Uncertainty Worksheet

1. Convert the following to relative (percentage) uncertainties:

   a. 2.70 ± 0.05 cm b. 12.02 ± 0.08 cm

2. Convert the following to absolute uncertainties:

   a. 3.5 cm $\pm$ 10 % b. 16 s $\pm$ 8 %

3. Complete the following, determining the appropriate uncertainty:

   a. $(2.70 \pm 0.05 \text{ cm}) + (12.02 \pm 0.08 \text{ cm})$

   b. $(2.70 \pm 0.05 \text{ cm}) - (12.02 \pm 0.08 \text{ cm})$

   c. $(2.70 \pm 0.05 \text{ cm}) + (3.5 \text{ cm} \pm 10\ \%)$

4. Complete the following, determining the appropriate uncertainty:

   a. $(2.70 \pm 0.05 \text{ cm}) \times (12.02 \pm 0.08 \text{ cm})$

   b. $(12.02 \pm 0.08 \text{ cm}) \div (16 \text{ s} \pm 8\ \%)$

   c. $(3.5 \text{ cm} \pm 10\ \%) \times (2.70 \pm 0.05 \text{ cm}) \div (16 \text{ s} \pm 8\ \%)$

5. Complete the following, determining the appropriate uncertainty:

   a. $2 \times (2.70 \pm 0.05 \text{ cm})$

   b. $2 \times (16 \text{ s} \pm 8\ \%)$

   c. $(12.02 \pm 0.08 \text{ cm})^2$

6. Complete the following determining the appropriate uncertainty:

   a. $(12.02 \pm 0.08\ \text{cm})^2 \div (3.5\ \text{cm} \pm 10\ \%)$

   b. $(12.02 \pm 0.08\ \text{cm})2 + (3.5\ \text{cm} \pm 10\ \%) \times (2.70 \pm 0.05\ \text{cm})$

   c. $[(3.5\ \text{cm} \pm 10\%) + (2.70 \pm 0.05\ \text{cm})] / (16\ \text{s} \pm 8\%)$

   d. $4\pi^2/(0.034 \pm 0.004\ \text{s}^2/\text{cm})$

7. Determine the perimeter and area of a rectangle of length 9.2 ± 0.05 cm and width 4.33 ± 0.01 cm.