

Fix it 1 The bounds of each value

Bounds in calculations · ANSWERS

Half the unit each way. To the nearest 10, that is 5 below and 5 above. To 1 decimal place, 0.05 each way. To significant figures, find the unit of the last figure first.

EXAMPLE

A jug holds 750 ml, to the nearest 50 ml. Find its bounds.

1. The unit is 50 ml. Half of it is 25 ml.
2. Lower bound: $750 - 25 = 725$ ml
3. Upper bound: $750 + 25 = 775$ ml

YOUR TURN

- 1 A sprint takes 8.3 s, to 1 decimal place. Find the lower and upper bounds.

8.25 and 8.35 s

- 2 A bottle holds 0.42 litres, to 2 decimal places. Find the lower and upper bounds.

0.415 and 0.425 litres

- 3 A crowd is 2400 people, to 2 significant figures. Find the lower and upper bounds.

2350 and 2450

Check: Your two bounds are one unit apart, and the value is exactly halfway between them.

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Fix it 2 Which bounds?

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+ and $\times$: the same bounds, both upper for the greatest, both lower for the least. – and $\div$: opposite bounds, upper – lower or upper $\div$ lower for the greatest, the other way round for the least.

EXAMPLE

$p = 8$ and $q = 5$, each to the nearest whole number. Which bounds give the greatest $p \times q$, and the greatest $p - q$?

1. $\times$ uses the same bounds:
upper $\times$ upper
2. Greatest $p \times q = 8.5 \times 5.5$
3. – uses opposite bounds:
upper – lower
4. Greatest $p - q = 8.5 - 4.5$

YOUR TURN

- 1 A lawn is 14 m by 9 m, each to the nearest metre. Which bounds give the least possible area?

13.5×8.5 (both lower)

- 2 1.8 litres of soup is shared into bowls of 0.3 litres, each to 1 decimal place. Which bounds give the least possible number of bowls?

$1.75 \div 0.35$ (lower $\div$ upper)

- 3 A shelf is 96 cm long. Two boxes on it are 41 cm and 37 cm wide. Each is to the nearest cm. Which bounds give the greatest possible gap left?

$96.5 - (40.5 + 36.5)$

Check: Swap one value to its other bound and work it out. For the greatest, the answer goes down; for the least, it goes up.

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Fix it 3 Work it out

Bounds in calculations · ANSWERS

Put the bounds in as they are (6.25, not 6.3). Work out a sum or difference on the top or bottom first (BIDMAS). Round only at the end.

EXAMPLE

The upper bound is $\frac{4.25 + 2.65}{1.95}$.

Work it out.

1. The top first: $4.25 + 2.65 = 6.9$
2. $6.9 \div 1.95 = 3.538461\dots$
3. Round only now: 3.5385 to 4 dp

YOUR TURN

- 1 The least possible area is $6.25 \times 3.45 \text{ cm}^2$. Work it out.

21.5625 cm²

- 2 A car's greatest possible speed is $1250 \div 37.5 \text{ m/s}$. Work it out to 4 decimal places.

33.3333 m/s

- 3 The upper bound is $\frac{9.45 - 3.15}{2.85}$. Work it out to 4 decimal places.

2.2105

Check: Work it out again with the rounded values. Your answer is close: above it for a greatest, below it for a least.

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Fix it 4 Round both bounds

Bounds in calculations · ANSWERS

Round the lower bound and the upper bound the same way: both to 1 significant figure, then both to 2, then 3, until they are different.

EXAMPLE

The bounds of an answer are 6.2914 and 6.3871. Round them.

1. Both to 1 sf: 6 and 6
2. Both to 2 sf: 6.4 and 6.3
3. They are different at 2 sf, so stop.

YOUR TURN

- 1 The bounds are 27.462 and 27.814. Round both to 3 sf.

27.5 and 27.8

- 2 The bounds are 0.06473 and 0.06518. Round both to 2 sf.

0.065 and 0.065

- 3 The bounds are 2.9971 and 3.0462. Round both to 2 sf.

3.0 and 3.0

Check: Count figures from the first one that is not zero. A zero after it counts: 3.0 is 2 sf, 0.065 is 2 sf.

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Give the most accurate rounding that both bounds agree on. Give the reason: both bounds round to it.

EXAMPLE

The bounds are 12.684 and 12.731.
Give the value to a suitable degree of accuracy.

1. 2 sf: 13 and 13
2. 3 sf: 12.7 and 12.7
3. 4 sf: 12.68 and 12.73, different
4. 12.7, as both bounds round to 12.7 to 3 sf

YOUR TURN

- 1 The bounds are 8.2817 and 8.3462. Give the value to a suitable degree of accuracy.

8.3 (both round to it, 2 sf)

- 2 The bounds are 148.12 and 149.86. Give the value to a suitable degree of accuracy.

150 (both round to it, 2 sf)

- 3 The bounds are 0.4119 and 0.4127. Give the value to a suitable degree of accuracy.

0.41 (both round to it, 2 sf)

Check: Round both bounds to one more figure. They must be different, or you could have given more.

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