

Error Intervals

Solutions

For Pearson Edexcel GCSE Mathematics (1MA1) • 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)

The height, h cm, of a houseplant is 38 cm correct to the nearest centimetre.
Write down the error interval for h .

The height was rounded to the nearest 1 cm.

Half of 1 cm is 0.5 cm.

Lowest value: $38 - 0.5 = 37.5$

Upper limit: $38 + 0.5 = 38.5$

38.5 would round up to 39, so it is not included. Use $<$ at the top.

Answer: $37.5 \leq h < 38.5$

Tip: The upper limit is 38.5, not 38.4 or 38.49. The $<$ sign already shows that 38.5 is not included.

Marks: 1 mark for 37.5. 1 mark for 38.5.

2 (2 marks)

Amara weighs a bag of apples.
Her scales give the weight, a kg, rounded to one decimal place.
The scales show 2.4 kg.
Using inequalities, write down the error interval for a .

1 decimal place means to the nearest 0.1.

Half of 0.1 is 0.05.

Lowest value: $2.4 - 0.05 = 2.35$

Upper limit: $2.4 + 0.05 = 2.45$

Answer: $2.35 \leq a < 2.45$

Tip: Write it as one inequality with the smaller number on the left: $2.35 \leq a < 2.45$.

Marks: 1 mark for 2.35. 1 mark for 2.45 with the correct inequality signs.

3 (2 marks)

The temperature in a greenhouse is $T^{\circ}\text{C}$.

$T = 15.2$ correct to 1 decimal place.

Complete the error interval for T .

1 decimal place, so go 0.05 each side.

$$15.2 - 0.05 = 15.15$$

$$15.2 + 0.05 = 15.25$$

Answer: $15.15 \leq T < 15.25$

Marks: 1 mark for 15.15. 1 mark for 15.25.

4 (2 marks)

$w = 12.84$ correct to 2 decimal places.

Write down the error interval for w .

2 decimal places means to the nearest 0.01.

Half of 0.01 is 0.005.

Lowest value: $12.84 - 0.005 = 12.835$

Upper limit: $12.84 + 0.005 = 12.845$

Answer: $12.835 \leq w < 12.845$

Marks: 1 mark for 12.835. 1 mark for 12.845.

5 (2 marks)

A number x is 400 correct to 1 significant figure.

Write down the error interval for x .

For 400, 1 significant figure means to the nearest 100.

Half of 100 is 50.

Lowest value: $400 - 50 = 350$

Upper limit: $400 + 50 = 450$

Answer: $350 \leq x < 450$

Marks: 1 mark for 350. 1 mark for 450.

6 (2 marks)

$y = 3600$ correct to 2 significant figures.

Complete the error interval for y .

For 3600, 2 significant figures means to the nearest 100.

Half of 100 is 50.

$3600 - 50 = 3550$ and $3600 + 50 = 3650$

Answer: $3550 \leq y < 3650$

Tip: First work out what the last significant figure is worth. Here the 6 is in the hundreds column, so it is to the nearest 100.

Marks: 1 mark for 3550. 1 mark for 3650.

7 (2 marks)

The trip meter in Kofi's car shows distances truncated to 1 decimal place.

At the end of a journey, the trip meter shows 2.9 miles.

The distance of the journey is d miles.

Write down the error interval for d .

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

Any distance from 2.9 up to 2.999 ... miles truncates to 2.9.

3.0 would show as 3.0, so it is not included.

Answer: $2.9 \leq d < 3$

Tip: Truncating is not rounding. $2.85 \leq d < 2.95$ is the rounding interval, and it is a very common wrong answer.

Marks: 1 mark for 2.9. 1 mark for 3 (or 3.0).

8 (2 marks)

Bilal's exact age is A years.

Bilal says, 'I am 14 years old.'

Bilal gives his age as the number of **complete** years he has lived.

Complete the error interval for A .

Giving your age in complete years is truncating: the part-year is chopped off, not rounded.

On his 14th birthday Bilal's age is exactly 14, so 14 is included.

Until his 15th birthday he still says 14, so A can be anything up to (but not including) 15.

Answer: $14 \leq A < 15$

Tip: This is not rounding: someone aged 14 years and 9 months still says they are 14. So the answer is not $13.5 \leq A < 14.5$.

Marks: 1 mark for 14. 1 mark for 15.

9 (2 marks)

A bank works out the interest, $\pounds i$, on Asha's savings account.

The bank pays only whole pennies. It does not round: any part of a penny is ignored.

The bank pays Asha $\pounds 12.36$ interest.

Complete the error interval for i .

Ignoring any part of a penny is truncating to 2 decimal places: the extra digits are chopped off, not rounded.

The interest could be exactly £12.36, or £12.36 and part of a penny, e.g. £12.3699...

So i is at least 12.36.

Interest of £12.37 or more would be paid as at least £12.37, so $i < 12.37$.

Answer: $12.36 \leq i < 12.37$

Tip: This is truncation, not rounding. Many students write $12.355 \leq i < 12.365$, which is the interval for rounding to the nearest penny.

Marks: 1 mark for 12.36. 1 mark for 12.37.

10 (2 marks)

The weight, w kg, of a bag of flour is 1.5 kg to the nearest 100 g.

What is the error interval for the weight in kilograms?

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

Half of 0.1 is 0.05.

$1.5 - 0.05 = 1.45$ and $1.5 + 0.05 = 1.55$

Answer: $1.45 \leq w < 1.55$

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

11 (3 marks)

The mass, m kg, of a parcel is 3 kg correct to the nearest kg.

(a) Write down the error interval for m .

Nearest kg, so go 0.5 kg each side.

$3 - 0.5 = 2.5$ and $3 + 0.5 = 3.5$

Answer: $2.5 \leq m < 3.5$

Marks: 1 mark for 2.5. 1 mark for 3.5.

- (b) Ali says,
‘The parcel could have a mass of 3.5 kg.’

Is Ali correct?

Give a reason for your answer.

3.5 kg would round up to 4 kg, not 3 kg.

The error interval says $m < 3.5$, so 3.5 is not included.

So Ali is not correct.

Answer: No, 3.5 kg rounds to 4 kg
