N57 Upper and Lower Bounds Calculations

OCR

Video created by W Neill

11 Sunil makes 7.5 litres of soup, correct to the nearest 0.5 litre.
He serves the soup in 300 ml portions, correct to the nearest 10 ml.
24 people order this soup.

Does Sunil definitely have enough soup to serve the 24 people?
Show how you decide.

..... **[4]**

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Does Sunil definitely have enough soup to serve the 24 people?
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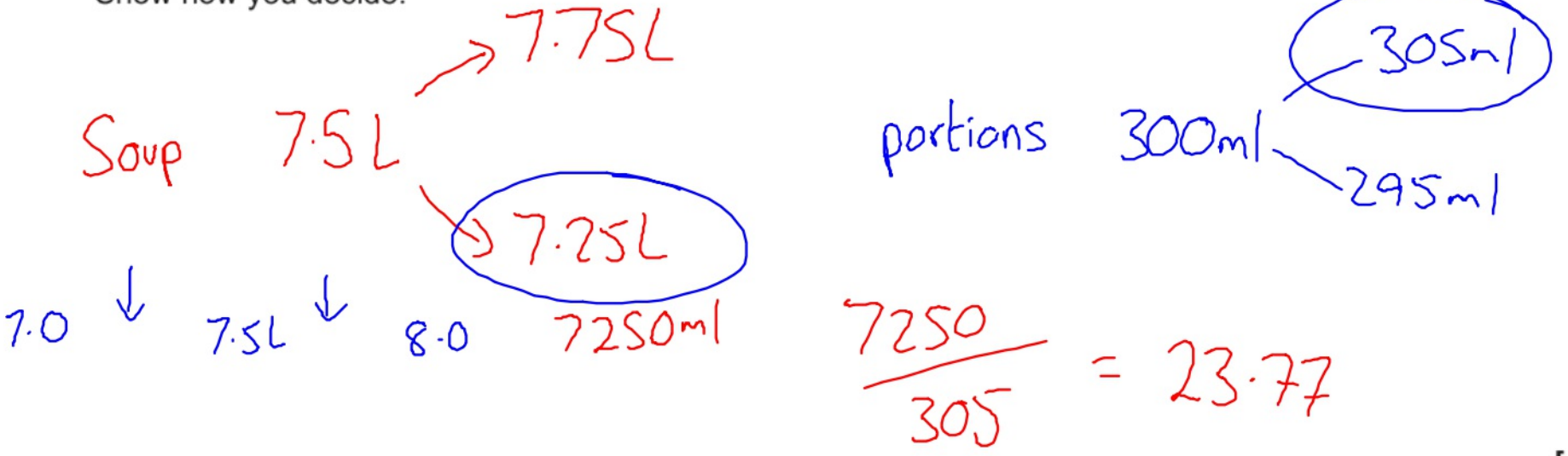

..... **[4]**

No, it may not be enough.

12 A log is 18 m long, correct to the nearest metre.
It is to be cut into fence posts which must be 80 cm long, correct to the nearest 10 centimetres.

N51

What is the largest number of fence posts that can possibly be cut from this log?

N57

..... **[4]**

12 A log is 18 m long, correct to the nearest metre.
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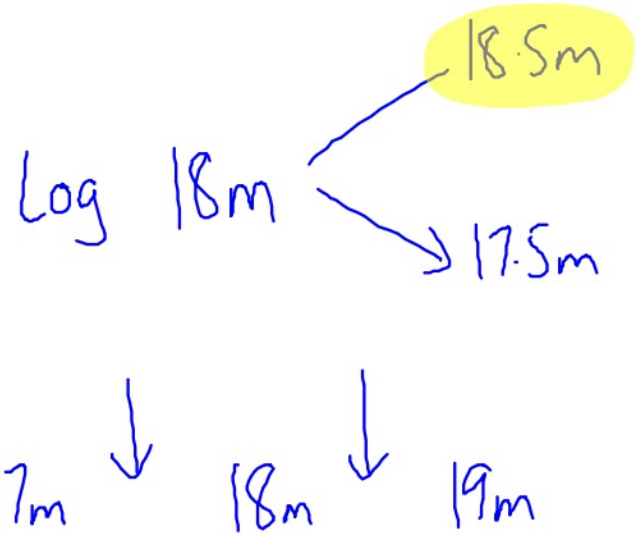
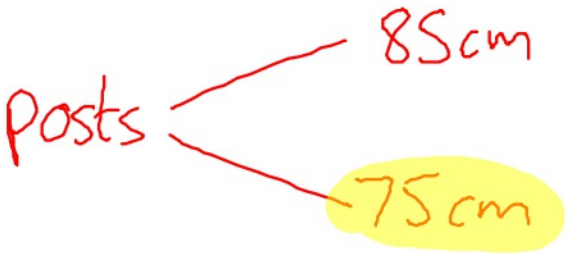
N51
N57

What is the largest number of fence posts that can possibly be cut from this log?





$$\frac{18.5\text{m}}{75\text{cm}} = \frac{1850\text{cm}}{75\text{cm}}$$

or $\frac{18.5\text{m}}{0.75\text{m}}$

$= 24.6$

24 ✓

..... [4]

14 **(a)** Standard bricks have dimensions 21.5 cm by 10.3 cm by 6.5 cm, correct to 1 decimal place.

A house is built using 4663 standard bricks.

Joslin says

Placed end to end, the bricks from the house would definitely reach over 1 km.

Show that Joslin's statement is correct. **[4]**

14 (a) Standard bricks have dimensions 21.5 cm by 10.3 cm by 6.5 cm, correct to 1 decimal place.

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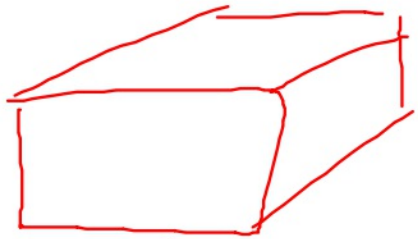

21·5cm

LB 21.45cm

UB 21.55cm

shortest x 4663

= 21.45cm x 4663

= 100021cm

yes, it is definitely over 1km

1000·21m

1·00021km

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(b) A standard brick should weigh 2.8 kg, correct to 1 decimal place.
A truck can carry a maximum load of 20 tonnes.

(i) Calculate the maximum number of standard bricks that the truck should be able to carry.

(b)(i) ..... **[3]**

(ii) Explain why your answer to **(b)(i)** may not be possible to achieve.

.....

..... **[1]**

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(b) A standard brick should weigh 2.8 kg, correct to 1 decimal place.
A truck can carry a maximum load of 20 tonnes.

(i) Calculate the maximum number of standard bricks that the truck should be able to carry.

Max = 20 tonnes

20,000Kg

Brick = 2.8Kg

2.75

2.85Kg

$\frac{20,000}{2.85}$ =

7017

7017

7020

(b)(i) ..... **[3]**

(ii) Explain why your answer to **(b)(i)** may not be possible to achieve.

The weight might be ok but there is not enough space.

..... **[1]**

Video created by W Neill

16 A £1 coin weighs 8.75 g, correct to the nearest 0.01 g.
Mitul weighs the contents of a large bag of £1 coins.
The coins weigh 2.63 kg, correct to the nearest 10 g.

Mitul says

> I am sure that the bag contains exactly £300 because, using bounds,
> 2625 ÷ 8.755 = 299.8 to 1 decimal place.

Show that Mitul may not be correct.

N57

.....

..... **[3]**

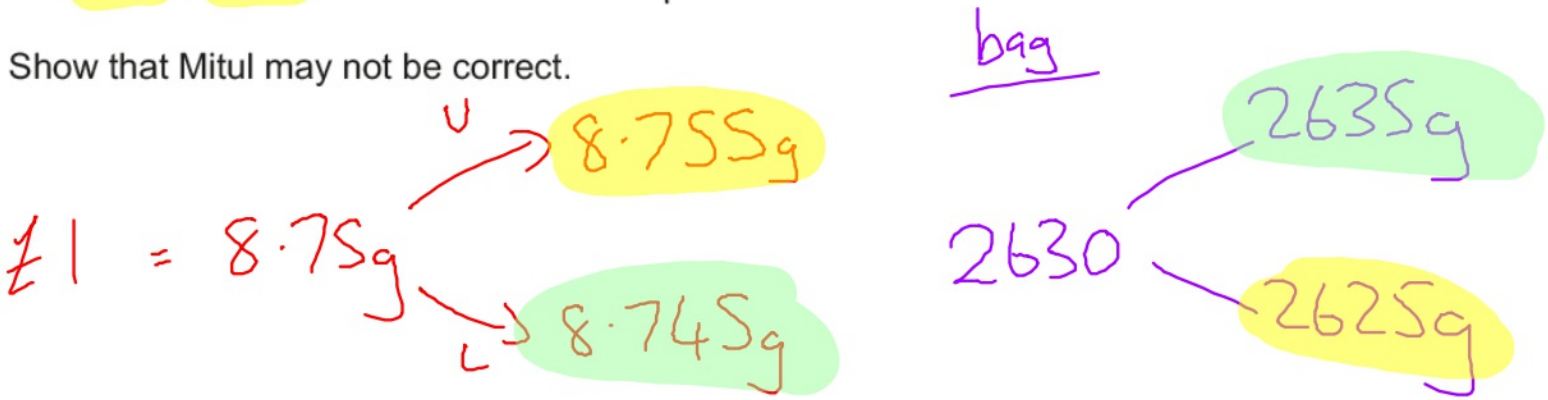
Video created by W Neill

16 A £1 coin weighs 8.75 g, correct to the nearest 0.01 g.
Mitul weighs the contents of a large bag of £1 coins.
N57 The coins weigh 2.63 kg, correct to the nearest 10 g.

Mitul says 2630

I am sure that the bag contains exactly £300 because, using bounds,
2625 ÷ 8.755 = 299.8 to 1 decimal place.

Show that Mitul may not be correct.



$\frac{2635}{8.745} = 301.3$

rounds to £301

So Mitul may not be correct. [3]

Edexcel

20 $m = \dfrac{1}{ps}$

$p = 5.37$ correct to 2 decimal places.
$s = 2.9$ correct to 1 decimal place.

Calculate the upper bound for the value for m.
You must show your working.

.....

(Total for Question 20 is 3 marks)

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20 $m = \dfrac{1}{ps}$

$p = 5.37$ correct to 2 decimal places.
$s = 2.9$ correct to 1 decimal place.

Calculate the upper bound for the value for m.
You must show your working.

$\frac{20}{5} = 4$

$\frac{20}{4} = 5$ → smallest possible

$p = 5.37 \rightarrow 5.375$, 5.365

$s = 2.9 \rightarrow 2.95$, 2.85

$m = \dfrac{1}{ps}$

$m = \dfrac{1}{5.365 \times 2.85}$

$m = 0.065401154 3$ ✓

.....

(Total for Question 20 is 3 marks)

Video created by W Neill

17 Kelly grows potatoes.
She has 2500 kg of potatoes, correct to the nearest 10 kg.

N57 Kelly is going to put the potatoes into sacks.
Each sack will contain 12.5 kg of potatoes.

Kelly assumes that 12.5 kg is measured correct to the nearest 0.1 kg.

(a) Does Kelly definitely have enough potatoes to fill 200 sacks?
You must show how you get your answer.

(3)

Kelly's assumption is wrong.
12.5 kg is measured correct to the nearest 0.5 kg.

(b) Explain how this could affect your decision in part (a).

.....

(1)

Video created by W Neill

17 Kelly grows potatoes.
She has 2500 kg of potatoes, correct to the nearest 10 kg.

12.5 12.75 13

12 12.22

N57 Kelly is going to put the potatoes into sacks.
Each sack will contain 12.5 kg of potatoes.

Kelly assumes that 12.5 kg is measured correct to the nearest 0.1 kg.

(a) Does Kelly definitely have enough potatoes to fill 200 sacks?
You must show how you get your answer.

Check smallest answer

Potatoes

2500 kg → 2505 kg

2500 kg → 2495 kg

Sack

12.5 kg → 12.55 kg

12.5 kg → 12.45 kg

$\frac{2495}{12.55}$

$= 198.8$ bags

So no she definitely does not have enough.

(1)

Kelly's assumption is wrong.
12.5 kg is measured correct to the nearest 0.5 kg.

12.5 kg → 12.75 kg

12.5 kg → 12.25 kg

(b) Explain how this could affect your decision in part (a).

It does not change it. as $\frac{2495}{12.75}$ must be smaller than 198 ✓

(1)

Video created by W Neill

17 A train travelled along a track in 110 minutes, correct to the nearest 5 minutes.

Jake finds out that the track is 270 km long.
He assumes that the track has been measured correct to the nearest 10 km.

(a) Could the average speed of the train have been greater than 160 km/h?
You must show how you get your answer.

(4)

Jake's assumption was wrong.
The track was measured correct to the nearest 5 km.

(b) Explain how this could affect your decision in part (a).

.....

.....

.....

(1)

Video created by W Neill

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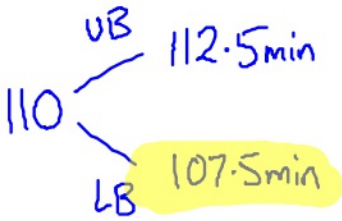

Speed = $\frac{275}{107.5}$

= 2.558 km/min

160km = 60min ÷60
2.6km = 1min
2.6km/min

No, the average speed could not have been greater.

Jake's assumption was wrong.
The track was measured correct to the nearest 5 km.

(b) Explain how this could affect your decision in part (a).

270 → 272.5km → 267.5km

$\frac{272.5}{107.5}$ = 2.53... speed would drop

(1)

13 A factory makes 450 pies every day.
The pies are chicken pies or steak pies.

Each day Milo takes a sample of 15 pies to check.

The proportion of the pies in his sample that are chicken is the same as the proportion of the pies made that day that are chicken.

On Monday Milo calculated that he needed exactly 4 chicken pies in his sample.

(a) Work out the total number of chicken pies that were made on Monday.

.....

(2)

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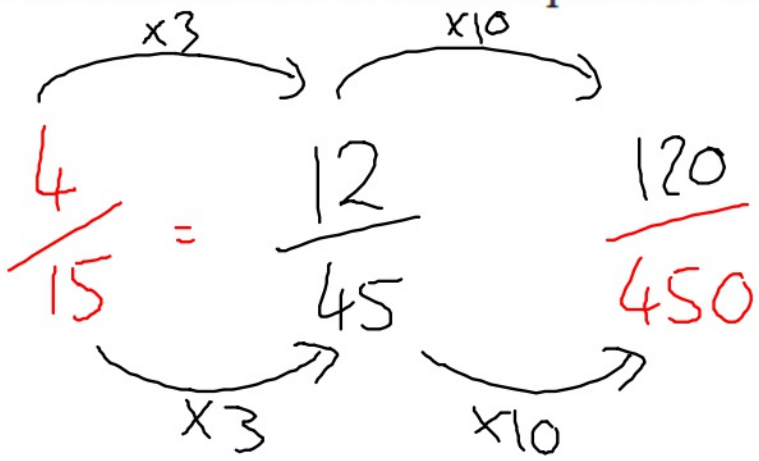


120

(2)

On Tuesday, the number of steak pies Milo needs in his sample is 6 correct to the nearest whole number.

Milo takes at random a pie from the 450 pies made on Tuesday.

(b) Work out the lower bound of the probability that the pie is a steak pie.

.....

(2)

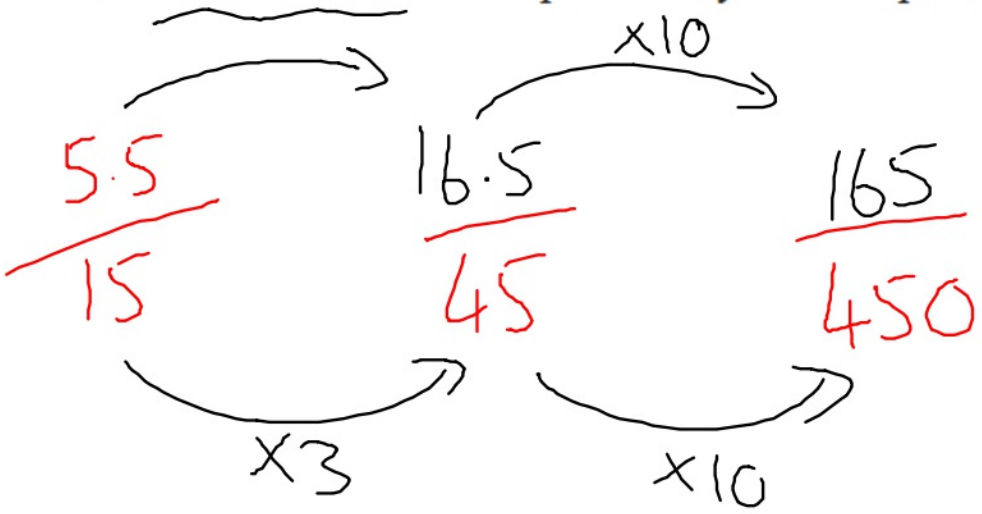
(Total for Question 13 is 4 marks)

On Tuesday, the number of steak pies Milo needs in his sample is 6 correct to the nearest whole number.

5.5 6.5

Milo takes at random a pie from the 450 pies made on Tuesday.

(b) Work out the lower bound of the probability that the pie is a steak pie.



$\frac{165}{450}$

(2)

(Total for Question 13 is 4 marks)

16 The petrol consumption of a car, in litres per 100 kilometres, is given by the formula

$$\text{Petrol consumption} = \frac{100 \times \text{Number of litres of petrol used}}{\text{Number of kilometres travelled}}$$

Nathan's car travelled 148 kilometres, correct to 3 significant figures.
The car used 11.8 litres of petrol, correct to 3 significant figures.

Nathan says,

"My car used less than 8 litres of petrol per 100 kilometres."

Could Nathan be wrong?
You must show how you get your answer.

(Total for Question 16 is 3 marks)

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Created by W Neill

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Nathan's car travelled 148 kilometres, correct to 3 significant figures.
The car used 11.8 litres of petrol, correct to 3 significant figures.

Nathan says,

"My car used less than 8 litres of petrol per 100 kilometres."

Could Nathan be wrong? → show it is more than 8
You must show how you get your answer.

(biggest ans possible) → $\frac{\text{biggest}}{\text{smallest}}$

148 km → 148.5 km
148 km → 147.5 km

11.8 L → 11.85 L
11.8 L → 11.75 L

$$= \frac{100 \times 11.85}{147.5}$$

Yes Nathan is wrong $= 8.033 > 8$ L/km

(Total for Question 16 is 3 marks)

AQA

Video created by W Neill

20 This sign shows when a lift is safe to use.

NS1
NS7

Total mass of people must be 450 kg or less

Ben and some other people are in the lift.

Their total mass is 525 kg to the nearest 5 kg

Ben gets out.

He has a mass of 78 kg to the nearest kg

Is the lift now safe to use?

You **must** show your working.

[4 marks]

Answer _____

Video created by W Neill

20 This sign shows when a lift is safe to use.

NS1
NS7

Total mass of people must be 450 kg or less

Ben and some other people are in the lift.

Their total mass is 525 kg to the nearest 5 kg

Ben gets out.

He has a mass of 78 kg to the nearest kg

Is the lift now safe to use?

You **must** show your working.

Total Mass

527.5kg

525kg

522.5kg

Ben 78kg

78.5kg

77.5kg

Heaviest mass left in lift ...

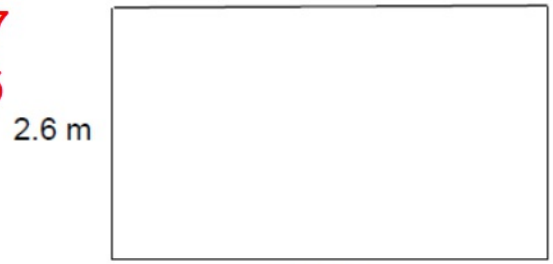
527.5kg - 77.5kg = 450kg

Answer Yes, lift is ok. ✓

Video created by W Neill

25 The dimensions of a rectangular floor are to the nearest 0.1 metres.

N57
R25



Not drawn accurately

A force of 345 Newtons is applied to the floor.

The force is to the nearest 5 Newtons.

$$\text{pressure} = \frac{\text{force}}{\text{area}}$$

Work out the upper bound of the pressure.

Give your answer to 4 significant figures.

You **must** show your working.

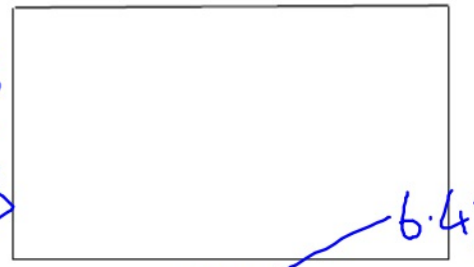
[5 marks]

Answer _____ N/m^2

Video created by W Neill

25 The dimensions of a rectangular floor are to the nearest 0.1 metres.

N57
R25 2.65



2.55

6.45

6.35

Not drawn accurately

A force of 345 Newtons is applied to the floor.

The force is to the nearest 5 Newtons.

$$\text{pressure} = \frac{\text{force}}{\text{area}}$$

greatest pressure

$\frac{\text{force}}{\text{Area}}$ $\frac{\text{Big}}{\text{Small}}$

350

force = 345 N

340

347.5 N

342.5 N

Area = Smallest = 2.55 × 6.35

= 16.1925

$$\text{Pressure} = \frac{347.5}{16.1925}$$

=

Work out the upper bound of the pressure.

Give your answer to 4 significant figures.

You **must** show your working.

[5 marks]

Answer 21.46 ✓ N/m^2

Video created by W Neill

24

N57
G31

A tank is a cuboid measuring 50 cm by 35 cm by 20 cm

All lengths are to the **nearest centimetre**.

A container has a capacity of **exactly** 34 litres.

1 litre = 1000 cm^3

Which has the greater capacity?

Tick **one** box.

☐ Tank ☐ Container ☐ Cannot tell

Show working to support your answer.

[4 marks]

Video created by W Neill

24

N57
G31

A tank is a cuboid measuring 50 cm by 35 cm by 20 cm

All lengths are to the **nearest centimetre**.

A container has a capacity of **exactly** 34 litres. → $34000\,cm^3$

1 litre = 1000 cm^3

Which has the greater capacity?

Tick **one** box.

☐ Tank ☐ Container ☑ Cannot tell

Show working to support your answer.

Volume

Max $50.5 \times 35.5 \times 20.5 = 36751\,cm^3$

Min $49.5 \times 34.5 \times 19.5 = 33301\,cm^3$

34000 is in between

Video created by W Neill

19 The length of a roll of ribbon is 30 metres, correct to the nearest half-metre.

A piece of length 5.8 metres, correct to the nearest 10 centimetres, is cut from the roll.

N57 Work out the maximum possible length of ribbon left on the roll.

[3 marks]

Answer _____ metres

29.5 ↓ 30 ↓ 30.5 5.7 ↓ 5.8 ↓ 5.9

Video created by W Neill

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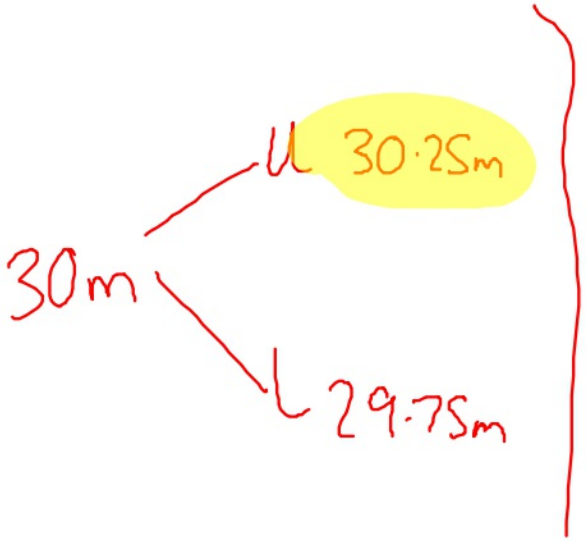

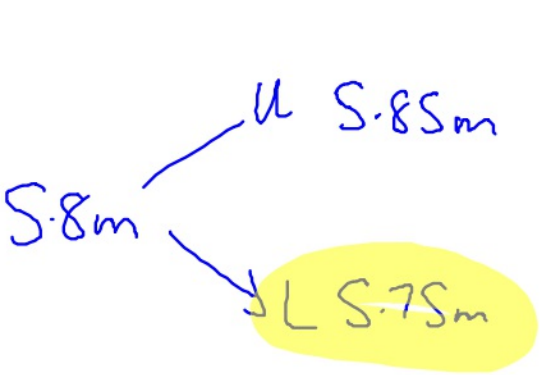

Biggest -

30.25
− 5.75
24.5

Answer 24.5 metres ✓