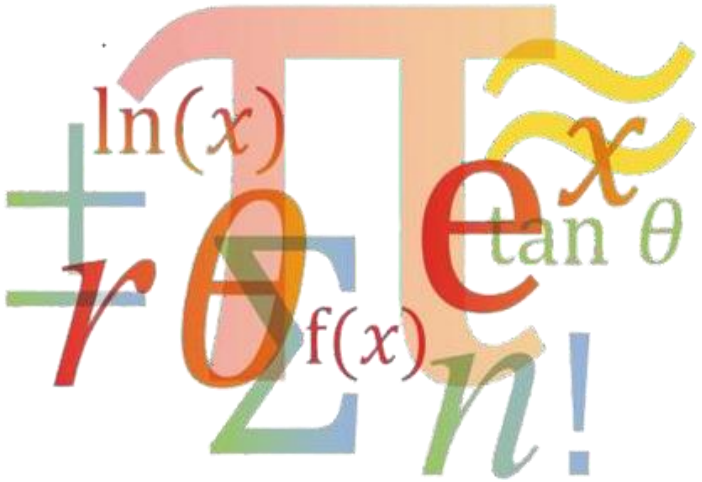
Cambridge Assessment International Education

Checkpoint 3

Topic:

Upper & Lower Bounds



Upper & Lower Bounds

Starter:

Round these numbers to 2sf and 3f.

		2sf	3sf
1	5316	5300	5320
2	0.002399	0.0024	0.00240
3	20081623	20 000 000	20 100 000
4	0.99999	1.0	1.00
5	0.50505	0.51	0.505
6	5.28431	5.3	5.28

Key words

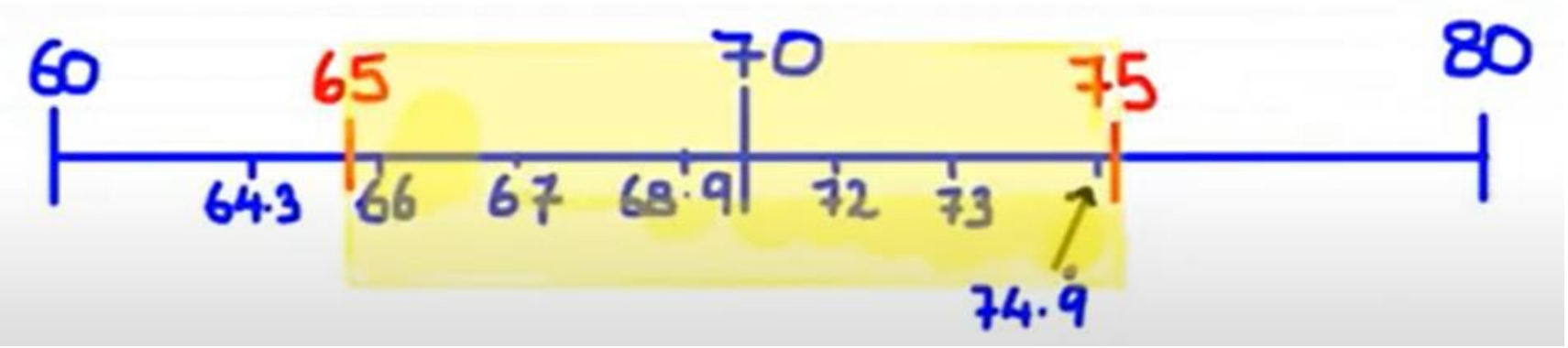
Accurate Upper and lower bounds Rounding

Significant figures

Upper & Lower Bounds

The Length of a line is measured to be 70 cm to the nearest 10 cm. Calculate the upper and lower bound for the length of the line.

Using a number line:



Lower Bound:	Upper Bound:
65	75

Let x =Length of line (cm) $65 \leq x < 75$

Upper & Lower Bounds

When you measure something, it is rarely totally accurate.
The accuracy depends on the units to which you are measuring

What is the upper and lower bounds of Michael Jordan's height?

Lower Bound:	Lower bound is the lowest number that can be rounded to 198cm
197.5cm	
Upper Bound:	Upper bound is the maximum number that can be rounded to 198cm
198.5cm	

$$197.5 \leq h < 198.5$$

Upper & Lower Bounds

What is the upper and lower bounds of Shaquille O'Neal's height?

Lower Bound:

2.155m

Lower bound is the lowest number that can be rounded to 2.16m

Upper Bound:

2.165m

Upper bound is the maximum number that can be rounded to 2.16m

$$2.155 \leq h < 2.165$$

Upper & Lower Bounds

Examples:

Find the upper and lower bounds for each quantity

Eg1 The population of Liverpool is 466,000 (to the nearest 1000)

Eg2 The distance from L'pool to M'chester is 34 miles (nearest mile)

Eg2 0.035m (to 2sf)

Upper & Lower Bounds

Examples:

Find the upper and lower bounds for each quantity

Eg1 The population of Liverpool is 466,000 (to the nearest 1000)

Lower Bound:	465,500	Upper Bound:	466.500

Eg2 The distance from L'pool to M'chester is 34 miles (nearest mile)

Lower Bound:	33.5 miles	Upper Bound:	34.5 miles

Eg2 0.035m (to 2sf)

Lower Bound:	0.0345m	Upper Bound:	0.0355m

Upper & Lower Bounds

Exercise 1:

Find the upper and lower bounds for each quantity

1	4500 people (nearest 100)
2	163cm (nearest cm)
3	£9 (1sf)
4	1.1kg (2sf)
5	A box of 8300 sweets (3sf)
6	2000cm (nearest 100)

Upper & Lower Bounds

Exercise 1:

Find the upper and lower bounds for each quantity

1	4500 people (nearest 100)	LB: 4450 UB: 4550
2	163cm (nearest cm)	LB: 162.5 UB: 163.5
3	£9 (1sf)	LB: £8.5 UB: £9.5
4	1.1kg (2sf)	LB: 1.05 UB: 1.15
5	A box of 8300 sweets (3sf)	LB: 8295 UB: 8305
6	2000cm (nearest 100)	LB: 1950 UB: 2050

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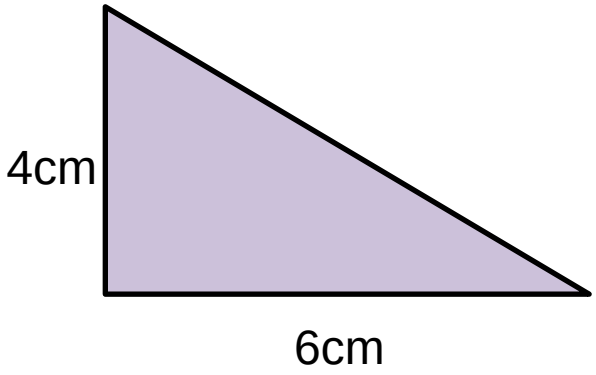
Upper & Lower Bounds

Calculations:

Find the upper and lower bounds for the area of this triangle.



$$A = \frac{1}{2} \times b \times h$$

6cm: LB = 5.5cm UB = 6.5cm

4cm: LB = 3.5cm UB = 4.5cm

Upper bound Area: ½ x 6.5 x 4.5 = $14.625cm^2$

Lower bound Area: ½ x 5.5 x 3.5 = $9.625cm^2$

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Upper & Lower Bounds

Calculations:

Find the upper and lower bounds for the speed of Usain Bolt's fastest 100m (to nearest m) race of 9.58 seconds (to nearest 2 dp)

$$S = \frac{d}{t}$$

100m: LB = 99.5m UB = 100.5m

9.58 secs: LB = 9.575 secs UB = 9.585 secs

$$\text{UB Speed} = \frac{d(\max)}{t(\min)} = \frac{100.5}{9.575} = 10.5 m/s$$

$$\text{LB Speed} = \frac{d(\min)}{t(\max)} = \frac{99.5}{9.585} = 10.4 m/s$$

Upper & Lower Bounds

Find the upper and lower bounds for each quantity

Eg4

$$\frac{5.3+31}{9.4}$$ All to 2sf

LB:

$$\frac{\text{min}+\text{min}}{\text{max}} = \frac{5.25+30.5}{9.45}$$

$$= 3.78$$

UB:

$$\frac{\text{max}+\text{max}}{\text{min}} = \frac{5.35+31.5}{9.35}$$

$$= 3.94$$