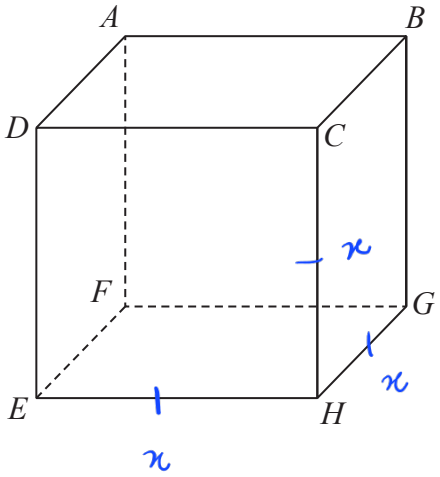
1 The diagram shows a cube.



$AH = 11.3$ cm correct to the nearest mm.

Calculate the lower bound for the length of an edge of the cube.
You must show all your working.

Error interval for 1 dp = $\frac{0.1}{2} = 0.05$

Lower bound for AH = $11.3 - 0.05$

$= 11.25$ cm (1)

(length of a diagonal)^2 = (length)^2 + (width)^2 + (height)^2

$AH^2 = x^2 + x^2 + x^2$ (1) cube = equal sides

$11.25^2 = 3x^2$ (1)

$x = 6.495$ (1)

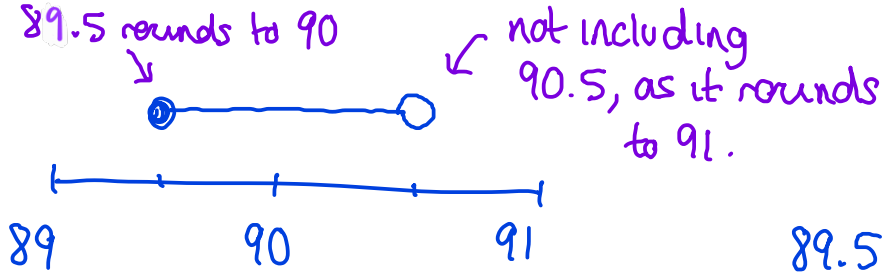
6.495

..... cm

(Total for Question 1 is 4 marks)

2 The length of a football pitch is 90 metres, correct to the nearest metre.

Complete the error interval for the length of the football pitch.



89.5 (1) m ⩽ length < 90.5 (1) m

(Total for Question 2 is 2 marks)

3 $p = \sqrt{\frac{2e}{f}}$

$e = 6.8$ correct to 1 decimal place.

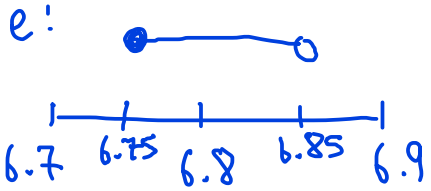
$f = 0.05$ correct to 1 significant figure.

Work out the upper bound for the value of p.
Give your answer correct to 3 significant figures.
You must show all your working.

$p = \sqrt{\frac{2e}{f}}$

to find UB of p, use UB of e (as it is on the numerator) and the LB of f (as it is in the denominator)

e:



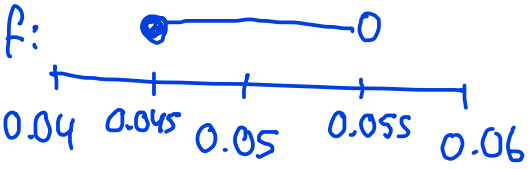
UB of $e = 6.85$ (1)

$\therefore$ UB of $p = \sqrt{\frac{2 \times 6.85}{0.045}}$ (1)

$= 17.448...$

$= 17.4$ (3sf) (1)

f:



LB of $f = 0.045$

17.4

(Total for Question 3 is 3 marks)

4 A race is measured to have a distance of 10.6 km, correct to the nearest 0.1 km.
Sam runs the race in a time of 31 minutes 48 seconds, correct to the nearest second.

Sam's average speed in this race is V km/hour.

By considering bounds, calculate the value of V to a suitable degree of accuracy.
You must show all your working and give a reason for your answer.

Distance = 10.6 km
- upper boundary = 10.65 km
- lower boundary = 10.55 km (1)

Speed = distance / time

CONVERSION

hour ×60 minute ×60 second
second ÷60 minute ÷60 hour

time = 31 minutes 48 seconds
= (31 × 60) + 48 = 1908 seconds
- U.B 1908.5 s
- L.B 1907.5 s

$$\text{Speed}_{\text{upper}} = \frac{\text{distance}_{\text{upper}}}{\text{time}_{\text{lower}}} = \frac{10.65 \text{ km}}{\frac{1907.5}{3600} \text{ hours}} = 20.0996\ldots \text{ km/h}$$ (1)

$$\text{Speed}_{\text{lower}} = \frac{\text{distance}_{\text{lower}}}{\text{time}_{\text{upper}}} = \frac{10.55 \text{ km}}{\frac{1908.5}{3600} \text{ hours}} = 19.9004\ldots \text{ km/h}$$ (1) (1)

Since the upper and lower bound both round to 20 km/h correct to 2 s.f., V = 20 km/h (1)

(Total for Question 4 is 5 marks)

5 Martin used his calculator to work out the value of a number P.
He wrote down the first two digits of the answer on his calculator.

He wrote down 1.2

Complete the error interval for P.

any number beginning 1.2 will truncate to 1.2, e.g. 1.25, 1.2999...

(1) (1)

1.2 $\leqslant P <$ 1.3

(Total for Question 5 is 2 marks)

6 A number, d, is rounded to 1 decimal place.
The result is 12.7

Complete the error interval for d.

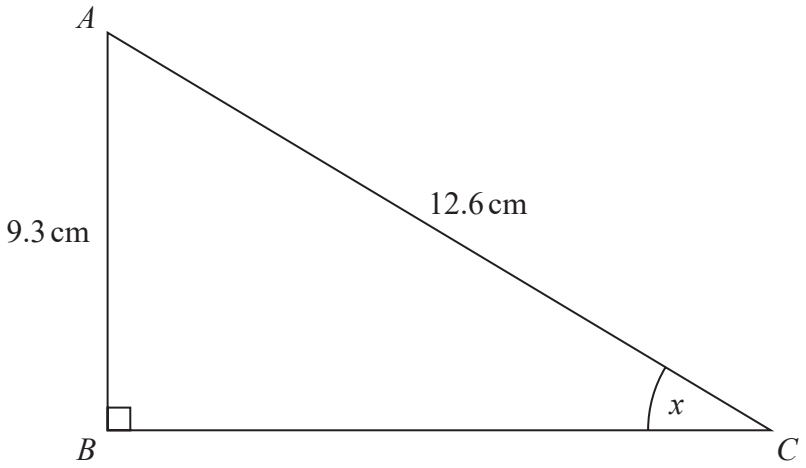
upper bound = 12.7 + 0.05 = 12.75
lower bound = 12.7 − 0.05 = 12.65

(1) (1)

12.65 $\leqslant d <$ 12.75

(Total for Question 6 is 2 marks)

7 ABC is a right-angled triangle.



$AB = 9.3$ cm correct to the nearest mm.
$AC = 12.6$ cm correct to the nearest mm.

Calculate the lower bound for the size of the angle marked x.
You must show all your working.

$$\sin x = \frac{AB}{AC}$$

to get the lower bound of angle x, we need to get the smallest combination of the fraction.

Hence; $\sin x = \dfrac{\text{Lower bound of } AB}{\text{Upper bound of } AC}$

Lower bound of $AB = 9.25$ cm (1)
Upper bound of $AC = 12.65$ cm

$\therefore \sin x = \dfrac{9.25}{12.65}$ (1)

$x = 46.99^\circ$ (1)

46.99 °

(Total for Question 7 is 3 marks)