TBLM OLE.3#1: Mental Math and Estimation

Discuss the following strategies with students, giving them a chance to share strategies that they use for mental math, estimation, and problem solving.

Compensation or Balancing Strategy
This strategy is based on the fact that it is easy to subtract a multiple of ten from another number.

Example:
- For 160 – 59, change 59 to 60, think 160 – 60 = 100, and then adjust or compensate by adding the 1 to make up for the extra 1 subtracted = 101.

Dropping and Reattaching of Common Zeros
This strategy is useful when computing with numbers sharing common trailing zeros.

Examples:
- For the subtraction equation 6000 – 300, temporarily drop the two common zeros and focus on the front-end digits: 60 – 3 = 57. Reattach the two zeros to get back the correct place value: 5700.
- For the division equation 600 ÷ 50, drop or cancel the common zero—this is the same as dividing both numbers by 10. Focus on the front-end digits: 60 ÷ 5 = 12.

Rounding
Change values to make them easier to compute. Several different rounding procedures can be used for a single question.

Example:
- 95 x 43 can be rounded to 90 x 40, 100 x 40, or 100 x 43.

Consider these common rules:
- If the last digit is 5 or greater, the number is rounded up.
- If the last digit is less than 5, the number is rounded down.

The way numbers are rounded often depends on custom and who is doing the rounding.

Examples:
- Your Mom's birthday may be next month, but when someone asks her age, she will seldom round up.
- When a grocery store sells 3 cans of food at $1.00, the price for 1 can is 33 1/3¢. That number should be rounded down, but stores almost always charge the customer 34¢.

Identifying Compatibles
This strategy is similar to rounding. The focus in this strategy is on searching for pairs of numbers that are easy to compute.

Example:
- In the question 2270 ÷ 6, rounding the dividend to 2300 (the nearest hundred) or 2000 (the nearest thousand) does not help much. Rounding it to 2400 (a compatible number because it is divisible by 6) helps tremendously.

(continued)

Clustering
This strategy is useful when adding a group of numbers that cluster around a common value. To obtain an estimate, select a reasonable average for the group of numbers, and then multiply that average by the number of values in the group.

Example:

$3.42
2.21
3.89
2.97
3.64
+2.50

- In this example, the values cluster around $3. Since there are 6 of them, the estimate is 6 x $3 = $18.

Front-End Estimating
Identify the most significant digits in a question, perform the appropriate operation, and then determine the place value of the result. This process is most appropriate for addition, subtraction, and division, and has an advantage over rounding in that all the numbers operated on are visible in the original question.

Examples:

4219	3168
7512	449
+ 2446	+ 2903

- In the first example, the total of the front-end digits is 13 (i.e., 4 + 7 + 2) and the place value is thousands. Therefore, a front-end estimate is 13 000.
- In the second example, the initial estimate using front-end digits is 5000. The adjacent place value could be examined and the initial estimate would be adjusted upward, resulting in an estimate of 6000.

Adjusting
This strategy is often applied to refine an original estimate that was obtained with another strategy. When using the front-end strategy, the estimates appear to be low after one looks at the leftover digits. On the examples shown for the front-end strategy, 1000 could be added to the estimated sums to obtain a more reasonable estimate. This results in estimates of 14 000 and 6400.

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Reference:
Manitoba Education and Training. *Grades 5 to 8 Mathematics: A Foundation for Implementation.* Winnipeg, MB: Manitoba Education and Training, 1997. (Appendix, Teacher Information: Mental Math and Estimation, n. pag.)