

Error Intervals

Solutions

For AQA GCSE Mathematics (8300) • Foundation tier

Each question is shown in grey, followed by the working, one step per line. The final answer is in a box. *Marks* shows how the marks are usually given in the exam, and **Tip** points out a common mistake.

1 (2 marks)

A length is 13 cm correct to the nearest centimetre.
Complete the error interval.

The length was rounded to the nearest 1 cm.

Half of 1 cm is 0.5 cm.

Lowest value: $13 - 0.5 = 12.5$

Upper limit: $13 + 0.5 = 13.5$

13.5 would round up to 14, so it is not included. Use $<$ at the top.

Answer: $12.5 \text{ cm} \leq \text{length} < 13.5 \text{ cm}$

Tip: The upper limit is 13.5, not 13.4 or 13.49. The $<$ sign already shows that 13.5 itself is not included.

Marks: 1 mark for 12.5. 1 mark for 13.5.

2 (2 marks)

A mass, m kg, is 4.6 kg correct to 1 decimal place.
Complete the error interval.

1 decimal place means to the nearest 0.1.

Half of 0.1 is 0.05.

Lowest value: $4.6 - 0.05 = 4.55$

Upper limit: $4.6 + 0.05 = 4.65$

Answer: $4.55 \leq m < 4.65$

Marks: 1 mark for 4.55. 1 mark for 4.65.

3 (2 marks)

The number of people at a concert is 2300 to the nearest hundred.
Complete the error interval for the number of people, n .

Rounded to the nearest 100.

Half of 100 is 50.

Lowest value: $2300 - 50 = 2250$

Upper limit: $2300 + 50 = 2350$

Answer: $2250 \leq n < 2350$

Marks: 1 mark for 2250. 1 mark for 2350.

4 (1 mark)

Circle the error interval for y when $y = 20$ correct to 1 significant figure.

Options: $19.5 \leq y < 20.5$, $15 \leq y < 25$, $10 \leq y < 30$, $19 \leq y < 21$

For 20, 1 significant figure means to the nearest 10.

Half of 10 is 5.

$20 - 5 = 15$ and $20 + 5 = 25$

Answer: $15 \leq y < 25$

5 (1 mark)

A bottle of water holds 750 ml, correct to the nearest 10 ml.

Which is the error interval for the volume, V ml?

Tick **one** box.

To the nearest 10 ml, so go half of 10, which is 5 ml, each side.

$$750 - 5 = 745 \text{ and } 750 + 5 = 755$$

745 rounds up to 750, so it is included: use $\leq$.

755 would round up to 760, so it is not included: use $<$.

Answer: $745 \leq V < 755$

Tip: Check the signs as well as the numbers. An error interval is always $\leq$ on the left and $<$ on the right. Use half of 10, not half of 1.

6 (2 marks)

$t = 3.7$ truncated to 1 decimal place.

Complete the error interval for t .

Truncating means chopping off the extra digits (no rounding).

Any number from 3.7 up to 3.7999 ... truncates to 3.7.

3.8 would truncate to 3.8, so it is not included.

Answer: $3.7 \leq t < 3.8$

Tip: Truncating is not rounding. $3.65 \leq t < 3.75$ is the answer for rounding, which is wrong here.

Marks: 1 mark for 3.7. 1 mark for 3.8.

7 (2 marks)

A bag of flour has a mass of 1.5 kg to the nearest 100 g.

Complete the error interval for the mass, in kilograms.

100 g = 0.1 kg, so the mass is to the nearest 0.1 kg.

Half of 0.1 is 0.05.

Lowest value: $1.5 - 0.05 = 1.45$

Upper limit: $1.5 + 0.05 = 1.55$

Answer: $1.45 \text{ kg} \leq \text{mass} < 1.55 \text{ kg}$

Marks: 1 mark for 1.45. 1 mark for 1.55.

8 (1 mark)

$x = 4.2$ correct to 1 decimal place.

Ella says the largest possible value of x is 4.25

Is Ella correct? Tick a box.

Give a reason for your answer.

The error interval for x is $4.15 \leq x < 4.25$.

4.25 rounds to 4.3 (to 1 decimal place), not 4.2.

So 4.25 is not a possible value of x .

Answer: No, 4.25 would round to 4.3

9 (1 mark)

The mass of a bag of sand is 25 kg, correct to the nearest kg.

Could the bag hold 26.9 kg? Tick a box.

Give a reason for your answer.

25 kg to the nearest kg means $24.5 \leq m < 25.5$.

26.9 is bigger than 25.5, so it is outside this interval.

(26.9 kg would round to 27 kg.)

Answer: No, the maximum is less than 25.5 kg

10 (3 marks)

A field is in the shape of a square.

The perimeter of the field is 240 m, correct to the nearest 10 m.

- (a) Complete the error interval for the perimeter, P m.

The perimeter is to the nearest 10 m.

Half of 10 m is 5 m.

Lowest value: $240 - 5 = 235$

Upper limit: $240 + 5 = 245$

Answer: $235 \leq P < 245$

Tip: The perimeter is to the nearest 10 m, so go 5 m each side, not 0.5 m.

Marks: 1 mark for 235. 1 mark for 245.

- (b) Complete the error interval for the length of one side, s m.

A square has 4 equal sides, so one side = $P \div 4$.

Lowest: $235 \div 4 = 58.75$

Upper limit: $245 \div 4 = 61.25$

Answer: $58.75 \leq s < 61.25$

Tip: Divide the limits from part (a) by 4. Do not work out $240 \div 4 = 60$ and then go 0.5 or 5 each side.

11 (2 marks)

Ivy has two suitcases.

The mass of each suitcase is 18 kg, correct to the nearest kg.

Ivy says,

‘The total mass of my two suitcases must be 36 kg, to the nearest kg.’

Give an example to show that Ivy is wrong.

Each suitcase is 18 kg to the nearest kg, so each mass is in $17.5 \leq \text{mass} < 18.5$.

Choose two masses near the top of this interval.

For example, $18.4 + 18.3 = 36.7$ kg.

36.7 kg rounds to 37 kg, not 36 kg.

So the total does not have to be 36 kg to the nearest kg. Ivy is wrong.

Answer: e.g. 18.4 kg and 18.3 kg (total 36.7 kg, which is 37 kg to the nearest kg)

Tip: Each mass must round to 18 kg, so it must be at least 17.5 and less than 18.5. Show the total and what it rounds to.

Marks: 1 mark for choosing two masses that each round to 18 kg. 1 mark for a total that does not round to 36 kg (at least 36.5 or less than 35.5).

12 (2 marks)

There is a gap between two kitchen cupboards.

The width of the gap is 60 cm, correct to the nearest centimetre.

The width of a washing machine is 59.6 cm, correct to the nearest millimetre.

Will the washing machine definitely fit in the gap? Tick a box.

Show working to support your answer.

Gap: 60 cm to the nearest cm, so $59.5 \leq \text{gap} < 60.5$.

The smallest the gap could be is 59.5 cm.

Washing machine: 59.6 cm to the nearest mm (0.1 cm), so $59.55 \leq \text{width} < 59.65$.

The widest the machine could be is (just under) 59.65 cm.

59.65 cm is more than 59.5 cm.

So if the gap is at its smallest and the machine at its widest, it will not fit.

Answer: No: the gap could be as small as 59.5 cm but the machine could be up to 59.65 cm wide

Tip: Do not just compare 60 with 59.6. For “definitely”, use the **smallest** possible gap and the **largest** possible machine.

Marks: 1 mark for 59.5 (smallest gap) or 59.65 (widest machine). 1 mark for No with both values compared.
