

Just in Time Quick Check

Standard of Learning 3.CE.1

Strand: Computation and Estimation

Standard of Learning 3.CE.1

The student will estimate, represent, solve, and justify solutions to single-step and multistep problems, including those in context, using addition and subtraction with whole numbers where addends and minuends do not exceed 1,000.

Students will demonstrate the following Knowledge and Skills:

- a) Determine and justify whether an estimate or an exact answer is appropriate when solving single-step and multistep contextual problems involving addition and subtraction, where addends and minuends do not exceed 1,000.
- b) Apply strategies (e.g., rounding to the nearest 10 or 100, using compatible numbers, using other number relationships) to estimate a solution for single-step or multistep addition or subtraction problems, including those in context, where addends or minuends do not exceed 1,000.
- c) Apply strategies (e.g., place value, properties of addition, other number relationships) and algorithms, including the standard algorithm, to determine the sum or difference of two whole numbers where addends and minuends do not exceed 1,000.
- d) Identify and use the appropriate symbol to distinguish between expressions that are equal and expressions that are not equal (e.g., $256 - 13 = 220 + 23$; $457 + 100 \neq 557 + 100$).
- e) Represent, solve, and justify solutions to single-step and multistep contextual problems involving addition and subtraction with whole numbers where addends and minuends do not exceed 1,000.

Just in Time Quick Check

Just in Time Quick Check Teacher Notes

Supporting and Prerequisite SOL: 2.CE.1, 3.CE.2, 3.PS.1, 3.PFA.1

Just in Time Quick Check 3.CE.1

1. A librarian is organizing a summer reading kickoff event at the town's library.

- There are 245 children registered to attend.
- There are 390 guests expected to attend.
- The town's library can seat 700 people.

The librarian wants to know whether the town's library is large enough for everyone to attend. Should the librarian find an exact total number of children and guests or make an estimate of the total number of children and guests? Justify your reasoning.

2. There are 355 students who attend Elm Street School. The number of students who attend Oak Lane School is 464.

a) About how many students attend these schools altogether?

b) Exactly how many students attend these two schools?

3. Estimate and then find the difference between 887 and 439.

4. Estimate and then solve: $659 + 76 = ?$

5. Estimate and then solve: $901 - 674 = ?$

6. Fill in the blanks to show if the expressions are equal (=) or not equal (\neq).

a) $20 + 14$ _____ $34 - 2$

b) $399 - 40$ _____ $350 + 9$

c) $457 + 200$ _____ $357 + 300$

d) $175 - 25$ _____ $175 + 25$

7. The teacher wrote the equation $180 + 10 = \underline{\hspace{2cm}} + 5$ on the board. Malachi said the missing number is 190. Is Malachi correct or incorrect? Explain how you know.
8. Ben had 414 trading cards. Alex gave him 319 more trading cards. Then Ben gave 208 cards to Scott. How many trading cards does Ben have now?
9. Javon had 214 marbles. Dacari gave him some more marbles. Now Javon has 302 marbles. How many marbles did Dacari give to Javon?
10. There are 805 students at Richmond High School. There are 443 students who are boys. The rest of the students are girls. How many girls are at Richmond High School?

11. The Virginia Heights library has 147 more books than the Round Hill library. The Round Hill library has 608 books. How many books do these libraries have altogether?

3.CE.1 Just in Time Quick Check Teacher Notes

Common Errors/Misconceptions and their Possible Indications

1. A librarian is organizing a summer reading kickoff event at the town's library.
 - There are 245 children registered to attend.
 - There are 390 guests expected to attend.
 - The town's library can seat 700 people.

The librarian wants to know whether the town's library is large enough for everyone to attend. Should the librarian find an exact total number of children and guests or make an estimate of the total number of children and guests? Justify your reasoning.

Students may have difficulty determining when an estimate or an exact answer is appropriate when solving contextual problems. In this example, students may believe that they must find the exact number of children and guests to determine whether they will all fit in the library. However, by rounding each number up to the nearest hundred ($300 + 400 = 700$), the librarian can easily determine that there will be enough seats to accommodate all students and guests.

When solving contextual problems, it may be beneficial for students to engage in discussions about when contextual problems require an exact solution and when an estimate will suffice. As they become more familiar with contexts where an estimate is needed, they may begin to recognize that certain estimation strategies (e.g., rounding all numbers up) are better suited to estimating when it is important to ensure that there are enough to meet the demands of the context (e.g., enough cookies for everyone in the class, enough money to pay for all of the groceries, enough seats to fit all children and guests).

2. There are 355 students who attend Elm Street School. The number of students who attend Oak Lane School is 464.
 - a) About how many students attend these schools altogether?
 - b) Exactly how many students attend these two schools?

Students who find an estimate by rounding the exact sum after calculating may benefit from more experiences that allow them to consider estimation strategies shared by their peers. Students benefit from practice with multistep estimation strategies that apply understanding of place value and benchmark numbers. For this example, students might use partial sums, first using the values in the hundreds ($300 + 400 = 700$). Then students may use the understanding that both 55 and 64 are close to 50, so the sum of 55 and 64 is close to (but more than) 100, yielding an overall estimate of 800 and the knowledge that the actual sum will be more than this estimate. Another strategy may be to round the two numbers differently, using $350 + 500 = 850$. Students may also recognize that the exact

sum of 455 and 464 will be less than the estimate of 850, since 500 is almost 40 more than 464. This indicates that students have a deep understanding of the process they are using to estimate and its relationship to the exact sum.

When determining the exact sum, students who use partial sums ($300 + 400 = 700$, $50 + 60 = 110$, $5 + 4 = 9$; $700 + 110 + 9 = 819$) may have difficulty adding the sums together. Students using the traditional algorithm may have difficulty regrouping. In both instances, students would benefit from modeling the problem using concrete materials that are both proportional and “regroupable” to illustrate the process.

3. Estimate and find the difference between 887 and 439.

Students who do not find an estimate, who find an estimate that is unreasonable, or who find the exact difference and then round that number to produce an estimate, would benefit from further exposure to a variety of estimation strategies. Opportunities for students to use valid estimates to determine the reasonableness of the result of computation may also be beneficial.

When students find an estimate, they will likely use a variety of strategies that produce a variety of estimates. In this problem, students may estimate the difference to be 500 ($900 - 400$) or 450 ($900 - 450$). It will be helpful for students to hear the estimates and estimation strategies used by their peers as they develop their estimation skills.

Students who find the sum rather than the difference would benefit from more experiences using the language associated with addition and subtraction during instruction and discussions with peers. Teachers should also model accurate vocabulary during instruction. For example, when asking students to share strategies used during problem solving, teachers may say, “Joe found the difference of these numbers to solve this problem. Joe, can you tell us how you decided you would subtract and find the difference?” Regularly incorporating the language of mathematics into instruction reinforces meaning and encourages students to use this language themselves.

4. Estimate and then solve: $659 + 76 = ?$

Students who find the exact sum to be 1,412 have not aligned the digits according to place value when rewriting the problem vertically and using the traditional algorithm. Students who recognize that the exact answer must be less than 800 (estimate: a value less than 700 + a value less than 100 = a value less than 800) will be able to identify that they have made an error.

Students using the traditional algorithm may have difficulty regrouping in the ones and tens places. These students may benefit from using concrete materials (e.g., base-ten blocks) to model and solve the problem. Students may also benefit from opportunities to see and hear different computation strategies used by peers, such as partial sums, which can be efficient alternatives to the traditional algorithm.

5. Estimate and then solve: $901 - 674 = ?$

Students who solve using the traditional algorithm may have difficulty regrouping to subtract, particularly across a zero. Regrouping errors may result in a variety of incorrect responses, including but not limited to:

- *“flipping” the digits, subtracting 1 from 4 in the ones, and 0 from 7 in the tens producing an incorrect answer of 373.*
- *changing the 0 tens in 901 to 10 tens without changing the 9 hundreds to 8 hundreds, resulting in an incorrect answer of 327.*

Students who use the traditional algorithm but have difficulty with regrouping may benefit from modeling and solving the problem using base-ten blocks or diagrams to build conceptual understanding. Additional experiences with a variety of computation strategies shared by peers may also expose students to efficient alternatives to the traditional algorithm that are less reliant on regrouping.

6. Fill in the blanks to show if the expressions are equal (=) or not equal (\neq).

a) $20 + 14$ _____ $34 - 2$

b) $399 - 40$ _____ $350 + 9$

c) $457 + 200$ _____ $357 + 300$

d) $175 - 25$ _____ $175 + 25$

A common misconception that some students have is to think that two expressions are not equal if the operations are different for each expression. Students often confuse operations when representing expressions that are equivalent, especially when the same digits are used, as in example d). Another common error is for students to say that example a) is equivalent because they only look at the first number in the second expression (i.e., $20 + 14 = 34$). It may be helpful to have students simplify each side independently of each other and compare the two values when determining whether the expressions are equal or not equal. For students who need additional support, it may be helpful to model the expressions using manipulatives to determine whether they are equivalent.

7. The teacher wrote the equation $180 + 10 =$ _____ $+ 5$ on the board. Malachi said the missing number is 190. Is Malachi correct or incorrect? Explain how you know.

Students may agree that Malachi’s answer is correct because they view the equal sign as meaning “the answer is” rather than understanding that the equal sign denotes the equivalence between two quantities or because students only looked at the first number in the second expression (i.e., $180 + 10$

= 190). It might be helpful to ask students to model the equation using manipulatives to determine if the equation is balanced or not balanced. In addition, it may be helpful for students to solve the right side of the equation as if the missing number was 190 ($190 + 5 = 195$) to show that the left side of $180 + 10$ is not equivalent to the right side of $190 + 5$.

8. Ben had 414 trading cards. Alex gave him 319 more trading cards. Then Ben gave 208 trading cards to Scott. How many trading cards does Ben have now?

Students may have difficulty with multistep problems. A common error is for students to say that Ben has 941 trading cards because they added the three numbers presented in the problem. This error may indicate that students are unsure of what operation(s) to use in the multistep problem.

In the first step of addition, students who use partial sums as a strategy ($400 + 300 = 700$, $10 + 10 = 20$, $4 + 9 = 13$, $700 + 20 + 13 = 733$) may have difficulty adding the sums together or keeping track of what has been combined. Students who use the traditional algorithm may arrive at a total of 7,213 (record the sum of 9 and 4 as 13 but write both digits in the ones place) or 751 (find $9 + 4 = 13$ but write 1 in the ones place and “carry” the 3 ones to the tens place). In both instances, students may benefit from using base-ten blocks or other models to illustrate the regrouping concept.

Students may have difficulty subtracting $733 - 208$ as the second step of the problem. Common errors include “flipping” the subtraction in the ones place and subtracting 3 from 8, resulting in an incorrect answer of 535, or regrouping one of the tens as 10 ones but forgetting about the original 3 ones, resulting in an incorrect answer of 522. Students who have trouble with regrouping (with addition or subtraction) may benefit from using base-ten blocks or other models to illustrate the regrouping concept.

Students should also be encouraged to estimate prior to solving so they are able to determine whether their answer is reasonable. Students may benefit from opportunities to share and explore strategies for multi-digit addition and subtraction with their classmates. These discussions can help students who may be relying on procedural knowledge to build conceptual understanding, while also developing flexible strategies for computation.

9. Javon had 214 marbles. Dacari gave him some more marbles. Now Javon has 302 marbles. How many marbles did Dacari give to Javon?

The most common error associated with this type of task is students who answer 516 as the total of the given numbers. This error may indicate that students are relying on a “key word” strategy and adding based on “more” from the context of the problem. These students need instructional experiences that focus on making sense of practical problems and will likely benefit from further exposure to the various problem types described in the Grade 3 Instructional Guide.

Students who perceive this as a missing addend (or join with the change unknown) problem may write the equation $214 + ? = 302$ but still have difficulty finding a solution. Representing the situation with this equation demonstrates an understanding of the context of the problem, but students may

have difficulty keeping track of the parts of the missing addend. For example, students may think $214 + 100$ will be close to 302, but they may not know what to do next.

Students who subtract using the traditional algorithm may struggle with regrouping in the tens place, or they may “flip” the digits when subtracting (i.e., subtract $4 - 2$ in the ones place, $1 - 0$ in the tens place, and $3 - 2$ in the hundreds place). These students would benefit with further practice using concrete materials that are proportional and that can be regrouped to connect place value meaning to the algorithm.

For each of these errors, students would benefit from more exposure to other computation strategies shared by their peers and opportunities to make sense of these strategies in new problem situations.

10. There are 805 students at Richmond High School. There are 443 students who are boys. The rest of the students are girls. How many girls are at Richmond High School?

Students who subtract using the traditional algorithm may have difficulty regrouping, especially across the tens in 805. Students who have difficulty with regrouping may benefit from more experiences with other strategies for problem solving that are shared, explained, and justified during classroom discussions. These students would also benefit from using models (i.e., base-ten blocks or diagrams) to represent the problem and to build greater conceptual understanding of the regrouping procedure.

A common error is for students to add the numbers instead of subtracting. This may indicate that students do not see this problem as a comparison problem and do not realize they should solve $805 - 443 = ?$ (or $443 + ? = 805$). Students will benefit from more experience with the various problem types described in the Grade 3 Mathematics Instructional Guide.

11. The Virginia Heights library has 147 more books than the Round Hill library. The Round Hill library has 608 books. How many books do these libraries have altogether?

The most common error when solving a multistep problem is solving only one portion of the problem. In this problem, students may not recognize that there are multiple steps and instead may add the two numbers together, resulting in an incorrect final answer of 755 books. Students may not realize this is the number of books at the Virginia Heights library and not the total number of books from both libraries. These students would benefit from additional experience solving multistep contextual problems.