



Bounds Exam Practice

Q1. Let a and b be such that a is 3 and $b = 7$ to the nearest whole number.

(a) Work out a lower bound for $a + b$

$$\text{LB of } a = 2.5$$

$$\text{LB of } b = 6.5$$

$$2.5 + 6.5 = 9$$

Answer: 9
(2 marks)

(b) Work out an upper bound for $a + b$.

$$\text{UB of } a = 3.5$$

$$\text{UB of } b = 7.5$$

$$3.5 + 7.5 = 11$$

Answer: 11
(2 marks)



Q2. Let a and b be such that a is 5.7 and $b = 14.2$ correct to 1 decimal place. Work out a lower bound and an upper bound for $a + b$.

$$\text{LB of } a = 5.65 \quad \text{UB of } a = 5.75$$

$$\text{LB of } b = 14.15 \quad \text{UB of } b = 14.25$$

$$\text{LB of } a + b = 5.65 + 14.15 = 19.8$$

$$\text{UB of } a + b = 5.75 + 14.25 = 20$$

Lower Bound: 19.8

Upper Bound: 20

(4 marks)

Q3. Let a and b be such that a is 16.74 and $b = 9.23$ correct to 2 decimal places. Work out a lower bound and an upper bound for $a - b$.

$$\text{LB of } a = 16.735 \quad \text{UB of } a = 16.745$$

$$\text{LB of } b = 9.225 \quad \text{UB of } b = 9.235$$

$$\Rightarrow \text{LB of } a - b = 16.735 - 9.235 = 7.5$$

$$\text{UB of } a - b = 16.745 - 9.225 = 7.52$$

Lower Bound: 7.5

Upper Bound: 7.52

(4 marks)



Bounds with Multiplication/Division

Q4. Let a and b be such that a is 5.7 and $b = 14.2$ correct to 1 decimal place.

(a) Work out a lower bound for ab

$$\text{LB for } a = 5.65 \quad \text{UB for } a = 5.75$$

$$\text{LB for } b = 14.15 \quad \text{UB for } b = 14.25$$

$$5.65 \times 14.15 = 79.9475$$

Answer: 79.9475
(2 marks)

(b) Work out an upper bound for ab

$$5.75 \times 14.25 = 81.9375$$

Answer: 81.9375
(2 marks)



Q5. Let r and s be such that r is 5.7 and $s = 14.2$ correct to 1 decimal place.
Work out a lower bound and an upper bound for $\frac{r}{s}$ as exact fractions.

$$\text{LB for } r = 5.65$$

$$\text{UB for } r = 5.75$$

$$\text{LB for } s = 14.15$$

$$\text{UB for } s = 14.25$$

$$\text{LB of } \frac{r}{s} = \frac{5.65}{14.25} = \frac{113}{285}$$

$$\text{UB of } \frac{r}{s} = \frac{5.75}{14.15} = \frac{115}{283}$$

Lower Bound: $\frac{113}{285}$

Upper Bound: $\frac{115}{283}$

(4 marks)

Q6. Let a and b be such that a is 24 and $b = 13$ to the nearest whole number.
Work out a lower bound and upper bound for $\frac{a}{b}$ as an exact fraction.

$$\text{LB of } a = 23.5$$

$$\text{UB of } a = 24.5$$

$$\text{LB of } b = 12.5$$

$$\text{UB of } b = 13.5$$

$$\text{LB of } \frac{a}{b} = \frac{23.5}{13.5} = \frac{47}{27}$$

$$\text{UB of } \frac{a}{b} = \frac{24.5}{12.5} = \frac{49}{25}$$

Lower Bound: $\frac{47}{27}$

Upper Bound: $\frac{49}{25}$

(4 marks)



Applied Mixed Practice Questions:

Q7. A rectangle has a length of 34 cm, to the nearest cm, and a width of 10.3 cm, to the nearest mm.

(a) Work out a lower bound for the area of the rectangle.

$$LB = 33.5 \times 10.25 = 343.375$$

Answer: 343.375 cm²
(2 marks)

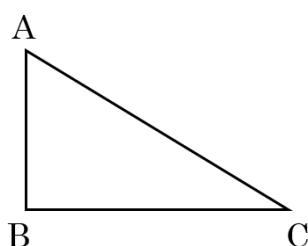
(b) Work out an upper bound for the perimeter of the rectangle.

$$2(34.5) + 2(10.35) = 89.7$$

Answer: 89.7 cm
(2 marks)



Q8. ABC is a right-angled triangle with lengths AB = 3.2 and BC = 7.8 correct to 1 decimal place.



Work out the length of AC to an appropriate degree of accuracy.

$$UB = \sqrt{3.25^2 + 7.85^2} = 8.49617561\dots$$

$$LB = \sqrt{3.15^2 + 7.75^2} = 8.365703796\dots$$

\therefore The same to 1sf

Answer: 8
(4 marks)

Q9. Rob wishes to stack a set of books into a box. Each book is a cuboid which has height 125 mm to the nearest mm. If the box measures 1.38 m in height to the nearest cm, show that it may not be possible to put 11 books in the box and close the lid.

$$UB = 125.5 \text{ mm} = 0.1255 \text{ m}$$

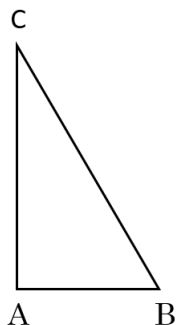
$$0.1255 \times 11 = 1.3805 \text{ m} > 1.38 \text{ m}$$

\therefore the books may possibly not fit.

(3 marks)



Q10. ABC is a right-angled triangle with AB = 20 cm and BC = 48 cm which are correct to the nearest cm.



Find the length of BC to an appropriate degree of accuracy.

$$UB = \sqrt{20.5^2 + 48.5^2} = 52.6545\dots$$

$$LB = \sqrt{19.5^2 + 47.5^2} = 51.3468\dots$$

Both equal to 1sf

Answer: 50cm
(4 marks)

Q11. Let $Q = \frac{m^2}{n}$ where m is 3.43 correct to 2 decimal places and n is 10.427 correct to 3 decimal places.

By considering upper and lower bounds, find the value of Q to a suitable degree of accuracy. You must justify your answer.

$$UB = \frac{3.435^2}{10.4265} = 1.1316\dots$$

$$LB = \frac{3.425^2}{10.4275} = 1.1249\dots$$

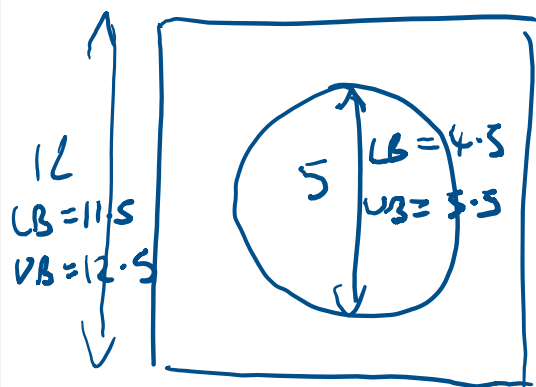
Equal to 2sf

Answer: 1.1
(4 marks)



Q12. A garden consists of a square of grass which contains a pond in the shape of a circle. The lawn has side length 12 feet to the nearest foot and the pond has diameter 5 feet to the nearest foot.

Work out a lower bound for the area of the garden which is grass to 2d.p. .



$$\begin{aligned}LB &= 11.5^2 - \pi \left(\frac{5.5}{2} \right)^2 \\ &= 108.49 \text{ ft}^2\end{aligned}$$

Answer: 108.49 ft²
(5 marks)