Rounding, Estimation & Bounds

Question Paper

Course	Edexcel IGCSE Maths
Section	1. Numbers & the Number System
Topic	Rounding, Estimation & Bounds
Difficulty	Hard

Time allowed: 80

Score: /63

Percentage: /100

Question 1

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.
He measures the diameter, d, as 54 mm to the nearest millimetre.

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

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

[4 marks]

Question 2

Steve travelled from Ashton to Barnfield.

He travelled 235 miles, correct to the nearest 5 miles.
The journey took him 200 minutes, correct to the nearest 5 minutes.

Calculate the lower bound for the average speed of the journey.
Give your answer in **miles per hour**, correct to 3 significant figures.
You must show all your working.

[4 marks]

Question 3

Jarek uses the formula

$$\text{Area} = \frac{1}{2} ab \sin C$$

to work out the area of a triangle.

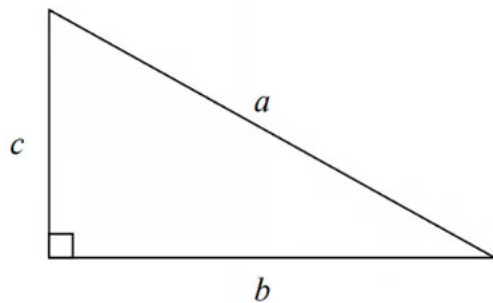For this triangle,

$a = 7.8$ cm correct to the nearest mm.
$b = 5.2$ cm correct to the nearest mm.
$C = 63°$ correct to the nearest degree.

Calculate the lower bound for the area of the triangle.

[3 marks]

Question 4

a is 8.3 cm correct to the nearest mm
b is 6.1 cm correct to the nearest mm

Calculate the upper bound for c.
You must show your working.

[4 marks]

Question 5a

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.

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

[4 marks]

Question 5b

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

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

[1 mark]

Question 6

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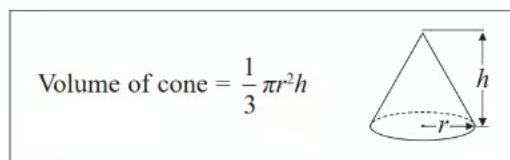
Could Nathan be wrong?
You must show how you get your answer.

[3 marks]

Question 7a

A cone has a volume of 98 cm^3.
The radius of the cone is 5.13 cm.

Volume of cone $= \frac{1}{3}\pi r^2 h$

Work out an estimate for the height of the cone.

[3 marks]

Question 7b

John uses a calculator to work out the height of the cone to 2 decimal places.

Will your estimate be more than John's answer or less than John's answer?
Give reasons for your answer.

[1 mark]

Question 8

Work out an estimate for $\sqrt{4.98 + 2.16 \times 7.35}$

[3 marks]

Question 9

Margaret has some goats.
The goats produce an average total of 21.7 litres of milk per day for 280 days.

Margaret sells the milk in $\frac{1}{2}$ litre bottles.

Work out an estimate for the total number of bottles that Margaret will be able to fill with the milk.
You must show clearly how you got your estimate.

[3 marks]

Question 10

Competition
a prize every 2014 seconds

In a competition, a prize is won every 2014 seconds.

Work out an estimate for the number of prizes won in 24 hours.
You must show your working.

[4 marks]

Question 11a

The mass of Jupiter is 1.899×10^{27} kg.
The mass of Saturn is 0.3 times the mass of Jupiter.

Work out an estimate for the mass of Saturn.
Give your answer in standard form.

[3 marks]

Question 11b

Give evidence to show whether your answer to (a) is an underestimate or an overestimate.

Question 12a

$$D = \frac{u^2}{2a}$$

$u = 26.2$ correct to 3 significant figures

$a = 4.3$ correct to 2 significant figures

Calculate the upper bound for the value of D.
Give your answer correct to 6 significant figures.
You must show all your working.

[3 marks]

Question 12b

The lower bound for the value of D is 78.6003 correct to 6 significant figures.

By considering bounds, write down the value of D to a suitable degree of accuracy.
You must give a reason for your answer.

[2 marks]

Question 13

Edith's van can safely carry a maximum load of 920 kilograms.

She wants to use her van to carry

      30 sacks of potatoes, each of mass 25 kilograms to the nearest kilogram

      and

      20 sacks of carrots, each of mass 7.5 kilograms to 1 decimal place.

Can she definitely use her van safely in one journey?

You **must** show your working.

[4 marks]

Question 14

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.

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

...................metres

[3 marks]

Question 15

Claudine cycled a distance of 53 km in 2.7 hours.
The distance is measured correct to the nearest km.
The time is given correct to 1 decimal place.

Calculate the lower and upper bounds of her average speed.

Give your answers correct to 2 decimal places.

Lower bound = ... km/h
Upper bound = ... km/h

[6 marks]

Question 16

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 marks]