

Mental Computation Strategies

The secret to successful mental computation is that each student should know a variety of strategies for mental calculations and be able to choose the most appropriate one for a given problem. Encourage students to develop and share their own strategies – they might find some you haven't thought of!

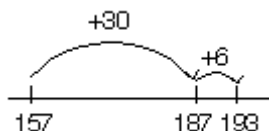
Probably the *least* effective strategy for mental computation is the traditional written one!

Mental Computation - the Empty Number Line for Addition and Subtraction

Teaching mental computation strategies requires that we use problems and ways of recording solutions that allow students to share what they are thinking.

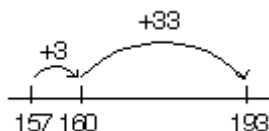
Think about adding together two numbers in your head, say 157 and 36. When this addition is carried out mentally, we often start from the left rather than from the right. An effective way to get the students to show their thinking is to have them show their solution on an empty number line.

Each student can show how he or she thought about the problem by drawing and filling in a blank number line. A student might do this by first adding 30 and then adding 6. This can be shown as follows:



A number line showing 30 and 6

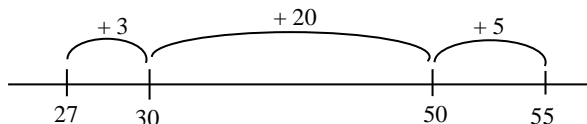
One of the interesting things about mental calculations is that we do not all think the same way. Some people start by breaking the 36 into 3 plus 33. This turns the question into the problem of adding 33 to 160.



A number line showing adding 3 and then 33

The Jump Method

To subtract $55 - 27$, it is often easiest to think “What do I add to 27 to get 55?”.



Use the empty number lines below to record other ways of solving these problems.

Three empty number lines for student use, each with vertical tick marks at the ends.

Mental Computation for Addition - The Split Method

To add $47 + 28$ using the Split Method, think:

$$40 + 20 = 60 \quad (\text{remember } 60)$$

$$7 + 8 = 15$$

$$60 + 15 = 75$$

To add $235 + 428$ using the Split Method, think:

$$200 + 400 = 600 \quad (\text{remember } 600)$$

$$30 + 20 = 50 \quad (\text{add to } 600 \text{ to get } 650, \text{ remember } 650)$$

$$5 + 8 = 13$$

$$650 + 13 = 663$$

In general, mental computation is easier if it is done left to right, rather than right to left.

Mental Computation – Compatible Numbers

1. Find the product $25 \times 99 \times 4$ without a calculator.

THINK:

$$25 \times 4 = 100 \quad \{\text{remember } 100\}$$

$$99 \times 100 = 9900$$

25 and 4 are called **compatible numbers** because their product is easy to find mentally.

2. Find the sum: $23 + 39 + 7 + 1$

THINK:

$$23 + 7 = 30 \quad \{\text{remember } 30\}$$

$$39 + 1 = 40$$

$$30 + 40 = 70$$

When calculating mentally, the secret is: *you should only have to remember one number at a time.*

Any method that requires you to remember more than one number at a time may not be the best method to use.

Mental Computation – Break Up and Multiply

Problem

Solve 78×2 mentally in as many different ways as you can.

Solution

Often it is easier to solve TWO easy questions than ONE hard question.

Often there is more than one way to think about a mental computation.

THINK:

$$78 = 70 + 8$$

$$70 \times 2 = 140 \quad \{\text{remember } 140\}$$

$$8 \times 2 = 16$$

$$140 + 16 = 156$$

OR

$$\begin{aligned} 78 &= 80 - 2 \\ 80 \times 2 &= 160 && \{\text{remember 160}\} \\ 2 \times 2 &= 4 \\ 160 - 4 &= 156 \end{aligned}$$

OR

$$\begin{aligned} 78 &= 75 + 3 \\ 75 \times 2 &= 150 && \{\text{remember 150}\} \\ 3 \times 2 &= 6 \\ 150 + 6 &= 156 \end{aligned}$$

Mental Computation – Break Up and Divide

Problem

Solve $78 \div 2$ mentally in as many different ways as you can.

Solution

Often it is easier to solve TWO easy questions than ONE hard question.

Often there is more than one way to think about a mental computation.

THINK:

$$\begin{aligned} 78 &= 70 + 8 \\ 78 \div 2 &= (70 \div 2) + (8 \div 2) \\ &= 35 + 4 = 39 \end{aligned}$$

OR

$$\begin{aligned} 78 &= 60 + 18 \\ 78 \div 2 &= (60 \div 2) + (18 \div 2) \\ &= 30 + 9 = 39 \end{aligned}$$

OR

$$\begin{aligned} 78 &= 80 - 2 \\ 78 \div 2 &= (80 \div 2) - (2 \div 2) \\ &= 40 - 1 = 39 \end{aligned}$$

Problem

Solve $78 \div 3$ mentally in as many different ways as you can.

Solution

THINK:

$$\begin{aligned} 78 &= 70 + 8 \\ (70 \div 3) & && \text{Nope, doesn't go } \otimes \end{aligned}$$

TRY:

$$\begin{aligned} 78 &= 60 + 18 \\ (60 \div 3) &= 20 && \{\text{remember 20}\} \\ 18 \div 3 &= 6 \\ 20 + 6 &= 26 \end{aligned}$$

TRY:

$$\begin{aligned} 78 &= 75 + 3 \\ 75 \div 3 &= 25 && \{\text{remember 25}\} \\ 3 \div 3 &= 1 \\ 25 + 1 &= 26 \end{aligned}$$

Mental Computation – Compatible Numbers

1. Find the product $25 \times 99 \times 4$ without a calculator.

THINK:

$$25 \times 4 = 100 \quad \{\text{remember } 100\}$$

$$99 \times 100 = 9900$$

25 and 4 are called **compatible numbers** because their product is easy to find mentally.

2. Find the sum: $23 + 39 + 7 + 1$

THINK:

$$23 + 7 = 30 \quad \{\text{remember } 30\}$$

$$39 + 1 = 40$$

$$30 + 40 = 70$$

When calculating mentally, the secret is: *you should only have to remember one number at a time.*

Any method that requires you to remember more than one number at a time may not be the best method to use.