

APPROXIMATION AND ERRORS

Form 2 Summer Course

Vol 1 - CH1

Part 2 - Errors

8. (a) upper limit of $a = 10.55$
 lower limit of $a = 10.45$
 upper limit of $b = 4.55$
 lower limit of $b = 4.45$
- (b) (i) least = $10.45 + 4.45 = 14.9$
 greatest = $10.55 + 4.55 = 15.1$
- (ii) least = $10.45 \times 4.45 = 46.5025$
 greatest = $10.55 \times 4.55 = 48.0025$
- (iii) least = $10.45 - 4.55 = 5.9$
 greatest = $10.55 - 4.45 = 6.1$
- (iv) least = $\frac{10.45}{4.55} = \frac{209}{91}$
 greatest = $\frac{10.55}{4.45} = \frac{211}{89}$
9. Maximum absolute error = 0.05 m
 Least = $(7.2 - 0.05) + (8.9 - 0.05) = 16$ m
 Greatest = $(7.2 + 0.05) + (8.9 + 0.05) = 16.2$ m
10. Maximum absolute error = 0.5 cm
 Least = $\frac{(10 - 0.5)(6 - 0.5)}{2} = 26.125$ cm²
 Greatest = $\frac{(10 + 0.5)(6 + 0.5)}{2} = 34.125$ cm²
11. Least = $(100 - 5) - (45 + 2.5) = 47.5$ cm
 Greatest = $(100 + 5) - (45 - 2.5) = 62.5$ cm
12. $\frac{100 - 5}{12 + 1} \approx 7.3077$
 $\frac{100 + 5}{12 - 1} \approx 9.5455$
 Least = 7, Greatest = 9

13. (a) Lower limit = $\frac{(5.5-0.05)(8.5-0.05)}{2} = 23.02625 \text{ cm}^2$

Upper limit = $\frac{(5.5+0.05)(8.5+0.05)}{2} = 23.72625 \text{ cm}^2$

$\therefore 23.02625 \text{ cm}^2 \leq \text{area of the triangle} < 23.72625 \text{ cm}^2$

(b) area of the triangle = $\frac{(5.5)(8.5)}{2} = 23.375 \text{ cm}^2$

percentage error = $\frac{23.72625 - 23.375}{23.375} \times 100\% \approx 1.50\%$

14. (a) Lower limit = $(3-0.5) \times 3 = 7.5 \text{ cm}$

Upper limit = $(3+0.5) \times 3 = 10.5 \text{ cm}$

$\therefore 7.5 \text{ cm} \leq \text{perimeter of the triangle} < 10.5 \text{ cm}$

(b) percentage error = $\frac{10.5-9}{9} \times 100\% \approx 16.7\%$