

# Multiplying and Dividing Integers

## Cruising Altitude

SUGGESTED LEARNING STRATEGIES: Shared Reading, Activating Prior Knowledge

My Notes

Ms. Flowers and the students in her math class are still not sure where they want to go for their field trip. Robbie suggested that they examine the idea of going to Hawaii. The students were excited about this possibility.

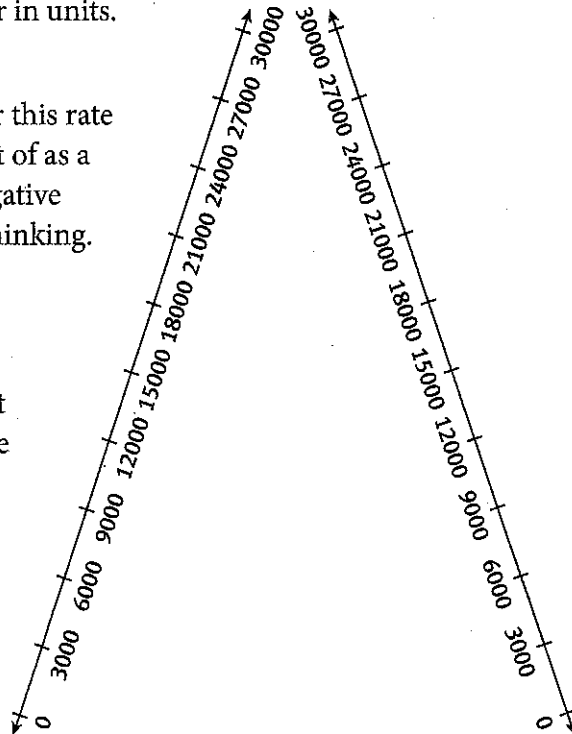
One student, Thane, was uncertain about flying. He did not know much about flying so he decided to do some research. He learned that when a passenger jet *ascends* from ground level, it could take as little as 10 minutes to reach the cruising altitude of 30,000 feet. He also found out that when a passenger jet *descends*, it could take about the same amount of time to reach ground level again.

### MATH TIP

*Ascend* means to move upward and *descend* means to move downward.

1. If a jet reaches its cruising altitude in the least amount of time, what is the distance the jet climbs vertically per minute during the ascent? Label your answer in units.
2. Would it make sense for this rate of ascent to be thought of as a positive integer or a negative integer? Explain your thinking.
3. What is the vertical distance the jet descends per minute during the descent if it takes 15 minutes for the jet to reach ground level? Label your answer in units.
4. Would it make sense for this rate of descent to be thought of as a positive integer or a negative integer? Explain your thinking.

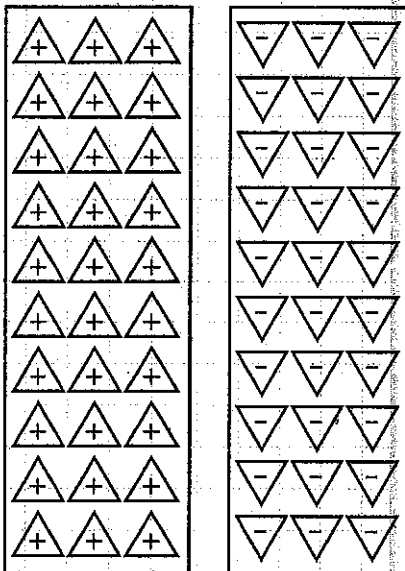
When Thane thought about this situation, he realized he could make a sketch of the jet's ascent and descent using number lines.



My Notes

5. For what mathematical operations could Thane's diagram be a model? Explain your choices.

When Thane showed his diagram to Ms. Flowers, she showed him a diagram she made of the same situation. She told him that each triangle stands for 1000 feet. Her diagram looked like the ones at the left.



6. How is the diagram Ms. Flowers made similar to the one Thane made?

7. Write a number sentence for each part of their diagrams.

8. Write the number sentence illustrated by each diagram. Each counter stands for 10. The first two have been done for you.

a.  $(+) (+) (+) \quad (+) (+) (+) \quad 2 \times 30 = 60$

b.  $(-) (-) (-) \quad (-) (-) (-) \quad 2 \times -30 = -60$

c.  $(+) (+) \quad (+) (+)$

d.  $(-) (-) (-) (-) \quad (-) (-) (-) (-)$

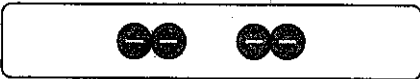
# Multiplying and Dividing Integers

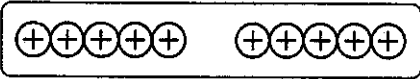
## Cruising Altitude

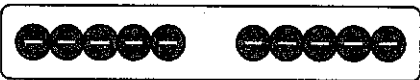
### ACTIVITY 1.3

**SUGGESTED LEARNING STRATEGIES:** Look for a Pattern, Group Presentation, Self Revision/Peer Revision, Quickwrite

My Notes

e. 

f. 

g. 

9. From your work in Question 8, what can you say about the sign of the product of a positive integer and a positive integer?
10. From your work in Question 8, what can you say about the sign of the product of a negative integer and a positive integer?

Thane wondered how to find the answer to a problem with two negative factors. Ms. Flowers gave Thane this table.

11. Complete the unshaded part of the table below. Then look for patterns to help you complete the shaded area.

$\times$	3	2	1	0	-1	-2	-3
3							
2							
1							
0							
-1							
-2							
-3							

SUGGESTED LEARNING STRATEGIES: Look for a Pattern, Quickwrite, Group Presentation, Create Representations, Think/Pair/Share

My Notes

12. What patterns did you notice in the preceding table that would help you when multiplying two negative integers?

13. What rule can you use to multiply two negative integers?

14. Using what you know about multiplying integers, draw a diagram using + and - counters for each division problem and give the answer.

a.  $10 \div 2 = \underline{\quad}$

b.  $15 \div 3 = \underline{\quad}$

c.  $-18 \div 6 = \underline{\quad}$

d.  $-10 \div 5 = \underline{\quad}$

15. What similarities are there between multiplying integers and dividing integers?

Thane wondered if dividing a negative integer by another negative integer had the same rule as multiplying two negative integers so he decided to make a table to investigate this idea.

# Multiplying and Dividing Integers

## Cruising Altitude

### ACTIVITY 1.3

*continued*

**SUGGESTED LEARNING STRATEGIES:** Quickwrite, Think/Pair/Share, Group Presentation, Look for a Pattern, Self Revision/Peer Revision, Summarize/Paraphrase/Retell, Create Representations

My Notes

16. Complete this table. Look for patterns in dividing integers.

Division Problem	Quotient	Related Multiplication	Related Product
$-18 \div 3$	$-6$	$-6 \times 3$	$-18$
$-18 \div 2$			
$-18 \div 1$			
$-18 \div (-1)$			
$-18 \div (-2)$			
$-18 \div (-3)$			

17. Why do you think that division by zero is not in the table above?

18. What did you observe about dividing a negative integer by a negative integer? What rule could you write for dividing a negative integer by a negative integer?

19. What is the relationship between multiplication and division?

**SUGGESTED LEARNING STRATEGIES:** Create Representations

### My Notes

In his research Thane learned that as a plane ascends, the air outside the plane gets colder. In general, the temperature of the Earth's atmosphere decreases by 5 degrees for each increase of 1000 feet of altitude.

20. Use this information to find the temperature change from sea level to 6,000 feet above sea level. Include a diagram and number sentence.

Diagram:

Number Sentence:

### CHECK YOUR UNDERSTANDING

Write your answers on notebook paper. Show your work.

- Evaluate  $\frac{2 \times 3 \times (-6)}{-9}$ .
- If an airplane descends at a rate of 500 feet per minute, write and evaluate an expression with integers to show how far will it descend in 6 minutes.
- Copy and complete the number statement by replacing the circle with  $<$ ,  $>$ , or  $=$ .
  - $3 \times (-3) - 1 \bigcirc 3 \times (-3) + 1$
  - $0 \div (4) + 9 \bigcirc 0 \div (-10) + 9$
- Divers can descend 7 feet per second. If the diver starts at sea level, what is the depth after 5 seconds of diving? Express your answer as a negative integer.
- Find the mean of the following cold temperatures at Yellowstone Park:  $-10^\circ \text{F}$ ,  $-23^\circ \text{F}$ ,  $-5^\circ \text{F}$ ,  $-18^\circ \text{F}$ , and  $-9^\circ \text{F}$ . (*Hint:* Find the mean by dividing the sum of the values by the number of values.)
- If a football team gained 5 yards per play for 3 plays and then lost 2 yards per play for 4 plays, write and evaluate an expression with integers to show their total gain or loss.
- $-3 \times 2 \times (-5) \times (-6) \times 4 =$
- Between low tide and high tide the width of a beach changes by  $-17$  feet/hour. What is the total change in 3 hours?
- MATHEMATICAL** Why are patterns useful in mathematics?