

SCO N09 Students will be expected to demonstrate an understanding of addition (limited to 1- and 2-digit numerals) with answers to 100 and the corresponding subtraction by
▪ using personal strategies for adding and subtracting with and without the support of manipulatives
▪ creating and solving problems that involve addition and subtraction
▪ explaining and demonstrating that the order in which numbers are added does not affect the sum
▪ explaining and demonstrating that the order in which numbers are subtracted matters when finding a difference
[C, CN, ME, PS, R, V]
[C] Communication [PS] Problem Solving [CN] Connections [ME] Mental Mathematics and Estimation
[T] Technology [V] Visualization [R] Reasoning

Performance Indicators

Use the following set of indicators to determine whether students have achieved the corresponding specific curriculum outcome.

- N09.01** Solve a given story problem of any type by modelling it with materials or a diagram, and write a number sentence that represents the thinking in the solution.
- N09.02** Solve a given story problem of any type by writing a number expression and combining the numbers to complete the number sentences.
- N09.03** Match a number sentence to a given story problem.
- N09.04** Create an addition or a subtraction number sentence and a story problem for a given solution.
- N09.05** Model addition and subtraction using concrete materials or visual representations and record the process symbolically.
- N09.06** Add a given set of numbers in two different ways and explain why the sum is the same.
- N09.07** Recognize and create equivalent addition and subtraction number sentences.

Scope and Sequence

Mathematics 1	Mathematics 2	Mathematics 3
<p>N09 Students will be expected to demonstrate an understanding of the addition of two single-digit numbers and the corresponding subtraction, concretely, pictorially, and symbolically in join, separate, equalize/compare, and part-part-whole situations.</p>	<p>N09 Students will be expected to demonstrate an understanding of addition (limited to 1- and 2-digit numerals) with answers to 100 and the corresponding subtraction by</p> <ul style="list-style-type: none"> ▪ using personal strategies for adding and subtracting with and without the support of manipulatives ▪ creating and solving problems that involve addition and subtraction ▪ explaining and demonstrating that the order in which numbers are added does not affect the sum ▪ explaining and demonstrating that the order in which numbers are subtracted matters when finding a difference 	<p>N06 Students will be expected to describe and apply mental mathematics strategies for adding two 2-digit numerals.</p> <p>N07 Students will be expected to describe and apply mental mathematics strategies for subtracting two 2-digit numerals.</p> <p>N08 Students will be expected to apply estimation strategies to predict sums and differences of 1-, 2-, and 3-digit numerals in a problem-solving context.</p> <p>N09 Students will be expected to demonstrate an understanding of addition and subtraction of numbers (limited to 1-, 2- and 3-digit numerals) with answers to 1000 by</p> <ul style="list-style-type: none"> ▪ using personal strategies for adding and subtracting with and without the support of manipulatives ▪ creating and solving problems in context that involve addition and subtraction of numbers, concretely, pictorially, and symbolically

Background

Students develop an understanding of addition and subtraction of numbers by modelling, acting out, building, drawing, and using appropriate mathematics language in creating number sentences and solving number stories. Through these experiences, students will also begin to develop personal strategies for adding and subtracting. New vocabulary words can be added to the mathematics word wall to reinforce the use of terminology, such as **together**, **part**, **sum**, **difference**, **add**, **subtract**, and **take away**. Addition and subtraction should be taught simultaneously to enable students to see the relationship between the two operations.

Students should have experience with the many different types of addition and subtraction problems. The meanings of, and the relationship between, addition and subtraction are developed using situations (see chart below) that are first modelled concretely, then pictorially, and lastly, symbolically.

Join			Part-Part-Whole	Compare
Result Unknown	Change Unknown	Start Unknown	Whole Unknown	Difference Unknown
Pat has 8 marbles. Her brother gives her 4. How many does she have now? $8 + 4 = ?$	Pat has 8 marbles but she would like to have 12. How many more does she need to get? $8 + ? = 12$ or $12 - 8 = ?$	Pat has some marbles. Her brother gave her 4 and now she has 12. How many did she have to start? $? + 4 = 12$ or $12 - 4 = ?$	Pat has 8 blue marbles and 4 green marbles. How many does she have in all? $8 + 4 = ?$	Pat has 8 blue marbles and 4 green marbles. How many more blue marbles does she have? $8 - 4 = ?$ or $4 + ? = 8$
Separate			Part-Part-Whole	Compare
Result Unknown	Change Unknown	Start Unknown	Part Unknown	Smaller or Larger Unknown
Pat has 12 marbles. She gives her brother 4 of them. How many does she have left? $12 - 4 = ?$	Pat has 12 marbles. She gives her brother some. Now she has 8. How many marbles did she give to her brother? $12 - ? = 8$ or $12 - 8 = ?$	Pat has some marbles. She gives her brother 4 of them. Now she has 8. How many marbles did she have to start? $? - 4 = 8$ or $8 + 4 = ?$	Pat has 12 marbles. Eight are blue and the rest are green. How many are green? $8 + ? = 12$ or $12 - 8 = ?$	Pat has 8 blue marbles and some green marbles. She has 4 more blue marbles than green ones. How many green marbles does she have? $8 - 4 = ?$ or $? + 4 = 8$

The strategies and symbols that students use should reflect how they thought about the problem. For example, consider the story problem: Pat has 12 marbles. She gives her brother some. Now she has 8. How many marbles did she give to her brother? This problem represents a separate situation and could be solved by some students by starting with 12 counters, counting back as counters are removed until they reach 8, and counting the counters that were removed to get 4. These students are likely to write $12 - 4 = 8$ to represent what they did. However, some students could start with 12 counters, remove the 8 that they knew were left, and count the remaining counters to get 4. These students are likely to write $12 - 8 = 4$ to represent what they did. Whichever number sentence is used, it is essential that students understand how each part of the number sentence relates to the situation. This story problem illustrates that one situation can be represented in different ways symbolically.

Additional Information

See Appendix A: Additional Information.

Assessment, Teaching, and Learning

Assessment Strategies

Assessment for learning can and should happen every day as a part of instruction. Assessment of learning should also occur frequently. A variety of approaches and contexts should be used for assessing all students—as a class, in groups, and individually.

Guiding Questions

- What are the most appropriate methods and activities for assessing student learning?
- How will I align my assessment strategies with my teaching strategies?

ASSESSING PRIOR KNOWLEDGE

Tasks such as the following could be used to determine students' prior knowledge.

- Present students with a pictorial representation of a story problem involving two single-digit numbers. Ask them to tell a story that matches the picture. Ask them to solve the problem and to record a number sentence that matches the story problem and solution.

WHOLE-CLASS/GROUP/INDIVIDUAL ASSESSMENT TASKS

Consider the following **sample tasks** (that can be adapted) for either assessment for learning (formative) or assessment of learning (summative).

- Give students an addition or subtraction sentence. Ask them to model the number sentence using concrete materials or pictures.
- Use base-ten blocks to model an addition or subtraction story problem. Ask students to record a number sentence that would match the base-ten model.
- Ask students to write the addition sentence that would help them solve the following:
 $? = 16 - 8$
 $18 - 9 = ?$
 $50 - ? = 20$
- Ask students to add the following equations two different ways and explain why the sum is the same regardless of the order that they used.
 $65 + 28 = ?$
 $7 + 4 + 3 + 6 = ?$
- Ask students to solve problems, such as the following, and to record their work with pictures and numbers.
 - My dad made 43 chocolate chip cookies and some peanut butter cookies. There were 92 cookies on the cupboard. How many were peanut butter? Solve and explain your thinking.
 - My mom used 28 nails to make a birdhouse. There are 55 nails left in the box. How many nails were in the box before she started? Solve and explain your thinking.
- Tell students that the answer to a problem is 31 balloons. Ask students to make up a story problem and give the number sentence that matches this answer.
- Give students an addition and/or subtraction number sentence and ask them to show different strategies to solve it. Encourage them to show as many different ways as they can.
- Ask students to add a given set of numbers in two different ways and to explain why the sum is the same. For example, if asked to add $2 + 5 + 3 + 8$, a student could add $2 + 3 + 5 + 8$ or $8 + 2 + 5 + 3$.
- Ask students to explain using models or pictures whether they would get the same answer for $9 - 3$ and for $3 - 9$.

FOLLOW-UP ON ASSESSMENT**Guiding Questions**

- What conclusions can be made from assessment information?
- How effective have instructional approaches been?
- What are the next steps in instruction for the class and for individual students?

RESPONDING TO ASSESSMENT

Numeracy Nets 3 (Bauman 2009)

- Grade 3 Checkpoint 3, pp. 25–27
- Grade 3 Checkpoint 5, pp. 33–34 (Line Masters 5.1 and 5.2)
- Grade 3 Checkpoint 6, pp. 36–37 (Line Master 6.1)

Planning for Instruction

Planning for a coherent instructional flow is a necessary part of an effective mathematics program.

Long-term Planning

- Yearly plan involving this outcome
- Unit plan involving this outcome

Guiding Questions

- Does the lesson fit into my yearly/unit plan?
- How can the processes indicated for this outcome be incorporated into instruction?
- What learning opportunities and experiences should be provided to promote learning of the outcomes and permit students to demonstrate their learning?
- What teaching strategies and resources should be used?
- How will the diverse learning needs of students be met?

CHOOSING INSTRUCTIONAL STRATEGIES

Consider the following strategies when planning daily lessons.

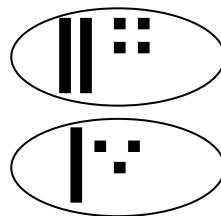
- Have students explore the fact that a story problem could be represented with an addition or a subtraction number sentence. For example: $2 + ? = 7$ describes the same situation as $7 - 2 = ?$ Either of these is acceptable.
- Continue to use models and other representations. Encourage students to match various representations of the same problem.
- Write number sentences horizontally to encourage more divergent thinking and development of personal strategies. Students using personal strategies find solving problems with numbers requiring “regrouping” as easy as those problems that do not require “regrouping.”
- Encourage students to create and solve the four different types of addition and subtraction problems: join, separate, part-part-whole, and compare (Van de Walle and Lovin, 2006, 67–69).

SUGGESTED LEARNING TASKS

- Tell students that Janet read 18 books and Fred read 42. Ask them to record a number sentence and then explain how to find the difference using an open number line (or other representation).
- Tell students that someone told you that you do not have to learn to subtract if you know how to add. Ask, Do you agree? Why or why not?
- Provide students with a variety of models and ask how they would add $42 + 29$. Have students explore different ways to find the sum. Have students explore additional examples that require regrouping.
- Have students explore different ways to find the difference between 22 and 6.
- Have students make a booklet and on the front cover write, “The Answer is 25.” Have students create their own addition and subtraction word problems that would result in an answer of 25. They

should record one problem on each page of their booklet. Students could illustrate each page to match the story problem.

- Ask students what the difference is between 6 and 12. Gradually extend the activity to use 2-digit numbers. Number lines are a good model to support students' thinking.
- Let students choose a favourite story and create addition and subtraction problems related to the story. These could be shared through dramatizations, pictures, or writing.
- Show two numbers modelled with base-ten blocks. After showing the students one pre-grouped model (top model) and the other pre-grouped model (bottom model), ask the students to record addition and/or subtraction sentences these represent and to explain their thinking (e.g., $37 - 23 = 14$).



SUGGESTED MODELS AND MANIPULATIVES

- | | |
|---|---|
| <ul style="list-style-type: none"> ▪ base-ten blocks ▪ hundred charts ▪ number lines | <ul style="list-style-type: none"> ▪ open number lines ▪ ten-frames |
|---|---|

MATHEMATICAL LANGUAGE

Teacher	Student
<ul style="list-style-type: none"> ▪ add, together, plus, sum, total ▪ compatible numbers ▪ how many more, how many less ▪ number sentence ▪ ones, tens ▪ order and grouping addends ▪ part, whole ▪ story problem, situation ▪ strategy ▪ strip diagram ▪ subtract, minus, difference, take away 	<ul style="list-style-type: none"> ▪ add, together, plus, sum, total ▪ friendly numbers ▪ how many more, how many less ▪ number sentence ▪ ones, tens ▪ order and grouping ▪ part, whole ▪ story problem ▪ strip diagram ▪ subtract, minus, difference, take away

Resources/Notes

Print

- *Making Math Meaningful to Canadian Students, K–8* (Small 2009), pp. 104–110, 162–173
- *Making Math Meaningful to Canadian Students, K–8*, Second Edition (Small 2013), pp. 159–166, 215–217
- *Teaching Student-Centered Mathematics, Grades K–3* (Van de Walle and Lovin 2006), pp. 65–75, 157–172

Videos

- *Comparing Mental Strategies: Addition* (14:42 min.) (ORIGO Education 2010)
- *Questions for Developing Mental Computation Strategies* (13:42 min.) (ORIGO Education 2010)
- *Using a Hands-On Approach to Develop Mental Strategies for Addition* (11:04 min.) (ORIGO Education 2010)
- *Using a Hands-On Approach to Develop Mental Strategies for Subtraction* (6:45 min.) (ORIGO Education 2010)
- *Using Language Stages to Develop Addition Concepts* (15:38 min.) (ORIGO Education)
- *Using Language Stages to Develop Subtraction Concepts* (18:32 min.) (ORIGO Education 2010)
- *Using Mental Strategies to Add* (26:15 min.) (ORIGO Education 2010)
- *Using Static Problems to Relate Addition and Subtraction and Introduce Equality* (13:25 min.) (ORIGO Education 2010)
- *Using Static Problems to Relate Addition and Subtractions and Introduce Functions* (18:59 min.) (ORIGO Education 2010)

Notes
