

## Computational Estimation Strategies

**Purpose:** To make computation easier when the answer only needs to be approximate and not exact. For example, we might want to know the approximate gas mileage in our car if we travel 326 miles on 16 gallons of gas ( $326 \div 16$ ).

### Techniques:

1. **Front-end methods.** This strategy focuses on the leading or leftmost digits in numbers, ignoring the rest. After an estimate is made on the basis of only these front-end digits, an adjustment can be made by noticing how much has been ignored.

|   |  |   |   |   |   |   |   |   |   |   |   |        |                                       |                             |
|---|--|---|---|---|---|---|---|---|---|---|---|--------|---------------------------------------|-----------------------------|
| + | <table style="border-collapse: collapse;"> <tr><td style="border-right: 1px solid black; padding: 2px 5px;">3</td><td style="padding: 2px 5px;">9</td><td style="padding: 2px 5px;">8</td></tr> <tr><td style="border-right: 1px solid black; padding: 2px 5px;">4</td><td style="padding: 2px 5px;">2</td><td style="padding: 2px 5px;">5</td></tr> <tr><td style="border-right: 1px solid black; padding: 2px 5px;">2</td><td style="padding: 2px 5px;">7</td><td style="padding: 2px 5px;">2</td></tr> </table> | 3 | 9 | 8 | 4 | 2 | 5 | 2 | 7 | 2 | <div style="border: 1px solid black; border-radius: 50%; padding: 10px; display: inline-block;"> <math>0 + 4 + 2 = 6</math><br/>about 6000         </div> | Adjust | $3 + 2 + 7 = 12$<br>1200 or 1300 more | Approximation<br>about 7300 |
| 3 | 9  | 8 |   |   |   |   |   |   |   |   |   |        |                                       |                             |
| 4 | 2  | 5 |   |   |   |   |   |   |   |   |   |        |                                       |                             |
| 2 | 7  | 2 |   |   |   |   |   |   |   |   |   |        |                                       |                             |

2. **Rounding methods.** This is the most familiar form of estimation and is a way of changing the problem to one that is easier to work with mentally. Good estimators follow their mental computation with and adjustment to compensate for the rounding. To round a number simply means to substitute a “nice” number that is close so that some computation can be done more easily.

|  |                    |                    |            |    |      |
|--|--------------------|--------------------|------------|----|------|
| <b>46 x 83 =</b>   |                    |                    |            |    |      |
| <table style="margin: 0 auto;"> <tr> <td style="text-align: center; padding-right: 20px;">round<br/>up<br/>↓</td> <td style="text-align: center;">round<br/>down<br/>↓</td> </tr> </table>   | round<br>up<br>↓   | round<br>down<br>↓ |            |    |      |
| round<br>up<br>↓   | round<br>down<br>↓ |                    |            |    |      |
| <table style="margin: 0 auto;"> <tr> <td style="text-align: center; padding-right: 20px;">50 x 80</td> </tr> <tr> <td style="text-align: center;">5 tens x 8 tens</td> </tr> <tr> <td style="text-align: center;">40 hundred</td> </tr> <tr> <td style="text-align: center;">or</td> </tr> <tr> <td style="text-align: center;">4000</td> </tr> </table> | 50 x 80            | 5 tens x 8 tens    | 40 hundred | or | 4000 |
| 50 x 80  |                    |                    |            |    |      |
| 5 tens x 8 tens  |                    |                    |            |    |      |
| 40 hundred   |                    |                    |            |    |      |
| or   |                    |                    |            |    |      |
| 4000   |                    |                    |            |    |      |

3. **Using compatible numbers (grouping).** When adding a long list of numbers, it is sometimes useful to look for two or three numbers that can be grouped to make 10 or 100.

| Your Restaurant Bill |         |
|----------------------|---------|
| steak                | \$14.10 |
| lasagna              | \$11.50 |
| wine                 | \$ 8.79 |
| Caesar salad         | \$ 6.15 |
| pie                  | \$ 2.75 |
| pudding              | \$ 2.00 |

14 & 6 is 20.  
The 8 & 11 (plus  
change) is another  
20 – that’s 40 & 5  
more – about \$45.