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PRACTICE 1

Parts one and two

UNDERSTAND INTEGERS

OBJECTIVES

In part one, students will:

- Use integers to describe real-life situations.
- Understand and determine absolute value of an integer.

In part two, students will:

- Use integers to describe real-life situations.
- Compare and order integers with and without a number line.

VOCABULARY

Part one

- **integers:** the set of whole numbers and their opposites. . . ., -3 , -2 , -1 , 0 , 1 , 2 , 3 , . . .
- **positive integers:** integers to the right of zero on the number line. They are shown using a positive sign (+) or no sign
- **negative integers:** integers to the left of zero on the number line. They are shown using a negative sign (-)
- **absolute value:** the distance of a number from zero on the number line

Part two

- **compare:** to determine if one number is greater than, less than or equal to another number
- **order:** to arrange three or more numbers in order from least to greatest or greatest to least.

AUSTRALIAN CURRICULUM CONTENT DESCRIPTIONS

See page 13 to cross-reference this lesson with aligned Australian Curriculum content descriptions.

RELATED STAMS® PLUS INSTRUCTION



For instruction that supports this practice, go to:

STAMS® Plus, Book G, Lesson 1,
Understand integers,
pp. 4–13

STAMS® IWB lessons, Level G, Visualise integers
<http://iwb.camsandstams.com.au>



Use features such as manipulable number lines to deepen students' understanding of integers.

Part one

PRACTICE
1
Part one

UNDERSTAND INTEGERS

Use the number line to solve the problem.

1. Challenger Deep, at the bottom of the Mariana Trench, has the lowest altitude in the world at 10911 metres below sea level. Mount Everest, which borders Nepal and China, has the highest altitude at 8848 metres above sea level.

On what part of the number line would you label the lowest altitude? negative, below 0

On what part of the number line would you label the highest altitude? positive, above 0

Let's solve this together.

Write a positive or negative integer to describe each situation. Fill in the blanks.

2. 7 point gain: 7
 3 point loss: -3

3. \$100 of debt: -\$100
 \$100 of profit: +\$100

Solve the problem.

4. Are all whole numbers **integers**? Are all integers whole numbers? Explain your answer.
 All whole numbers are integers. All integers are whole numbers. The group of integers or whole numbers consists of the positive and negative whole numbers and zero.

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Understand integers

MENTAL MATHS Fill in the blanks to help you compare two absolute values.

5. How many units from zero is the number 3? 3 units

6. How many units from zero is the number 32? 32 units

7. How many units from zero is the number -4? 4 units

8. How many units from zero is the number -65? 65 units

9. How many units from zero is the number 47? 47 units

The absolute value of a number is its distance from zero on the number line.

REASONING

Solve the problem. Explain your thinking.

10. Jackie was solving a maths problem about integers. She explained that, since -45 is a smaller number than 35, then the absolute value of -45 is less than the absolute value of 35. Is she correct? Explain why or why not.

Jackie is incorrect because absolute value is the distance from zero. So -45 is 45 units from zero, and 35 is 35 units from zero. 45 is larger than 35, so the absolute value of -45 is more than the absolute value of 35.

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At a Glance

Students use positive and negative integers to model real-world situations and explore absolute value. If students have difficulty, check for these common pitfalls and use the related tips to provide help.

Solve Problems 2–3

If If students have difficulty deciding if a situation is represented by a positive or a negative quantity, they may not understand the terms.

Then Review scenarios and terms that involve integers, explaining that negative numbers are often used to describe an absence or decrease.

Solve Problem 4

If If students are unsure of the intent of the question, they may not understand the structure of the number system.

Then Review the number system, including whole number and integers. Elicit that one number can belong to more than one set of numbers, just as a student can be part of a family, a class, a year level and a school.

Mental Maths, Problems 5–9

If If students answer 5–9 incorrectly, they may not be conceptualising distance from 0.

Then Have students use number line models to work with problems in this exercise set, drawing arcs to count spaces.

Reasoning, Problem 10

If If students say that Jackie is *correct*, they may not understand the meaning of absolute value.

Then Use number lines to reinforce the idea that absolute value refers to distance from 0.

Part two

PRACTICE
1
 Part two

UNDERSTAND INTEGERS

Use the number line to solve the problem.

1. A clothing company advertises different types of coats by labelling them with a temperature guide. This temperature guide tells you the coldest temperature at which the coat should keep you warm.

Coat A

Coat C

Coat B

Using the number line to help you, explain why Coat A is the best for the coldest winter weather.

Solution: Coat A is furthest from zero to the left of zero, so its temperature guide shows a temperature that is the lowest of the three. The lowest temperature is best for the coldest weather.

Let's solve this together.

Fill in the blanks to solve each problem.

2. Negative four is 4 units to the left of zero on the number line. Negative two is 2 units to the left of zero on the number line. Compare the two numbers using an inequality: $-4 \square -2$. Which of the two numbers has the larger absolute value? 4

3. Four is 4 units to the right of zero on the number line. Two is 2 units to the right of zero on the number line. Compare the two numbers using an inequality: $4 \square 2$. Which of the two numbers has the larger absolute value? 4

4. Plot points for the numbers -4 , -2 , 3 , and 5 on the number line below.

5. Using the number line above to justify your answer, explain why the absolute value of 4 and -4 is the same.
Four is 4 units to the right of zero and -4 is 4 units to the left of zero. Since they are both the same distance from zero, their absolute values are equal.

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Understand integers

Solve each problem. Choose the best answer.

6. Sarah is comparing her company's monthly income for a period of 4 months.

Month	Income
January	-1000
February	250
March	40
April	-25

Which shows the company's monthly income ordered from least to most?
 Ⓐ 250, 40, -25, -1000 Ⓑ -1000, -25, 40, 250
 Ⓒ -1000, 250, 40, -25 Ⓓ -25, 40, 250, -1000

7. Which number line best represents the inequality $-6 > -9$?

8. Which inequality best represents the information on the number line below?

Ⓐ $-4 > 2$ Ⓒ $4 > -2$
 Ⓑ $-4 < 2$ Ⓓ $4 < -2$

9. Which shows all integer values that make the inequality the absolute value of $x < 2$ true?
 Ⓐ $-2, -1, 0, 1, 2$ Ⓒ $0, 1$
 Ⓑ $-1, 0, 1$ Ⓓ 1

Solve the problem.

10. Write an inequality to represent the following scenario.
 Dr Baker measured the growth of two guinea pigs. Guinea pig A gained 500 grams in a month, while guinea pig B lost 250 grams in the same month. Write an inequality that compares guinea pig A's weight change to guinea pig B's weight change.
Solution: $500 > -250$

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At a Glance

Students use positive and negative integers to model real-world situations and explore absolute value. If students have difficulty, check for these common pitfalls and use the related tips to provide help.

Solve Problems 2–5

If If students incorrectly compare integers in problem 2's first comparison, they may be comparing the absolute values of the numbers instead of the numbers themselves.

Then Draw a number line across the board. Have students walk from negative positions to 0. Elicit that the negative number with the greater absolute value is further away from 0 on the number line, so it is smaller.

Solve Problems 6–9

If If students choose C as the answer to problem 9, they may be unsure about the meaning of absolute value.

Then Have students substitute various positive and negative values for x and find the absolute value of each number. Encourage them to make generalisations about absolute values.

Solve Problem 10

If If students answered problem 10 incorrectly, they may have trouble writing inequalities.

Then Remind students that the inequality “mouth” “eats up” the larger number. Caution students to pay attention to the sign as well as the numeral when writing inequalities involving negative integers.

REVIEWS 1–2

REVIEWS 1–2: PRACTICES 1–4

OBJECTIVES

In review 1, students will:

- Order integers.
- Understand and determine absolute value of an integer.
- Use integers to describe real-life situations.
- Understand how to add, subtract, multiply and divide integers.

In review 2, students will:

- Identify and use additive and multiplicative inverses.
- Identify and use the Identity, Commutative and Associative Properties of Addition and Multiplication to evaluate and simplify expressions.
- Explain how an expression was simplified by using properties of addition and multiplication.

VOCABULARY

Review 1

- **order:** to arrange three or more numbers in order from least to greatest or greatest to least
- **negative integers:** integers to the left of zero on the number line; shown using a negative sign ($-$)
- **positive integers:** integers to the right of zero on the number line; shown using a positive sign ($+$) or no sign

Review 2

- **additive identity:** the number 0
- **multiplicative identity:** the number 1
- **Commutative Property of Addition/Multiplication:** property that allows addition/multiplication in any order
- **Associative Property of Addition/Multiplication:** property that allows any grouping of addition/multiplication
- **additive inverses (opposites):** a pair of numbers whose sum is 0
- **multiplicative inverses (reciprocals):** a pair of numbers whose product is 1

AUSTRALIAN CURRICULUM CONTENT DESCRIPTIONS

See page 13 to cross-reference this lesson with aligned Australian Curriculum content descriptions.

Review 1

REVIEW
1

REVIEW 1: PRACTICES 1–3

Solve the problem.

- Order the integers from smallest to largest.
 - 4, 2, 4, 0, -6 -6, -4, 0, 2, 4
 - 7, -3, -2, 5, 0 -3, -2, 0, 5, 7

List all values for x that make the following sentences true.

- The absolute value of x equals 17.
-17, 17
- The absolute value of x equals -3.
none

For each number line, list the pair of integers that have a sum of -3 . Use the variable names (W, X, Y, Z) to express each sum. (Example: $X + Y$)

- Solution:** $W + Y$
- Solution:** $X + Z$

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Review 1: Practices 1–3

Solve each problem. Choose the best answer.

- A submarine was at 100 metres below sea level. It came up 30 metres and stopped to take underwater photos. Which integer best describes its distance relative to sea level?
 - 130 metres
 - 70 metres
 - 70 metres
 - 130 metres
- Charlie will make 30 car payments of \$300 each for his new car. Which integer best represents Charlie's debt from his car purchase?
 - \$9000
 - \$6000
 - \$6000
 - \$9000
- To subtract a negative integer from another integer,
 - switch the order and then subtract.
 - subtract the opposite.
 - add the opposite.
 - ignore the signs. The difference will be negative.

CONNECTIONS

10. Zack is climbing stairs for exercise. He starts on the first floor landing (stair 0) then climbs 30 stairs. His routine continues as follows: down 40 stairs, then up 30, then down 40. What stair does he end up on? Show your work.

$30 + -40 + 30 + -40 = -20$

He ends up on step -20.

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At a Glance

Students review operations with integers and absolute value. If students have difficulty, check for these common pitfalls and use the related tips to provide help.

Solve Problem 1

If If students write the numbers in an incorrect order, they may have trouble comparing and ordering simultaneously.

Then Have students make an index card for each number on the list. Encourage them to compare two cards at a time and then order them.

Solve Problems 4–5

If If students cannot find the pairs of integers that represent a sum of -3 , they may be confused by the variable labels on the number line.

Then Have students list the sums represented by each pair of integers shown on the number line, and then select the correct answer from their list.

Solve Problems 6–9

If If students choose D for number 6, they might be adding 100 and 30 instead of -100 and 30.

Then Clarify that 100 metres below sea level can be represented by -100 .

Connections, Problem 10

If If students solve the problem incorrectly, they may not be keeping track of all the steps.

Then Have students draw and label an arc on their number line for each step in the problem.