Solutions to Past Paper Questions – Upper and Lower Bounds

19) (a) $4.5 \times 6.5 = 29.25$

(b) $\frac{3.5}{6.5} = 0.538$ (3sf)

20) (a) Upper bound of volume = $\frac{1}{3} \times 230.5^2 \times 146.5 = 2594527$ m^3

Lower bound of volume = $\frac{1}{3} \times 229.5^2 \times 145.5 = 2554507$ m^3

Difference = 40020= 40000 m^3 (to 3sf)

16) (a) $1.65 \leq r < 1.75$ $\quad 30.95 \leq R < 31.05$

(b) Lower bound of R – r = 30.95 – 1.75 = 29.2

(c) Lower bound of volume of large sphere = $\frac{4}{3} \times \pi \times 30.95^3$

Upper bound of volume of small sphere = $\frac{4}{3} \times \pi \times 1.75^3$

Divide these to get 5531

19) Area of whole sheet = $12.5 \times 10 = 125$cm^2 (these measurements were given exactly)

To get greatest possible amount of waste we need least possible area of trapezium.

This is $\frac{1}{2} \times 9.65 \times (8.65 + 11.35) = 96.5$ cm^2

So greatest possible waste = 125 - 96.5 = 28.5 cm^2

18) (a) Upper bound for area = ½ × 83.5 ×95 = 3966.25 mm^2

(b) Lower bound for tanx = $\frac{85}{83.5} = 1.0179\ldots$

(d) To 2sf, UB = 52000 mm^3 and LB = 46000 mm^3 which are not the same.

To 1sf, both UB and LB are 50000 mm^3, so the appropriate degree of accuracy is:

Volume = 50000 mm^3 to 1sf

Answer is asked for in cm^3, so convert to **50 cm^3 (1sf)**

9) (a)

$$\frac{BD}{120} = \tan 15°$$

$$BD = 120 \times \tan 15° = 32.15$$

$$CD = 148 - BD = 116 \text{ cm to nearest cm}$$

(b) Use BC = 147.5cm, AB = 120.5cm, angle DAB = 15.5°