The Maths Society

$65 < x < 75$

UPPER
LOWER

BOUNDS

UPPER BOUND

24 KG

80 — UB:85
80 — LB:75

LOWER BOUND

Question 1

The length of a car is 4.2 m, correct to 1 decimal place.

Write down the upper bound and the lower bound of the length of this car. [2]

UB = 4.25

LB = 4.15

Question 2

1mm = 0.1cm

→ 0.05

The sides of an equilateral triangle are 9.4 cm, correct to the nearest millimetre. [2]

Work out the upper bound of the perimeter of this triangle.

UB = 9.45 cm

UB = 9.45 × 3

= 28.35 cm

Question 3

1mm = 0.1cm

→ 0.05

A metal pole is 500 cm long, correct to the nearest centimetre.
The pole is cut into rods each of length 5.8 cm, correct to the nearest millimetre. [3]

Calculate the largest number of rods that the pole can be cut into.

no of rods (UB) = $\frac{\text{Pole} \leftarrow \text{UB}}{\text{rods} \leftarrow \text{LB}}$

$= \frac{500.5}{5.75} = 87$ rods

Question 4

A rectangle has length 5.8 cm and width 2.4 cm, both correct to 1 decimal place. [3]

Calculate the lower bound and the upper bound of the perimeter of this rectangle.

length = 5.85, 5.75 width = 2.45, 2.35

Perimeter ⇒ UB = 16.6

LB = 16.2

Question 5

One year ago Ahmed's height was 114 cm.
Today his height is 120 cm.
Both measurements are correct to the nearest centimetre. [2]

Work out the upper bound for the increase in Ahmed's height.

Increase = 120 − 114
UB UB LB
= 120.5 − 113.5
= 7 cm

Question 6

The length, l metres, of a football pitch is 96m, correct to the nearest metre. [2]

Complete the statement about the length of this football pitch.

$95.5 \leqslant l < 96.5$

Question 7

The length, p cm, of a car is 440 cm, correct to the nearest 10 cm.

Complete the statement about p. [2]

$435 \leqslant p < 445$

Question 8

1mm = 0.1cm
→ 0.05

An equilateral triangle has sides of length 16.1 cm, correct to the nearest millimetre.

Find the lower and upper bounds of the perimeter of the triangle. [2]

length ⇒ UB = 16.15
LB = 16.05

Perimeter ⇒ UB = 48.45
LB = 48.15

Question 9

A large water bottle holds 25 litres of water correct to the nearest litre.
A drinking glass holds 0.3 litres correct to the nearest 0.1 litre.

0.05

Calculate the lower bound for the number of glasses of water which can be filled from the bottle.

no of glasses (LB) = water bottle ← LB / glass ← UB

= 24.5 / 0.35 = 70 glasses

[3]

Question 10

A carton contains 250 ml of juice, correct to the nearest millilitre.

Complete the statement about the amount of juice, j ml, in the carton.

$249.5 \leqslant j < 250.5$

[2]

Question 11

The sides of a rectangle are 6.3 cm and 4.8cm, each correct to 1 decimal place.

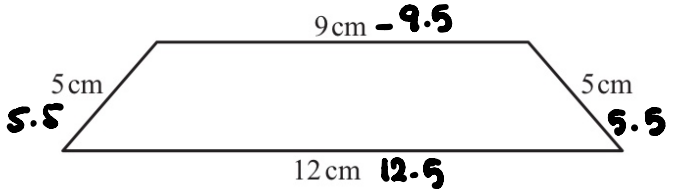
Calculate the upper bound for the area of the rectangle.

[2]

UB = 6.35 × 4.85

= 30.7975

Question 12



NOT TO SCALE

The diagram shows a quadrilateral.
The lengths of the sides are given to the nearest centimetre.

Calculate the upper bound of the perimeter of the quadrilateral.

[2]

P = 33 cm

Question 13

The cost of making a chair is \$28 correct to the nearest dollar.

Calculate the lower and upper bounds for the cost of making 450 chairs. [2]

LB = 27.5 × 450 = 12375 \$

UB = 28.5 × 450 = 12825 \$

Question 1

The population of a city is 128 000, correct to the nearest thousand.

(a) Write 128 000 in standard form. [1]

1000 ⇒ 500

1.28×10^5

(b) Write down the upper bound of the population. [1]

128500

Question 2

Helen measures a rectangular sheet of paper as 197 mm by 210 mm, each correct to the nearest millimetre.
Calculate the upper bound for the perimeter of the sheet of paper. [2]

P(UB) = 2 × (197.5 + 210.5)

= 816 mm

Question 3

The length of a side of a regular hexagon is 6.8 cm, correct to one decimal place.

Find the smallest possible perimeter of the hexagon. [2]

0.1 ÷ 0.05

LB = 6.75 × 6

= 40.5 cm

Question 4

1cm = 0.01 m

A fence is made from 32 identical pieces of wood, each of length 2 metres correct to the nearest centimetre.

→ 0.005

Calculate the lower bound for the total length of the wood used to make this fence. [3]

Write down your full calculator display.

LB = 32 × 1.995

= 63.84 m

Question 5

The length of each side of an equilateral triangle is 74 mm, correct to the nearest millimetre. [2]

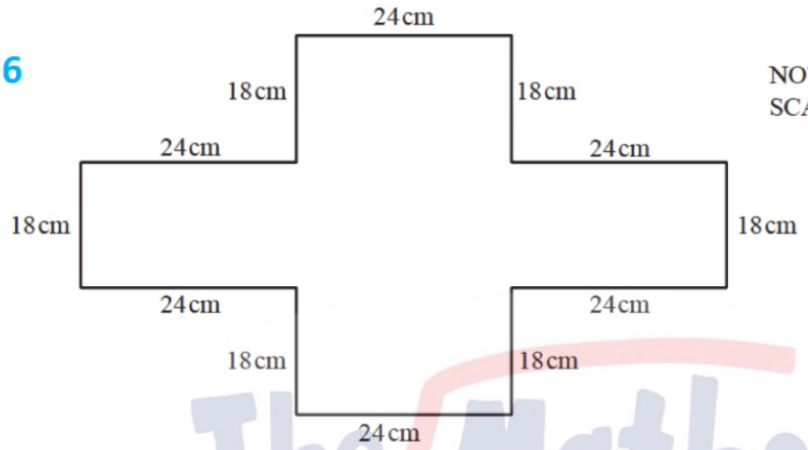
1mm = 0.5

Calculate the smallest possible perimeter of the triangle.

$P = 73.5 \times 3$

$= 220.5\text{ mm}$

Question 6



[3]

Each of the lengths 24 cm and 18 cm is measured correct to the nearest centimetre.
Calculate the upper bound for the perimeter of the shape.

$P(UB) = (6 \times 24.5) + (6 \times 18.5)$

$= 258\text{ cm}$

Question 7

In 2005 there were 9 million bicycles in Beijing, correct to the nearest million.
The average distance travelled by each bicycle in one day was 6.5 km correct to one decimal place.
Work out the upper bound for the **total** distance travelled by all the bicycles in one day.

$6.55 \times 9.5 = 62.225$ [2]

Question 8

$8\frac{1}{12}$ $7\frac{11}{12}$ $\frac{1}{6} \rightarrow \frac{1}{12}$

Angharad sleeps for 8 hours each night, correct to the nearest 10 minutes.
The total time she sleeps in the month of November (30 nights) is T hours. [2]
Between what limits does T lie?

$\frac{95}{12} \times 30^{5} \leq T < \frac{97}{12} \times 30^{5}$

$237.5 \leq T_{(h)} < 242.5$

Question 9

To raise money for charity, Jalaj walks 22 km, correct to the nearest kilometre, every day for 5 days.

(a) Complete the statement in the answer space for the distance, d km, he walks in one day. [2]

$21.5 \leqslant d < 22.5$

(b) He raises \$1.60 for every kilometre that he walks.
Calculate the least amount of money that he raises at the end of the 5 days. [1]

$21.5 \times 1.6 = \$34.4 \times 5 = \$172$

Question 10

A square has sides of length d metres.
This length is 120 metres, correct to the nearest 10 metres. [1]

(a) Complete the statement in the answer space.

$115 \leqslant d < 125$

(b) Calculate the difference between the largest and the smallest possible areas of the square. [2]

$A(UB) = 125 \times 125 = 15625$

$(LB) = 115 \times 115 = 13225$

$2400\,m$

Question 11

The population, P, of a small island was 6380, correct to the nearest 10. [2]
Complete the statement about the limits of P.

$6375 \leqslant P < 6385$

Question 12

(a) 32 493 people were at a football match. [1]
Write this number to the nearest thousand.

32000

(b) At another match there were 25 500 people, to the nearest hundred. [2]
Complete the inequality about n, the number of people at this match.

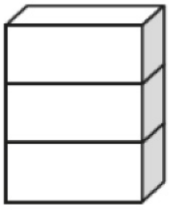
$25450 \leqslant n < 25550$

Question 13

A rectangular field is 18 metres long and 12 metres wide. Both measurements are correct to the nearest metre. Work out exactly the smallest possible area of the field. [2]

$A(LB) = 17.5 \times 11.5 = 201.25\,m^2$

Question 1



NOT TO SCALE

The diagram shows three identical cuboids in a tower.
The height of one cuboid is 6.5 cm, correct to the nearest millimetre. [2]

Work out the upper bound of the height of the tower.

h(UB) = 65.5 x 3 = 196.5 mm

Question 2

The sides of a triangle are 5.2 cm, 6.3 cm and 9.4 cm, each correct to the nearest millimetre.

[2]

Calculate the lower bound of the perimeter of the triangle.

P(LB) = 51.5 + 62.5 + 93.5 = 207.5 mm

Question 3

A rectangle has length 62 mm and width 47 mm, both correct to the nearest millimetre.
The area of this rectangle is A mm^2.

[3]

Complete the statement about the value of A.

A(UB) = 62.5 x 47.5 = 2968.75 mm^2

A(LB) = 61.5 x 46.5 = 2859.75 mm^2

Question 4

The length of a rectangle is 9.3 cm, correct to 1 decimal place.
Its width is 7.7 cm, correct to 1 decimal place.

Write down the lower bound and the upper bound for the area of the rectangle. [3]

A(UB) = 9.35 x 7.75 = 72.4625 cm^2

A(LB) = 9.25 x 7.65
= 70.7625 cm^2

Question 5

The sides of a square are 8 cm, correct to the nearest centimetre.

[2]

Calculate the upper bound for the area of the square.

$A(UB) = 8.5 \times 8.5 = 72.25$

Question 6

(a) $V = IR$

In an experiment I and R are both measured correct to 1 decimal place.

[2]

When $I = 4.0$ and $R = 2.7$, find the **lower** bound for V.

$V(LB) = 3.95 \times 2.65 = 10.4675$

(b) $S = \frac{D}{T}$

In an experiment D and T are both measured correct to 2 significant figures.

[2]

When $D = 7.6$ and $T = 0.23$, find the **upper** bound for S.

$S(UB) = \frac{7.65}{0.235} = 32.55$

Question 7

The volume of a cuboid is 878 cm^3, correct to the nearest cubic centimetre.
The length of the base of the cuboid is 7 cm, correct to the nearest centimetre.
The width of the base of the cuboid is 6cm, correct to the nearest centimetre.

[3]

Calculate the lower bound for the height of the cuboid.

$h(LB) = \frac{877.5}{6.5 \times 7.5} = 18$ cm

LB

UB

Question 8

Rice is sold in 75 gram packs and 120 gram packs.
The masses of both packs are given correct to the nearest gram.

[2]

Calculate the lower bound for the difference in mass between the two packs.

$119.5 - 75.5 = 44g$

Question 9

The mass of 1 cm^3 of copper is 8.5 grams, correct to 1 decimal place.

[2]

Complete the statement about the total mass, T grams, of 12 cm^3 of copper.

$8.45 \times 12 \leqslant T(g) < 8.55 \times 12$

$101.4 \leqslant T(g) < 102.6$

Question 10

A rectangle has length 127.3 cm and width 86.5 cm, both correct to 1 decimal place.

Calculate the upper bound and the lower bound for the perimeter of the rectangle. [3]

$P(UB) = (2 \times 127.35) + (2 \times 86.55) = 427.8$

$P(LB) = (2 \times 127.25) + (2 \times 86.45) = 427.4$

Question 11

A circle has a radius of 8.5 cm correct to the nearest 0.1 cm.

The lower bound for the area of the circle is $p\pi cm^2$.
The upper bound for the area of the circle is $q\pi cm^2$.

Find the value of p and the value of q. [3]

$A(UB) = (8.55)^2 \pi$

$q\pi = 73.1025\pi$

$\therefore q = 73.1025$

$A(LB) = (8.45)^2 \pi$

$p\pi = 71.4025\pi$

$\therefore p = 71.4025$