Extended Mathematics
Topic : Number
Year :May 2013 -May 2024
Paper - 4
Questions Booklet

Question 1

(a) Ali and Ben receive a sum of money.
They share it in the ratio 5 : 1.
Ali receives $2345.

Calculate the total amount.

Answer(a) $ ..... [2]

(b) Ali uses 11% of his $2345 to buy a television.

Calculate the cost of the television.

Answer(b) $ ..... [2]

Continue on the next page……

(c) A different television costs $330.

(i) Ben buys one in a sale when this cost is reduced by 15%.

How much does Ben pay?

Answer(c)(i) $ ..... [2]

(ii) $330 is 12% less than the cost last year.

Calculate the cost last year.

Answer(c)(ii) $ ..... [3]

Continue on the next page……

(d) Ali invests \$1500 of his share in a bank account.
The account pays compound interest at a rate of 2.3% per year.

Calculate the total amount in the account at the end of 3 years.

Answer(d) \$ ..... [3]

(e) Ali also buys a computer for \$325.
He later sells this computer for \$250.

Calculate Ali's percentage loss.

Answer(e) ..... % [3]

Question 2

$1^2 = 1$

$1^2 + 2^2 = 5$

$1^2 + 2^2 + 3^2 = 14$

$1^2 + 2^2 + 3^2 + 4^2 = 30$

$1^2 + 2^2 + 3^2 + 4^2 + \ldots\ldots\ldots\ldots + n^2 = an^3 + bn^2 + \frac{n}{6}$

Work out the values of a and b.

Answer(b) $a =$ .....

$b =$ ..... [6]

Question 3

A tennis club has 560 members.

(a) The ratio men : women : children = 5 : 6 : 3.

(i) Show that the club has 240 women members.

Answer(a)(i)

[2]

(ii) How many members are children?

Answer(a)(ii) ..... [1]

(b) $\frac{5}{8}$ of the 240 women members play in a tournament.

How many women members do **not** play in the tournament?

Answer(b) ..... [2]

Continue on the next page……

(c) The annual membership fee in 2013 is \$198 for each adult and \$75 for each child.

(i) Calculate the total amount the 560 members pay in 2013.

Answer(c)(i) \$ ..... [2]

(ii) The adult fee of \$198 in 2013 is 5.6% more than the fee in 2012.

Calculate the adult fee in 2012.

Answer(c)(ii) \$ ..... [3]

Continue on the next page……

(d) The club buys 36 tennis balls for \$9.50 and sells them to members for \$0.75 each.

Calculate the percentage profit the club makes.

Answer(d) ..... % [3]

(e) A tennis court is a rectangle with length 23.7 m and width 10.9 m, each correct to 1 decimal place.

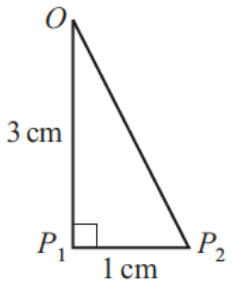
Calculate the upper and lower bounds of the perimeter of the court.

Answer(e) Upper bound ..... m

Lower bound ..... m [3]

Question 4

Sidney draws the triangle OP_1P_2.
$OP_1 = 3$ cm and $P_1P_2 = 1$ cm.
Angle $OP_1P_2 = 90°$.



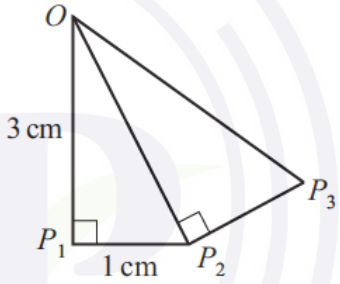
NOT TO SCALE

(a) Show that $OP_2 = \sqrt{10}$ cm.

Answer(a)

[1]

(b) Sidney now draws the lines P_2P_3 and OP_3.
Triangle OP_2P_3 is mathematically similar to triangle OP_1P_2.



NOT TO SCALE

(i) Write down the length of P_2P_3 in the form $\frac{\sqrt{a}}{b}$ where a and b are integers.

Answer(b)(i) $P_2P_3 =$ ..... cm [1]

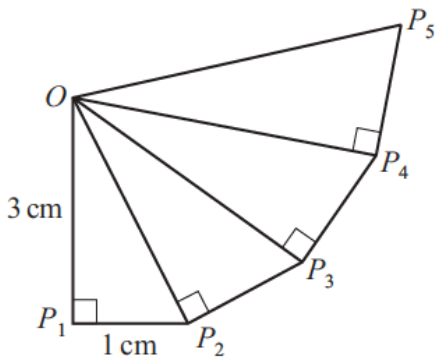
(ii) Calculate the length of OP_3 giving your answer in the form $\frac{c}{d}$ where c and d are integers.

Answer(b)(ii) $OP_3 =$ ..... cm [2]

Continue on the next page……

(c) Sidney continues to add mathematically similar triangles to his drawing.

Find the length of OP_5.



NOT TO SCALE

Answer(c) OP_5 = ... cm [2]

Continue on the next page……

(d) (i) Show that angle $P_1OP_2 = 18.4°$, correct to 1 decimal place.

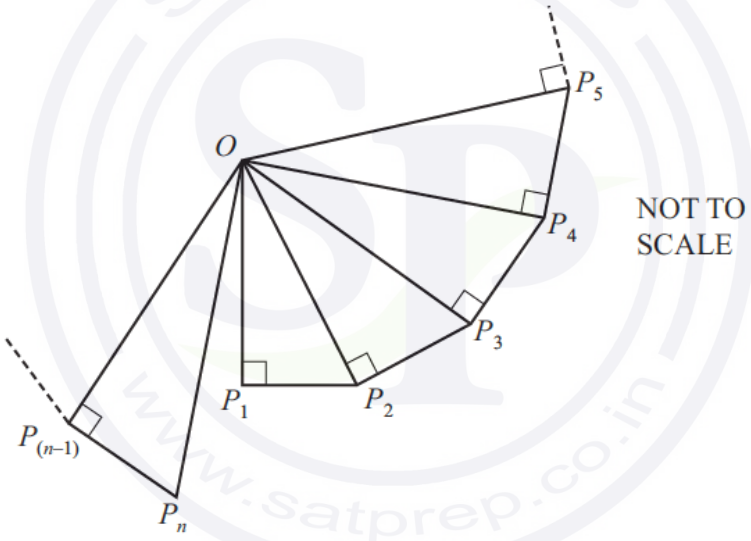
Answer(d)(i)

[2]

(ii) Write down the size of angle P_2OP_3.

Answer(d)(ii) Angle P_2OP_3 = ... [1]

(iii) The last triangle Sidney can draw without covering his first triangle is triangle $OP_{(n-1)}P_n$.



Calculate the value of n.

Answer(d)(iii) n = ... [3]

Question 5

(a) One day, Maria took 27 minutes to walk 1.8 km to school.
She left home at 07 48.

(i) Write down the time Maria arrived at school.

Answer(a)(i) ..... [1]

(ii) Show that Maria's average walking speed was 4 km/h.

Answer(a)(ii)

[2]

(b) Another day, Maria cycled the 1.8 km to school at an average speed of 15 km/h.

(i) Calculate the percentage **increase** that 15 km/h is on Maria's walking speed of 4 km/h.

Answer(b)(i) ..... % [3]

Continue on the next page……

(ii) Calculate the percentage **decrease** that Maria's cycling time is on her walking time of 27 minutes.

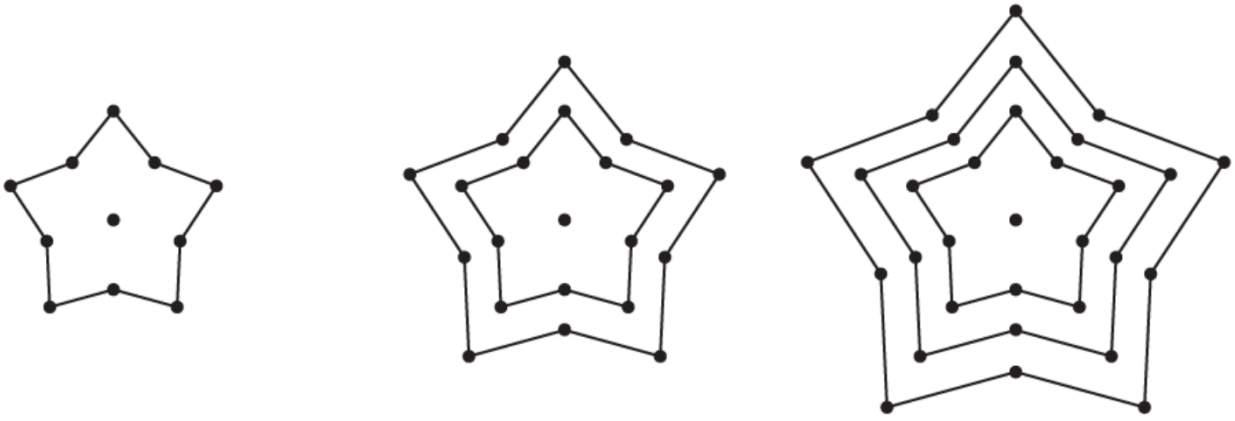
Answer(b)(ii) ..... % [3]

(iii) After school, Maria cycled to her friend's home.
This took 9 minutes, which was 36% of the time Maria takes to walk to her friend's home.

Calculate the time Maria takes to walk to her friend's home.

Answer(b)(iii) ..... min [2]

Question 6



Star 1 Star 2 Star 3

The diagrams show a sequence of stars made of lines and dots.

(a) Complete the table for Star 5, Star 7 and Star n.

	Star 1	Star 2	Star 3	Star 4	Star 5		Star 7		Star n
Number of lines	10	20	30	40					
Number of dots	11	21	31	41					

[4]

Continue on the next page……

(b) The sums of the number of dots in two consecutive stars are shown in the table.

Star 1 and Star 2	Star 2 and Star 3	Star 3 and Star 4
32	52	72

Find the sum of the number of dots in

(i) Star 10 and Star 11,

Answer(b)(i) ..... [1]

(ii) Star n and Star $(n + 1)$,

Answer(b)(ii) ..... [1]

(iii) Star $(n + 7)$ and Star $(n + 8)$.

Answer(b)(iii) ..... [1]

Continue on the next page…

(c) The **total number of dots** in the first n stars is given by the expression $5n^2 + 6n$.

(i) Show that this expression is correct when $n = 3$.

Answer(c)(i)

[2]

(ii) Find the total number of dots in the first 10 stars.

Answer(c)(ii) ..... [1]

(d) The total number of dots in the first n stars is $5n^2 + 6n$.
The number of dots in the $(n + 1)$th star is $10(n + 1) + 1$.

Add these two expressions to show that the total number of dots in the first $(n + 1)$ stars is

Add these two expressions to show that the total number of dots in the first $(n + 1)$ stars is

$$5(n + 1)^2 + 6(n + 1) .$$

You must show each step of your working.

Answer(d)

[4]

Question 7

(a) **(i)** In a camera magazine, 63 pages are used for adverts.
The ratio number of pages of adverts : number of pages of reviews = 7 : 5 .

Calculate the number of pages used for reviews.

Answer(a)(i) ..... [2]

(ii) In another copy of the magazine, 56 pages are used for reviews and for photographs.
The ratio number of pages of reviews : number of pages of photographs = 9 : 5 .

Calculate the number of pages used for photographs.

Answer(a)(ii) ..... [2]

(iii) One copy of the magazine costs \$4.90 .
An annual subscription costs \$48.80 for 13 copies.

Calculate the percentage discount by having an annual subscription.

Answer(a)(iii) ..... % [3]

Continue on the next page……

(b) In a car magazine, 25% of the pages are used for selling second-hand cars, $62\frac{1}{2}$% of the **remaining** pages are used for features, and the other 36 pages are used for reviews.

Work out the total number of pages in the magazine.

Answer(b) ..... [4]

Question 8

The first four diagrams in a sequence are shown below.

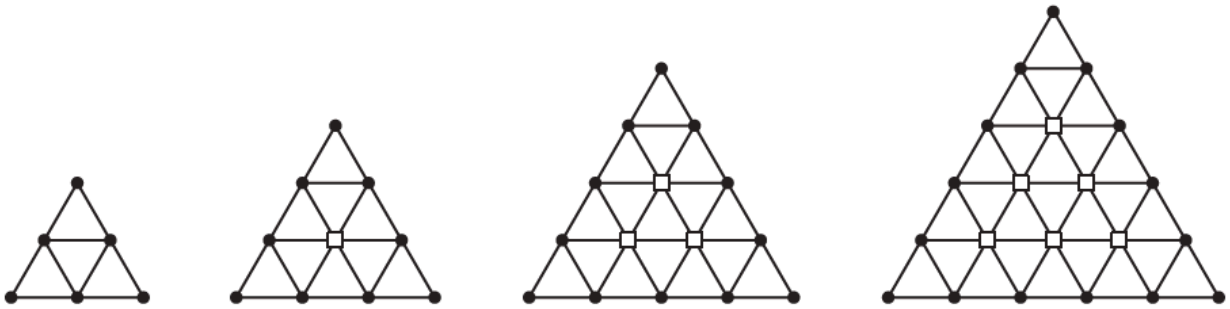


Diagram 1 Diagram 2 Diagram 3 Diagram 4

The diagrams are made from dots (●) and squares (□) joined by lines.

(a) Complete the table.

Diagram	1	2	3	4	5	n
Number of dots	6	9	12			
Number of squares	0	1	3			$\frac{1}{2}n(n-1)$
Number of triangles	4	9	16			
Number of lines	9	18	30	45	63	$\frac{3}{2}(n+1)(n+2)$

[9]

(b) Which diagram has 360 lines?

Answer(b) ..... [2]

Continue on the next page……

(c) The **total** number of lines in the first n diagrams is

$$\frac{1}{2}n^3 + pn^2 + qn.$$

(i) When $n = 1$, show that $p + q = 8\frac{1}{2}$.

Answer(c)(i)

[1]

(ii) By choosing another value of n and using the equation in **part (c)(i)**, find the values of p and q.

Answer(c)(ii) $p =$ .....

$q =$ ..... [5]

Question 9

Last year Mukthar earned $18 900 .
He did not pay tax on $5500 of his earnings.
He paid 24% tax on his remaining earnings.

(a) (i) Calculate how much tax Mukthar paid last year.

Answer(a)(i) $ ..... [2]

(ii) Calculate how much Mukthar earned each month after tax had been paid.

Answer(a)(ii) $ ..... [2]

(b) This year Mukthar now earns $19 750.50 .

Calculate the percentage increase from $18 900.

Answer(b) ..... % [2]

Continue on the next page……

(c) Mukthar has \$1500 to invest in one of the following ways.

- **Account A** paying **simple** interest at a rate of 4.1% per year
- **Account B** paying **compound** interest at a rate of 3.3% per year

Which account will be worth more after **3 years** and by how much?

Answer(c) Account ..... by \$ ..... [5]

Question 10

Noma flies from Johannesburg to Hong Kong.
Her plane leaves Johannesburg at 18 45 and arrives in Hong Kong 13 hours and 25 minutes later.
The local time in Hong Kong is 6 hours ahead of the time in Johannesburg.

(a) At what time does Noma arrive in Hong Kong?

Answer(a) ..... [2]

(b) Noma sleeps for part of the journey.
The time that she spends sleeping is given by the ratio

$$\text{sleeping} : \text{awake} = 3 : 4 .$$

Calculate how long Noma sleeps during the journey.
Give your answer in hours and minutes.

Answer(b) ..... h ..... min [2]

Continue on the next page…

(c) **(i)** The distance from Hong Kong to Johannesburg is 10 712 km.
The time taken for the journey is 13 hours and 25 minutes.

Calculate the average speed of the plane for this journey.

Answer(c)(i) ..... km/h [2]

(ii) The plane uses fuel at the rate of 1 litre for every 59 metres travelled.

Calculate the number of litres of fuel used for the journey from Johannesburg to Hong Kong.
Give your answer in standard form.

Answer(c)(ii) ..... litres [4]

(d) The cost of Noma's journey is 10 148 South African Rand (R).
This is an increase of 18% on the cost of the journey one year ago.

Calculate the cost of the same journey one year ago.

Answer(d) R ..... [3]

Question 11

Complete the table for the following sequences.
The first row has been completed for you.

	Sequence				Next two terms		*n*th term	
	1	5	9	13	17	21	$4n - 3$	
(a)	12	21	30	39				[3]
(b)	80	74	68	62				[3]
(c)	1	8	27	64				[2]
(d)	2	10	30	68				[2]

Question 12

David sells fruit at the market.

(a) In one week, David sells 120 kg of tomatoes and 80 kg of grapes.

(i) Write 80 kg as a fraction of the total mass of tomatoes and grapes.
Give your answer in its lowest terms.

Answer(a)(i) ..... [1]

(ii) Write down the ratio mass of tomatoes : mass of grapes.
Give your answer in its simplest form.

Answer(a)(ii) ..... : ..... [1]

(b) **(i)** One day he sells 28 kg of oranges at \$1.56 per kilogram.
He also sells 35 kg of apples.
The total he receives from selling the oranges and the apples is \$86.38 .

Calculate the price of 1 kilogram of apples.

Answer(b)(i) \$ ..... [2]

(ii) The price of 1 kilogram of oranges is \$1.56 .
This is 20% more than the price two weeks ago.

Calculate the price two weeks ago.

Answer(b)(ii) \$ ..... [3]

(c) On another day, David received a total of \$667 from all the fruit he sold.
The cost of the fruit was \$314.20 .
David worked for $10\frac{1}{2}$ hours on this day.

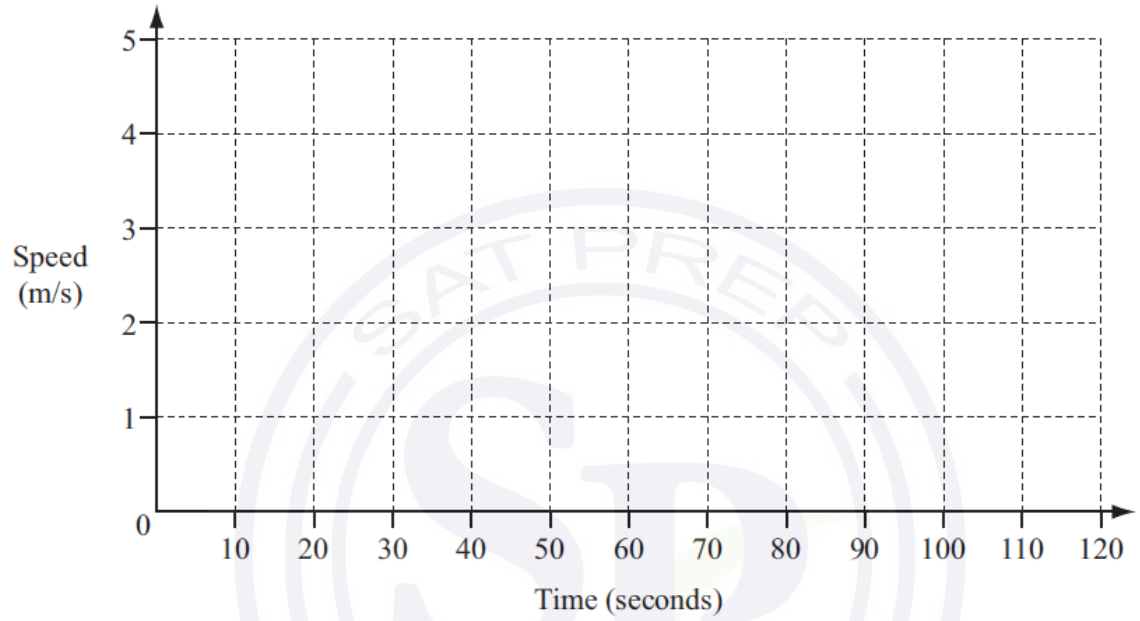
Calculate David's rate of profit in dollars per hour.

Answer(c) ..... dollars/h [2]

Question 13

Emily cycles along a path for 2 minutes.
She starts from rest and accelerates at a constant rate until she reaches a speed of 5 m/s after 40 seconds.
She continues cycling at 5 m/s for 60 seconds.
She then decelerates at a constant rate until she stops after a further 20 seconds.

(a) On the grid, draw a speed-time graph to show Emily's journey.



[2]

(b) Find Emily's acceleration.

Answer(b) ..... m/s^2 [1]

(c) Calculate Emily's average speed for the journey.

Answer(c) ..... m/s [4]

Question 14

(a)

$1 = 1$

$1 + 2 = 3$

$1 + 2 + 3 = 6$

$1 + 2 + 3 + 4 = 10$

(i) Write down the next line of this pattern.

Answer(a)(i) ..... [1]

(ii) The sum of the first n integers is $\frac{n}{k}(n + 1)$.

Show that $k = 2$.

Answer(a)(ii)

[2]

(iii) Find the sum of the first 60 integers.

Answer(a)(iii) ..... [1]

(iv) Find n when the sum of the first n integers is 465.

Answer(a)(iv) $n =$ ..... [2]

Continue on the next ….

(v) $1 + 2 + 3 + 4 + \ldots\ldots + x = \dfrac{(n-8)(n-7)}{2}$

Write x in terms of n.

Answer(a)(v) $x =$ ..... [1]

(b)

$1^3 = 1$

$1^3 + 2^3 = 9$

$1^3 + 2^3 + 3^3 = 36$

$1^3 + 2^3 + 3^3 + 4^3 = 100$

(i) Complete the statement.

$1^3 + 2^3 + 3^3 + 4^3 + 5^3 =$ ..... $=$ (.....)^2 [2]

(ii) The sum of the first n integers is $\frac{n}{2}(n+1)$.

Find an expression, in terms of n, for the sum of the first n cubes.

Answer(b)(ii) ..... [1]

(iii) Find the sum of the first 19 cubes.

Answer(b)(iii) ..... [2]

Question 15

In July, a supermarket sold 45 981 bottles of fruit juice.

(a) The cost of a bottle of fruit juice was \$1.35 .

Calculate the amount received from the sale of the 45 981 bottles.
Give your answer correct to the nearest hundred dollars.

Answer(a) \$ ..... [2]

(b) The number of bottles sold in July was 17% more than the number sold in January.

Calculate the number of bottles sold in January.

Answer(b) ..... [3]

(c) There were 3 different flavours of fruit juice.
The number of bottles sold in each flavour was in the ratio apple : orange : cherry = 3 : 4 : 2.
The total number of bottles sold was 45 981.

Calculate the number of bottles of orange juice sold.

Answer(c) ..... [2]

Continue on the next ….

(d) One bottle contains 1.5 litres of fruit juice.

Calculate the number of 330 ml glasses that can be filled completely from one bottle.

Answer(d) ..... [3]

(e) $\frac{5}{9}$ of the 45 981 bottles are recycled.

Calculate the number of bottles that are recycled.

Answer(e) ..... [2]

Question 16

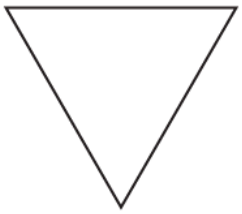


Diagram 1

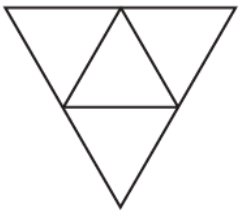


Diagram 2

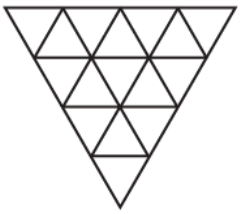


Diagram 3

The first three diagrams in a sequence are shown above.
Diagram 1 shows an equilateral triangle with sides of length 1 unit.

In Diagram 2, there are 4 triangles with sides of length $\frac{1}{2}$ unit.

In Diagram 3, there are 16 triangles with sides of length $\frac{1}{4}$ unit.

(a) Complete this table for Diagrams 4, 5, 6 and n.

	Diagram 1	Diagram 2	Diagram 3	Diagram 4	Diagram 5	Diagram 6		Diagram n
Length of side	1	$\frac{1}{2}$	$\frac{1}{4}$					
Length of side as a power of 2	2^0	2^{-1}	2^{-2}					

[6]

(b) **(i)** Complete this table for the number of the smallest triangles in Diagrams 4, 5 and 6.

	Diagram 1	Diagram 2	Diagram 3	Diagram 4	Diagram 5	Diagram 6
Number of smallest triangles	1	4	16			
Number of smallest triangles as a power of 2	2^0	2^2	2^4			

[2]

(ii) Find the number of the smallest triangles in Diagram n, giving your answer as a power of 2.

Answer(b)(ii) ..... [1]

(c) Calculate the number of the smallest triangles in the diagram where the smallest triangles have sides of length $\frac{1}{128}$ unit.

Answer(c) ..... [2]

Question 17

Jane and Kate share \$240 in the ratio $5:7$.

(a) Show that Kate receives \$140.

Answer(a)

[2]

(b) Jane and Kate each spend \$20.

Find the new ratio Jane's remaining money : Kate's remaining money.
Give your answer in its simplest form.

Answer(b) ..... : ..... [2]

(c) Kate invests \$120 for 5 years at 4% per year simple interest.

Calculate the total amount Kate has after 5 years.

Answer(c) \$ ..... [3]

(d) Jane invests \$80 for 3 years at 4% per year compound interest.

Calculate the total amount Jane has after 3 years.
Give your answer correct to the nearest cent.

Answer(d) \$ ..... [3]

(e) An investment of \$200 for 2 years at 4% per year compound interest is the same as an investment of \$200 for 2 years at r% per year simple interest.

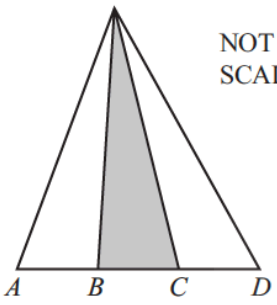
Find the value of r.

Answer(e) $r =$ ..... [3]

Question 18

11 The total area of each of the following shapes is X.
The area of the shaded part of each shape is kX.

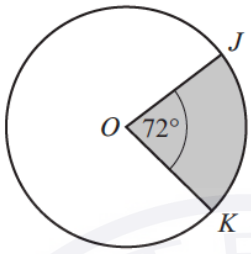
For each shape, find the value of k and write your answer below each diagram.



NOT TO SCALE

$AB = BC = CD$

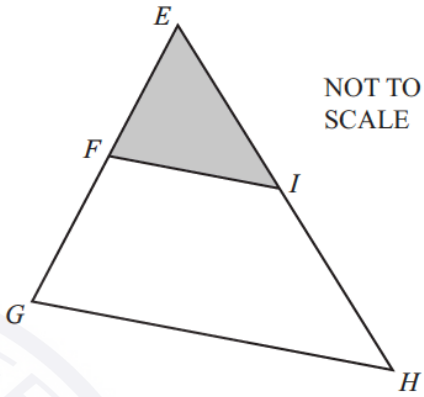
$k =$ .....



NOT TO SCALE

Angle $JOK = 72°$

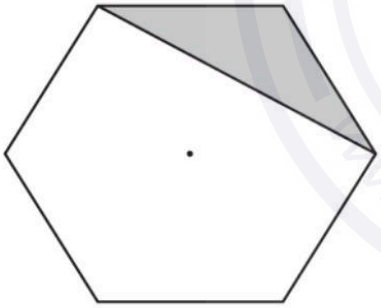
$k =$ .....



NOT TO SCALE

$EF = FG$ and $EI = IH$

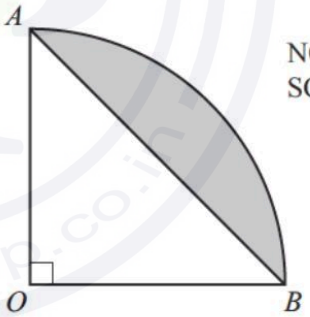
$k =$ .....



NOT TO SCALE

The shape is a regular hexagon.

$k =$ .....



NOT TO SCALE

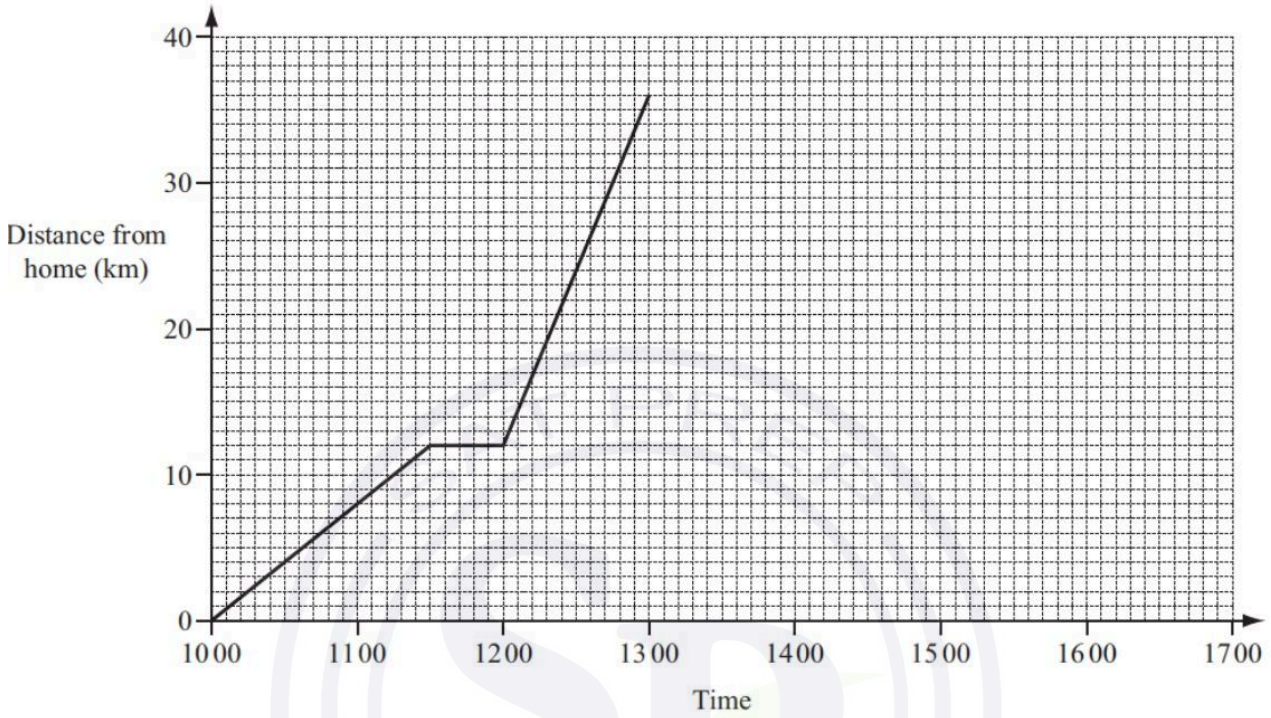
The diagram shows a sector of a circle centre O.
Angle $AOB = 90°$

$k =$ .....

[10]

Question 19

Ali leaves home at 1000 to cycle to his grandmother's house. He arrives at 1300.
The distance-time graph represents his journey.



(a) Calculate Ali's speed between 1000 and 1130.
Give your answer in kilometres per hour.

Answer(a) ..... km/h [2]

(b) Show that Ali's average speed for the whole journey to his grandmother's house is 12 km/h.

Answer(b)

[2]

(c) Change 12 kilometres per hour into metres per minute.

Answer(c) ..... m/min [2]

Continue on the next page…

(d) Ali stays for 45 minutes at his grandmother's house and then returns home.
He arrives home at 1642.

Complete the distance-time graph. [2]

Question 20

(a) The running costs for a papermill are $75 246.
This amount is divided in the ratio labour costs : materials = 5 : 1.

Calculate the labour costs.

Answer(a) $ ..... [2]

(b) In 2012 the company made a profit of $135 890.
In 2013 the profit was $150 675.

Calculate the percentage increase in the profit from 2012 to 2013.

Answer(b) ..... % [3]

(c) The profit of $135 890 in 2012 was an increase of 7% on the profit in 2011.

Calculate the profit in 2011.

Answer(c) $ ..... [3]

Question 21

There are three different areas, A, B and C, for seating in a theatre.
The numbers of seats in each area are in the ratio $A:B:C = 11:8:7$.
There are 920 seats in area B.

(a) **(i)** Show that there are 805 seats in area C.

Answer(a)(i)

[1]

(ii) Write the number of seats in area B as a percentage of the total number of seats.

Answer(a)(ii) ..... % [2]

(b) The cost of a ticket for a seat in each area of the theatre is shown in the table.

Area A	\$11.50
Area B	\$15
Area C	\$22.50

For a concert 80% of area B tickets were sold and $\frac{3}{5}$ of area C tickets were sold.
The total amount of money taken from ticket sales was \$35 834.

Calculate the number of area A tickets that were sold.

Answer(b) ..... [5]

Continue on the next page…

(c) The total ticket sales of $35 834 was 5% less than the ticket sales at the previous concert.

Calculate the ticket sales at the previous concert.

Answer(c) $..... [3]

Question 22

(a) Alfonso has \$75 to spend on the internet.
He spends some of the money on music, films and books.

(i) The money he spends on music, films and books is in the ratio

$$\text{music} : \text{films} : \text{books} = 5 : 3 : 7.$$

He spends \$16.50 on music.

Calculate the **total** amount he spends on music, films and books.

Answer(a)(i) \$ ..... [3]

(ii) Find this total amount as a percentage of the \$75.

Answer(a)(ii) ..... % [1]

(b) The download times for the music, films and books are in the ratio

$$\text{music} : \text{films} : \text{books} = 2 : 9 : 1.$$

The **total** download time is 3 hours and 33 minutes.

Calculate the download time for the films.
Give your answer in hours, minutes and seconds.

Answer(b) ..... hours ..... minutes ..... seconds [3]

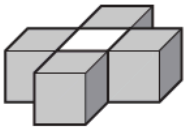
(c) The cost of \$16.50 for the music was a reduction of 12% on the original cost.

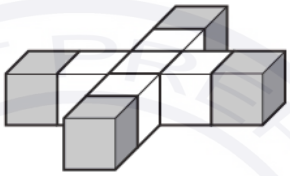
Calculate the original cost of the music.

Answer(c) \$..... [3]

Question 23

Layer 1 

Layer 2 

Layer 3 

The diagrams show layers of white and grey cubes.
Khadega places these layers on top of each other to make a tower.

(a) Complete the table for towers with 5 and 6 layers.

Number of layers	1	2	3	4	5	6
Total number of **white** cubes	0	1	6	15		
Total number of **grey** cubes	1	5	9	13		
Total number of cubes	1	6	15	28		

[4]

Continue on the next page..

(iii) Khadega has plenty of white cubes but only 200 grey cubes.
How many layers are there in the highest tower that she can build?

Answer(b)(iii) ..... [2]

(c) The expression for the **total** number of **white** cubes in a tower with n layers is $pn^2 + qn + 3$.

Find the value of p and the value of q.
Show all your working.

Answer(c) p = ...

q = ... [5]

(d) Find an expression, in terms of n, for the **total** number of cubes in a tower with n layers.
Give your answer in its simplest form.

Answer(d) ..... [2]

Question 24

Jaideep builds a house and sells it for $450 000.

(a) He pays a tax of 1.5% of the selling price of the house.

Show that he pays $6750 in tax.

Answer(a)

[1]

(b) $6750 is 12.5% more than the tax Jaideep paid on the first house he built.

Calculate the tax Jaideep paid on the first house he built.

Answer(b) $..... [3]

(c) The house is built on a rectangular plot of land, 21 m by 17 m, both correct to the nearest metre.

Calculate the upper bound for the area of the plot.

Answer(c) ..... m^2 [2]

Continue on the next page..

(d) On a plan of the house, the area of the kitchen is $5.6\,cm^2$.
The scale of the plan is 1:200.

Calculate the actual area of the kitchen in square metres.

Answer(d) ..... m^2 [2]

(e) The house was built using cuboid blocks each measuring 12 cm by 16 cm by 27 cm.

Calculate the volume of one block.

Answer(e) ..... cm^3 [2]

(f) Jaideep changes \$12 000 into euros (€) to buy land in another country.
The exchange rate is €1 = \$1.33 .

Calculate the number of euros Jaideep receives.
Give your answer correct to the nearest euro.

Answer(f) €..... [3]

Question 25

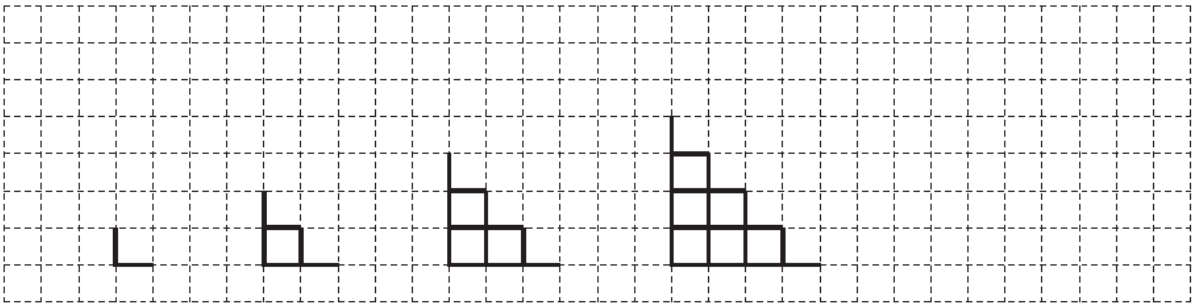


Diagram 1 Diagram 2 Diagram 3 Diagram 4 Diagram 5

Diagram 1 shows two lines of length 1 unit at right angles forming an L.

Two Ls are added to Diagram 1 to make Diagram 2. This forms one small square.

Three Ls are added to Diagram 2 to make Diagram 3. This forms three small squares.
The sequence of Diagrams continues.

(a) Draw Diagram 5. [1]

(b) Complete the table.

	Diagram 1	Diagram 2	Diagram 3	Diagram 4	Diagram 5
Number of lines of length 1 unit	2	6	12	20	
Number of small squares	0	1	3	6	

[2]

(c) Find an expression, in terms of n, for the number of lines of length 1 unit in Diagram n.

Answer(c) ..... [2]

(d) Find an expression, in terms of n, for the number of small squares in Diagram n.

Answer(d) ..... [2]

Question 26

(a) **(i)** Eduardo invests \$640 at a rate of 2% per year compound interest.

Show that, at the end of 6 years, Eduardo has \$721, correct to the nearest dollar.

Answer(a)(i)

[2]

(ii) Manuela also invests \$640.
At the end of 4 years, Manuela has \$721.

Find the yearly compound interest rate.

Answer(a)(ii) ..... % [4]

(b) Carlos buys a motor scooter for \$1200.
Each year the value of the scooter decreases by 10% of its value at the beginning of that year.

Find the value of the scooter after 3 years.

Answer(b) \$ ..... [2]

Question 27

The first four terms of sequences A, B, C and D are shown in the table.

Sequence	1st term	2nd term	3rd term	4th term	5th term		*n*th term
A	$\frac{1}{3}$	$\frac{2}{4}$	$\frac{3}{5}$	$\frac{4}{6}$			
B	3	4	5	6			
C	–1	0	1	2			
D	–3	0	5	12			

(a) Complete the table.

[8]

(b) Which term in sequence A is equal to $\frac{36}{37}$?

Answer(b) ..... [2]

(c) Which term in sequence D is equal to 725?

Answer(c) ..... [2]

Question 28

(a) Last year a golf club charged \$1650 for a family membership.
This year the cost increased by 12%.

Calculate the cost of a family membership this year.

Answer(a) \$ ..... [2]

(b) The golf club runs a competition.
The total prize money is shared in the ratio 1st prize : 2nd prize = 9 : 5.
The 1st prize is \$500 more than the 2nd prize.

(i) Calculate the total prize money for the competition.

Answer(b)(i) \$ ..... [2]

(ii) What percentage of the total prize money is given as the 1st prize?

Answer(b)(ii) .....% [1]

Continue on the next page..

(c) For the members of the golf club the ratio men : children = 11 : 2.
The ratio women : children = 10 : 3.

(i) Find the ratio men : women.

Answer(c)(i) ..... : ..... [2]

(ii) The golf club has 24 members who are children.

Find the total number of members.

Answer(c)(ii) ..... [3]

(d) The club shop sold a box of golf balls for $20.40 .
The shop made a profit of 20% on the cost price.

Calculate the cost price of the golf balls.

Answer(d) $ ..... [3]

Question 29

12 000 vehicles drive through a road toll on one day.
The ratio cars : trucks : motorcycles = 13 : 8 : 3.

(a) **(i)** Show that 6500 cars drive through the road toll on that day.

Answer(a)(i)

[1]

(ii) Calculate the number of trucks that drive through the road toll on that day.

Answer(a)(ii) ..... [1]

(b) The toll charges in 2014 are shown in the table.

Vehicle	Charge
Cars	$2
Trucks	$5
Motorcycles	$1

Show that the total amount paid in tolls on that day is $34 500.

Answer(b)

[2]

Continue on the next page..

(c) This total amount is a decrease of 8% on the total amount paid on the same day in 2013.

Calculate the total amount paid on that day in 2013.

Answer(c) $..... [3]

(d) 2750 of the 6500 car drivers pay their toll using a credit card.

Write down, in its simplest terms, the fraction of car drivers who pay using a credit card.

Answer(d) ..... [2]

(e) To the nearest thousand, 90 000 cars drive through the road toll in one week.

Write down the lower bound for this number of cars.

Answer(e) ..... [1]

Question 30

(a) Kolyan buys water for \$2.60 .
He also buys biscuits.

(i) The ratio cost of biscuits : cost of water = 3 : 2.

Find the cost of the biscuits.

Answer(a)(i) \$..... [2]

(ii) Kolyan has \$9 to spend.

Work out the total amount Kolyan spends on water and biscuits as a fraction of the \$9.
Give your answer in its lowest terms.

Answer(a)(ii) ..... [2]

(iii) The \$9 is 62.5% less than the amount Kolyan had to spend last week.

Calculate the amount Kolyan had to spend last week.

Answer(a)(iii) \$..... [3]

(b) Priya buys a bicycle for \$250.
Each year the value of the bicycle decreases by 8% of its value at the beginning of that year.

Calculate the value of Priya's bicycle after 10 years.
Give your answer correct to the nearest dollar.

Answer(b) \$..... [3]

Question 31

10 Complete the table for each sequence.

Sequence	1st term	2nd term	3rd term	4th term	5th term	6th term		*n*th term
A	15	8	1	–6				
B	$\frac{5}{18}$	$\frac{6}{19}$	$\frac{7}{20}$	$\frac{8}{21}$				
C	2	5	10	17				
D	2	6	18	54				

[11]

Question 32

A film company uses 512 actors in a film.
The actors are in the ratio men : women : children = 7 : 11 : 14.

(a) **(i)** Show that there are 224 children in the film.

Answer(a)(i)

[2]

(ii) Find the number of men in the film.

Answer(a)(ii) ..... [1]

(b) Every working day, each child is given \$1 to spend.
Each child works for 45 days.

Calculate the total amount that the film company gives the children to spend.
Give your answer correct to the nearest \$100.

Answer(b) \$..... [2]

(c) The children have lessons every day in groups of no more than 12.

Calculate the smallest possible number of groups.

Answer(c) ..... [2]

(d) The film costs four million and ninety three thousand dollars to make.

(i) Write this number in figures.

Answer(d)(i) ..... [1]

(ii) Write your answer to **part (d)(i)** in standard form.

Answer(d)(ii) ..... [1]

Continue on the next page…

(e) A DVD copy of the film costs \$2.75 to make.
The selling price is \$8.20 .

Calculate the percentage profit.

Answer(e) .....% [3]

Question 33

The table shows the first five terms of sequences A, B and C.

Sequence	1st term	2nd term	3rd term	4th term	5th term	6th term
A	3	4	5	6	7	
B	0	1	4	9	16	
C	–3	–3	–1	3	9	

(a) Complete the table for the 6th term of each sequence. [2]

(b) Write down the nth term of sequence A.

Answer(b) ..... [1]

(c) **(i)** Find the nth term of sequence B.

Answer(c)(i) ..... [2]

(ii) Find the value of n when the nth term of sequence B is 8281.

Answer(c)(ii) $n =$ ..... [2]

(d) **(i)** Find the nth term of sequence C in its simplest form.

Answer(d)(i) ..... [2]

Continue on the next page…

(ii) Find the 8th term of sequence C.

Answer(d)(ii) ..... [1]

(e) The nth term of another sequence D is $\left(-\frac{1}{2}\right)^{n-1}$.

Complete the table for the first four terms of sequence D.

Sequence	1st term	2nd term	3rd term	4th term
D				

[3]

Question 34

(a) Luc is painting the doors in his house.
He uses $\frac{3}{4}$ of a tin of paint for each door.

Work out the least number of tins of paint Luc needs to paint 7 doors.

Answer(a) ..... [3]

(b) Jan buys tins of paint for \$17.16 each.
He sells the paint at a profit of 25%.

For how much does Jan sell each tin of paint?

Answer(b) \$ ..... [2]

Continue on the next page…

(c) The cost of \$17.16 for each tin of paint is 4% more than the cost in the previous year.

Work out the cost of each tin of paint in the previous year.

Answer(c) \$ ..... [3]

(d) In America a tin of paint costs \$17.16 .
In Italy the same tin of paint costs €13.32 .
The exchange rate is \$1 = €0.72 .

Calculate, in dollars, the difference in the cost of the tin of paint.

Answer(d) \$ ..... [2]

(e) Paint is sold in cylindrical tins of height 11 cm.
Each tin holds 750 ml of paint.

(i) Write 750 ml in cm^3.

Answer(e)(i) ..... cm^3 [1]

(ii) Calculate the radius of the tin.
Give your answer correct to 1 decimal place.

Answer(e)(ii) ..... cm [3]

(iii) A mathematically similar tin has a height of 22 cm.

How many **litres** of paint does this tin hold?

Answer(e)(iii) ..... litres [2]

Continue on the next page…

(f) The mass of a tin of paint is 890 grams, correct to the nearest 10 grams.

Work out the upper bound of the total mass of 10 tins of paint.

Answer(f) ..... g [1]

(g) The probability that a tin of paint is dented is 0.07 .

Out of 3000 tins of paint, how many would you expect to be dented?

Answer(g) ..... [2]

(h) Tins of paint are filled at the rate of $2\,m^3$ per minute.

How many 750 ml tins of paint can be filled in 1 hour?

Answer(h) ..... [3]

Question 35

The first three diagrams in a sequence are shown below.
The diagrams are made by drawing lines of length 1 cm.

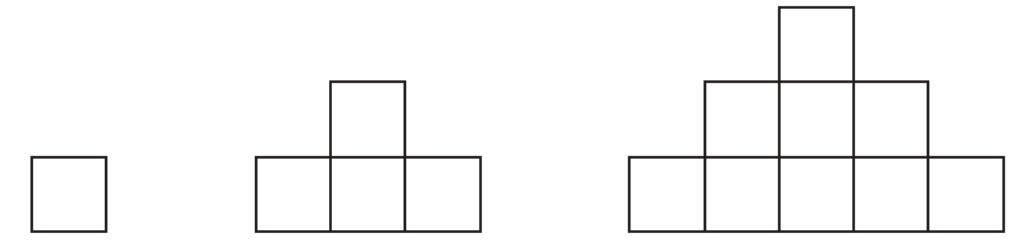


Diagram 1 Diagram 2 Diagram 3

(a) The areas of each of the first three diagrams are shown in this table.

Diagram	1	2	3
Area (cm^2)	1	4	9

(i) Find the area of Diagram 4.

Answer(a)(i) ..... cm^2 [1]

(ii) Find, in terms of n, the area of Diagram n.

Answer(a)(ii) ..... cm^2 [1]

(b) The numbers of 1 cm lines needed to draw each of the first three diagrams are shown in this table.

Diagram	1	2	3
Number of 1 cm lines	4	13	26

(i) Find the number of 1 cm lines needed to draw Diagram 4.

Answer(b)(i) ..... [1]

(ii) In which diagram are 118 lines of length 1 cm needed?

Answer(b)(ii) ..... [1]

Continue on the next page..

(c) The **total** number of 1 cm lines needed to draw both Diagram 1 and Diagram 2 is 17.
The **total** number of 1 cm lines needed to draw all of the first n diagrams is

$$\frac{2}{3}n^3 + an^2 + bn.$$

Find the value of a and the value of b.
Show all your working.

Answer(c) $a =$ .....

$b =$ ..... [6]

Question 36

Aasha, Biren and Cemal share \$640 in the ratio 8 : 15 : 9.

(a) Show that Aasha receives \$160.

[1]

(b) Calculate the amount that Biren and Cemal receive.

Biren \$ .....

Cemal \$ ..... [2]

(c) Aasha uses her \$160 to buy some books.
Each book costs \$15.25 .

Find the greatest number of books that she can buy.

..... [2]

(d) Biren spends $\frac{3}{8}$ of his share on clothes and $\frac{1}{3}$ of his share on a computer.

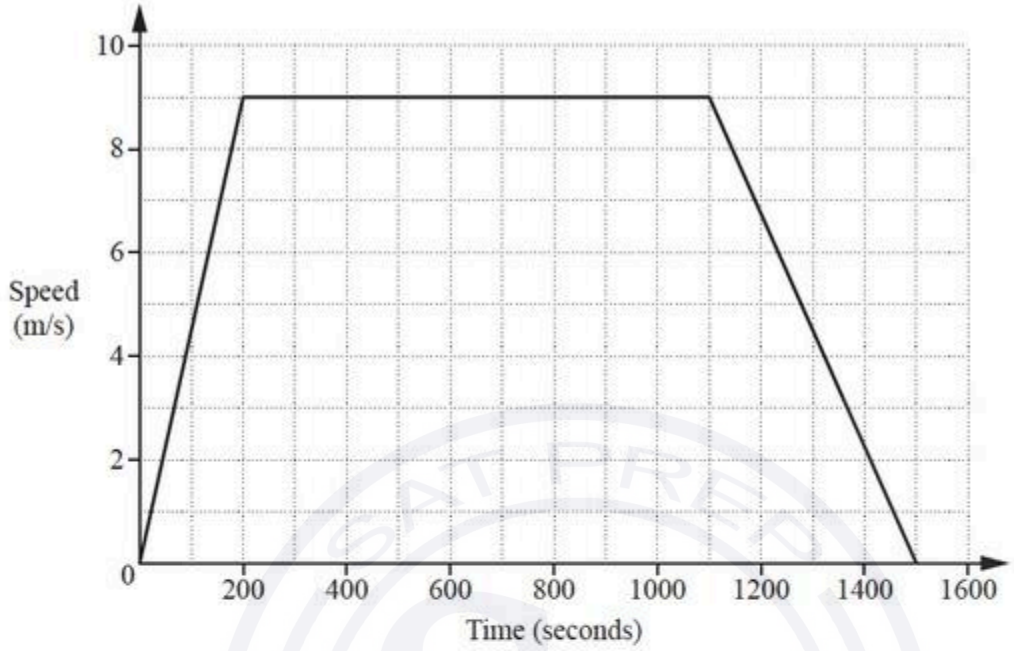
Find the fraction of his share that he has left.
Write your fraction in its lowest terms.

..... [3]

..... [3]

Question 37

Davinder draws a speed-time graph for his bus journey to the market.



Find

(i) the acceleration of the bus during the first 200 seconds.

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

(ii) the total distance travelled by the bus.

..... m [3]

(iii) the average speed of the bus for the whole journey.

..... m/s [1]

Question 38

(a) Meena sells her car for $6000.
This is a loss of 4% on the price she paid.

Calculate the price Meena paid for the car.

$ ..... [3]

(b) Eisha changes some euros (€) into dollars ($) when the exchange rate is €1 = $1.351 .
She receives $6000.

Calculate how many euros Eisha changes.
Give your answer correct to the nearest euro.

€ ..... [3]

(c) Meena and Eisha both invest their $6000.
Meena invests her $6000 at a rate of 1.5% per year compound interest.
Eisha invests her $6000 in a bank that pays simple interest.
After 8 years, their investments are worth the same amount.

Calculate the rate of simple interest per year that Eisha received.

..... % [5]

Question 39

A football club sells tickets at different prices dependent on age group.

(a) **(i)** At one game, the club sold tickets in the ratio

under 18 : 18 to 60 : over 60 = 2 : 7 : 3.

There were 6100 tickets sold for people aged under 18.

Calculate the **total** number of tickets sold for the game.

..... [3]

(ii) Calculate the percentage of tickets sold for people aged under 18.

.....% [1]

(b) The table shows the football ticket prices for the different age groups.

Age	Price
Under 18	\$15
18 to 60	\$35
Over 60	\$18

At a **different** game there were 42 600 tickets sold.

- 14% were sold to people aged under 18
- $\frac{2}{3}$ of the tickets were sold to people aged 18 to 60
- The remainder were sold to people aged over 60

Calculate the total amount the football club receives from ticket sales for this game.

\$ ..... [5]

Continue on the next page…

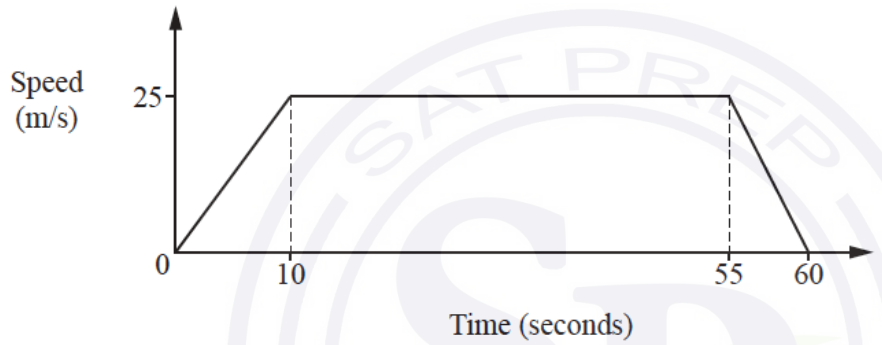
(c) In a sale, the football club shop reduced the price of the football shirts to $23.80 .
An error was made when working out this sale price.
The price was reduced by 30% instead of 20%.

Calculate the correct sale price for the football shirt.

$..... [5]

Question 40

A cheetah runs for 60 seconds.
The diagram shows the speed-time graph.



(i) Work out the acceleration of the cheetah during the first 10 seconds.

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

(ii) Calculate the distance travelled by the cheetah.

..... m [3]

Question 41

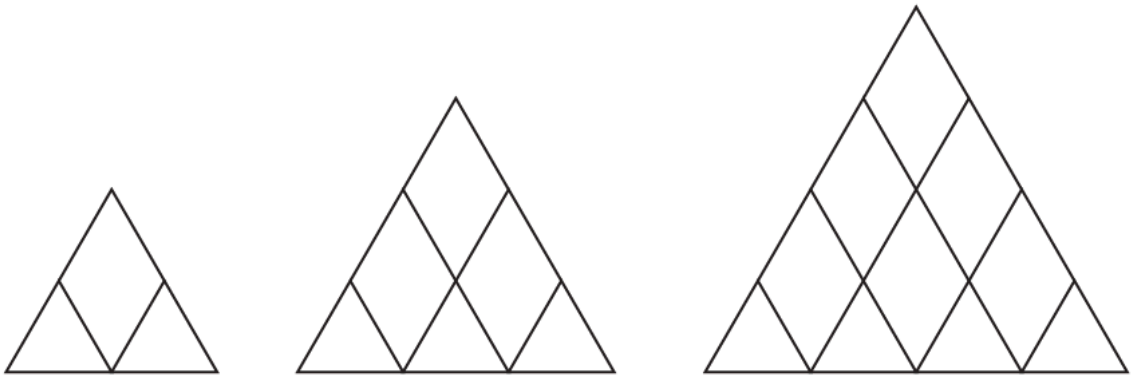


Diagram 1 Diagram 2 Diagram 3

Each diagram is made from tiles in the shape of equilateral triangles and rhombuses.
The length of a side of each tile is 1 unit.

(a) Complete the table below for this sequence of diagrams.

Diagram	1	2	3	4	5
Number of equilateral triangle shaped tiles	2	3	4	5	6
Number of rhombus shaped tiles	1	3	6		
Total number of tiles	3	6	10		
Number of 1 unit lengths	8	15	24		

[6]

(b) **(i)** The number of 1 unit lengths in Diagram n is $n^2 + 4n + p$.

Find the value of p.

p = ... [2]

(ii) Calculate the number of 1 unit lengths in Diagram 10.

.....[1]

Continue on the next page…

(c) The total number of tiles in Diagram n is $an^2 + bn + 1$.

Find the value of a and the value of b.

$a =$ .....

$b =$ ..... [5]

(d) Part of the Louvre museum in Paris is in the shape of a square-based pyramid made from glass tiles. Each of the triangular faces of the pyramid is represented by Diagram 17 in the sequence.

(i) Calculate the total number of glass tiles on one triangular face of this pyramid.

..... [2]

(ii) 11 tiles are removed from one of the triangular faces to create an entrance into the pyramid.

Calculate the total number of glass tiles used to construct this pyramid.

..... [1]

Question 42

Mr Chan flies from London to Los Angeles, a distance of 8800 km.
The flight takes 11 hours and 10 minutes.

(a) **(i)** His plane leaves London at 09 35 local time.
The local time in Los Angeles is 8 hours behind the time in London.

Calculate the local time when the plane arrives in Los Angeles.

..... [2]

(ii) Work out the average speed of the plane in km/h.

.....km/h [2]

(b) There are three types of tickets, economy, business and first class.
The price of these tickets is in the ratio economy : business : first class = 2 : 5 : 9.

(i) The price of a business ticket is $2350.

Calculate the price of a first class ticket.

$..... [2]

(ii) Work out the price of an economy ticket as a percentage of the price of a first class ticket.

.....% [1]

(c) The price of a business ticket for the same journey with another airline is $2240.

(i) The price of a first class ticket is 70% more than a business ticket.

Calculate the price of this first class ticket.

$..... [2]

Continue on the next page…

(ii) The price of a business ticket is 180% **more** than an economy ticket.

Calculate the price of this economy ticket.

$..... [3]

(d) Mr Chan hires a car in Los Angeles.
The charges are shown below.

Car Hire

$28.00 per day plus $6.50 per day insurance.

$1.25 for every kilometre travelled after the first 800 km.
The first 800 km are included in the price.

Mr Chan hired the car for 12 days and paid $826.50 .

(i) Find the number of kilometres Mr Chan travelled in this car.

..... km [4]

(ii) The car used fuel at an average rate of 1 litre for every 10 km travelled.
Fuel costs $1.30 per litre.

Calculate the cost of the fuel used by the car during the 12 days.

$..... [2]

Question 43

(a) Kristian and Stephanie share some money in the ratio 3 : 2.
Kristian receives $72.

(i) Work out how much Stephanie receives.

$ ..... [2]

(ii) Kristian spends 45% of his $72 on a computer game.

Calculate the price of the computer game.

$ ..... [1]

(iii) Kristian also buys a meal for $8.40 .

Calculate the fraction of the $72 Kristian has left after buying the computer game and the meal.
Give your answer in its lowest terms.

..... [2]

(iv) Stephanie buys a book in a sale for $19.20 .
This sale price is after a reduction of 20%.

Calculate the original price of the book.

$.....[3]

Continue on the next page…

(b) Boris invests \$550 at a rate of 2% per year simple interest.

Calculate the amount Boris has after 10 years.

\$ ..... [3]

(c) Marlene invests \$550 at a rate of 1.9% per year compound interest.

Calculate the amount Marlene has after 10 years.

\$ ..... [2]

(d) Hans invests \$550 at a rate of x% per year compound interest.
At the end of 10 years he has a total amount of \$638.30, correct to the nearest cent.

Find the value of x.

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

Question 44

(a) A jigsaw puzzle has edge pieces and inside pieces.
The ratio edge pieces : inside pieces = 3 : 22.

(i) There are 924 inside pieces.

Calculate the total number of pieces in the puzzle.

..... [2]

(ii) Find the percentage of the total number of pieces that are edge pieces.

.....% [1]

(iii) Anjum and Betty spent a total of 9 hours completing the puzzle.
The ratio Anjum's time : Betty's time = 7 : 5.

Work out how much time Anjum spent on the puzzle.

..... hours [2]

(b) The price of the puzzle was $15.99 in a sale.
This was 35% less than the original price.

Calculate the original price of the puzzle.

$..... [3]

Continue on the next page…

(c) Betty takes a photograph of the completed puzzle.
The photograph and the completed puzzle are mathematically similar.

The area of the photograph is 875 cm^2 and the area of the puzzle is 2835 cm^2.
The length of the photograph is 35 cm.

Work out the length of the puzzle.

..... cm [3]

(d) **(i)** The area of another puzzle is 6610 cm^2.

Change 6610 cm^2 into m^2.

.....m^2 [1]

(ii) The cost price of this puzzle is $12.50 .
The selling price is $18.50 .

Calculate the percentage profit.

.....% [3]

Question 45

(a) Complete the table for the four sequences A, B, C and D.

	Sequence				Next term	nth term
A	2	5	8	11		
B	20	14	8	2		
C	1	4	9	16		
D	0	2	6	12		

[10]

(b) The sum of the first n terms of a sequence is $\frac{n(3n+1)}{2}$.

(i) When the sum of the first n terms is 155, show that $3n^2 + n - 310 = 0$.

[2]

(ii) Solve $3n^2 + n - 310 = 0$.

n = ... or n = ... [3]

(iii) Complete the statement.

The sum of the first ..... terms of this sequence is 155. [1]

Question 46

(a) **(i)** Each year the value of a car decreases by 15% of its value at the beginning of that year.
Alberto buys a car for $18 000.

Calculate the value of Alberto's car after 3 years.

$ ..... [2]

(ii) Belinda bought a car one year ago.
The value of this car has decreased by 15% to $14025.

Calculate how much Belinda paid for the car.

$ ..... [3]

(b) Chris invested some money at a rate of 5% per year compound interest.
After 2 years the value of this investment is $286.65 .

Calculate how much Chris invested.

$ ..... [2]

Continue on the next page…

(c) Dani invested \$200 and after 2 years the value of this investment is \$224.72 .

Calculate the rate of interest per year when the interest is

(i) simple,

.....% [3]

(ii) compound.

.....% [3]

Question 47

(a) **(i)** Divide \$105 in the ratio 4 : 3.

\$ ..... and \$ ..... [2]

(ii) Increase \$105 by 12%.

\$ ..... [2]

(iii) In a sale the original price of a jacket is reduced by 16% to \$105.

Calculate the original price of the jacket.

\$ ..... [3]

(b) Jakob invests \$500 at a rate of 2% per year compound interest.
Claudia invests \$500 at a rate of 2.5% per year simple interest.

Calculate the difference between these two investments after 30 years.
Give your answer in dollars correct to the nearest cent.

\$ ..... [6]

Continue on the next page…

(c) Michel invests $\$P$ at a rate of 3.8% per year compound interest.
After 30 years the value of this investment is \$1469.

Calculate the value of P.

$P =$ ..... [3]

(d) The population of a city increases exponentially at a rate of x% **every 5 years**.
In 1960 the population was 60 100.
In 2015 the population was 120 150.

Calculate the value of x.

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

Question 48

The Smith family paid $5635 for a holiday in India.
The total cost was divided in the ratio travel : accommodation : entertainment = 10 : 17 : 8.

(a) Calculate the percentage of the total cost spent on entertainment.

.....% [2]

(b) Show that the amount spent on accommodation was $2737.

[2]

(c) The $5635 was the total amount Mr Smith received from an investment he made 5 years ago.
Compound interest at a rate of 2.42% per year was paid on this investment.

Calculate the amount he invested 5 years ago.

$ ..... [3]

(d) Mr Smith, his wife and their three children visit a theme park.
The tickets cost 2500 Rupees for an adult and 1650 Rupees for a child.

Calculate the total cost of the tickets.

..... Rupees [2]

(e) One day the youngest child spent 130 Rupees on sweets.
On this day the exchange rate was 1 Rupee = $0.0152 .

Calculate the value of the sweets in dollars, correct to the nearest cent.

$ ..... [2]

Question 49

11 On Monday, Ankuri sent this text message to two friends.

> Today is Day Number 1.
> Tomorrow, please add 1 to the Day Number and send this text message to two friends.

All the friends who receive a text message follow the instructions.

(a) Complete the table.

Day	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
Day Number	1	2	3				
Number of text messages sent today	2	4					

[4]

(b) Write down an expression for the number of text messages sent on Day Number n.

..... [1]

(c) Ankuri thinks that, by the end of Day Number 3, the **total** number of text messages that have been sent is $2^4 - 2$.

(i) Show that she is correct.

[2]

(ii) Complete the statement.

The **total** number of text messages sent by the end of Day Number 5 is ..... which is equal to $2^k - 2$ where $k =$ ..... . [2]

(iii) Write down an expression for the **total** number of text messages sent by the end of Day Number n.

.....[1]

(iv) Find the Day Number when the **total** number of text messages sent by the end of the day is 1022.

.....[1]

Question 50

(a) In 2016, a company sold 9600 cars, correct to the nearest hundred.

(i) Write down the lower bound for the number of cars sold.

……[1]

(ii) The average profit on each car sold was \$2430, correct to the nearest \$10.

Calculate the lower bound for the total profit.
Write down the exact answer.

\$……[2]

(iii) Write your answer to **part (a)(ii)** correct to 4 significant figures.

\$……[1]

(iv) Write your answer to **part (a)(iii)** in standard form.

\$……[2]

(b) In April, the number of cars sold was 546.
This was an increase of 5% on the number of cars sold in March.

Calculate the number of cars sold in March.

……[3]

(c) The price of a new car grows exponentially by 3% per year.
A new car has a price of \$3000 in 2013.

Find the price of a new car 4 years later.

\$……[2]

Question 51

The table shows the first four terms in sequences A, B, C and D.

Complete the table.

Sequence	1st term	2nd term	3rd term	4th term	5th term		nth term
A	16	25	36	49			
B	5	8	11	14			
C	11	17	25	35			
D	$\frac{3}{2}$	$\frac{4}{3}$	$\frac{5}{4}$	$\frac{6}{5}$			

[12]

Question 52

(a) Annie and Dermot share \$600 in the ratio 11 : 9.

(i) Show that Annie receives \$330.

[1]

(ii) Find the amount that Dermot receives.

\$ ..... [1]

(b) **(i)** Annie invests \$330 at a rate of 1.5% per year compound interest.

Calculate the amount that Annie has after 8 years.
Give your answer correct to the nearest dollar.

\$ ..... [3]

(ii) Find the amount of **interest** that Annie has, after the 8 years, as a percentage of the \$330.

..... % [2]

Continue on the next page…

(c) Dermot has \$70 to spend.
He spends \$24.75 on a shirt.

(i) Find \$24.75 as a fraction of \$70.
Give your answer in its lowest terms.

..... [1]

(ii) The \$24.75 is the sale price after reducing the original price by 10%.

Calculate the original price.

\$ ..... [3]

(d) After one year, the value of Annie's car had reduced by 20%.
At the end of the second year, the value of Annie's car had reduced by a further 15% of its value at the end of the first year.

(i) Calculate the overall percentage reduction after the two years.

..... % [2]

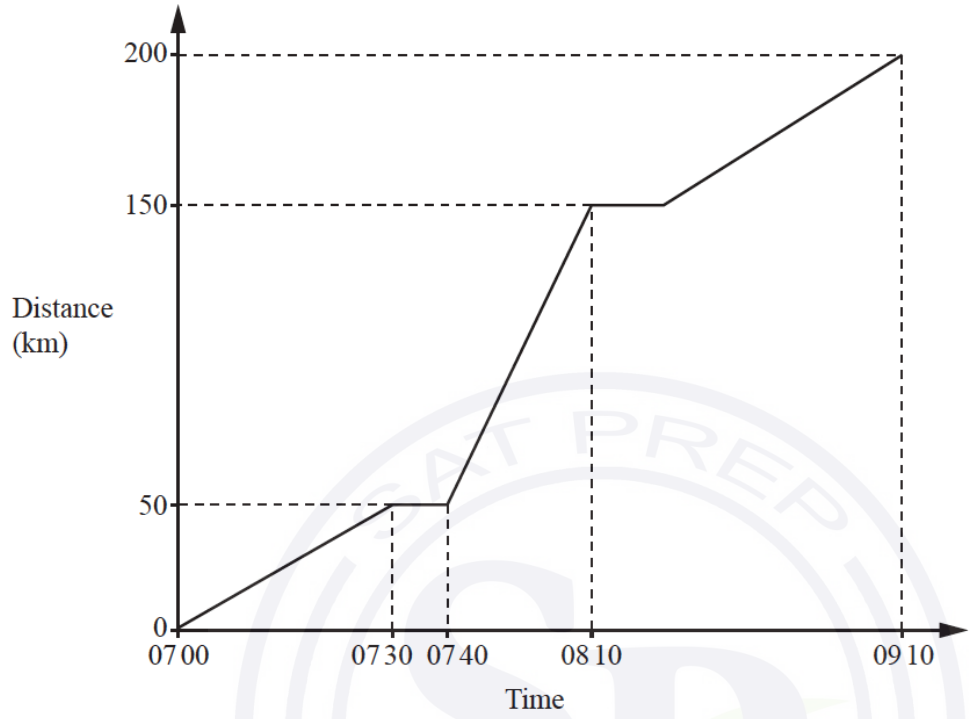
(ii) After three years the overall percentage reduction in the value of Annie's car is 40.84%.

Calculate the percentage reduction in the third year.

..... % [2]

Question 53

(a)



The distance-time graph shows the journey of a train.

(i) Find the speed of the train between 07 00 and 07 30.

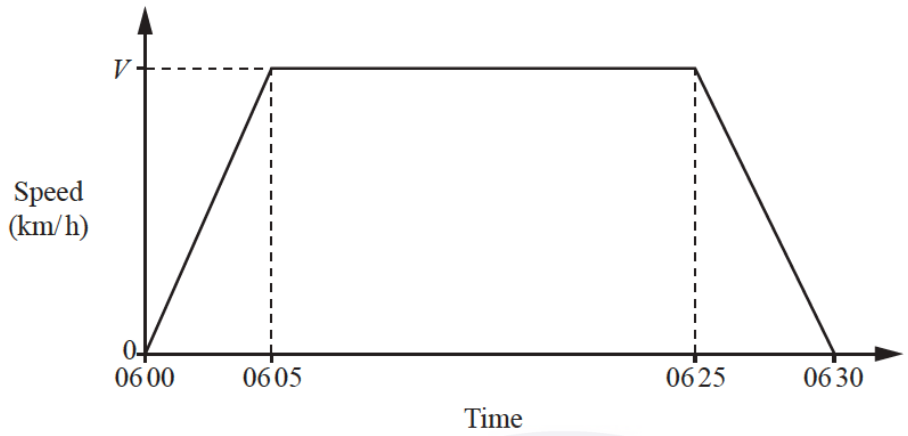
..... km/h [1]

(ii) Find the average speed for the whole journey.

..... km/h [3]

Continue on the next page…

(b)



NOT TO SCALE

The speed-time graph shows the first 30 minutes of another train journey.
The distance travelled is 100 km.
The maximum speed of the train is V km/h.

(i) Find the value of V.

$V =$ ..... [3]

(ii) Find the acceleration of the train during the first 5 minutes.
Give your answer in m/s^2.

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

Question 54

An energy company charged these prices in 2013.

Electricity price	Gas price
23.15 cents per day plus 13.5 cents for each unit used	24.5 cents per day plus 5.5 cents for each unit used

(a) **(i)** In 90 days, the Siddique family used 1885 units of **electricity**.

Calculate the total cost, in dollars, of the electricity they used.

$ ..... [2]

(ii) In 90 days, the **gas** used by the Khan family cost $198.16 .

Calculate the number of units of gas used.

..... units [3]

(b) In 2013, the price for each unit of electricity was 13.5 cents.
Over the next 3 years, this price increased exponentially at a rate of 8% per year.

Calculate the price for each unit of electricity after 3 years.

..... cents [2]

(c) Over these 3 years, the price for each unit of gas increased from 5.5 cents to 7.7 cents.

(i) Calculate the percentage increase from 5.5 cents to 7.7 cents.

..... % [3]

Continue on the next page…

(ii) Over the 3 years, the 5.5 cents increased exponentially by the same percentage each year to 7.7 cents.

Calculate the percentage increase **each year**.

..... % [3]

(d) In 2015, the energy company divided its profits in the ratio

shareholders : bonuses : development = 5 : 2 : 6.

In 2015, its profits were $390 million.

Calculate the amount the company gave to shareholders.

$ ..... million [2]

(e) The share price of the company in June 2015 was $258.25 .
This was an increase of 3.3% on the share price in May 2015.

Calculate the share price in May 2015.

$ ..... [3]

Question 55

(a) The nth term of a sequence is $8n - 3$.

(i) Write down the first two terms of this sequence.

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

(ii) Show that the number 203 is not in this sequence.

[2]

(b) Find the nth term of these sequences.

(i) 13, 19, 25, 31, …

..... [2]

(ii) 4, 8, 14, 22, …

..... [2]

(c) … , 20, 50, …

The second term of this sequence is 20 and the third term is 50.
The rule for finding the next term in this sequence is subtract y then multiply by 5.

Find the value of y and work out the first term of this sequence.

$y =$ .....

First term = ... [4]

Question 56

(a) The angles of a triangle are in the ratio 2 : 3 : 5.

(i) Show that the triangle is right-angled.

[1]

(ii) The length of the hypotenuse of the triangle is 12 cm.

Use trigonometry to calculate the length of the shortest side of this triangle.

..... cm [3]

(b) The sides of a different right-angled triangle are in the ratio 3 : 4 : 5.

(i) The length of the shortest side is 7.8 cm.

Calculate the length of the longest side.

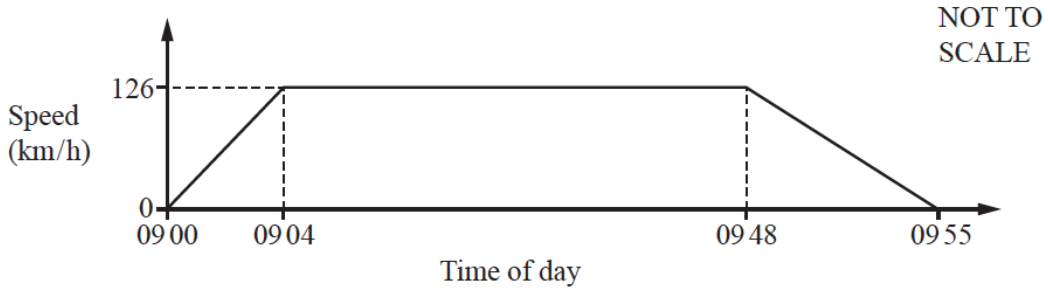
..... cm [2]

(ii) Calculate the smallest angle in this triangle.

..... [3]

Question 57

The graph shows information about the journey of a train between two stations.



(a) **(i)** Work out the acceleration of the train during the first 4 minutes of this journey.
Give your answer in km/h^2.

..... km/h^2 [2]

(ii) Calculate the distance, in kilometres, between the two stations.

..... km [4]

Continue on the next page…

(b) **(i)** Show that 126 km/h is the same speed as 35 m/s.

[1]

(ii) The train has a total length of 220 m.
At 09 30, the train crossed a bridge of length 1400 m.

Calculate the time, in seconds, that the train took to completely cross the bridge.

.....s [3]

(c) On a different journey, the train took 73 minutes, correct to the nearest minute, to travel 215 km, correct to the nearest 5 km.

Calculate the upper bound of the average speed of the train for this journey.
Give your answer in km/h.

.....km/h [4]

Question 58

(a) Alex has \$20 and Bobbie has \$25.

(i) Write down the ratio Alex's money : Bobbie's money in its simplest form.

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

(ii) Alex and Bobbie each spend $\frac{1}{5}$ of their money.

Find the ratio Alex's remaining money : Bobbie's remaining money in its simplest form.

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

(iii) Alex and Bobbie **then** each spend \$4.

Find the new ratio Alex's remaining money : Bobbie's remaining money in its simplest form.

..... : ..... [2]

(b) **(i)** The population of a town in the year 1990 was 15 600.
The population is now 11 420.

Calculate the percentage decrease in the population.

.....% [3]

(ii) The population of 15 600 was 2.5% less than the population in the year 1980.

Calculate the population in the year 1980.

..... [3]

Continue on the next page..

(c) Chris invests \$200 at a rate of x% per year simple interest.
At the end of 15 years the total interest received is \$48.

Find the value of x.

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

(d) Dani invests \$200 at a rate of y% per year compound interest.
At the end of 10 years the value of her investment is \$256.

Calculate the value of y, correct to 1 decimal place.

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

Question 59

(a) A shop sells dress fabric for $2.97 per metre.

(i) A customer buys 9 metres of this fabric.

Calculate the change he receives from $50.

$ ..... [2]

(ii) The selling price of $2.97 per metre is an increase of 8% on the cost price.

Calculate the cost price.

$ ..... per metre [3]

(b) A dressmaker charges $35 or 2300 rupees to make a dress.

Calculate the difference in price when the exchange rate is 1 rupee = $0.0153 .
Give your answer in rupees.

..... rupees [2]

(c) The dressmaker measures a length of fabric as 600 m, correct to the nearest 5 metres.
He cuts this into dress lengths of 9 m, correct to the nearest metre.

Calculate the largest number of complete dress lengths he could cut.

..... [3]

Question 60

The table shows the first five terms of sequences A, B and C.

Sequence	1st term	2nd term	3rd term	4th term	5th term	6th term
A	0	1	4	9	16	
B	4	5	6	7	8	
C	-4	-4	-2	2	8	

(a) Complete the table. [3]

(b) Find an expression for the nth term of

(i) sequence A,

..... [2]

(ii) sequence B.

..... [1]

(c) Find the value of n when the nth term of sequence A is 576.

$n =$ ..... [2]

(d) **(i)** Find an expression for the nth term of sequence C.
Give your answer in its simplest form.

..... [3]

(ii) Find the value of the 30th term of sequence C.

..... [2]

Question 61

(a) Rowena buys and sells clothes.

(i) She buys a jacket for $40 and sells it for $45.40 .

Calculate the percentage profit.

..... % [3]

(ii) She sells a dress for $42.60 after making a profit of 20% on the cost price.

Calculate the cost price.

$ ..... [3]

(b) Sara invests $500 for 15 years at a rate of 2% per year simple interest.

Calculate the total interest Sara receives.

$ ..... [2]

Continue on the next page…

(c) Tomas has two cars.

(i) The value, today, of one car is \$21 000.
The value of this car **decreases** exponentially by 18% each year.

Calculate the value of this car after 5 years.
Give your answer correct to the nearest hundred dollars.

\$ ..... [3]

(ii) The value, today, of the other car is \$15 000.
The value of this car **increases** exponentially by x% each year.
After 12 years the value of the car will be \$42 190.

Calculate the value of x.

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

Question 62

(a) Here is a list of ingredients to make 20 biscuits.

260g of butter
500g of sugar
650g of flour
425g of rice

(i) Find the mass of rice as a percentage of the mass of sugar.

..... % [1]

(ii) Find the mass of butter needed to make 35 of these biscuits.

..... g [2]

(iii) Michel has 2kg of each ingredient.

Work out the greatest number of these biscuits that he can make.

..... [3]

(b) A company makes these biscuits at a cost of $1.35 per packet.
These biscuits are sold for $1.89 per packet.

(i) Calculate the percentage profit the company makes on each packet.

..... % [3]

(ii) The selling price of $1.89 has increased by 8% from last year.

Calculate the selling price last year.

$ ..... [3]

(c) Over a period of 3 years, the company's sales of biscuits increased from 15.6 million packets to 20.8 million packets.
The sales increased exponentially by the same percentage each year.

Calculate the percentage increase **each year**.

..... % [3]

(d) The people who work for the company are in the following age groups.

Group A	Group B	Group C
Under 30 years	30 to 50 years	Over 50 years

The ratio of the number in group A to the number in group B is 7 : 10.
The ratio of the number in group B to the number in group C is 4 : 3.

(i) Find the ratio of the number in group A to the number in group C.
Give your answer in its simplest form.

..... : ..... [3]

(ii) There are 45 people in group C.

Find the total number of people who work for the company.

..... [3]

Question 63

Adele, Barbara and Collette share \$680 in the ratio 9 : 7 : 4.

(a) Show that Adele receives \$306.

[1]

(b) Calculate the amount that Barbara and Collette each receives.

Barbara \$ .....

Collette \$ ..... [3]

(c) Adele changes her \$306 into euros (€) when the exchange rate is €1 = \$1.125 .

Calculate the number of euros she receives.

€ ..... [2]

(d) Barbara spends a total of \$17.56 on 5 kg of apples and 3 kg of bananas.
Apples cost \$2.69 per kilogram.

Calculate the cost per kilogram of bananas.

\$ ..... [3]

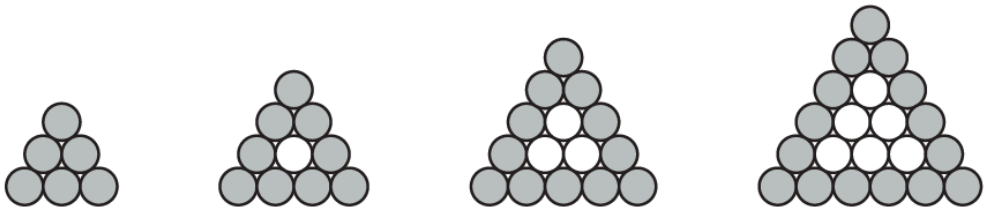
(e) Collette spends half of her share on clothes and $\frac{1}{5}$ of her share on books.

Calculate the amount she has left.

\$..... [3]

Question 64

Marco is making patterns with grey and white circular mats.



Pattern 1 Pattern 2 Pattern 3 Pattern 4

The patterns form a sequence.
Marco makes a table to show some information about the patterns.

Pattern number	1	2	3	4	5
Number of grey mats	6	9	12	15	
Total number of mats	6	10	15	21	

(a) Complete the table for Pattern 5. [2]

(b) Find an expression, in terms of n, for the number of grey mats in Pattern n.

..... [2]

(c) Marco makes a pattern with 24 grey mats.

Find the total number of mats in this pattern.

..... [2]

(d) Marco needs a total of 6 mats to make the first pattern.
He needs a total of 16 mats to make the first two patterns.
He needs a total of $\frac{1}{6}n^3 + an^2 + bn$ mats to make the first n patterns.

Find the value of a and the value of b.

$a =$ .....

$b =$ ..... [6]

Question 65

(a) The Muller family are on holiday in New Zealand.

(i) They change some euros (€) and receive $1962 (New Zealand dollars).
The exchange rate is €1 = $1.635 .

Calculate the number of euros they change.

€ ..... [2]

(ii) The family spend 15% of their New Zealand dollars on a tour.

Calculate the number of dollars they have left.

$ ..... [2]

(iii) The family visit two waterfalls, the Humboldt Falls and the Bridal Veil Falls.
The ratio of the heights Humboldt Falls : Bridal Veil Falls = 5 : 1.
The Humboldt Falls are 220 m higher than the Bridal Veil Falls.

Calculate the height of the Humboldt Falls.

..... m [2]

Continue on the next page…

(b) **(i)** Water flows over the Browne Falls at a rate of 3680 litres per second.
After rain, this rate increases to 9752 litres per second.

Calculate the percentage increase in this rate.

..... % [3]

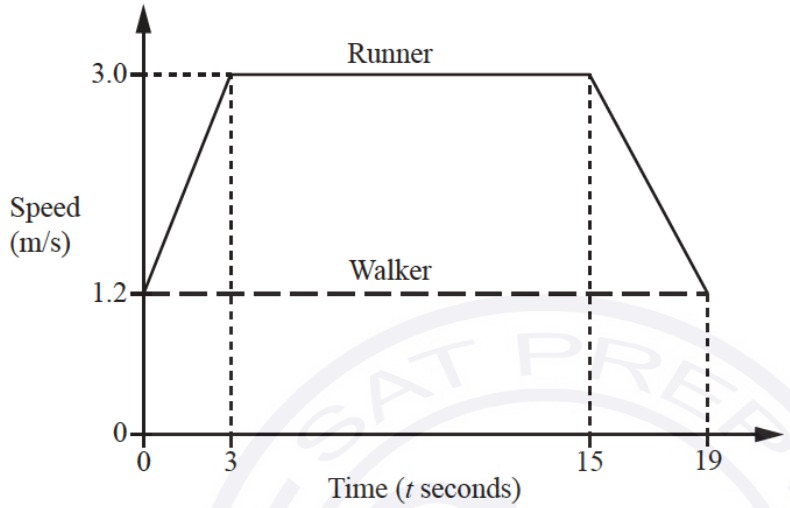
(ii) After rain, water flows over the Sutherland Falls at a rate of 74 240 litres per second.
This is an increase of 45% on the rate before the rain.

Calculate the rate before the rain.

..... litres/second [3]

Question 66

The diagram shows the speed–time graph for part of a journey for two people, a runner and a walker.



NOT TO SCALE

(a) Calculate the acceleration of the runner for the first 3 seconds.

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

(b) Calculate the total distance travelled by the runner in the 19 seconds.

..... m [3]

(c) The runner and the walker are travelling in the same direction along the same path.
When $t = 0$, the runner is 10 metres behind the walker.

Find how far the runner is ahead of the walker when $t = 19$.

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

Question 67

Marianne sells photos.

(a) The selling price of each photo is \$6.

(i) The selling price for each photo is made up of two parts, printing cost and profit.
For each photo, the ratio printing cost : profit = 5 : 3.

Calculate the profit she makes on each photo.

\$ ..... [2]

(ii) Calculate her profit as a percentage of the selling price.

.....% [1]

(iii) Calculate the selling price of a photo in euros (€) when the exchange rate is €1 = \$1.091 .

€ ..... [2]

(b) Marianne sells two sizes of photo.
These photos are mathematically similar rectangles.
The smaller photo has length 15 cm and width 12 cm.
The larger photo has area 352.8 cm^2.

Calculate the length of the larger photo.

..... cm [3]

(c) In a sale, Marianne buys a new camera for \$483.
This is a reduction of 8% on the original price.

Calculate the original price of the camera.

\$ ..... [3]

Question 68

Amol and Priya deliver 645 parcels in the ratio Amol : Priya = 11 : 4.

(a) Calculate the number of parcels Amol delivers.

..... [2]

(b) Amol drives his truck at an average speed of 50 km/h.
He leaves at 07 00 and arrives at 11 15.

Calculate the distance he drives.

..... km [2]

(c) Priya drives her van a distance of 54 km.
She leaves at 10 55 and arrives at 12 38.

Calculate her average speed.

..... km/h [3]

(d) Priya has 50 identical parcels.
Each parcel has a mass of 17 kg, correct to the nearest kilogram.

Find the upper bound for the total mass of the 50 parcels.

..... kg [1]

Continue on the next page…

(e) 67 of the 645 parcels are damaged on the journey.

Calculate the percentage of parcels that are damaged.

..... % [1]

(f) **(i)** 29 parcels each have a value of \$68.

By writing each of these numbers correct to 1 significant figure, find an estimate for the total value of these 29 parcels.

\$ ..... [1]

(ii) Without doing any calculation, complete this statement.

The actual total value of these 29 parcels is less than the answer to **part (f)(i)**

because ..... [1]

Question 69

Here is part of a train timetable for a journey from London to Marseille.
All times given are in local time.
The local time in Marseille is 1 hour ahead of the local time in London.

London	07 19
Ashford	07 55
Lyon	13 00
Avignon	14 08
Marseille	14 46

(a) **(i)** Work out the total journey time from London to Marseille.
Give your answer in hours and minutes.

..... h ..... min [2]

(ii) The distance from London to Ashford is 90 km.
The local time in London is the same as the local time in Ashford.

Work out the average speed, in km/h, of the train between London and Ashford.

..... km/h [3]

(iii) During the journey, the train takes 35 seconds to completely cross a bridge.
The average speed of the train during this crossing is 90 km/h.
The length of the train is 95 metres.

Calculate the length, in metres, of this bridge.

..... m [4]

Continue on the next page…

(b) The fares for the train journey are shown in the table below.

From London to Marseille	Standard fare	Premier fare
Adult	\$84	\$140
Child	\$60	\$96

(i) For the **standard fare**, write the ratio adult fare : child fare in its simplest form.

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

(ii) For an **adult**, find the percentage increase in the cost of the standard fare to the premier fare.

..... % [3]

(iii) For one journey from London to Marseille, the ratio

number of adults : number of children = 11 : 2.

There were 220 adults in total on this journey.
All of the children and 70% of the adults paid the standard fare.
The remaining adults paid the premier fare.

Calculate the total of the fares paid by the adults and the children.

\$ ..... [5]

(c) There were 3.08×10^5 passengers that made this journey in 2018.
This was a 12% decrease in the number of passengers that made this journey in 2017.

Find the number of passengers that made this journey in 2017.
Give your answer in standard form.

..... [3]

Question 70

(a) 19, 15, 11, 7, ...

(i) Write down the next two terms of the sequence.

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

(ii) Find the nth term of this sequence.

..... [2]

(iii) Find the value of n when the nth term is -65.

$n =$ ..... [2]

(b) Another sequence has nth term $2n^2 + 5n - 15$.

Find the difference between the 4th term and the 5th term of this sequence.

..... [2]

Question 71

(a) The price of a newspaper increased from \$0.97 to \$1.13 .

Calculate the percentage increase.

..... % [3]

(b) One day, the newspaper had 60 pages of news and advertisements.
The ratio number of pages of news : number of pages of advertisements = 5 : 7.

(i) Calculate the number of pages of advertisements.

..... [2]

(ii) Write the number of pages of advertisements as a percentage of the number of pages of news.

..... % [1]

(c) On holiday Maria paid 2.25 euros for the newspaper when the exchange rate was \$1 = 0.9416 euros.
At home Maria paid \$1.13 for the newspaper.

Calculate the difference in price.
Give your answer in dollars, correct to the nearest cent.

\$ ..... [3]

Continue on the next page..

(d) The number of newspapers sold decreases exponentially by x% each year.
Over a period of 21 years the number of newspapers sold decreases from 1 763 000 to 58 000.

Calculate the value of x.

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

(e) Every page of the newspaper is a rectangle measuring 43 cm by 28 cm, both correct to the nearest centimetre.

Calculate the upper bound of the area of a page.

..... cm^2 [2]

Question 72

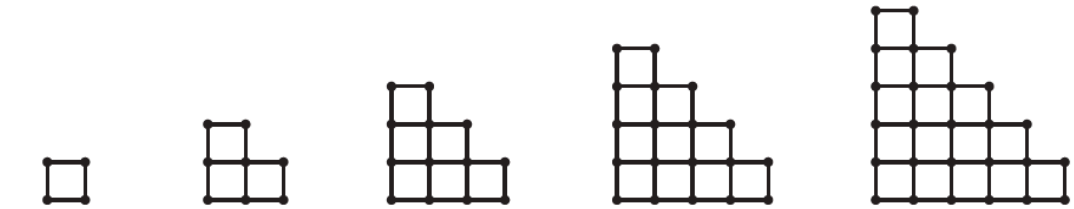


Diagram 1 Diagram 2 Diagram 3 Diagram 4 Diagram 5

The sequence of diagrams above is made up of small lines and dots.

(a) Complete the table.

	Diagram 1	Diagram 2	Diagram 3	Diagram 4	Diagram 5	Diagram 6
Number of small lines	4	10	18	28		
Number of dots	4	8	13	19		

[4]

(b) For Diagram n find an expression, in terms of n, for the number of small lines.

..... [2]

(c) Diagram r has 10 300 small lines.

Find the value of r.

$r =$ ..... [2]

Question 73

(a) The price of a book increases from \$2.50 to \$2.65 .

Calculate the percentage increase.

..... % [3]

(b) Scott invests \$500 for 7 years at a rate of 1.5% per year simple interest.

Calculate the value of his investment at the end of the 7 years.

\$..... [3]

(c) In a city the population is increasing exponentially at a rate of 1.6% per year.

Find the overall percentage increase at the end of 20 years.

..... % [2]

(d) The population of a village is 6400.
The population is decreasing exponentially at a rate of r% per year.
After 22 years, the population will be 2607.

Find the value of r.

$r =$ ..... [3]

Question 74

(a) In a cycling club, the number of members are in the ratio males : females = 8 : 3.
The club has 342 females.

(i) Find the total number of members.

..... [2]

(ii) Find the percentage of the total number of members that are female.

..... % [1]

(b) The price of a bicycle is $1020.
Club members receive a 15% discount on this price.

Find how much a club member pays for this bicycle.

$ ..... [2]

(c) In 2019, the membership fee of the cycling club is $79.50 .
This is 6% more than last year.

Find the **increase** in the cost of the membership.

$ ..... [3]

Continue on to the next…

(d) Asif cycles a distance of 105 km.
On the first part of his journey he cycles 60 km in 2 hours 24 minutes.
On the second part of his journey he cycles 45 km at 20 km/h.

Find his average speed for the whole journey.

..... km/h [4]

(e) Bryan invested $480 in an account 4 years ago.
The account pays compound interest at a rate of 2.1% per year.
Today, he uses some of the money in this account to buy a bicycle costing $430.

Calculate how much money remains in his account.

$ ..... [3]

Question 75

(a) Mohsin has 600 pear trees and 720 apple trees on his farm.

(i) Write the ratio pear trees : apple trees in its simplest form.

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

(ii) Each apple tree produces 16 boxes of apples each year.
One box contains 18 kg of apples.

Calculate the total mass of apples produced by the 720 trees in one year.
Give your answer in standard form.

..... kg [3]

(b) **(i)** One week, the total mass of pears picked was 18 540 kg.
For this week, the ratio mass of apples : mass of pears = 13 : 9.

Find the mass of apples picked that week.

..... kg [2]

(ii) The apples cost Mohsin \$0.85 per kilogram to produce.
He sells them at a profit of 60%.

Work out the selling price per kilogram of the apples.

\$ ..... [2]

(c) Mohsin exports some of his pears to a shop in Belgium.
The shop buys the pears at \$1.50 per kilogram.
The shop sells the pears for 2.30 euros per kilogram.
The exchange rate is \$1 = 0.92 euros.

Calculate the percentage profit per kilogram made by the shop.

..... % [5]

(d) Mohsin's earnings increase exponentially at a rate of 8.7% each year.
During 2018 he earned \$195 600.

During 2027, how much **more** does he earn than during 2018?

\$ ..... [3]

Question 76

Car *A* and car *B* take part in a race around a circular track.
One lap of the track measures 7.6 km.

Car *A* takes 2 minutes and 40 seconds to complete each lap of the track.
Car *B* takes 2 minutes and 25 seconds to complete each lap of the track.
Both cars travel at a constant speed.

(a) Calculate the speed of car *A*.
Give your answer in kilometres per hour.

..... km/h [3]

(b) Both cars start the race from the same position, *S*, at the same time.

(i) Find the time taken when both car *A* and car *B* are next at position *S* **at the same time**.
Give your answer in minutes and seconds.

..... min ..... s [4]

(ii) Find the distance that car *A* has travelled at this time.

..... km [2]

Question 77

(a) Ali and Mo share a sum of money in the ratio Ali : Mo = 9 : 7.
Ali receives $600 more than Mo.

Calculate how much each receives.

Ali $ .....

Mo $ ..... [3]

(b) In a sale, Ali buys a television for $195.80 .
The original price was $220.

Calculate the percentage reduction on the original price.

..... % [3]

(c) In the sale, Mo buys a jacket for $63.
The original price was reduced by 25%.

Calculate the original price of the jacket.

$ ..... [3]

Question 78

(a) Dina invests \$600 for 5 years at a rate of 2% per year compound interest.

Calculate the value of this investment at the end of the 5 years.

\$ ..... [2]

(b) The value of a gold ring increases exponentially at a rate of 5% per year.
The value is now \$882.

(i) Calculate the value of the ring 2 years ago.

\$ ..... [2]

(ii) Find the number of complete years it takes for the ring's value of \$882 to increase to a value greater than \$1100.

..... [2]

Question 79

(a) Complete the table for the 5th term and the nth term of each sequence.

1st term	2nd term	3rd term	4th term	5th term		nth term
9	5	1	−3			
4	9	16	25			
1	8	27	64			
8	16	32	64			

[11]

(b) 0, 1, 1, 2, 3, 5, 8, 13, 21, …

This sequence is a Fibonacci sequence.
After the first two terms, the rule to find the next term is "add the two previous terms".
For example, $5+8=13$.

Use this rule to complete each of the following Fibonacci sequences.

2 4 ....

1 11

..... −1 1

[3]

(c) $\frac{1}{3}$, $\frac{3}{4}$, $\frac{4}{7}$, $\frac{7}{11}$, $\frac{11}{18}$, …

(i) One term of this sequence is $\frac{p}{q}$.

Find, in terms of p and q, the next term in this sequence.

..... [1]

(ii) Find the 6th term of this sequence.

..... [1]

Question 80

Dhanu has a model railway.

(a) He has a train that consists of a locomotive and 4 coaches.
The mass of the locomotive is 87 g and the mass of each coach is 52 g.

(i) Work out the total mass of the train.

..... g [2]

(ii) Work out the mass of the locomotive as a percentage of the total mass of the train.

..... % [1]

(b) The train is 61 cm long and travels at a speed of 18 cm/s.
It takes 4 seconds for the whole of the train to cross a bridge.

Calculate the length of the bridge.

..... cm [2]

(c) A new locomotive costs \$64.

Calculate the cost of the locomotive in rupees when the exchange rate is 1 rupee = \$0.0154 .
Give your answer correct to the nearest 10 rupees.

..... rupees [2]

Continue on the next page…

(d) The cost of a railway magazine increases by 12.5% to \$2.70 .

Calculate the cost of the magazine before this increase.

\$ ..... [2]

(e) Dhanu plays with his model railway from 06 50 to 11 15.
He then rides his bicycle for 3 hours.

Find the ratio time playing with model railway : time riding bicycle.
Give your answer in its simplest form.

..... : ..... [3]

(f) The value of Dhanu's model railway is \$550.
This value increases exponentially at a rate of r% per year.
At the end of 5 years the value will be \$736.

Calculate the value of r.

$r =$ ..... [3]

Question 81

(a) Manjeet uses 220 litres of water each day.
She reduces the amount of water she uses by 15%.

Calculate the number of litres of water she now uses each day.

..... litres [2]

(b) Manjeet has two mathematically similar bottles in her bathroom.
The large bottle holds 1.35 litres and is 29.7 cm high.
The small bottle holds 0.4 litres.

Calculate the height of the small bottle.

..... cm [3]

(c) Water from Manjeet's shower flows at a rate of 12 litres per minute.
The water from the shower flows into a tank that is a cuboid of length 90 cm and width 75 cm.

Calculate the increase in the level of water in the tank when the shower is used for 7 minutes.

..... cm [3]

Question 82

Find the nth term of each sequence.

(i) 4 2 0 -2 -4 …

..... [2]

(ii) 1 7 17 31 49 …

..... [2]

Question 83

(a)

Campsite fees (per day)	
Tent	$15.00
Caravan	$25.00

The sign shows the fees charged at a campsite.
Today there are 54 tents and 18 caravans on the site.

Calculate the fees charged today.

$ ..... [2]

(b) In September the total income at the campsite was $37 054.
This was a decrease of 4.5% on the total income in August.

Calculate the total income in August.

$ ..... [2]

(c) The visitors to the campsite today are in the ratio

men : women = 5 : 4 and women : children = 3 : 7.

(i) Calculate the ratio men : women : children in its simplest form.

..... : ..... : ..... [2]

(ii) Today there are 224 children at the campsite.

Calculate the total number of men and women.

..... [3]

(d) The space allowed for each tent is a rectangle measuring 8 m by 6 m, each correct to the nearest metre.

Calculate the upper bound for the area of the space allowed for each tent.

..... m^2 [2]

(e) The value of the campsite has increased exponentially by 1.5% every year since it opened 30 years ago.

Calculate the value of the campsite now as a percentage of its value 30 years ago.

..... % [2]

Question 84

(a) **(i)** Divide \$24 in the ratio 7 : 5.

\$ ..... , \$ ..... [2]

(ii) Write \$24.60 as a fraction of \$2870.
Give your answer in its lowest terms.

..... [2]

(iii) Write \$1.92 as a percentage of \$1.60 .

..... % [1]

(b) In a sale the original prices are reduced by 15%.

(i) Calculate the sale price of a book that has an original price of \$12.

\$ ..... [2]

(ii) Calculate the original price of a jacket that has a sale price of \$38.25 .

\$ ..... [2]

Continue on the next page…

(c) **(i)** Dean invests \$500 for 10 years at a rate of 1.7% per year simple interest.

Calculate the total interest earned during the 10 years.

\$ ..... [2]

(ii) Ollie invests \$200 at a rate of 0.0035% **per day** compound interest.

Calculate the value of Ollie's investment at the end of 1 year.
[1 year = 365 days.]

\$ ..... [2]

(iii) Edna invests \$500 at a rate of r% per year compound interest.
At the end of 6 years, the value of Edna's investment is \$559.78 .

Find the value of r.

$r =$ ..... [3]

Question 85

(a) In 2018, Gretal earned $32 000.

(i) She paid tax of 24% on these earnings.

Work out the amount she paid in tax in 2018.

$ ..... [2]

(ii) In 2019, Gretal's earnings increased by 7%.

Work out her earnings in 2019.

$ ..... [2]

(b) Gretal invests $5000 at a rate of 2% per year compound interest.

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

$ ..... [2]

(c) One month, Gretal spent a total of $360 on presents.
She spent $\frac{1}{5}$ of this total on presents for her parents.
She spent $\frac{2}{3}$ of the remaining money on presents for her friends.
She spent the rest of the money on presents for her sisters.

Calculate the percentage of the $360 that she spent on presents for her sisters.

..... % [4]

Continue on the next page…

(d) Arjun earned \$36 515 in 2019.
This was an increase of 9% on his earnings in 2018.

Work out his earnings in 2018.

\$ ..... [2]

(e) Arjun and Gretal each pay rent.

In 2018, the ratio of the amount each paid in rent was Arjun : Gretal = 5 : 7.
In 2019, the ratio of the amount each paid in rent was Arjun : Gretal = 9 : 13.

Arjun paid the same amount of rent in both 2018 and 2019.
Gretal paid \$290 more rent in 2019 than she did in 2018.

Work out the amount Arjun paid in rent in 2019.

\$ ..... [4]

Question 86

The table shows the first four terms in sequences A, B, and C.

Sequence	1st term	2nd term	3rd term	4th term	5th term		nth term
A	4	9	14	19			
B	3	10	29	66			
C	1	4	16	64			

Complete the table.

[9]

Question 87

(a) The Earth has a surface area of approximately 510 100 000 km^2.

(i) Write this surface area in standard form.

..... km^2 [1]

(ii) Water covers 70.8% of the Earth's surface.

Work out the area of the Earth's surface covered by water.

..... km^2 [2]

(b) The table shows the surface area of some countries and their estimated population in 2017.

Country	Surface area (km^2)	Estimated population in 2017
Brunei	5.77×10^3	433 100
China	9.60×10^6	1 388 000 000
France	6.41×10^5	67 000 000
Maldives	3.00×10^2	374 600

(i) Find the total surface area of Brunei and the Maldives.

..... km^2 [1]

(ii) The ratio surface area of the Maldives : surface area of China can be written in the form 1 : n.

Find the value of n.

$n =$ ..... [2]

(iii) Find the surface area of France as a percentage of the surface area of China.

..... % [2]

(iv) Find the population density of the Maldives.
[Population density = population ÷ surface area]

..... people/km^2 [2]

Continue on the next page…

(c) The population of the Earth in 2017 was estimated to be 7.53×10^9.

The population of the Earth in 2000 was estimated to be 6.02×10^9.

(i) Work out the percentage increase in the Earth's estimated population from 2000 to 2017.

..... % [2]

(ii) Assume that the population of the Earth increased exponentially by y% each year for these 17 years.

Find the value of y.

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

Question 87

Sequence	1st term	2nd term	3rd term	4th term	5th term		*n*th term
A	13	9	5	1			
B	0	7	26	63			
C	$\frac{7}{8}$	$\frac{8}{16}$	$\frac{9}{32}$	$\frac{10}{64}$			

(a) Complete the table for the three sequences.

[10]

(b) One term in Sequence C is $\frac{p}{q}$.

Write down the next term in Sequence C in terms of p and q.

..... [2]

Question 88

(a) Beth invests \$2000 at a rate of 2% per year compound interest.

(i) Calculate the value of this investment at the end of 5 years.

\$ ..... [2]

(ii) Calculate the overall percentage increase in the value of Beth's investment at the end of 5 years.

..... % [2]

(iii) Calculate the minimum number of complete years it takes for the value of Beth's investment to increase from \$2000 to more than \$2500.

..... [3]

(b) The population of a village decreases exponentially at a rate of 4% each year.
The population is now 255.

Calculate the population 16 years ago.

..... [3]

Question 89

Karel travelled from London to Johannesburg and then from Johannesburg to Windhoek.

(a) The flight from London to Johannesburg took 11 hours 10 minutes.
The average speed was 813 km/h.

Calculate the distance travelled from London to Johannesburg.
Give your answer correct to the nearest 10 km.

..... km [3]

(b) The total time for Karel's journey from London to Windhoek was 15 hours 42 minutes.
The total distance travelled from London to Windhoek was 10 260 km.

(i) Calculate the average speed for this journey.

..... km/h [2]

(ii) The cost of Karel's journey from London to Windhoek was $470.

(a) Calculate the distance travelled per dollar.

..... km per dollar [1]

(b) Calculate the cost per 100 km of this journey.
Give your answer correct to the nearest cent.

$ ..... per 100 km [2]

(c) Karel changed $300 into 3891 Namibian dollars.

Complete the statement.

$1 = ... Namibian dollars [1]

Question 90

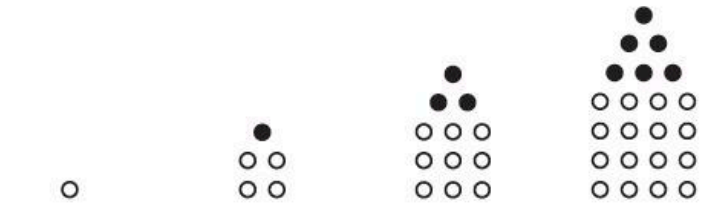


Diagram 1 Diagram 2 Diagram 3 Diagram 4

These are the first four diagrams of a sequence.
The diagrams are made from white dots and black dots.

(a) Complete the table for Diagram 5 and Diagram 6.

Diagram	1	2	3	4	5	6
Number of white dots	1	4	9	16		
Number of black dots	0	1	3	6		
Total number of dots	1	5	12	22		

[2]

(b) Write an expression, in terms of n, for the number of white dots in Diagram n.

..... [1]

(c) The expression for the total number of dots in Diagram n is $\frac{1}{2}(3n^2 - n)$.

(i) Find the total number of dots in Diagram 8.

..... [1]

(ii) Find an expression for the number of black dots in Diagram n.
Give your answer in its simplest form.

..... [2]

(d) T is the total number of dots used to make **all** of the first n diagrams.

$$T = an^3 + bn^2$$

Find the value of a and the value of b.
You must show all your working.

$a =$ ..... *and* b ..... [5]

Question 91

(a) A plane has 14 First Class seats, 70 Premium seats and 168 Economy seats.

Find the ratio First Class seats : Premium seats : Economy seats.
Give your answer in its simplest form.

..... : ..... : ..... [2]

(b) **(i)** For a morning flight, the costs of tickets are in the ratio

First Class : Premium : Economy = 14 : 6 : 5.

The cost of a Premium ticket is $114.

Calculate the cost of a First Class ticket and the cost of an Economy ticket.

First Class $ .....

Economy $ ..... [3]

(ii) For an afternoon flight, the cost of a Premium ticket is reduced from $114 to $96.90 .

Calculate the percentage reduction in the cost of a ticket.

..... % [2]

(c) When the local time in Athens is 09 00, the local time in Berlin is 08 00.
A plane leaves Athens at 13 15.
It arrives in Berlin at 15 05 local time.

(i) Find the flight time from Athens to Berlin.

..... h ..... min [1]

(ii) The distance the plane flies from Athens to Berlin is 1802 km.

Calculate the average speed of the plane.
Give your answer in kilometres per hour.

..... km/h [2]

Question 92

Painter	Plumber	Electrician
$35 per hour	Fixed charge $40 plus $26.50 per hour	$48 per hour for the first 2 hours then $32 per hour

These are the rates charged by a painter, a plumber and an electrician who do some work for Mr Sharma.

(a) The painter works for 7 hours.

Calculate the amount Mr Sharma pays the painter.

$ ..... [1]

(b) Mr Sharma pays the plumber $252.

Calculate how many hours the plumber works.

..... hours [2]

(c) Mr Sharma pays the electrician $224.

Calculate how many hours the electrician works.

..... hours [2]

(d) Write down the ratio of the amount Mr Sharma pays to the painter, the plumber and the electrician.
Give your answer in its lowest terms.

painter : plumber : electrician = ... : ..... : ..... [2]

Question 93

(a) These are the first four terms of a sequence.

11 7 3 −1

(i) Write down the next term.

..... [1]

(ii) Write down the term to term rule for this sequence.

..... [1]

(iii) Find the nth term of this sequence.

..... [2]

(b) The nth term of a different sequence is $\frac{2n}{n+1}$.

(i) Find the difference between the 5th term and the 6th term of this sequence.
Give your answer as a fraction.

..... [2]

(ii) Is $\frac{3}{4}$ a term in this sequence?
Show how you decide.

[3]

Question 94

(a) **(i)** Yasmin and Zak share an amount of money in the ratio 21 : 19.
Yasmin receives \$6 more than Zak.

Calculate the total amount of money shared by Yasmin and Zak.

\$ ..... [2]

(ii) In a sale, all prices are reduced by 15%.

(a) Yasmin buys a blouse with an original price of \$40.

Calculate the sale price of the blouse.

\$ ..... [2]

(b) Zak buys a shirt with a sale price of \$29.75 .

Calculate the original price of the shirt.

\$ ..... [2]

(b) Xavier's salary increases by 2% each year.
In 2010, his salary was \$40 100.

(i) Calculate his salary in 2015.
Give your answer correct to the nearest dollar.

\$ ..... [3]

(ii) In which year is Xavier's salary first greater than \$47 500?

..... [3]

(c) In January 2020, the population of a town was 5% **more** than its population in January 2018.
In January 2021, the population of this town was 2% **less** than its population in January 2020.

Calculate the overall percentage increase in the population from January 2018 to January 2021.

..... % [2]

Question 95

The table shows four sequences A, B, C and D.

Sequence	1st term	2nd term	3rd term	4th term	5th term		nth term
A	1	8	27	64			
B	5	11	17	23			
C	0.25	0.5	1	2	4		
D	4.75	10.5	16	21			

Complete the table.

[9]

Question 96

(a) A 2.5-litre tin of paint costs \$13.50 .
In a sale, the cost is reduced by 14%.

(i) Work out the sale price of this tin of paint.

\$ ..... [2]

(ii) Work out the cost of buying 42.5 litres of paint at this sale price.

\$ ..... [2]

(b) Henri buys some paint in the ratio red paint : white paint : green paint = 2 : 8 : 5.

(i) Find the percentage of this paint that is white.

..... % [1]

(ii) Henri buys a total of 22.5 litres of paint.

Find the number of litres of green paint he buys.

..... litres [2]

(c) Maria paints a rectangular wall.
The length of the wall is 20.5 m and the height is 2.4 m, both correct to 1 decimal place.

One litre of paint covers an area of exactly 10 m^2.

Calculate the smallest number of 2.5-litre tins of paint she will need to be sure all the wall is painted.
Show all your working.

.....[4]

Question 96

(a) The exchange rate is 1 euro = \$1.142 .

(i) Johann changes \$500 into euros.

Calculate the number of euros Johann receives.
Give your answer correct to the nearest euro.

..... euros [2]

(ii) Johann buys a computer for \$329.
The same computer costs 275 euros.

Calculate the difference in cost in dollars.

\$ ..... [2]

(b) Lucy spends $\frac{3}{8}$ of the money she has saved this month on a book that costs \$5.25 .

Calculate how much money Lucy has saved this month.

\$ ..... [2]

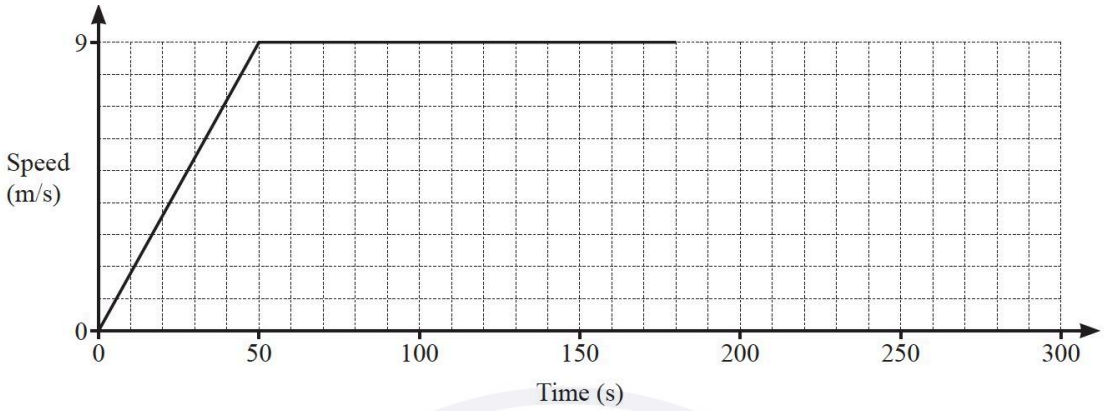
(c) Kamal invests \$6130 at a rate of r% per year compound interest.
The value of his investment at the end of 5 years is \$6669.

Calculate the value of r.

$r =$ ..... [3]

Question 97

The diagram shows the speed–time graph for the first 180 seconds of a train journey.



(a) Find the acceleration, in m/s^2, of the train during the first 50 seconds.

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

(b) After 180 seconds, the train decelerates at a constant rate of 1944 $\mathbf{km/h^2}$.

Show that the train decelerates for 60 seconds until it stops.

[2]

(c) Complete the speed–time graph. [1]

(d) Calculate the average speed of the train for the whole journey.

..... m/s [4]

Question 98

(a) The total cost of a taxi journey is calculated as

- \$0.50 per kilometre

plus

- \$0.40 per minute.

(i) Calculate the total cost of a journey of 32 km that takes 30 minutes.

\$ ..... [2]

(ii) The total cost of a journey of 100 km is \$98.

Show that the time taken is 2 hours.

[3]

Driver 1 ..... km

Driver 2 ..... km

Driver 3 ..... km [3]

(c) After midnight, the cost of any taxi journey increases by 45%.
One journey costs \$84.10 after midnight.

\$ ..... [2]

Question 99

(a) \$500 is invested at a rate of 3% per year.

Calculate the total interest earned at the end of 7 years when

(i) simple interest is paid,

\$ ..... [2]

(ii) compound interest is paid.

\$ ..... [3]

Question 100

(a) Malena has 450 fruit trees.
The fruit trees are in the ratio apple : pear : plum = 8 : 7 : 3.

(i) Show that Malena has 200 apple trees.

[2]

(ii) Find the number of plum trees.

..... [1]

(iii) Malena wants to increase the number of pear trees by 32%.

Calculate the number of extra pear trees she needs.

..... [2]

(iv) Each apple tree produces 48.5 kg of apples.
The apples have an average mass of 165 g each.

Calculate the total number of apples produced by the 200 trees.
Give your answer correct to the nearest 1000 apples.

..... [3]

(b) Malena's land is valued at three million and seventy-five thousand dollars.

(i) Write this number in figures.

..... [1]

(ii) Write your answer to **part (b)(i)** in standard form.

..... [1]

(c) In 2020, each plum tree produced 37.7 kg of plums.
This was 16% more than in 2019.

Calculate the mass of plums produced by each plum tree in 2019.

..... kg [2]

Continue on the next page..

(d) Malena invests \$1800 at a rate of 2.1% per year compound interest.

Calculate the value of her investment at the end of 15 years.

\$ ..... [2]

Question 101

Bob, Chao and Mei take part in a run for charity.

(a) Their times to complete the run are in the ratio Bob : Chao : Mei = 4 : 5 : 7.

(i) Find Chao's time as a percentage of Mei's time.

..... % [1]

(ii) Bob's time for the run is 55 minutes 40 seconds.

Find Mei's time for the run.
Give your answer in minutes and seconds.

..... min ..... s [3]

(b) Chao collects \$47.50 for charity.

(i) Bob collects 28% more than Chao.

Find the amount Bob collects.

\$ ..... [2]

(ii) Chao collects 60% less than Mei.

Find how much more money Mei collects than Chao.

\$ ..... [3]

(c) When running, Chao has a stride length of 70 cm, correct to the nearest 5 cm.
Chao runs a distance of 11.2 km, correct to the nearest 0.1 km.

Work out the minimum number of strides that Chao could take to complete this distance.

Continue on the next …

..... [4]

(d) In 2015, a charity raised a total of \$1.6 million.
After 2015, this amount increased exponentially by 2.4% each year for the next 5 years.

Work out the amount raised by the charity in 2020.

\$ ..... million [2]

Question 102

A company employed 300 workers when it started and now employs 852 workers.

(a) Calculate the percentage increase in the number of workers.

..... % [2]

(b) Of the 852 workers, the ratio part-time workers : full-time workers = 5 : 7.

Calculate the number of full-time workers.

..... [2]

(c) The company makes 40 600 headphones in one year.

Write this number

(i) in words,

..... [1]

(ii) in standard form.

..... [1]

(d) In one month, the company sells 3 000 headphones.
Of these, 48% are exported, $\frac{3}{8}$ are sold to shops and the rest are sold online.

Calculate the number of headphones that are sold online.

..... [3]

(e) One year, sales increased by 15%.
The following year sales increased by 18%.

Calculate the overall percentage increase in sales.

..... % [3]

Question 103

(a) The table shows the numbers of tigers reported to be living in the wild in the year 2014 in some countries.

Country	Number
India	2226
Indonesia	371
Nepal	198
Bangladesh	106

(i) Using the table,

(a) find the number of tigers in Nepal as a percentage of the number of tigers in Bangladesh,

..... % [1]

(b) find the ratio tigers in Bangladesh : tigers in Indonesia : tigers in India, giving your answer in its simplest form.

..... : ..... : ..... [2]

(ii) Five years later, the number of tigers reported in India was 2967.

Find the percentage increase in the population of tigers in India.

..... % [2]

(iii) The number of tigers in India in the year 2014 is approximately 30.48% greater than in the year 2010.

Find the number of tigers in India in the year 2010.
Give your answer correct to the nearest integer.

..... [3]

Continue on the next …

(b) At the start of June, a hive has a population of 2000 bees.
Three months after the start of June the hive has a population of 2662 bees.

The population of this hive can be calculated using the formula

$$P = ab^x,$$

where P is the population of the hive x months after the start of June.

By finding the value of a and the value of b, calculate the population of the hive 7 months after the start of June.
Give your answer correct to the nearest integer.

..... [5]

Question 104

Here is part of a bus timetable.

Abbots	06 50	08 25	09 20
Callet	07 12	08 47	09 42
North Moor	07 30	09 05	10 00
South Moor	07 37	09 12	10 07
Centre Point	08 00	09 35	10 30

(a) Rashid catches the 09 20 bus at Abbots.

Find the time the bus arrives at South Moor.

..... [1]

(b) Annisa leaves home at 8.27 am and takes 25 minutes to walk to the bus stop at Callet.
She catches the next bus to Centre Point.

Find the total time, in minutes, for her journey from leaving home to arriving at Centre Point.

..... min [2]

(c) The distance from Abbots to Centre Point is 29.4 km.
Each bus takes the same time for the journey.

Calculate the average speed of a bus for this journey.
Give your answer in kilometres per hour.

..... km/h [2]

(d) On one journey, all 56 seats on the bus are filled.
The ratio of adults to children on this journey is adults : children = 5 : 3.
The cost for an adult ticket is \$2.80 .
The cost for a child ticket is $\frac{3}{4}$ of the adult cost.

Work out the total cost of the tickets for this journey.

\$ ..... [4]

Question 105

At a festival, 380 people out of 500 people questioned say that they are camping.
There are 55 300 people at the festival.

Calculate an estimate of the total number of people camping at the festival.

..... [2]

Question 106

Arno buys a student ticket for \$43.68 .
This is a saving of 16% on the full price of a ticket.

Calculate the full price of a ticket.

\$ ..... [2]

Question 107

At a football match, there are 29 800 people, correct to the nearest 100.

(i) At the end of the football match, the people leave at a rate of 400 people per minute, correct to the nearest 50 people.

Calculate the lower bound for the number of minutes it takes for all the people to leave.

..... min [3]

(ii) At a cricket match there are 27 500 people, correct to the nearest 100.
Calculate the upper bound for the difference between the number of people at the football match and at the cricket match.

..... [2]

Question 108

(a) Find the lowest common multiple (LCM) of 30 and 75.

..... [2]

(b) Share \$608 in the ratio 4 : 5 : 7.

\$ .....

\$ .....

\$ ..... [3]

(c) Work out $\frac{6.39 \times 10^4}{2.45 \times 10^6}$.

Give your answer in standard form.

..... [2]

(d) Write $0.\dot{2}\dot{7}$ as a fraction.

..... [1]

(e) A stone has volume $45\,cm^3$ and mass 126 g.
Find the density of the stone, giving the units of your answer.

[Density = mass ÷ volume]

.... [2]

Question 109

(a) Alex, Bobbie and Chris share strawberries in the ratio Alex : Bobbie : Chris = 3 : 2 : 2.
Chris receives 12 strawberries.

Calculate the total number of strawberries shared.

..... [2]

(b) In a sale, a shop reduces all prices by 12%.

(i) Dina buys a book which has an original price of $6.50 .

Calculate how much Dina pays for the book.

$ ..... [2]

(ii) Elu pays $11 for a toy.

Calculate the original price of the toy.

$ ..... [2]

(c) Feri invests some money.
The rate of interest for the first year is 2.5%.
At the end of the second year the overall percentage increase of Feri's investment is 6.6%.

Find the rate of interest for the second year.

..... % [2]

(d) A radioactive substance decays at an exponential rate of 2% per day.
The initial mass is 80 g.

(i) Find the mass at the end of 5 days.

..... g [2]

(ii) Find how many **more** whole days, after day 5, it takes for the mass to reduce to less than 67 g.

..... [3]

Question 110

(a) Here are the ingredients needed to make a pasta bake to serve 12 people.

250 g butter
600 g pasta
460 g mushrooms
280 g cheese
800 ml milk

(i) Find the mass of the cheese as a percentage of the mass of the mushrooms.

..... % [1]

(ii) Find the mass of butter needed to make a pasta bake to serve 18 people.

..... g [2]

(iii) Monica has 2.2 litres of milk and 1.5 kg of each other ingredient.

Calculate the greatest number of people she can serve with pasta bake.

..... [3]

Continue on the next page….

(b) In 2019, a packet of pasta cost \$2.40.
This was an increase of 25% of the cost of a packet in 2018.

(i) Work out the cost in 2018.

\$ ..... [2]

(ii) In 2020, the cost of a packet increased by 15% from the cost in 2019.

Work out the total percentage increase in the cost of a packet from 2018 to 2020.

..... % [3]

(c)

NOT TO SCALE

Pasta is sold in packets with width 11.5 cm, correct to the nearest 0.5 cm.
A shop places these packets in a single line on a shelf of length 2 m, correct to the nearest 0.1 m.

Find the maximum number of these packets that will fit along this shelf.
You must show all your working.

..... [3]

Question 111

A sequence has nth term $3n^2$.

Write down the first 3 terms of this sequence.

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

Question 112

Find the nth term for each of these sequences.

(i) 13, 16, 19, 22, 25, …

..... [2]

(ii) 3, 17, 55, 129, 251, …

..... [2]

Question 113

(a) (i) At a football club, season tickets are sold for seated areas and for standing areas.
The cost of season tickets are in the ratio seated : standing = 5 : 3.
The cost of a season ticket for the standing area is \$45.

Find the cost of a season ticket for the seated area.

\$ ..... [2]

(ii) In 2021, the value of the team's players was \$2.65 million.
In 2022 this value has decreased by 12%.

Find the value in 2022.

\$ ..... million [2]

(iii) The number of people at a football match is 1455.
This is 6.25% of the total number of people allowed in the stadium.

Find the total number of people allowed in the stadium.

..... [2]

(iv) The average attendance increased exponentially by 4% each year for the three years from 2016 to 2019.
In 2019 the average attendance was 1631.

Find the average attendance for 2016.

..... [3]

Continue on the next page…

(b) Another club sells season tickets for individuals and for families.
In 2018, the number of season tickets sold is in the ratio family : individual = 2 : 7.

(i) The number of family season tickets sold is x.

Write an expression, in terms of x, for the number of individual season tickets sold.

..... [1]

(ii) In 2019, the number of family season tickets sold increases by 12 and the number of individual season tickets sold decreases by 26.

Complete the table by writing expressions, in terms of x, for the number of tickets sold each year.

Year	Family tickets	Individual tickets
2018	x	
2019		

[2]

(iii) In 2019, the number of individual season tickets sold is 3 times the number of family season tickets sold.

Write an equation in x and solve it to find the number of family tickets sold in 2018.

$x =$ ..... [4]

Question 114

(a) **(i)** Zak invests \$500 at a rate of 2% per year simple interest.

Calculate the value of Zak's investment at the end of 5 years.

\$ ..... [3]

(ii) Yasmin invests \$500 at a rate of 1.8% per year compound interest.

Calculate the value of Yasmin's investment at the end of 5 years.

\$ ..... [2]

(iii) Zak and Yasmin continue with these investments.

How many **more complete** years is it before the value of Yasmin's investment is greater than the value of Zak's investment?

..... [3]

(b) Xavier buys a car for \$2500.
The value of the car decreases exponentially at a rate of 10% each year.

Calculate the value of Xavier's car at the end of 5 years.
Give your answer correct to the nearest dollar.

\$ ..... [3]

(c) The number of a certain type of bacteria increases exponentially at a rate of r% each day.
After 22 days, the number of this bacteria has doubled.

Find the value of r.

$r =$ ..... [3]

Question 115

(a) Write

(i) 2994.99 correct to the nearest 10,

..... [1]

(ii) 0.983 correct to 1 decimal place,

..... [1]

(iii) 2090 correct to 2 significant figures.

..... [1]

(b) Write down a prime number between 90 and 100.

..... [1]

(c) Write 2^{-6} as a fraction.

..... [1]

(d) Write 0.007 01 in standard form.

..... [1]

(e) Simplify $1.5 \times 10^{x} + 1.5 \times 10^{x-1}$ giving your answer in standard form.

..... [2]

(f) Write $0.3\dot{7}$ as a fraction.
You must show all your working.

..... [2]

Question 116

(a) (i) Alain and Beatrice share $750 in the ratio Alain : Beatrice = 8 : 7.
Show that Alain receives $400.

[1]

(ii) (a) Alain spends $150.
Write $150 as a percentage of $400.

.....% [1]

(b) He invests the remaining $250 at a rate of 2% per year simple interest.
Calculate the amount Alain has at the end of 5 years.

$ ..... [3]

(iii) Beatrice invests her $350 at a rate of 0.25% per month compound interest.

Calculate the amount Beatrice has at the end of 5 years.
Give your answer correct to the nearest dollar.

$ ..... [3]

(b) Carl, Dina and Eva share 100 oranges.
The ratio Carl's oranges : Dina's oranges = 3 : 5.
The ratio Carl's oranges : Eva's oranges = 2 : 3.
Find the number of oranges Carl receives.

..... [2]

(c) Fred buys a house.
At the end of the first year, the value of the house increases by 5%.
At the end of the second year, the value of the house increases by 3% of its value at the end of the first year.
The value of Fred's house at the end of the second year is $60 564.

Calculate how much Fred paid for the house.

$ ..... [3]

(d) Gabrielle invests $500 at a rate of r % per year compound interest.
At the end of 8 years the value of Gabrielle's investment is $609.20 .

Find the value of r.

r = ... [3]

Question 117

(a) Tomas sells a computer, a bike and a phone.
The amounts he receives are in the ratio computer : bike : phone = 14 : 17 : 9.

(i) Calculate the amount he receives for the phone as a percentage of the total.

..... % [2]

(ii) The total amount he receives is $560.

Calculate how much he receives for the bike.

$ ..... [2]

(iii) Tomas originally bought the bike for $195.
He wanted to make a profit of at least 25% when he sold it.

Does Tomas make a profit of at least 25%?
You must show all your working to support your decision.

[3]

(b) Ulla invests $725 for 6 years in an account paying simple interest at a rate of 1.3% per year.

Calculate the total interest earned at the end of 6 years.

$ ..... [2]

(c) In a sale, all prices are reduced by 24%.
Victor pays $36.86 for a pair of shoes in the sale.

Calculate the original price of the shoes.

$ ..... [2]

Question 118

(a) A sequence has nth term $\frac{n}{2n+3}$.

(i) Find the first three terms of this sequence.

Give your answers as fractions.

(ii) The kth term of this sequence is $\frac{12}{25}$.

Find the value of k.

$k =$ ..... [2]

(b) Find the nth term of each sequence.

(i) 6, 13, 32, 69, 130, …

..... [2]

(ii) 100, 50, 25, 12.5, 6.25, …

..... [2]

Question 119

(a) Anil changes \$830 into euros when the exchange rate is 1 euro = \$1.16.
He spends 500 euros.
He then changes the remaining money back into dollars at the same exchange rate.

Work out how much, in dollars, Anil receives.

\$ ..... [3]

(b) In 2021, Anil earns \$37 000.

(i) He spends \$12 400 on bills in 2021.

Calculate the percentage of his earnings he spends on bills.

.....%. [2]

(ii) His earnings of \$37 000 increase by 3.2% in 2022.

Calculate his earnings in 2022.

\$ ..... [2]

(c) Anil invests \$3500 in an account that pays a rate of 2.4% per year compound interest.

(i) Calculate the total interest earned at the end of 5 years.

\$ ..... [3]

(ii) Find the number of complete years before Anil has at least \$5000 in this account.

..... years [3]

Question 120

One year, a farmer makes a profit of $24 730 selling eggs.

Write this profit

(i) correct to 2 significant figures

$ ..... [1]

(ii) in standard form.

$ ..... [1]

(c) On a farm, there are 500 hens, correct to the nearest 10.

(i) In one year, the mean number of eggs laid per hen was 320 eggs, correct to the nearest 20.

Calculate the upper bound for the total number of eggs all the hens lay in that year.

..... [3]

(ii) Another farm has 800 hens, correct to the nearest 20.

Calculate the lower bound for the difference between the number of hens on the two Farms.

..... [2]

Question 121

(a) An orchard has 1250 trees.
The trees are in the ratio apple : pear : cherry = 12 : 9 : 4.

(i) Calculate the number of apple trees.

..... [2]

(ii) Last year in the orchard, the mean mass of fruit produced was 64 kg per tree.

Calculate the total mass of fruit produced last year.
Give your answer in tonnes.
[1 tonne = 1000 kg]

..... tonnes [2]

(iii) Last year, the mean mass of pears produced was 54 kg per tree.
This was a decrease of 10% on the mean mass of pears produced per tree from the year before.

Calculate the mean mass of pears produced by each pear tree the year before.

..... kg [2]

(iv) The orchard loses $\frac{1}{5}$ of its total number of trees in a storm.

Calculate the number of trees that remain.

..... [2]

(b) Paulo buys some pears from a market.
Pears cost \$0.54 each or 0.51 euros each.

(i) Paulo pays **in dollars** for 12 pears.

Calculate the change he receives from \$10.

\$ ..... [2]

(ii) The exchange rate is \$1 = 0.826 euros.

Calculate how much more Paulo pays for **each** pear when he pays in euros.
Give your answer in dollars, correct to the nearest cent.

\$ ..... [3]

Question 122

The table shows the amount received when exchanging **$100** in some countries.

Country	Amount received for $100
Wales	77.05 pounds
India	7437.05 rupees
China	671.20 yuan
Spain	85.35 euros

(a) Brad changes $250 to Indian rupees.

Calculate the amount he receives correct to the nearest rupee.

..... rupees [2]

(b) Wang changes 5400 Chinese yuan into dollars.

Calculate how much he receives in dollars, correct to the nearest cent.

$ ..... [2]

(c) Gretal lives in Spain and goes on holiday to Wales.
She spends 3500 euros in total on travel and hotels in the ratio

travel : hotels = 4 : 3.

(i) Work out how much Gretal spends, in euros, on travel.

..... euros [2]

(ii) Work out how much she spends, **in pounds**, on hotels.

..... pounds [3]

Continue on the next page…

(iii) Gretal flies home to Spain.
The plane flies a distance of 2200 km, correct to the nearest 100 km.
The average speed of the plane is 740 km/h, correct to the nearest 20 km/h.

Calculate the lower bound of the time taken, in hours and minutes, for this flight.

..... h ..... min [3]

Question 123

(a) The value of Priya's car decreases by 10% every year.
The value today is $7695.

(i) Calculate the value of the car after one year.

$ ..... [2]

(ii) Calculate the value of the car one year ago.

$ ..... [2]

(b) Ali invests $600 at a rate of 2% per year simple interest.

Calculate the value of Ali's investment at the end of 5 years.

$ ..... [3]

(c) Sara invests $500 at a rate of r% per year compound interest.
At the end of 12 years, the value of Sara's investment is $601.35, correct to the nearest cent.

Find the value of r.

$r =$ ..... [3]

(d) The mass of a radioactive substance decreases exponentially at a rate of 3% each day.

(i) Find the overall percentage decrease at the end of 10 days.

..... % [2]

(ii) Find the number of whole days it takes until the mass of this substance is one half of its original amount.

..... [3]

Question 124

(a)

Sequence	1st term	2nd term	3rd term	4th term	5th term		*n*th term
A	-7	-3	1	5			
B	7	13	23	37			
C	$\frac{2}{27}$	$\frac{3}{81}$	$\frac{4}{243}$	$\frac{5}{729}$			

Complete the table for the three sequences.

[10]

(b) In a sequence, the sum of the first 49 terms is 7644.
The sum of the first 50 terms is 7975.

Find the 50th term of this sequence.

..... [1]

Question 125

(a) The table shows information about some of the planets in the solar system.

Planet	Diameter (km)	Average distance from the Sun (km)
Earth	12 800	1.496×10^8
Mars	6 800	2.279×10^8
Jupiter	143 000	7.786×10^8
Saturn	120 500	1.434×10^9
Neptune	49 500	4.495×10^9

(i) The average distance of Mars from the Sun is 2.279×10^8 km.

Write this distance as an ordinary number.

..... km [1]

(ii) The planet Uranus has a diameter that is 35.8% of the diameter of Jupiter.

Calculate the diameter of Uranus.

..... km [2]

(iii) The ratio diameter of Neptune : diameter of Saturn can be written in the form 1 : n.

Find the value of n.

..... km [2]

(iii) The ratio diameter of Neptune : diameter of Saturn can be written in the form 1 : n.

Find the value of n.

n = ... [1]

(iv) Find the average distance of Neptune from the Sun as a percentage of the average distance of the Earth from the Sun.

.....% [2]

(v) Distances within the solar system are also measured in astronomical units (AU).
The average distance of Jupiter from the Sun is 5.20 AU.

Calculate the average distance of Mars from the Sun in astronomical units.

Continue on the next page…

..... AU [2]

(vi) The diameter of Mars is 39.2% greater than the diameter of Mercury.

Calculate the diameter of Mercury.

..... km [2]

(b) One light year is the distance that light travels in a year of 365.25 days.
The speed of light is 2.9979×10^5 kilometres per second.

(i) Show that one light year is 9.461×10^{12} km, correct to 4 significant figures.

..... million years [2]

Question 126

(a) Janna and Kamal each invest \$8000.
At the end of 12 years, they each have \$12 800.

(i) Janna invests in an account that pays simple interest at a rate of r% per year.

Calculate the value of r.

$r =$ ..... [3]

(ii) Kamal invests in an account that pays compound interest at a rate of R% per year.

Calculate the value of R.

$R =$ ..... [3]

b) The population of a city is growing exponentially at a rate of 1.8% per year.
The population now is 260 000.

Find the number of complete years from now when the population will first be more than 300 000.

..... years [3]

Question 127

A grocer sells potatoes, mushrooms and carrots.

(a) A customer buys 3 kg of mushrooms at \$1.04 per kg and 4 kg of carrots at \$1.28 per kg.

Calculate the total cost.

\$ ..... [2]

(b) In one week, the ratio of the masses of vegetables sold by the grocer is

potatoes : mushrooms : carrots = 11 : 8 : 6.

(i) Work out the mass of mushrooms sold as a percentage of the total mass.

..... % [2]

(ii) The total mass of potatoes, mushrooms and carrots sold is 1500 kg.

Find the mass of carrots the grocer sells this week.

..... kg [2]

(iii) The profit the grocer makes selling 1 kg of carrots is \$0.75 .

Find the total profit the grocer makes selling carrots this week.

\$ ..... [1]

(iv) On the last day of the week, the grocer reduces the price of 1 kg of potatoes by 8% to \$1.15 .

Calculate the original price of 1 kg of potatoes.

\$ ..... [2]

(c) The grocer buys 620 kg of onions, correct to the nearest 20 kg.
He packs them into bags each containing 5 kg of onions, correct to the nearest 1 kg.

Calculate the upper bound for the number of bags of onions that he packs.

..... [3]

Question 128

(a) **(i)** A car travels 50 km at an average speed of 75 km/h.

Find the time taken.
Give your answer in minutes.

..... min [2]

(ii) Another car travels 47 km, correct to the nearest kilometre.
The average speed of this car is 75 km/h, correct to the nearest 5 km/h.

Calculate the lower bound of the time taken.
Give your answer in minutes.

..... min [3]

(b) A train travels a total of 240 km.
The train travels for t **minutes** at an average speed of 100 km/h.
It then travels for $(t+60)$ **minutes** at an average speed of 110 km/h.

Find the average speed for the whole journey.

..... km/h [6]

Question 129

(a) The nth term of a sequence is $120-n^3$.

(i) Find the 4th term of this sequence.

..... [1]

(ii) Find the value of n when the nth term is -1211.

$n =$ ..... [2]

(b) The nth term of a different sequence is $3\times(0.2)^{n-1}$.

Find the 5th term of this sequence.

..... [1]

Continue on the next pages…

(c) The table shows the first four terms of sequences A, B and C.

Sequence	1st term	2nd term	3rd term	4th term	5th term		nth term
A	7	4	1	-2			
B	$\frac{1}{4}$	$\frac{2}{5}$	$\frac{3}{6}$	$\frac{4}{7}$			
C	0	2	6	12			

Question 130

(a) In 2023 a football club had 50 adult members and 70 child members.
The membership fee for an adult was \$40 and the membership fee for a child was \$15.

(i) Calculate the total of the membership fees received by the club in 2023.

\$ ..... [2]

(ii) The cost of running the club in 2023 was \$2780.

Calculate \$2780 as a percentage of the total of the membership fees received by the club.

..... % [1]

(iii) In 2023 there were 120 members.
This was a decrease by 4% of the number of members in 2022.

Calculate the number of members in 2022.

..... [2]

(iv) In 2024 the total number of members increased from the 120 members in 2023.
The number of adult members and the number of child members each increased by the same number.
The ratio number of adult members : number of child members changed to 14 : 19.

(a) Find the total number of members in 2024.

..... [2]

Continue on the next page…

(b) Calculate the percentage increase in the total number of members from 2023 to 2024.

..... % [2]

(b) The population of a village is 2500.
The population is decreasing exponentially at a rate of 3% per year.

(i) Calculate the population at the end of 3 years.

..... [2]

(ii) Find the number of complete years it takes for the population to first fall below 2000.

..... years [2]

Question 131

(a) Simplify $\left(25x^6\right)^{\frac{3}{2}}$.

..... [2]

(b) These are the first five terms of a sequence.

$$\frac{1}{6} \qquad 1 \qquad 6 \qquad 36 \qquad 216$$

Find the nth term of the sequence.

..... [2]

Question 132

(a) A fruit drink is made using 1.5 litres of apple juice and 450 millilitres of mango juice.

Write the ratio apple juice : mango juice in its simplest form.

..... : ..... [2]

(b) One litre of fruit drink is shared between three cups.
The amount in the cups is in the ratio 9 : 6 : 10.

Calculate the number of millilitres in each cup.

..... ml , ... ml , ... ml [3]

(c) A shop buys bottles of the fruit drink for $3.20 each.
It sells them at a profit of 15%.

Calculate the selling price of each bottle of fruit drink.

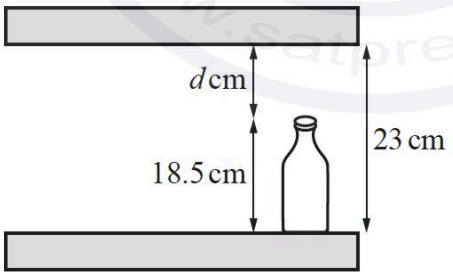
$ ..... [2]

(d) The number of bottles of fruit drink sold has grown exponentially at a constant rate of 2.5% per year.
5 years ago, the shop sold 16 620 bottles.

Calculate the number of bottles sold this year.

..... [2]

(e)



NOT TO SCALE

The bottles of juice are 18.5 cm tall, correct to the nearest millimetre.
They are stored on shelves.
The distance between the shelves is 23 cm, correct to the nearest centimetre.

Calculate the lower bound for the distance, d cm, between the top of a bottle and the shelf above it.

..... cm [3]

Question 133

(a) The table shows the areas, in km^2, of the four largest rainforests in the world.

Rainforest	Area (km^2)
Amazon	5 500 000
Congo	2 000 000
Atlantic	1 315 000
Valdivian	250 000

(i) Find the area of the Valdivian rainforest as a percentage of the area of the Amazon rainforest.

..... % [1]

(ii) Write, in its simplest form, the ratio of the areas of the rainforests Valdivian : Atlantic : Congo.

..... : ..... : ..... [2]

(iii) The Amazon rainforest has 60% of its area in Brazil and 10% of its area in Colombia.
$43\frac{1}{3}$% of the **remaining area** of the rainforest is in Peru.

Find the percentage of the Amazon rainforest that is in Brazil, Colombia and Peru.

..... % [3]

(iv) The area of the Amazon rainforest represents $\frac{27}{50}$ of the total area of rainforest in the world.

Calculate the total area of rainforest in the world.
Give your answer correct to the nearest 100 000 km^2.

..... km^2 [3]

(v) In the world, 60.7 hectares of rainforest are lost every minute.

Calculate the total area, in hectares, of rainforest that is lost in 365 days.
Give your answer in standard form.

..... hectares [3]

(b) The Amazon river has a length of 6440 km, correct to the nearest 10 km.
The Congo river has a length of 4400 km, correct to the nearest 100 km.

Calculate the upper bound of the difference between the lengths of the Amazon river and the Congo river.

..... km [3]