

ES1 N5 Applications of Maths (Geometry & Measure)

Tolerance

Worked Solutions Courtesy of Mr R. Milton

$$\begin{aligned} \textcircled{1} \quad 25.4\text{cm} \pm 2\text{mm} &\leftarrow \\ &= 25.4 \pm 0.2\text{cm} \leftarrow [1\text{cm} = 10\text{mm}] \end{aligned}$$

$$\text{UPPER} = 25.4 + 0.2 = \underline{25.6\text{cm}} \quad \checkmark$$

$$\text{LOWER} = 25.4 - 0.2 = \underline{25.2\text{cm}} \quad \checkmark$$

$$\begin{aligned} \textcircled{2} \quad 3.6\text{m} \pm 5\text{cm} &\leftarrow [100\text{cm} = 1\text{m}] \\ &= 3.6 \pm 0.05\text{m} \leftarrow \end{aligned}$$

$$\text{UPPER} = 3.6 + 0.05 = \underline{3.65\text{m}} \quad \checkmark$$

$$\text{LOWER} = 3.6 - 0.05 = \underline{3.55\text{m}} \quad \checkmark$$

$$\begin{aligned} \textcircled{3} \quad 13.1\text{cm} \pm 3\text{mm} \\ &= 13.1\text{cm} \pm 0.3\text{cm} \end{aligned}$$

$$\text{UPPER} = 13.1 + 0.3 = \underline{13.4\text{cm}} \quad \checkmark$$

$$\text{LOWER} = 13.1 - 0.3 = \underline{12.8\text{cm}} \quad \checkmark$$

$$\textcircled{4} \quad 17.7 \text{ kg} \pm 1.3 \text{ kg}$$

$$\text{UPPER} = 17.7 + 1.3 = \underline{19 \text{ kg}} \quad \checkmark$$

$$\text{LOWER} = 17.7 - 1.3 = \underline{16.4 \text{ kg}} \quad \checkmark$$

$$\textcircled{5} \quad 36.8^\circ\text{C} \pm 0.4^\circ\text{C}$$

$$\text{UPPER} = 36.8 + 0.4 = \underline{37.2^\circ\text{C}} \quad \checkmark$$

$$\text{LOWER} = 36.8 - 0.4 = \underline{36.4^\circ\text{C}} \quad \checkmark$$

$$\textcircled{6} \quad 373 \text{ mm} \pm 17 \text{ mm}$$

$$\text{UPPER} = 373 + 17 = \underline{390 \text{ mm}} \quad \checkmark$$

$$\text{LOWER} = 373 - 17 = \underline{356 \text{ mm}} \quad \checkmark$$

$$\textcircled{7} \quad 10\% \text{ OF } 3.2 \text{ cm} = 0.32 \text{ cm}$$

$$\Rightarrow 3.2 \text{ cm} \pm 10\%$$

$$= 3.2 \text{ cm} \pm 0.32 \text{ cm}$$

$$\text{UPPER} = 3.2 + 0.32 = \underline{3.52 \text{ cm}} \quad \checkmark$$

$$\text{LOWER} = 3.2 - 0.32 = \underline{2.88 \text{ cm}} \quad \checkmark$$

$$\textcircled{8} \quad 500\text{g} \pm 5\%$$

$$5\% \text{ OF } 500\text{g} = 25\text{g}$$

$$500\text{g} \pm 25\text{g}$$

$$\text{UPPER} = 500 + 25 = \underline{525\text{g}} \checkmark$$

$$\text{LOWER} = 500 - 25 = \underline{475\text{g}} \checkmark$$

$$\textcircled{9} \quad 19.6\text{cm} \pm 10\%$$

$$10\% \text{ OF } 19.6\text{cm} = 1.96\text{cm}$$

$$19.6 \pm 1.96\text{cm}$$

$$\text{UPPER} = 19.6 + 1.96 = \underline{21.56\text{cm}} \checkmark$$

$$\text{LOWER} = 19.6 - 1.96 = \underline{17.64\text{cm}} \checkmark$$

$$\textcircled{10} \quad 700\text{mm} \pm 3\%$$

$$3\% \text{ OF } 700 = 0.03 \times 700 = 21$$

$$\text{UPPER} = 700 + 21 = \underline{721\text{mm}} \checkmark$$

$$\text{LOWER} = 700 - 21 = \underline{679\text{mm}} \checkmark$$

AQ

LIMITS $4.2g \pm 5\%$

$$5\% \text{ of } 4.2 = 0.21g$$

$$\Rightarrow 4.2g \pm 0.21g$$

$$\text{UPPER } 4.2 + 0.21 = 4.41g$$

$$\text{LOWER } 4.2 - 0.21 = 3.99g$$

WEIGHTS

4.21 ✓ ~~3.95~~ 4.15 ✓ ~~4.37~~ 4.07 ✓ ~~4.5~~ ~~3.98~~ 4.25 ✓ ~~4.39~~
4.3 ✓ ~~3.9~~ 4.02 ✓ ~~4.43~~ 4.36 ✓ ~~4.18~~ 4.05 ✓ ~~3.99~~ ~~4.27~~ ~~4.42~~

REJECTION = 6

$$\% \text{ REJECTED} = \frac{6}{20} \times 100$$

$$= \underline{30\%}$$