

GCSE Maths: Upper and lower bounds in calculations (Higher): answers

GCSE Maths - Decimals, Rounding and Estimation - Higher - Lesson 4.9

Answers. Final answers to the worksheet questions. Full step-by-step solutions for every question are free at websink.site/gcse/maths/ch04-decimals-rounding-estimation/higher/upper-and-lower-bounds-in-calculations/

Exercise 4J Bounds in calculations Calculator allowed

1 Each number is correct to the accuracy shown. Work out the bound asked for.

- (a) $a = 5.6$ and $b = 3.2$ (1 d.p.). Upper bound of $a + b$.

Answer: 8.9

- (b) $a = 9.5$ and $b = 4.2$ (1 d.p.). Lower bound of $a - b$.

Answer: 5.2

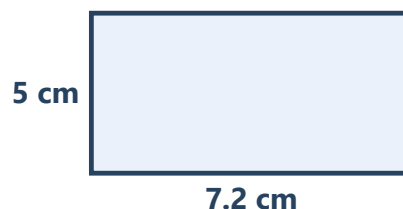
- (c) $a = 3.5$ and $b = 2.4$ (1 d.p.). Upper bound of $a \times b$.

Answer: 8.6975

- (d) $a = 13$ and $b = 3$ (both to the nearest whole number). Upper bound of $a \div b$.

Answer: 5.4

2 A rectangle has length 7.2 cm and width 4.5 cm, each correct to 1 decimal place. Work out



- (a) the lower bound of the area

Answer: 31.8175 cm²

- (b) the upper bound of the perimeter

Answer: 23.6 cm

3 Box A has a mass of 40 g and box B has a mass of 60 g. Each mass is correct to the nearest 10 g. Work out the lower bound and the upper bound of the total mass of the two boxes.

Answer: lower bound 90 g, upper bound 110 g

4 A metal block has mass 240 g, correct to the nearest 10 g, and volume 85 cm³, correct to the nearest cm³. Density = mass $\div$ volume. Work out the density, giving your answer to a suitable degree of accuracy. You must show all your working.

Answer: 3 g/cm³ (to 1 s.f.)

- 5 A sprinter runs 100 m, correct to the nearest metre, in 12.4 seconds, correct to 1 decimal place. Calculate her average speed in metres per second. Give your answer to a suitable degree of accuracy.

Answer: 8 m/s (to 1 s.f.)

- 6 $x = 4.2$, $y = 3.1$ and $z = 0.5$, each correct to 1 decimal place. Work out the lower bound and the upper bound of $\frac{x+y}{z}$.

Answer: lower bound 13.09, upper bound 16.44

- 7 The area of a rectangle is found from a length of 12.4 cm and a width of 8.6 cm, each correct to 1 decimal place. (a) Show that the area could be more than 107 cm^2 . (b) Is it possible that the area is exactly 108 cm^2 ?

- (a) show that the area could be more than 107 cm^2

Answer: upper bound $107.6925 > 107$

- (b) is it possible that the area is exactly 108 cm^2 ?

Answer: No

- 8 Write each result to a suitable degree of accuracy, given its lower bound and upper bound.

- (a) lower bound 7.31, upper bound 7.34

Answer: 7.3 m

- (b) lower bound 3.846, upper bound 3.912

Answer: 4

- (c) lower bound 0.4551, upper bound 0.4612

Answer: 0.46 kg

- (d) lower bound 1204, upper bound 1231

Answer: 1200

- 9 A square tile has side 12.5 cm, correct to 1 decimal place. Work out the upper bound of the area of the tile.

Answer: 157.5025 cm^2

- 10 Parcel A has mass 2.35 kg, correct to 2 decimal places. Parcel B has mass 4.8 kg, correct to 1 decimal place. The postal limit is 7.2 kg. The total mass of the two parcels is worked out as $2.35 + 4.8 = 7.15 \text{ kg}$. Is it possible that the total mass is more than 7.2 kg? You must show your working.

Answer: Yes (the upper bound of the total is 7.205 kg)

- 11 Ben says: "The upper bound of $a \div b$ is UB of a divided by UB of b ." Use $a = 12$ and $b = 4$, each correct to the nearest whole number, to show that Ben is wrong.

Answer: Ben gets 2.78, but a bigger value, 3.57, is possible

- 12 Explain why the lower bound of $a - b$ uses the **upper** bound of b .

Answer: To make the difference as small as possible, take away the biggest possible b

- 13 The area of a rectangle is 24 cm^2 , correct to the nearest cm^2 . Its width is 4 cm, correct to the nearest cm. Work out the upper bound of the length of the rectangle. (Length = area $\div$ width.)

Answer: 7 cm

- 14** $a = 40$ and $b = 60$, each correct to the nearest 10. Work out the lower bound of $a \times b$ without a calculator.

Answer: 1925

- 15** Five identical planks are laid end to end. Each plank has length 2.4 m, truncated to 1 decimal place. Work out the lower bound and the upper bound of the total length of the five planks.

Answer: lower bound 12 m, upper bound 12.5 m

- 16** $x = 6.3$ and $y = 2.1$, each correct to 1 decimal place. Show that $\frac{x}{y}$ could be less than 3.

Answer: lower bound 2.91 (3 s.f.), which is less than 3