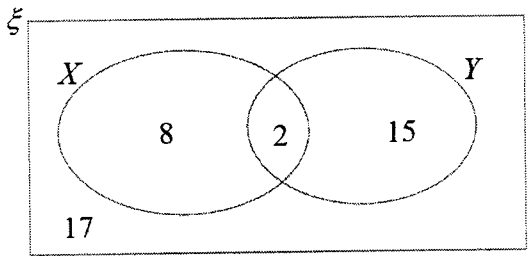
---

18 Alice borrowed a sum of money from the bank which charges a compound interest of 3.5% per annum, compounded quarterly.
Given that Alice had to pay \$67.30 in interest at the end of the first year, find the original sum of money borrowed, giving your answer correct to the nearest dollar.

Answer \$ ..... [3]

---

19 The Venn diagram shows the universal set and the number of elements in each of its subsets.



Find the value of

(a) $\mathrm{n}\left(X' \cap Y\right)'$,

Answer ..... [1]

(b) $\mathrm{n}\left(\left(X' \cup Y\right) \cap \left(X \cup Y\right)'\right)$.

Answer ..... [1]

---

20 **(a)** Write 0.0000000357 in standard form.

Answer ..... [1]

(b) Write 5.7×10^{97} in the form $A\times10^{98}$.

Answer ..... [1]

(c) **Hence** work out $\left(100.2\times10^{98}\right)-\left(5.7\times10^{97}\right)$.
Give your answer in standard form.

Answer ..... [1]

---

21 x is a number between 200 and 300.
The highest common factor of x and 126 is 21.
Find the smallest possible value of x.

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

22

$$\sin\left(\frac{1}{2}x^\circ\right)=0.961$$

Find two possible values of x in the range $0\le x\le360$.

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

---

23 12 24 8 21 28 17 $2p$ $4p^2$

The list shows information about the number of text messages Mei received each day for 8 days.
The total number of text messages is 140.

(a) Show that $p = 2.5$.

Answer

[3]

(b) The standard deviation for Mei's data is 7.89.

For the same 8 days, Mei's brother also received some text messages.
For his data, the mean is 19 and the standard deviation 8.51.

Make two comparisons between the distributions for the number of text messages received by Mei and her brother.

1. .....

.....

.....

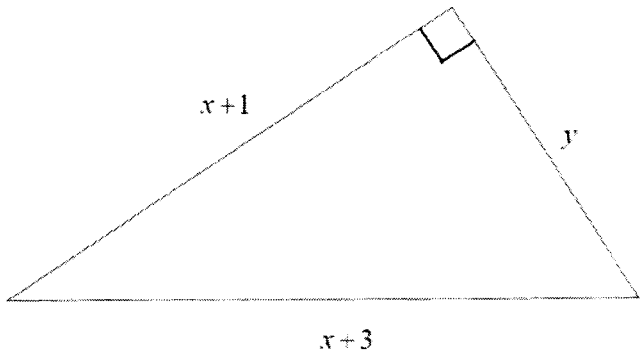
2. .....

.....

.....

[2]

24



The right-angled triangle has sides $(x+1)$, $(x+3)$ and y where x and y are integers.

(a) Show that y is an even number.
Answer

[4]

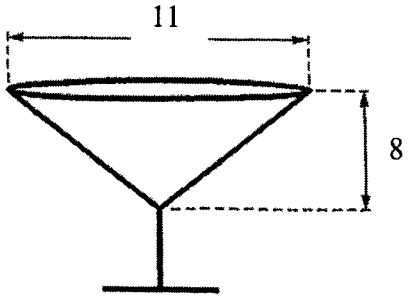
(b) Find a possible value of y and the corresponding value of x.

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

25 Solve the equation $a^2 + 17a - 30 = 0$ by completing the square.
Give your solutions correct to 2 decimal places.

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

26



A glass in the shape of a cone on a stem is filled to the brim with water.
The diameter of the top of the glass is 11 cm.
The height of the cone is 8 cm.
The thickness of the glass is negligible.

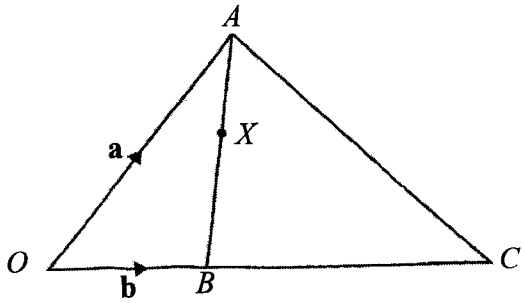
(a) Calculate the curved surface area of the inside of the glass.

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

(b) Ethan pours 40% of the water in this glass into a second glass.
The second glass is in the shape of a cylinder.
The depth of water in the cylindrical glass is 2.5 cm.
Calculate the diameter of the cylindrical glass.

Answer ..... cm [4]

27



OAC is a triangle and B is a point on OC.
$\overrightarrow{OA} = \mathbf{a}$, $\overrightarrow{OB} = \mathbf{b}$ and $OB : BC = 2 : 3$.
X is the point on AB such that $AX : XB = 1 : 2$.

(a) Express $\overrightarrow{AC}$ in terms of **a** and **b**, as simply as possible.

Answer $\overrightarrow{AC}$ = ... [2]

(b) Express $\overrightarrow{XB}$ in terms of **a** and **b**, as simply as possible.

Answer $\overrightarrow{XB}$ = ... [2]

(c) Y is the point on OC such that $AXYC$ is a trapezium.
Find, in terms of **a** and **b**, $\overrightarrow{XY}$.

Answer $\overrightarrow{XY}$ = ... [2]

END OF PAPER
Setter: Low SG

AHMAD IBRAHIM SECONDARY SCHOOL
GCE O-LEVEL PRELIMINARY EXAMINATION 2025

SECONDARY 4 EXPRESS / 5 NORMAL ACADEMIC

Name:	Class:	Register No.:

MATHEMATICS
Paper 2

4052/02
7 August 2025
2 hours 15 minutes

Candidates answer on the Question Paper.

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 staples, paper clips, glue or correction fluid.

Answer **all** questions.
If working is needed for any questions 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.

At the end of the examination, fasten all your work securely together.
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 90.

For Examiner's Use
/ 90

This document consists of **21** printed pages.

Mathematical Formulae

Compound Interest

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

Mensuration

Curved surface area of a cone $= \pi rl$

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

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

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

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

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

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

Trigonometry

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

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

Statistics

$$\text{Mean} = \frac{\Sigma fx}{\Sigma f}$$

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

Answer **all** the questions.

1 **(a)** Find all the prime numbers that will satisfy the inequality $-5 \leq 2x-1 < x+3$.

Answer ..... [3]

(b) Simplify $\frac{30x^2y^2}{11z} \div \frac{25xz^3}{22y}$.

Answer ..... [3]

(c) Simplify $\left(\frac{p^{12}}{81q^{16}}\right)^{-\frac{3}{4}}$.

Answer ..... [2]

(d) Solve $\frac{x}{x-1}+2=\frac{4}{2-x}$.

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

---

2 **(a)** The position vector of A is $\begin{pmatrix} -1 \\ 4 \end{pmatrix}$.

$\overrightarrow{AB} = \begin{pmatrix} -3 \\ 5 \end{pmatrix}$.

(i) Find the coordinates of B.

Answer (....., ...) [1]

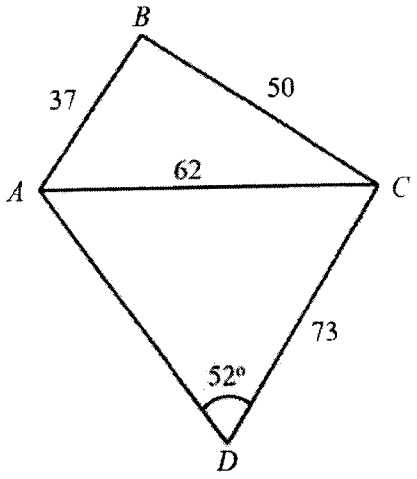
(ii) Find the equation of line AB.

Answer ..... [2]

(b) C is the point $(-2, 5)$.
D is a point that lies on the line $x = 3$.
The length of CD is 13 units.
Find the two possible pairs of coordinates of D.

Answer (....., ...) and (....., ...) [3]

3



Points A, B, C and D are on horizontal ground.
$AB = 37$ m, $BC = 50$ m, $AC = 62$ and $CD = 73$ m.
Angle $ADC = 52°$.

A is due west of C.

(a) Find angle ABC.

Answer ..... °[3]

(b) The bearing of E from C is 124°.
Find the bearing of C from E.

Answer ..... °[1]

[Turn Over

(c) Find the bearing of D from A.

Answer ..... °[3]

(d) Point C is the base of a vertical flagpole CF.
The angle of elevation of F from B is 8°.

Calculate the angle of elevation of F from D.

Answer ..... °[3]

4 Jennie travels from Town A to Town B at a speed of x km/h.
The journey takes 1 hour.
She then spends 30 minutes having her lunch in Town B, before setting off to Town C, which takes x minutes at $(x - 20)$ km/h.

The total distance of the journey is 120 km.

(a) Show that $x^2 + 40x - 7200 = 0$.

Answer

[3]

(b) Solve the equation $x^2 + 40x - 7200 = 0$.

Given your solutions correct to 2 decimal places.

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

[Turn Over

(c) Explain why one of the solutions in **part (b)** must be rejected.

.....

..... [1]

(d) Calculate the difference between the times Jennie spent driving from Town *A* to Town *B* and from Town *B* to Town *C*.

Give your answer in minutes and seconds, correct to the nearest second.

Answer ..... minutes ..... seconds [1]

(e) Calculate Jennie's average speed for the entire journey.

Answer ..... km/h [3]

5 **(a)** There are 25 students in a class.
The table shows the distribution of the heights of these students.

Height (x cm)	Frequency
$140 < x \leq 150$	3
$150 < x \leq 160$	10
$160 < x \leq 170$	7
$170 < x \leq 180$	4
$180 < x \leq 190$	1

(i) Find the interval that contains the median height.

Answer ..... $< x \leq$ ..... [1]

(ii) Calculate an estimate of the mean height.

Answer ..... cm [1]

(iii) State an estimate of the standard deviation of the heights.

Answer ..... cm [1]

[Turn Over

(iv) Explain why the mean height and standard deviations in **part (ii)** and **part (iii)** are estimates.

.....

..... [1]

(v) Five students have transferred out of the class.
The estimated mean height of the students in the class is now 163 cm.

Explain what this tells you about the mean heights of the five students who transferred out.

.....

..... [1]

(b) A bag contains 5 red, 7 blue and 3 yellow identical balls.

(i) One ball is selected at random.

Find the probability that it is a yellow ball.

Answer ..... [1]

(ii) Two balls are selected at random without replacement.

Find the probability that both balls are of different colours.

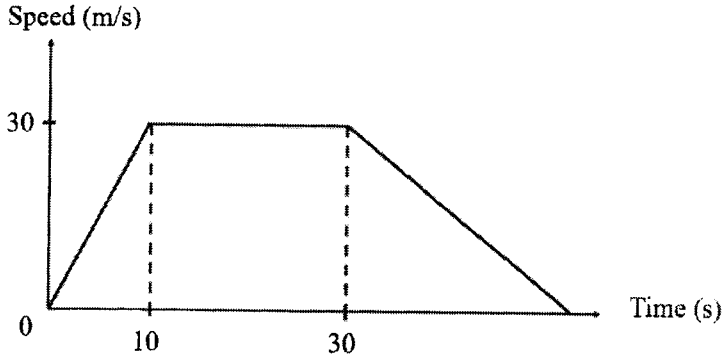
Answer ..... [2]

(iii) Three balls are selected at random, with replacement.

Find the probability that two red balls and one blue ball are chosen.

Answer ..... [3]

6 The diagram shows the speed-time graph of a train.



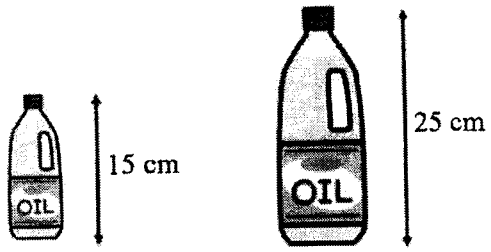
(a) Find the acceleration of the train in the first 10 seconds.

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

(b) Given that the train decelerates at a rate of 2 m/s^2, find the total distance travelled by the train.

Answer ..... m [3]

7 (a)



The diagram shows two geometrically similar bottles, containing cooking oil.
The height of the smaller bottle is 15 cm.
The height of the larger bottle is 25 cm.

(i) The diameter of the base of the larger bottle is 10 cm.
Calculate the diameter of the base of the smaller bottle.

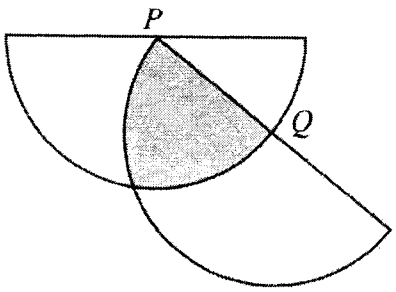
Answer ..... cm [2]

(ii) The smaller bottle has a capacity of 400 ml.
The manufacturer makes another geometrically similar bottle that holds 1.2 litres.
Calculate the height of this bottle.

Answer ..... cm [2]

[Turn Over

(b) Two congruent semicircles with radius 4 cm and centres P and Q overlap as shown below.



Calculate the area of the shaded region.

Answer ..... cm^2 [5]

8 A bakery makes cakes.
The bakery operates for 6 days each week.
The matrix, **M**, shows the number of cakes of different types that are made each day.

$$\mathbf{M} = \begin{array}{c} \begin{matrix} \text{Small} & \text{Medium} & \text{Large} \end{matrix} \\ \begin{pmatrix} 8 & 5 & 2 \\ 6 & 4 & 3 \end{pmatrix} \end{array} \begin{matrix} \\ \text{Chocolate} \\ \text{Blackforest} \end{matrix}$$

(a) Evaluate the matrix $\mathbf{P} = 6\mathbf{M}$.

Answer $\mathbf{P} =$ [1]

(b) Small cakes cost \$10 to make.
Medium cakes cost \$15 to make.
Large cakes cost \$20 to make.
Represent these amounts in a 3×1 matrix **N**.

Answer $\mathbf{N} =$ [1]

(c) Evaluate the matrix $\mathbf{T} = \mathbf{PN}$.

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

[Turn Over

(d) State what each of the elements of **T** represents.

.....

..... [1]

(e) The bakery sells each cake for 70% more than it costs to make.
One week they sold $\frac{2}{3}$ of each size of the chocolate cakes and $\frac{5}{6}$ of each size of the blackforest cakes made that week.
The unsold cakes were given away.

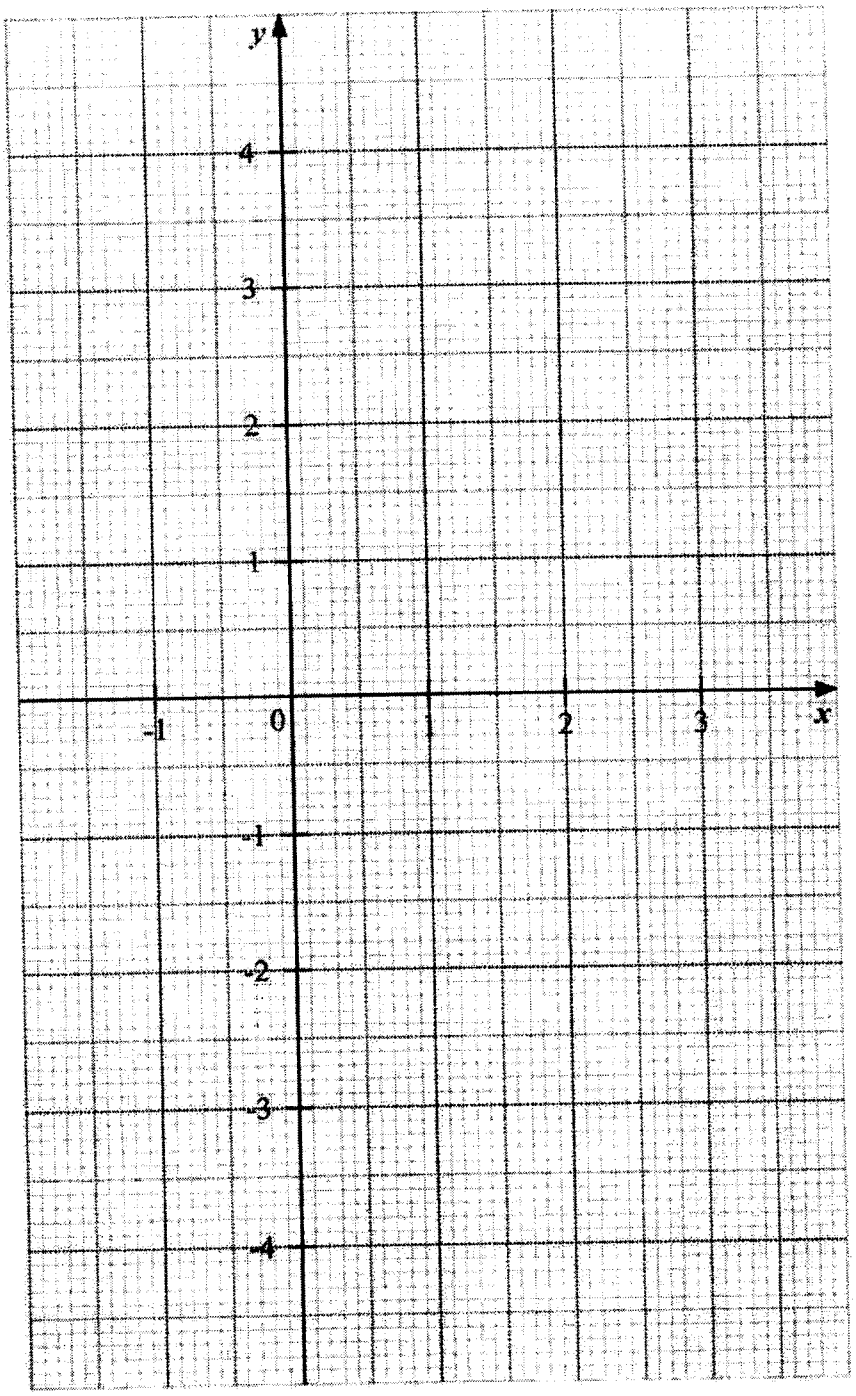
Calculate the total amount of profit the bakery made that week.

Answer $ ..... [4]

9 **(a)** Complete the table of values for $y = 3x^2 - x^3 - 1$. [1]

x	–1	0	1	1.5	2	2.5	3
y	3		1	2.4	3	2.1	

(b) On the grid, draw the graph of $y = 3x^2 - x^3 - 1$ for $-1 \leq x \leq 3$. [3]



(c) By drawing a tangent, find the gradient of the graph when $x = 1$.

Answer ..... [2]

(d) Using your graph, solve $3 - x = \frac{1}{x^2} - \frac{1}{x}$.

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

10 A new 52-level private condominium, with units starting from the first level, has just been launched.

The sale price of a unit depends on the floor area and the level the unit is on.

The price of each similar unit increases by a specific amount per level.

Below is some information of the different types of units available.

Type of unit	2-room	3-room	4-room	5-room
Number of toilets	1	2	2	2
Floor area (m^2)	40	60	90	110
Price per square feet ($/feet^2)	890	990	1100	1300
Increase in price per level ($)	13 000	16 000	19 000	22 000

(a) Given that 1 m = 3.28 feet, show that the floor area of a 3-room unit is 646 square feet, correct to 3 significant figures.

Answer [2]

(b) Calculate the sale price of a 3-room unit on the first level.

Answer $ ..... [1]

[Turn Over

Lisa is planning to buy a 3-room unit.

To purchase the unit, she decides to pay 45% of the price of the unit and take a housing loan from the bank to pay the remaining amount by monthly instalments.

The bank charges a simple interest rate of 3% per year for 25 years.

Lisa has a gross monthly salary of $7500, and she does not plan to spend more than 30% of her gross monthly salary to pay for the monthly instalment.

(c) Suggest the maximum level that Lisa can afford to purchase.

Justify the decisions you make and show your calculations clearly.

Answer

[7]

End of Paper

Setter: Miss Melody Ho