Answer ALL TWENTY ONE questions.

Write your answers in the spaces provided.

You must write down all the stages in your working.

1 (a) Simplify $g^6 \times g^4$

.....

(1)

(b) Simplify $k^{10} \div k^3$

.....

(1)

(c) Simplify $(3cd^4)^2$

.....

(2)

(d) Solve the inequality $4x + 7 > 2$

.....

(2)

(Total for Question 1 is 6 marks)

2 The table shows information about the lengths of time, in minutes, 120 customers spent in a supermarket.

Length of time (L minutes)	Frequency
$20 < L \leqslant 30$	6
$30 < L \leqslant 40$	26
$40 < L \leqslant 50$	31
$50 < L \leqslant 60$	40
$60 < L \leqslant 70$	17

(a) Write down the modal class.

.....

(1)

(b) Work out an estimate for the mean length of time spent by the 120 customers in the supermarket.

.....minutes

(4)

(Total for Question 2 is 5 marks)

3

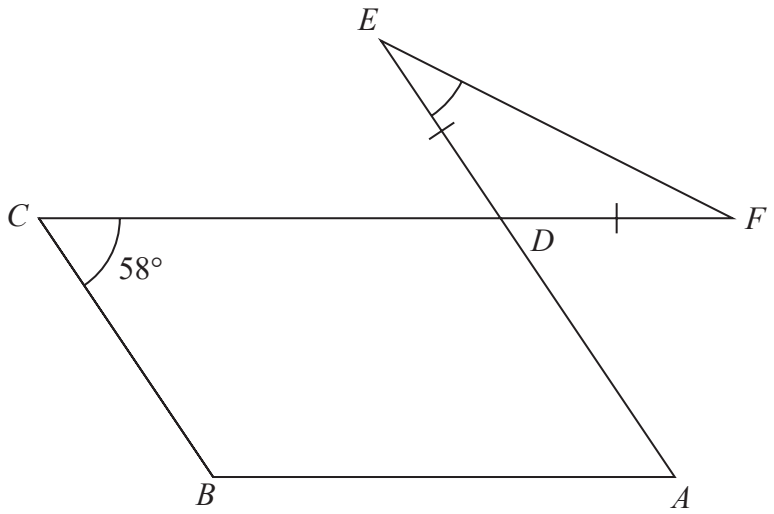


Diagram **NOT** accurately drawn

The diagram shows a parallelogram *ABCD* and an isosceles triangle *DEF* in which *DE* = *DF*

CDF and *ADE* are straight lines.
Angle *BCD* = 58°

Work out the size of angle *DEF*.
Give a reason for each stage of your working.

.....°

(Total for Question 3 is 5 marks)

4 Andreas, Isla and Paulo share some money in the ratios 3 : 2 : 5

The **total** amount of money that Isla and Paulo receive is £76 more than the amount of money that Andreas receives.

Andreas buys a video game for £48.50 with some of his share of the money.

Work out how much money Andreas has left from his share of the money when he has bought the video game.

£.....

(Total for Question 4 is 4 marks)

5 Himari's annual salary is 3 130 000 Japanese Yen (JPY).
She gets a salary increase of 4%

(a) Work out Himari's salary after this increase.

.....JPY

(3)

Kaito bought a car.
The value of the car when Kaito bought it was 750 000 JPY.
At the end of each year, the value of his car had depreciated by 15%

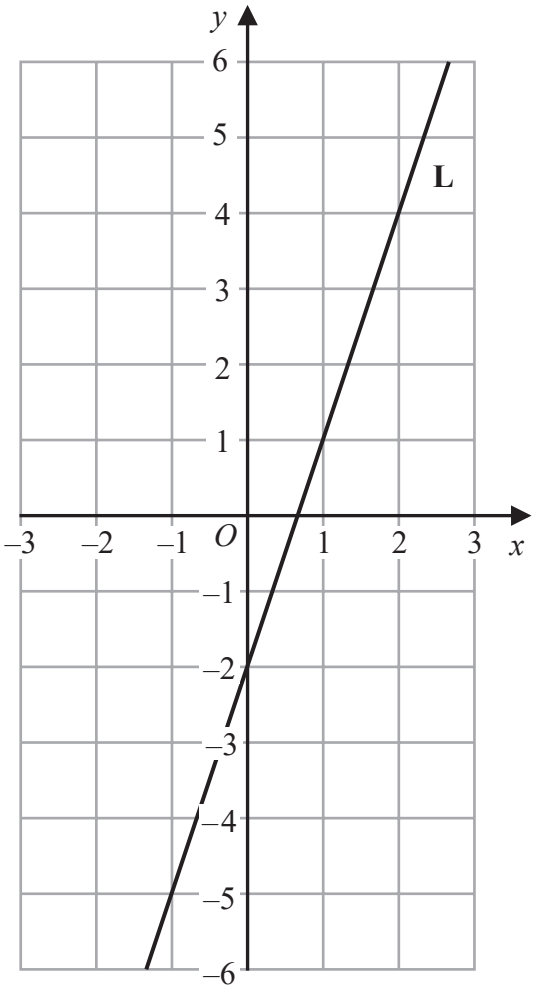
(b) Work out the value of Kaito's car at the end of 3 years.
Give your answer correct to the nearest JPY.

..... JPY

(3)

(Total for Question 5 is 6 marks)

6 The line **L** is shown on the grid.



Find an equation for **L**.

.....

(Total for Question 6 is 2 marks)

7 The diagram shows a right-angled triangle.

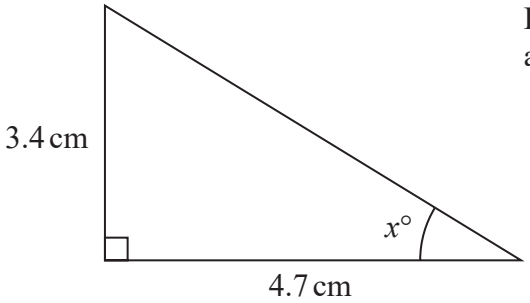


Diagram **NOT** accurately drawn

Calculate the value of x.
Give your answer correct to one decimal place.

$x =$ .....

(Total for Question 7 is 3 marks)

8 The diagram shows an isosceles triangle.

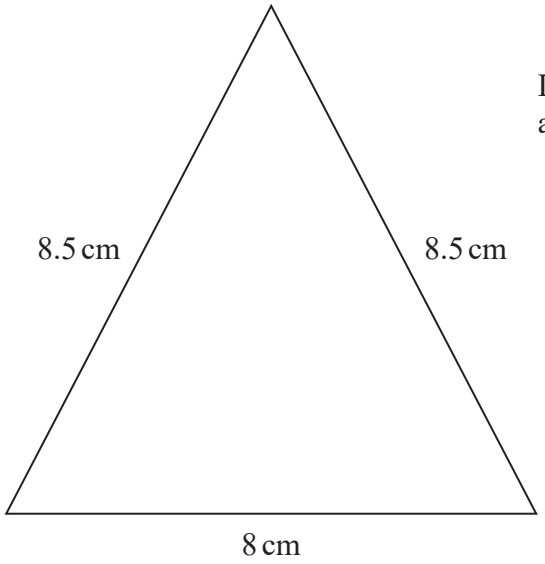


Diagram **NOT** accurately drawn

Work out the area of the triangle.

.....cm^2

(Total for Question 8 is 4 marks)

9 The diagram shows a solid cylinder with radius 3 m.

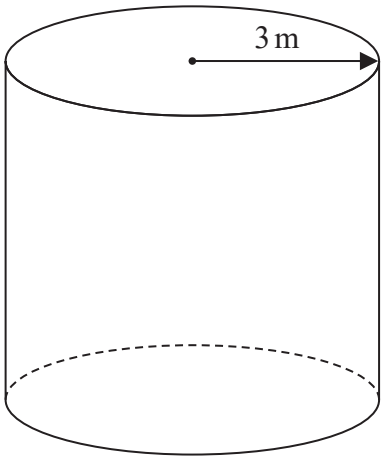


Diagram **NOT** accurately drawn

The volume of the cylinder is 72π m^3

Calculate the **total** surface area of the cylinder.
Give your answer correct to 3 significant figures.

.....m^2

(Total for Question 9 is 5 marks)

10 The table shows information about the number of minutes each of 120 buses was late last Monday.

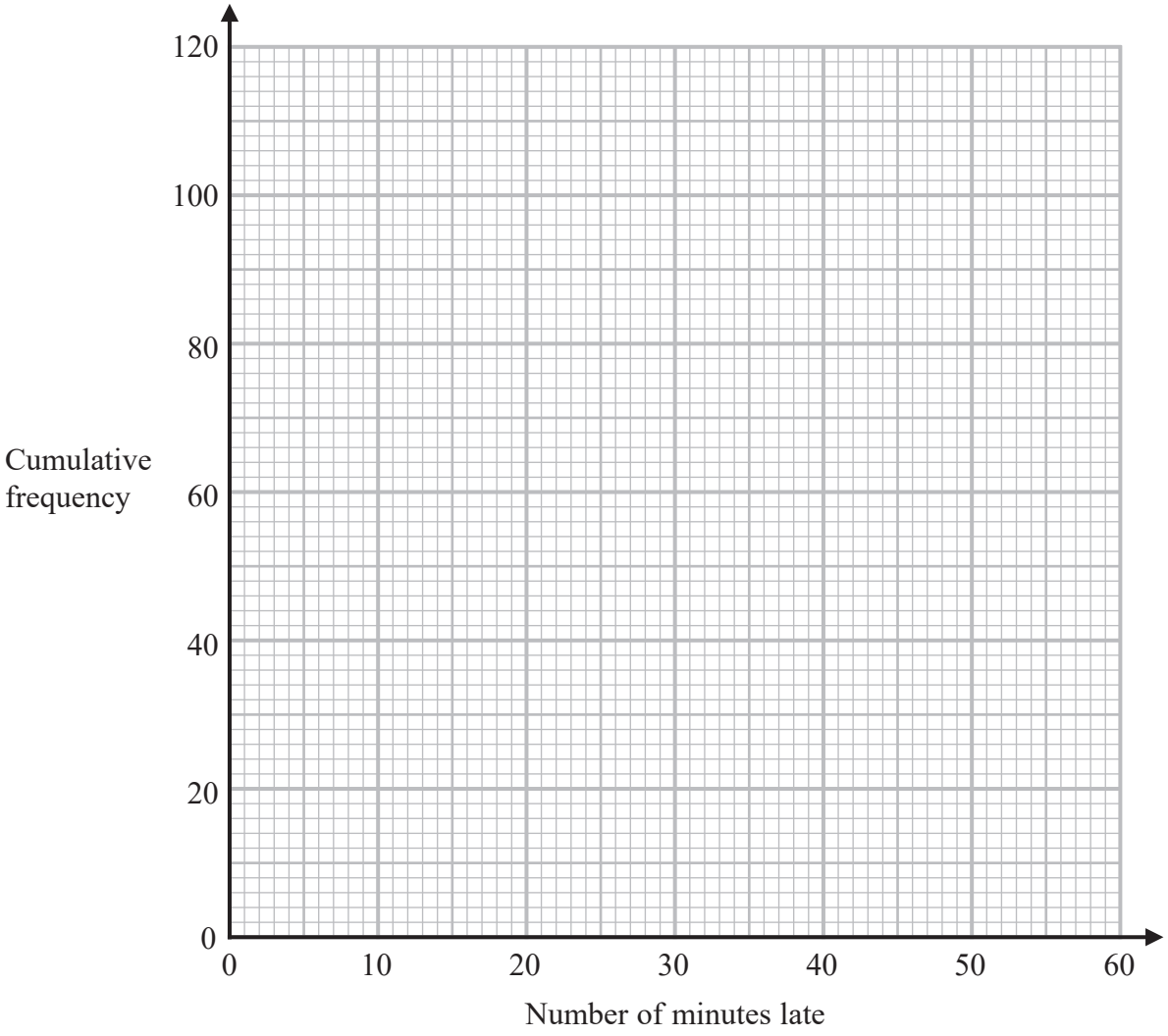
Number of minutes late (L)	Frequency
$0 < L \leqslant 10$	10
$10 < L \leqslant 20$	16
$20 < L \leqslant 30$	44
$30 < L \leqslant 40$	29
$40 < L \leqslant 50$	15
$50 < L \leqslant 60$	6

(a) Complete the cumulative frequency table below.

Number of minutes late (L)	Cumulative frequency
$0 < L \leqslant 10$	
$0 < L \leqslant 20$	
$0 < L \leqslant 30$	
$0 < L \leqslant 40$	
$0 < L \leqslant 50$	
$0 < L \leqslant 60$	

(1)

(b) On the grid, draw a cumulative frequency graph for your table.



(2)

(c) Use your graph to find an estimate for the interquartile range.

.....minutes

(2)

(d) Use your graph to find an estimate for the number of buses that were more than 48 minutes late last Monday.

.....

(2)

(Total for Question 10 is 7 marks)

11 (a) Simplify fully $(8e^{15})^{\frac{2}{3}}$

.....

(2)

(b) Express $\left(\frac{y}{2}\right)^{-4}$ in the form ay^n where a and n are integers.

.....

(2)

(c) Solve $\frac{4x-2}{3} - \frac{5-3x}{4} = 6$

Show clear algebraic working.

$x =$ .....

(4)

(Total for Question 11 is 8 marks)

12 Given that $\frac{3^x}{9^{3x}} = 81$

find the value of x.
Show clear algebraic working.

$x =$ .....

(Total for Question 12 is 3 marks)

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

13 Use algebra to show that $0.6\dot{8}\dot{1} = \frac{15}{22}$

(Total for Question 13 is 2 marks)

14 $\mathscr{E}$ = {integers x such that $10 \leqslant x \leqslant 25$}
$A = \{x : x < 18\}$
$B = \{x : 13 \leqslant x < 22\}$

(a) Write down n(A)

.....

(1)

(b) List the members of the set $(A \cup B)'$

.....

(2)

(c) List the members of the set $A' \cap B$

.....

(2)

$C \subset A$, $C \subset B$ and n(C) = 5

(d) List the members of the set C

.....

(1)

(Total for Question 14 is 6 marks)

15 Make x the subject of $y = \dfrac{5 - 2x}{x + 3}$

.....

(Total for Question 15 is 4 marks)

16 Solve the simultaneous equations

$$3xy - y^2 = 8$$
$$x - 2y = 1$$

Show clear algebraic working.

.....

(Total for Question 16 is 5 marks)

17 The diagram shows a rectangle.

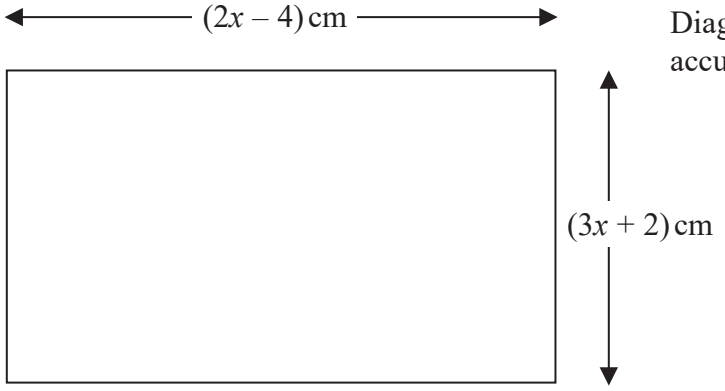


Diagram **NOT** accurately drawn

The area of the rectangle is A cm^2

Given that $A < 3x + 27$
find the range of possible values for x.

(Total for Question 17 is 5 marks)

18 The diagram shows cuboid *ABCDEFGH*.

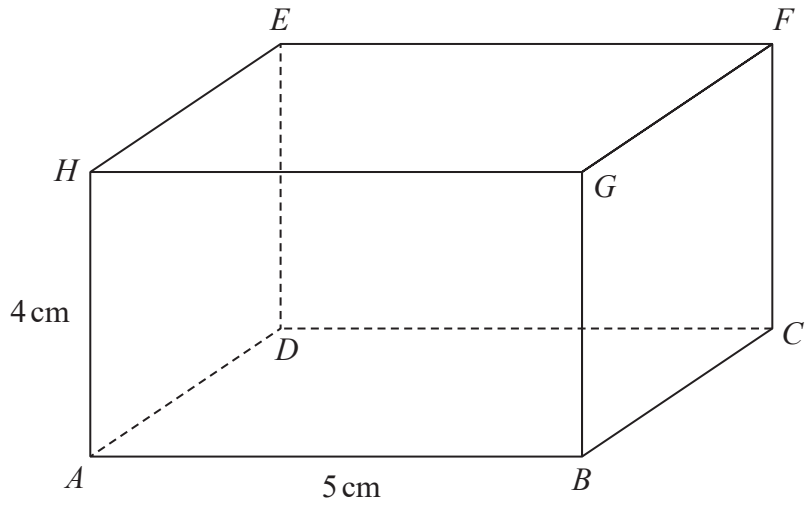


Diagram **NOT** accurately drawn

$AB = 5$ cm
$AH = 4$ cm
The size of the angle between CH and the plane $ABCD$ is 35°

Calculate the volume of the cuboid.
Give your answer correct to 3 significant figures.

.....cm^3

(Total for Question 18 is 5 marks)

19 OAB is a triangle.

$\overrightarrow{OA} = \mathbf{a}$ $\overrightarrow{OB} = \mathbf{b}$

The point C lies on OA such that $OC : CA = 1 : 2$
The point D lies on OB such that $OD : DB = 1 : 2$

Using a vector method, prove that $ABDC$ is a trapezium.

(Total for Question 19 is 3 marks)

20 A bag contains X counters.

There are only red counters and blue counters in the bag.

There are 4 more blue counters than red counters in the bag.

Finty takes at random 2 counters from the bag.

The probability that Finty takes 2 blue counters from the bag is $\frac{3}{8}$

Work out the value of X.
Show clear algebraic working.

.....

(Total for Question 20 is 5 marks)

21 The function f is such that $f(x) = 5 + 6x - x^2$ for $x \leqslant 3$

(a) Express $5 + 6x - x^2$ in the form $p - (x - q)^2$ where p and q are constants.

.....

(2)

(b) Using your answer to part (a), find the range of values of x for which $f^{-1}(x)$ is positive.

.....

(5)

(Total for Question 21 is 7 marks)