

Upper & Lower Bounds

How to ...

Dan does an experiment to find the value of π .

He measures the circumference and the diameter of a circle.

He measures the circumference, C , as 170 mm to the nearest millimetre. $LB \Rightarrow 169.5$ $UB \Rightarrow 170.5$

He measures the diameter, d , as 54 mm to the nearest millimetre. $LB \Rightarrow 53.5$ $UB \Rightarrow 54.5$

Dan uses $\pi = \frac{C}{d}$ to find the value of π .

Calculate the upper bound and the lower bound for Dan's value of π .

To get biggest value of π need $UB \div LB$
 $UB \text{ of } \pi = \frac{170.5}{53.5} = 3.186915...$

To get smallest value we need $LB \div UB$
 $LB \text{ of } \pi = \frac{169.5}{54.5} = 3.1100917...$

Upper bound = 3.19

Lower bound = 3.11

(4)

Now have a go yourself ...

SORTED IT - write down the upper and lower bound of these numbers (sig figs = significant figures)

- a) 84 (2 sig figs) b) 84.0 (3 sig figs)
 c) 84.00 (4 sig figs) d) 0.9 (1 decimal place)
 e) 0.09 (2 decimal places) f) 0.90 (2 decimal places)

NAILED IT

- (a) The length of a line is 118 cm correct to the nearest cm. Write down the upper bound and lower bound of the length of the line.
 (b) The mass of a stone is 6.4 kg correct to the nearest one tenth of a kg. Write down the upper bound and lower bound of the mass.
 (c) The amount of fuel in a tank is 48.0 litres correct to the nearest tenth of a litre. Write down the upper and lower bound of the amount of fuel.

MASTERED IT

- (a) $p = 480$ (3 s.f.), $q = 56$ (2 s.f.) work out the lower bounds of
 (i) $p + q$ (ii) pq (iii) p^2
 (b) $c = 2.44$ (2 d.p.), $d = 4.45$ (2 d.p.) work out the lower bounds of
 (i) $c + d$ (ii) cd (iii) $10c$
 (c) $C = 42$ (2 s.f.), $d = 30$ (2 s.f.) work out the upper bounds of
 (i) $C - d$ (ii) $C \div d$

Exam Questions

- (1) $x = 4.9$ to 1 decimal place and $y = 12.1$ to 1 decimal place. Work out the upper bounds of:

(a) $x + y$ (b) $4x + y$ (c) xy (d) x^2

- (2) Katy drove for 238 km, correct to the nearest mile. She used 27.3 litres of petrol, to the nearest tenth of a litre.

Work out the upper bound for the petrol consumption in km per litre for Katy's journey . Give your answer correct to 2 decimal places.

Ready to be marked ?

Checklist

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Answer checked

☐

Working out shown



Keywords



Things to remember ...



What went well ...

Teacher comment ..