LIMITS OF ACCURACY
GRADE 9

1. Five boys have a mass, given to the nearest 10 kg, of: 40 kg, 50 kg, 50 kg, 60 kg and 80 kg. Calculate the least possible total mass.

$35+45+45+55+75$
$= 255\text{kg}$ [2]

2. A water tank measures 30 cm by 50 cm by 20 cm. If each of these measurements is given to the nearest centimetre, calculate the largest possible volume of the tank.

$30.5 \times 50.5 \times 20.5$
$= 31,575.125\text{cm}^3$ [2]

3. The volume of a cube is given as 125 cm³ to the nearest whole number.
   a) Express as an inequality the upper and lower bounds of the cube's volume.
   b) Express as an inequality the upper and lower bounds of the length of each of the cube's edges.

$124.5 \leq V < 125.5\text{cm}^3$ [3]

$4.99 \leq l < 5.01\text{ m}$ [2]

4. The radius of a circle is given as 4.00 cm to 2 d.p. Express as an inequality the upper and lower bounds for:
   a) the circumference of the circle,
   b) the area of the circle.

$25.1013 \leq C < 25.1642$ [3]
$50.1399 \leq A < 50.3912$ [2]

5. A cylindrical water tank has a volume of 6000 cm³ correct to 1 s.f. A full cup of water from the tank has a volume of 300 cm³ correct to 2 s.f. Calculate the maximum number of full cups of water that can be drawn from the tank.

$\frac{6500}{295} = 22.03 \approx 22$ cups [3]

6. A match measures 5 cm to the nearest centimetre. 100 matches end to end measure 5.43 m correct to 3 s.f.
   a) Calculate the upper and lower limits of the length of one match.
   b). How can the limits of the length of a match be found to 2 d.p.?

$LB = 4.5\text{cm}$, $UB = 5.5\text{cm}$ [2]

$LB = 5.425$ [3]
≈ 5.43
5.435 M1
5.44 A2

7. The masses to the nearest 0.5 kg of two parcels are 1.5 kg and 2.5 kg. Calculate the lower and upper bounds of their combined mass.

$LB = 1.25+2.25$
$= 3.5\text{kg}$
$UB = 1.75+2.75$
$= 4.5\text{kg}$ [4]

8. The mass of 60 potatoes is given as 42 kg correct to 2 s.f. Calculate the lower and upper bounds for the average mass of one potato.

$LB = \frac{41.5}{60}$
$= 2.691\overline{6}\text{ kg}$
$UB = \frac{42.5}{60}$
$= 0.708\overline{3}\text{ kg}$ [2]

9. The dimensions of a rectangle are 100m and 50 both correct to 1 sig fig. Write as an inequality the upper and lower bound of its area.

$LB = 95 \times 45$
$= 4275$
$UB = 150 \times 55$
$= 8250$ [4]

10a) John wants to estimate the value of π.
He measures the circumference of a circular pizza as 105 cm and its diameter as 34 cm, both correct to the nearest centimetre.

Calculate the lower bound of his estimate of the value of π.
Give your answer correct to 3 decimal places.

$LB = \frac{C}{d} = \frac{104.5}{34.5} = 3.029$ [3]

b)i) Given that the volume of a cylinder is $V = \pi r^2 h$ (where r and h are the radius and height of the cylinder) make r the subject of the formula.

$r = \sqrt{\frac{V}{\pi h}}$ [2]

ii) The volume of a cylindrical can is 550 cm³, correct to the nearest 10 cm³.
The height of the can is 12 cm correct to the nearest centimetre.

Calculate the upper bound of the radius of the can.
Give your answer correct to 3 decimal places.

$r = \sqrt{\frac{555}{\pi \times 11.5}} = 3.919$ [3]