

Mental Math



Grade Level: 4-6

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Classroom Procedure:

1. Begin by asking students if they have any strategies that they use to do math calculations in their heads. Allow for a discussion.
2. While reading the content pages, reinforce various methods and give students additional examples of problems to work in their heads. Use the additional resources to enhance understanding.
3. Introduce the notes on mental math. Have students practice problems with and without using their mental math strategies to check for accuracy. Use the additional resources to enhance understanding.
4. Have students practice problems while explaining their reasoning out loud.
5. Follow Activity page with students. Have students work in pairs to solve the problems and then come back together as a large class to discuss which strategy was used and how.
6. Distribute Practice page. Check and review the students' responses as a class.
7. Distribute the Homework page. Go over the answers to make sure that students understand and are able to use at least one strategy confidently.
8. In closing, ask students to name places and situations in which mental math will be important.
9. Allow for responses and discussion.

Approximate Grade Level: 4 – 6

Objectives:

The students will be able to compute mathematical problems in their head using various strategies.

Common Core State Standards:

CCSS.Math.Content.4.OA.A.1

CCSS.Math.Content.5.OA.A.2

None for Grade 6

Class Sessions (45 minutes):

1 class

Teaching Materials/Worksheets:

Mental Math content pages (2), Activity pages (1), Practice page, Homework page, Quiz

Student Supplies:

White Boards and dry erase markers for Sage and Scribe activity

None

Prepare Ahead of Time:

Copy materials

Options for Lesson:

Have students break into groups and choose a strategy to make a poster about and to teach the class, have students use cards to play mental math games using the first card as the ones and the second card as the tenths to create problems, have students discuss why mental math will be important to them in higher level math classes.





Teacher Notes



Additional Resources:

CONTENT:

- <https://educators.brainpop.com/lesson-plan/multiplication-blocks/>
- http://people.stfx.ca/lborden/mental%20math/05_day%201e/mental%20math%20grade%205.pdf
- <http://www.math-play.com/5th-grade-math-games.html>
- http://www.gov.pe.ca/photos/original/eecd_gr6math.pdf

WORKSHEETS:

- <http://www.math-salamanders.com/mental-math-5th-grade.html>
- <http://www.math-salamanders.com/mental-maths-tests.html>
- <https://www.teachervision.com/worksheet/mental-math>
- <https://www.math-drills.com/>

VIDEOS:

- <https://www.youtube.com/watch?v=Plfnly7echY>
- <https://www.youtube.com/watch?v=TDT78NkZQTW>
- https://www.youtube.com/watch?v=X1DtcZ_qH7Q&t=27s
- <https://www.youtube.com/watch?v=Rgw9Ik5ZGaY>



Mental Math

Mental Math uses strategies to get exact answers by doing the calculations in your head. Sometimes if there are a lot of steps, writing down a number or sub-step can help if you need to keep that number in your memory.

Many times, students use strategies to recall basic operational mathematical facts. Some of these strategies are simple such as any number times one is itself because it is looking in a mirror and some are more complex like remembering multiples of nine by subtracting one for the tens place and adding the amount needed to make nine for the ones place. Once these facts become solidified in your memory you no longer have to use them to retrieve the answers.

Mental math is important for day-to-day activities, even though phones have a calculator on them, it is faster and easier to mentally solve the answer. And most importantly, you need to develop mental strategies to understand if an answer is reasonable regardless of how you solve the problem (mental or calculator).

Mathematics is comprised of patterns and relationships. Some of these patterns can be seen. We are going to look at some of these patterns to help us strengthen our mental math strategies.



FRONT END ADDITION

This strategy uses the highest place value and then adds the sums of the next place values.

For example, $27 + 38$. Using the highest place value (*tens*), think $20 + 30 = 50$. And then the next place value $7 + 8 = 15$. Combine these answers $50 + 15$ to get the final total of 65. For $5200 + 1700$, use the highest place value (*thousands*), think $5000 + 1000 = 6000$. And then the next place value $200 + 700 = 900$. Combine these answers $6000 + 900$ to get the final total of 6900.

For decimals such as $4.7 + 2.5$, use the highest place value (*ones*), think $4 + 2 = 6$. And then the next place value (*tenths*) $0.7 + 0.5 = 1.2$. Combine these answers $6 + 1.2$ to get the final total of 7.2.

BREAK UP AND BRIDGE

Using this strategy, begin with the first number and add parts of the second number. Adding the largest part of the second numbers will often make the problem easier to solve, but you can combine parts of the second number in any way that works best for you.

For example, $42 + 37$, you should think 42 and 30 (from the 37) is 62, and 62 plus 7 (the rest of the 37) is 69.

For decimals such as $7.6 + 10.3$, think, "7.6 and 10 (from the 10.3) is 17.6 and 17.6 plus 0.3 (the rest of 10.3) is 17.9."



FINDING COMPATIBLES

Compatible numbers are also called friendly numbers or nice numbers. This strategy involves looking for pairs of numbers that combine to make easy sums such as 10, 100, or 1,000. Some examples of compatible numbers are 1 and 9, 25 and 75, and 400 and 600.

If you are given a string of numbers such as $4 + 7 + 2 + 1 + 6 + 1$, think 4 and 6 is 10 as well as 8, 2, and 1 are also 10, and $10 + 10 = 20 +$ the left over 1 = 21.

For decimals such as $0.6 + 0.8 + 0.4 + 1.2$, think, "0.6 and 0.4 is 1 and 0.8 plus 1.2 is 2. Then add $1 + 2$ for a final answer of 3.

PLACE VALUE CHANGE STRATEGY

You have a great understanding of how place values changes when multiplying and dividing by 10, 100 and 1000. Now let's apply that understanding to decimals to multiply and divide by 0.1, 0.01, and 0.001. All the place values of the number being multiplied decrease one place when multiplying by 0.1, two places when multiplying by 0.01 and three places when multiplying by 0.001. All the place values of the number being divided increase one place when dividing by 0.1, two places when dividing by 0.01 and three places when dividing by 0.001.

For example, 5×0.1 , remember that if you multiply by 0.1 the place value will decrease by one. The 5 ones will decrease one place to 5 tenths. Then the answer is 0.5.

Another example, 0.3×0.2 , first begin by multiplying 3 times 2 to equal 6. Then remember that if you multiply the 0.3 by 0.2 the place value of 0.3 will decrease by one. The 0.3 tenths will change to a 6 and decrease one place to 6 hundredths. Then the answer is 0.06.

Another example, 7×0.001 , remember that if you multiply the 7 by 0.001 the place value of 7 will decrease by three. Then the answer is 0.007.

Another example, $8 \div 0.01$, remember that if you divide the 8 by 0.01 the place value of 8 will increase by two. Add two zeros to 8. Then the answer is 800.

One more example, $12 \div 0.1$, remember that if you divide the 12 by 0.1 the place value of 12 will increase by one. Add one zeros to 12. Then the answer is 120.

Instructions

Mental Math Sage and Scribe

The scribe will follow the instructions of the sage without talking (unless there is a mistake, in which case the scribe can cough or grunt). The scribe may only write down what the sage says. The scribe must write down how the sage is mentally solving the problem. Then have the class come back together and choose a sage/scribe pair to explain their partner's reasoning to the class. Have students switch positions after each problem.

Here are a few problems to get started with, add to the examples as needed for your students and their strengths and weaknesses.

FRONT END ADDITION

$$4.6 + 3.2 =$$

$$1.5 + 1.5 =$$

$$0.45 + 0.44 =$$

BREAK UP AND BRIDGE

$$2.08 + 3.2 =$$

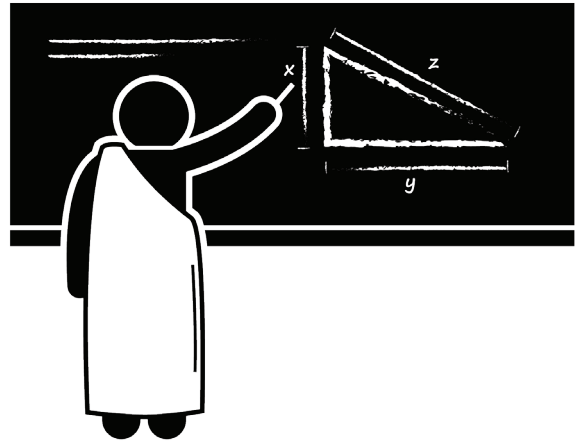
$$5.43 + 2.26 =$$

$$6.03 + 2.45 =$$

$$15.45 + 1.25 =$$

$$43.30 + 7.49 =$$

$$70.32 + 9.12 =$$



FINDING COMPATIBLES

$$0.2 + 0.3 + 0.5 + 0.4 =$$

$$1.6 + 0.3 + 2.7 + 0.4 =$$

$$0.1 + 0.9 + 0.5 + 0.4 + 0.1 + 0.3 =$$

PLACE VALUE CHANGE STRATEGY

$$3 \times 0.1 =$$

$$0.7 \times 0.1 =$$

$$0.5 \times 0.1 =$$

$$6 \times 0.01 =$$

$$8 \times 0.01 =$$

$$1.2 \times 0.01 =$$

$$3 \times 0.001 =$$

$$80 \times 0.001 =$$





Practice

Name _____ Date _____

Instructions

Use the various strategies to solve each problem.

FRONT END ADDITION

$5.4 + 3.7 =$	$3.3 + 2.4 =$	$0.36 + 0.43 =$
$1.85 + 2.25 =$	$0.75 + 0.05 =$	$6.6 + 3.6 =$

BREAK UP AND BRIDGE

$4.2 + 3.7 =$	$0.32 + 0.56 =$	$4.15 + 3.22 =$
$6.1 + 2.8 =$	$9.2 + 3.5 =$	$6.3 + 1.9 =$

FINDING COMPATIBLES

$0.2 + 0.4 + 0.3 + 0.8 + 0.6 =$	$0.2 + 0.4 + 0.8 + 2.6 =$	$0.25 + 0.50 + 0.75 =$
$0.7 + 0.1 + 0.9 + 0.3 =$	$0.4 + 0.5 + 0.6 + 0.2 + 0.5 =$	$0.80 + 0.26 = 0.45 + 0.63 =$

PLACE VALUE CHANGE STRATEGY

$6 \div 0.1 =$	$3.9 \times 0.01 =$	$62 \div 0.001 =$
$330 \times 0.01 =$	$10 \div 0.1 =$	$406 \times 0.1 =$
$8 \div 0.001 =$	$0.1 \times 3.2 =$	$0.7 \div 0.01 =$





Instructions

Use the various strategies to solve each problem.

FRONT END ADDITION

$5.4 + 3.7 = 9.1$	$3.3 + 2.4 = 5.7$	$0.36 + 0.43 = 0.79$
$1.85 + 2.25 = 4.1$	$0.75 + 0.05 = 0.8$	$6.6 + 3.6 = 10.2$

BREAK UP AND BRIDGE

$4.2 + 3.7 = 7.9$	$0.32 + 0.56 = 0.88$	$4.15 + 3.22 = 7.37$
$6.1 + 2.8 = 8.9$	$9.2 + 3.5 = 12.7$	$6.3 + 1.9 = 8.2$

FINDING COMPATIBLES

$0.2 + 0.4 + 0.3 + 0.8 + 0.6 = 2.3$	$0.2 + 0.4 + 0.8 + 2.6 = 4$	$0.25 + 0.50 + 0.75 = 1.5$
$0.7 + 0.1 + 0.9 + 0.3 = 2$	$0.4 + 0.5 + 0.6 + 0.2 + 0.5 = 2.2$	$0.80 + 0.26 = 0.45 + 0.63 = 2.14$

PLACE VALUE CHANGE STRATEGY

$6 \div 0.1 = 60$	$3.9 \times 0.01 = 0.039$	$62 \div 0.001 = 62,000$
$330 \times 0.01 = 3.3$	$10 \div 0.1 = 100$	$406 \times 0.1 = 40.6$
$8 \div 0.001 = 8,000$	$0.1 \times 3.2 = 0.32$	$0.7 \div 0.01 = 70$





Homework

Name _____ Date _____

Instructions

Solve using a mental math strategy.

$70 \div 0.1 =$	$112 \times 0.1 =$	$4.25 + 0.75 =$
$0.2 + 3.9 =$	$0.3 + 0.7 + 0.5 + 0.2 + 0.5 =$	$6.1 + 7.7 =$
$42 \times 0.001 =$	$6 \div 0.1 =$	$84 \times 0.01 =$
$0.8 + 0.2 + 0.6 + 0.2 + 0.2 + 0.3 =$	$5.2 + 3.5 =$	$1.2 + 3.2 =$
$14.6 + 0.7 =$	$9 \div 0.01 =$	$107 \times 0.01 =$
$32 \div 0.001 =$	$7.15 + 3.6 =$	$1.4 + 0.5 + 2.6 + 0.2 + 1.5 =$
$3.26 + 3.68 =$	$0.7 + 0.2 + 0.5 + 0.8 + 0.5 =$	$0.4 \times 0.1 =$
$4.2 + 3.7 =$	$24 \div 0.001 =$	$0.1 + 0.4 + 0.3 + 0.9 + 0.2 =$





Homework

Name Answer Key

Date _____

Instructions

Solve using a mental math strategy.

$70 \div 0.1 =$ 700	$112 \times 0.1 =$ 11.2	$4.25 + 0.75 =$ 5
$0.2 + 3.9 =$ 4.1	$0.3 + 0.7 + 0.5 + 0.2 + 0.5 =$ 2.2	$6.1 + 7.7 =$ 13.8
$42 \times 0.001 =$ 0.042	$6 \div 0.1 =$ 60	$84 \times 0.01 =$ 0.84
$0.8 + 0.2 + 0.6 + 0.2 + 0.2 + 0.3 =$ 2.3	$5.2 + 3.5 =$ 8.7	$1.2 + 3.2 =$ 4.4
$14.6 + 0.7 =$ 15.3	$9 \div 0.01 =$ 900	$107 \times 0.01 =$ 1.07
$32 \div 0.001 =$ 32,000	$7.15 + 3.6 =$ 10.75	$1.4 + 0.5 + 2.6 + 0.2 + 1.5 =$ 6.2
$3.26 + 3.68 =$ 6.94	$0.7 + 0.2 + 0.5 + 0.8 + 0.5 =$ 2.7	$0.4 \times 0.1 =$ 0.04
$4.2 + 3.7 =$ 7.9	$24 \div 0.01 =$ 2,400	$1.1 + 0.4 + 0.3 + 0.9 + 0.2 =$ 1.9





QUIZ

Name _____ Date _____

Instructions

Use the various strategies to solve each problem and show your 'mental' work.

FRONT END ADDITION

$$2.14 + 6.35 =$$

BREAK UP AND BRIDGE

$$7.2 + 10.5 =$$

FINDING COMPATIBLES

$$0.25 + 0.3 + 0.75 + 0.8 + 0.7 =$$

PLACE VALUE CHANGE STRATEGY

$$3 \div 0.01 =$$

$$8 \times 0.1 =$$





Quiz

Name _____ Answer Key _____ Date _____

Instructions

Use the various strategies to solve each problem and show your 'mental' work.

FRONT END ADDITION

$$2.14 + 6.35 =$$

8.49

BREAK UP AND BRIDGE

$$7.2 + 10.5 =$$

17.7

FINDING COMPATIBLES

$$0.25 + 0.3 + 0.75 + 0.8 + 0.7 =$$

2.8

PLACE VALUE CHANGE STRATEGY

$$3 \div 0.01 =$$

300

$$8 \times 0.1 =$$

0.8

