



# Number and Operations in Base Ten: Two-Digit Computation Mental Math Grade 2 Formative Assessment Lesson

Designed and revised by the Kentucky Department of Education  
Field-tested by Kentucky Mathematics Leadership Network Teachers

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Revised 2016

This Formative Assessment Lesson is designed to be part of an instructional unit. This task should be implemented approximately two-thirds of the way through the instructional unit. The results of this task should be used to inform the instruction that will take place for the remainder of your unit.

## Mathematical goals

This lesson is intended to help you assess how well students are able to fluently add and subtract within 100 using strategies based on place value, properties of operations, and/or relationships between adding and subtracting. It will help you to identify students who have the following difficulties:

- Recognizing place value of ones, tens, and hundreds.
- Understanding the commutative and associative properties as they relate to the numbers used in addition and subtraction equations.
- Applying efficient strategies (especially strategies based on place-value, properties of operations, and the relationship between addition and subtraction) to add and subtract fluently.

## Kentucky Academic Standards

This lesson involves *mathematical content* in the standards from across the grades, with emphasis on:

### Number and Operations in Base Ten 2.NBT

- Use place value understanding and properties of operations to add and subtract.

This lesson involves a range of *Standards for Mathematical Practice*, with emphasis on:

2. Reason abstractly and quantitatively.
7. Look for and make use of structure.

## Introduction

This lesson is structured in the following way:

- Before the lesson, students work individually on an assessment task that is designed to reveal their current understandings and difficulties. You then review their work and create questions for students to answer in order to improve their solutions.
- Students work in small groups (partners/pairs) on collaborative discussion tasks to add and subtract numbers within 100 using mental math strategies. Throughout their work, students justify and explain their decisions to their peers. Calculators, manipulatives, drawings, and “paper/pencil” calculations **should not** be used.
- Students return to their original assessment tasks, and try to improve their own responses.

## Materials required

Each pair of students will need:

- Card Sets (Each set printed on different colored paper/cardstock will be helpful.)
- Recording Sheet
- A mini-whiteboard, marker, and eraser.

## Time needed

Approximately 15 minutes before the lesson for the individual assessment task, one 40-minute lesson (30-minutes for group task and 10 minutes for whole class discussion), and 15 minutes for a follow-up lesson for students to revisit individual assessment task. Timings given are only approximate. Exact timings will depend on the needs of the class. All students need not finish all card sets to complete the lesson.

Formative Assessment Lesson Student Task Alpha 10/2011, Revised 4/2012

Mental Math Name \_\_\_\_\_

Use mental math strategies to solve the problem. Explain your thinking.

A. 42 + 54	Explain your thinking: _____ _____ _____ _____
B. 34 - 12	Explain your thinking: _____ _____ _____ _____
C. 36 + 74	Explain your thinking: _____ _____ _____ _____
D. 35 - 22	Explain your thinking: _____ _____ _____ _____

## Before the Lesson

**Assessment task: *Mental Math* (15 minutes)**

**Framing the task:**

*Today we will work on a task to see how you are using mental math strategies to solve problems. Explain your thinking on the lines provided. You will have 15 minutes to work independently on the task "Mental Math." After 15 minutes I will collect your papers and see how you used mental math strategies.*

Have students do this task individually in class a day or more before the formative assessment lesson. This will give you an opportunity to assess the work, and to find out the kinds of difficulties students have. You will be able to target your help more effectively in the follow-up lesson. Depending on your class you can have them do it all at once or in small groups (they should still work individually).

Give each student a copy of the assessment. Students should use mental math strategies to calculate the number sentences.

It is important that the students are allowed to answer the questions without your assistance or use of manipulatives, calculator, or paper/pencil. The intention is students will determine the answer to the problem using mental math strategies. Students should use mental math not rewrite the problem and solve.

Students should not worry too much if they do not understand or cannot do everything, because in the next lesson they will engage in a similar task, which should help them. Explain to students that by the end of the next lesson, they should expect to answer questions such as these confidently. This is their goal.

## Assessing students' responses

Collect students' responses to the task. Make some notes about what their work reveals about their current levels of understanding, and their different problem solving approaches.

We suggest that you do not score students' work. The research shows that this will be counterproductive, as it will encourage students to compare their scores, and will distract their attention from what they can do to improve their mathematics.

Instead, help students to make further progress by summarizing their difficulties as a series of questions. Some questions on the following page may serve as examples. These questions have been drawn from commonly identified student misconceptions. These can be written/displayed on the board at the end of the lesson before students revisit initial task.

We suggest that you write a list of your own questions, based on your students' work, using the ideas that follow. You may choose to write questions on each student's work. If you do not have time to do this, select a few questions that will be of help to the majority of students. These can be written on the board at the end of the lesson.

Below is a list of common issues and questions/prompts that may be written on individual initial tasks or during the collaborative activity to help students clarify and extend their thinking.

Common Issues:	Suggested questions and prompts:
Students want to work out the problems with paper and pencil.	<p><i>How can you use number sense and strategies to solve the problems?</i></p> <p><i>Can solving one problem be related to solving another problem?</i></p> <p><i>How can you chunk the numbers together?</i></p> <p><i>How can you use place value to help you solve the problem?</i></p>
Students not using anchor numbers to solve problems.	<p><i>Can you anchor a number to a 5 or a 10?</i></p> <p><i>If you anchor 24 to the number 20, what do you need to add or subtract?</i></p>
Students do not recognize the commutative property does not apply to subtraction.	<p><i>5 + 3 is the same as 3+5, but 5-3 is not the same as 3-5.</i></p> <p><i>Does the order of the numbers make a difference in subtraction? What about addition?</i></p>

## Suggested lesson outline

### Whole Class Introduction

*Today we are going to do some work with mental math strategies.*

Each student should have a dry erase board, marker, and eraser. Show number cards with 40 and 30. Ask students, “How would you add these numbers using mental math strategies? Share your thinking with a partner. Show your model on your dry erase board.” Select one or two models and then demonstrate the strategies for the class. Select models that DO NOT demonstrate the standard algorithm. Focus on open number lines, using tens and ones, composing numbers, etc.

Write 70 on the board.

Show number cards 24 and 32. Follow procedure above.

Write 56 on the board.

Ask students to find the difference between these two numbers using mental math strategies on their dry erase board. Follow procedure above.

This is the process students will use during the collaborative activity.

### Collaborative Activity: Difference War

Homogeneously group students based on the results of the pre-assessment. Groups should consist of two or four students. Within groups of four, students will need to work in pairs. With larger groups, some students may not fully engage in the task.

#### Framing the Collaborative Activity:

**Card Set A** (*Decade to Decade numerals 10-50*)

Introduce the lesson carefully:

*Today we will work on an activity to help practice using mental math skills with addition and subtraction. You will work with a partner. Shuffle the stack of cards and place the stack in the middle. Each team member turns over two cards. Find the sum. Decide who has the higher sum. Record totals on record sheet for five rounds. For each round, **explain your thinking clearly to your partner describing the mental strategy you used.** If your partner disagrees with your total, challenge him or her to explain why. It is important that you both understand how each sum was figured. Circle the largest sum. When you both have your totals, subtract to find the*

*difference between the two numbers. Record that number in the record sheet. In case of a tie, record 0 as the difference.*

*There is a lot of work to do today and you may not all finish all of the rounds on your record sheets. The important thing is to learn something new, so take your time.*

Levels advance by difficulty of addition (Card Set A: Decade/Decade 10-50, 20 cards, 4 of each 10-50) (Card Set B: Non-decade to non-decade with no regrouping – 20 cards with 4 being the highest number in the ones place) (Card Set C: Two digit numbers to 50 so students can regroup mentally)

Your tasks during the small group work are to make a note of student approaches to the task, and to support student problem solving.

Give each group Card Set A of numeral cards and recording sheet. Copy the recording sheet on both sides of the paper so students can go through the rounds several times as time allows.

### **Make a note of student approaches to the task**

You can then use this information to focus a whole-class discussion towards the end of the lesson. In particular, notice any common mistakes. Partners should be engaged in checking their partner, asking for clarification, and taking turns. When calling on students make sure you allow the struggling groups to share first.

### **Support student problem solving**

Try not to make suggestions that move students toward a particular approach to the task. Instead, ask questions to help students clarify their thinking. Encourage students to use each other as a resource for learning.

If one student has added or subtracted in a particular way, challenge their partner to provide an explanation.

If you find students have difficulty articulating their decisions, then you may want to use the questions from the *Common Issues* table to support your questioning.

If the whole class is struggling on the same issue, then you may want to write a couple of questions on the board and organize a whole class discussion.

This task is designed for students to apply mental strategies they have been developing during the unit of instruction. Manipulatives should only be considered for students who have exhausted all other strategies.

**Card Set B** (*Card Set B: Non-decade to non-decade with no regrouping – 20 cards with 4 being the highest number in the ones place*)

As students finish working with card set A and are able to explain their reasoning, hand out Card Set B. These are developed to be more difficult. Students should continue using mental math strategies along with place value strategies to add the numbers drawn.

As you monitor the work, listen to the discussion and help students to look for patterns and generalizations. Make note of strategies you want students to share in the plenary discussion.

**Card Set C** (*Card Set C: Two-digit numbers to 50 with regrouping*)

As students finish with Card Set B and are able to explain their reasoning, hand out Card Set C. Students will now be challenged to use mental strategies to add larger numbers and finding the difference of larger numbers. Do not take up the previous sets of cards. Students may use these for guidance in making their decisions.

As students finish the 5 rounds, they may go back and replay for the next game.

**Sharing Work (10 minutes)**

Students can share aloud some mental strategies.

**Extension activities**

Extension 1: Challenge those students who complete card set C to play another game.

Extension 2: Challenge students to add up the columns on the record sheet using manipulatives to explore representations of adding within one thousand. Groups may use manipulatives to add up the record sheet columns to practice adding larger numbers. (2.NBT.7)

**Whole-class discussion (10 minutes)**

Conclude the lesson by discussing and generalizing what has been learned. Students sharing the strategies they used aloud will be valuable to the learning of the group. The generalization involves extending what has been learned to new examples.

**Improving individual solutions to the assessment task (10 minutes)**

Return the initial task, *Mental Math*, to students as well as a second blank copy of the task.

*Look at your original responses and think about what you have learned during this lesson.*

*Using what you have learned, try to improve your work.*

If you have not added feedback questions to individual pieces of work then write your list of questions on the board. Students should select from this list only the questions appropriate to their own work. (With second graders, you may only focus on the questions students really seemed to need and state these out loud and ask them again as you move around the room or work with a small group at a time.)

**Resources:**

Card Set A, B, C, Record Sheet

This lesson format was designed from the Classroom Challenge Lessons intended for students in grades 6 through 12 from the [Math Assessment Project](#).



**Mental Math**

Name \_\_\_\_\_

Use mental math strategies to solve the problem. Explain your thinking.

A.

$$42 + 54$$

Explain your thinking.

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B.

$$34 - 12$$

Explain your thinking.

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C.

$$36 + 74$$

Explain your thinking.

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D.

$$35 - 22$$

Explain your thinking.

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## Card Set A Decade to Decade

10

Card Set A

20

Card Set A

30

Card Set A

40

Card Set A

50

Card Set A

10

Card Set A

20

Card Set A

30

Card Set A

40

Card Set A

50

Card Set A

10

Card Set A

20

Card Set A

30

Card Set A

40

Card Set A

50

Card Set A

10

Card Set A

20

Card Set A

30

Card Set A

40

Card Set A

50

Card Set A

**Card Set B Non Decade to Non Decade without regrouping**

21

Card Set B

22

Card Set B

23

Card Set B

24

Card Set B

25

Card Set B

31

Card Set B

32

Card Set B

33

Card Set B

34

Card Set B

41

Card Set B

42

Card Set B

43

Card Set B

44

Card Set B

50

Card Set B

20

Card Set B

30

Card Set B

40

Card Set B

11

Card Set B

12

Card Set B

13

Card Set B

Card Set C Non Decade with Regrouping

27

Card Set C

28

Card Set C

29

Card Set C

30

Card Set C

32

Card Set C

36

Card Set C

37

Card Set C

38

Card Set C

39

Card Set C

45

Card Set C

46

Card Set C

47

Card Set C

48

Card Set C

49

Card Set C

33

Card Set C

34

Card Set C

35

Card Set C

40

Card Set C

50

Card Set C

26

Card Set C

## Difference War Record Sheet    Name \_\_\_\_\_

Deal ten cards to each team. Put the cards face down in front of you. Turn over two cards at the same time. Add the cards using mental math strategies. ***BE SURE TO SHARE YOUR STRATEGIES WITH YOUR PARTNER.*** Record your total. Circle the highest total. Determine the difference using mental math strategies. The person with the highest total takes the cards. Repeat for 5 rounds.

	Card 1	Card 2	<b>My Total</b>		Card 1	Card 2	Your Total	Difference
<b>Round 1</b>								
<b>Round 2</b>								
<b>Round 3</b>								
<b>Round 4</b>								
<b>Round 5</b>								

	Card 1	Card 2	<b>My Total</b>		Card 1	Card 2	Your Total	Difference
<b>Round 1</b>								
<b>Round 2</b>								
<b>Round 3</b>								
<b>Round 4</b>								
<b>Round 5</b>								