Questions

Q1.

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

$p = 5.37$ 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.

$$5.365 \leq p < 5.375$$

$$2.85 \leq s < 2.95$$

$$m_{max} = \frac{1}{(5.365 \times 2.85)}$$

$$= 0.0654 \quad \text{to 3 s.f.}$$

(Total for question = 3 marks)

Q2.

Kiera used her calculator to work out the value of a number x.
She wrote down the first two digits of the answer on her calculator.

She wrote down 7.3

Write down the error interval for x.

$$7.3 \leq x < 7.4$$

(Total for question = 2 marks)

Q3.

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

$u = 26.2$ correct to 3 significant figures

$$26.15 \leq u < 26.25 \checkmark$$

$$4.25 \leq a < 4.35$$

$a = 4.3$ correct to 2 significant figures

$$\frac{26.25^2}{(2 \times 4.25)}$$

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

≤ 81.0662

(3)

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

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

80 to 1 s.f.   upper bound and lower bound
agree to only 1 s.f.

(2)

(Total for question = 5 marks)

Q4.

Sasha drops a ball from a height of d metres onto the ground.

The time, t seconds, that the ball takes to reach the ground is given by

$$t = \sqrt{\frac{2d}{g}}$$

where g m/s^2 is the acceleration due to gravity.

$d = 35.6$ correct to 3 significant figures.
$g = 9.8$ correct to 2 significant figures.

lower bound for d

(a) Write down the lower bound of d.

35.55

(1)

(b) Calculate the lower bound of t.

$35.55 \leq d < 35.65$

$9.75 \leq g < 9.85$

You must show all your working.

$$t_{lower} = \sqrt{\frac{2 \times 35.55}{9.85}}$$

$$= 2.69 \quad \text{to } 3 \text{ s.f.}$$

. . . .

(3)

(Total for Question is 4 marks)

Q5.

Jarek uses the formula

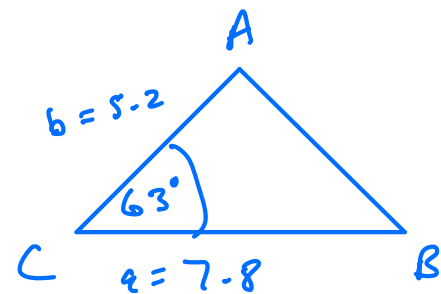$$\text{Area} = \frac{1}{2}ab\sin C$$

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.

$b = 5.2$

$63°$

$C \quad a = 7.8 \quad B$

A

$7.75 \leq a < 7.85$

$5.15 \leq b < 5.25$

$62.5° \leq C < 63.5°$

$$\text{Area}_{min} = \frac{1}{2} \times 7.75 \times 5.15 \times \sin 62.5° \qquad\qquad = 17.7 \quad \text{to } 3 \text{ s.f.} \text{ cm}^2$$

(Total for question = 3 marks)

Q6.

$$I = \frac{V}{R}$$

V = 250 correct to the nearest 5

$247.5 \leq V < 252.5$

$3850 \leq R < 3950$

R = 3900 correct to the nearest 100

Work out the lower bound for the value of *I*.
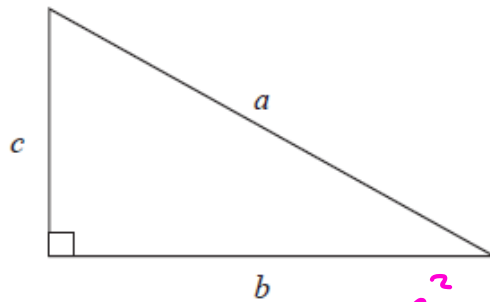Give your answer correct to 3 decimal places.
You must show your working.

$$I_{Lower} = \frac{V_{Lower}}{R_{upper}}$$

$$= \frac{247.5}{3950}$$

0.063   to   3 d.p.

(Total for question = 3 marks)

Q7.

8.25 ≤ a < 8.35
6.05 ≤ b < 6.15

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.

$$a^2 = b^2 + c^2$$

$$a^2 - b^2 = c^2$$

$$c^2_{upper} = a^2_{upper} - b^2_{lower}$$

$$= 8.35^2 - 6.05^2$$

$$c_{upper} = \sqrt{8.35^2 - 6.05^2}$$

.... cm

= 5.75 cm   to   3 s.f.

(Total for question = 4 marks)

Q8.

A high speed train travels a distance of 487 km in 3 hours.

486.5 ≤ D < 487.5

The distance is measured correct to the nearest kilometre.
The time is measured correct to the nearest minute.

179.5 ≤ T < 180.5

By considering bounds, work out the average speed, in km/minute, of the train to a
suitable degree of accuracy.
You must show all your working and give a reason for your answer.

$$S = \frac{D}{T}$$

.... km/minute

$$S_{upper} = \frac{D_{upper}}{T_{lower}} = \frac{487.5}{179.5} = 2.716 \text{ km/min}$$

(Total for question = 5 marks)

$$S_{lower} = \frac{D_{lower}}{T_{upper}} = \frac{486.5}{180.5} = 2.695 \text{ km/min}$$

These agree to 2 s.f.   So 2.7 km/min

Q9.

A number, y, is rounded to 2 significant figures.

$$0.455 \le y < 0.465$$

The result is 0.46

Write down the error interval for y.

....

(Total for question = 2 marks)

Q10.

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.

.... mph

$$232.5_{\text{miles}} \le D < 237.5 \text{ miles}$$

(Total for question = 4 marks)

$$197.5_{\text{min}} \le T < 202.5 \text{ min}$$

$$\frac{197.5}{60} \text{ hrs} \le T < \frac{202.5}{60} \text{ hr}$$

$$S = \frac{D}{T} \qquad S_{min} = \frac{D_{min}}{T_{max}} = \frac{232.5}{\left(\frac{202.5}{60}\right)} = 68.9 \text{ mph}$$