

Math 3131 Prof. Pennance – Summary of Lecture 11 - Estimation

1. Symbol for approximation: \approx

(b) $8\overset{\uparrow}{6}3 \div 4\overset{\downarrow}{7} \leq 880 \div 40 = 22$

2. Some applications

10. Underestimation - lower bounds

3. Rounding

(a) $8\overset{\downarrow}{6}3 \times 4\overset{\downarrow}{7} \geq 800 \times 40 = 32,000$

(a) $1834 \approx 2000$

(b) $8\overset{\downarrow}{6}3 \div 4\overset{\uparrow}{7} \geq 850 \div 50 = 17$

(b) $1834 \approx 1800$

(c) $1834 \approx 1830$

11. Interval estimates

(d) $1834.6 \approx 1835$

(a) $32,000 \leq 863 \times 47 \leq 45,000$

(e) $1834.4 \approx 1834$

(b) $17 \leq 863 \div 47 \leq 22$

(f) $1834.5 \approx 1835$

4. Truncation

12. Calculator estimates

(a) $12.3 \approx 12$

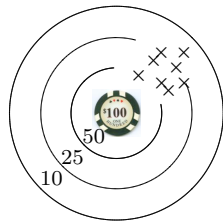
(a) $863 \times 47 = 40,561$

(b) $12.7 \approx 12$

(b) $863 \div 47 \approx 18.361707$

5. Biased estimates

13. Compensation



(a) $8\overset{\downarrow}{6}3 \times 4\overset{\uparrow}{7} \approx 800 \times 50 = 40,000$

(b) $8\overset{\uparrow}{6}3 \times 4\overset{\downarrow}{7} \approx 900 \times 40 = 36,000$

(c) $8\overset{\downarrow}{6}3 \div 4\overset{\downarrow}{7} = 840 \div 40 = 21$

(d) $8\overset{\uparrow}{6}3 \div 4\overset{\uparrow}{7} = 900 \div 50 = 18$

6. Rounding

14. Assumed means

(a) $1685 + 391 \approx 1700 + 400$

(a) $\text{Av}(21, 23, 19, 23, 19) \approx 20$

(b) $1685 + 391 \approx 2000 + 0$

(b) $\text{Av}(21, 23, 19, 23, 19) = 20 + \text{Av}(1, 3, -1, 3, -1)$

7. Rounding

(a) $21.6 \times 7.7 \approx 20 \times 10$

(b) $21.6 \times 7.7 \approx 20 \times 8$

(c) $21.6 \times 7.7 \approx 22 \times 8$

(d) $21.6 \times 7.7 = 166.32$

15. Application to long division:

8. Rounding by more than one digit

(a) $546 \div 7 \approx 560 \div 7$

$$\begin{array}{r} 647 \\ 19 \overline{)12309} \\ \underline{11400} \\ 909 \\ \underline{760} \\ 149 \\ \underline{133} \\ 16 \end{array}$$

$$\begin{array}{l} 123 \div 19 \\ \approx 120 \div 20 = 6 \\ 90 \div 19 \\ \approx 900 \div 20 = 4 \\ 149 \div 19 \\ \approx 160 \div 20 = 8 \\ 149 \div 19 \\ \approx 150 \div 20 = 7 \end{array}$$

9. Overestimation - upper bounds

(a) $8\overset{\uparrow}{6}3 \times 4\overset{\uparrow}{7} \leq 900 \times 50 = 45,000$