

Fahrenheit vs. Celsius

Purpose

Students will solve problems by choosing strategies, explaining their reasoning, making calculations, and checking results.

Materials

For the teacher: transparency of Black Line Master (BLM) *Fahrenheit vs. Celsius Graph*, overhead projector, chalk, chalkboard
For each student: copy of BLMs *Fahrenheit vs. Celsius Graph* and *Finding a Formula for Fahrenheit/Celsius Conversion*

Activity

A. Introduction to the Problem

1. Discuss examples of events that would require conversions between Celsius and Fahrenheit, such as listening to a different country's weather report, doing a science experiment instructions in Celsius using a Fahrenheit thermometer, etc.
2. Ask students how they might be able to convert between the units of temperature.
3. Tell students that they will be looking at the graph on the BLM *Fahrenheit vs. Celsius Graph* to find a formula for Celsius and Fahrenheit conversions.

B. Solving the Problem

1. Have students circle all the points on the line graph that have whole numbers for both their Fahrenheit and Celsius temperatures.
2. Compare the circled numbers to confirm students have chosen correct temperatures.
3. Have students choose three or four points that they want to compare. Instruct them to write the Fahrenheit and Celsius temperatures representing those points in the first T-table on the BLM *Finding a Formula for Fahrenheit/Celsius Conversion*.
4. Tell students they will be looking for similarities in the numbers in each column and performing operations on them to bring the values in one column equal to the values in the other column.

(continued)



MEETING INDIVIDUAL NEEDS

Challenge students by asking them to find the temperature at which Celsius and Fahrenheit are equal (by setting the formulas equal to one another). Tell them that you want to solve the problem so that $C = F$. Lead them to substitute the formulas for the variables. Remind them that the numbers that will replace the variables in the individual formulas will be equal so that the same variable could be used (use T for temperature, rather than C and F).



INCORPORATING TECHNOLOGY

Have students visit the Web site www.shodor.com/interactivate/activities/graphit/index.html and create graphs using the formula for Fahrenheit/Celsius conversion.

Standards Links
6.3.2, 6.3.6, 6.3.8, 6.5.9

Activity (continued)

5. Tell students that they will be writing the operation that was performed in the box above the T-table and the new numbers that were produced by performing that operation in the columns. Tell them the first operation has been written for them.
6. Have students perform the operation “Subtract 32 from F” on the numbers in the Fahrenheit column and rewrite the new numbers in the second T-table. Have them carry over the numbers from the Celsius column to the second T-table.
7. Tell students to look for similarities in the numbers in one column to determine an operation that could be performed on all of the numbers in one column that would bring the numbers in that column closer to the numbers in the other column.
8. Remind students to write the operation they are performing in the box above the T-table.


C. Conclusion


1. When students have performed operations necessary to bring the numbers in both columns equal, bring their attention back to you.
2. Write: “ $F = C$ ” on the chalkboard. Tell students that the Fahrenheit temperatures did NOT equal the Celsius temperatures in the first table, so you will need to make changes to the equation so that the formula for conversion is created.
3. Have the students offer the operations that they performed and write the corresponding symbols necessary to create a true equation that can be transformed into a formula. See the example for creating a formula in the Answer Key on the back of the BLM.
4. Remind students how to correctly place parentheses and use inverse operations as you create the formula.


Classroom Assessment


Basic Concepts and Processes

During the activity and when reviewing the BLM, discuss the following questions with your students to gauge their understanding of the Standard Indicators:

 What numbers did you choose to place in the first T-table?

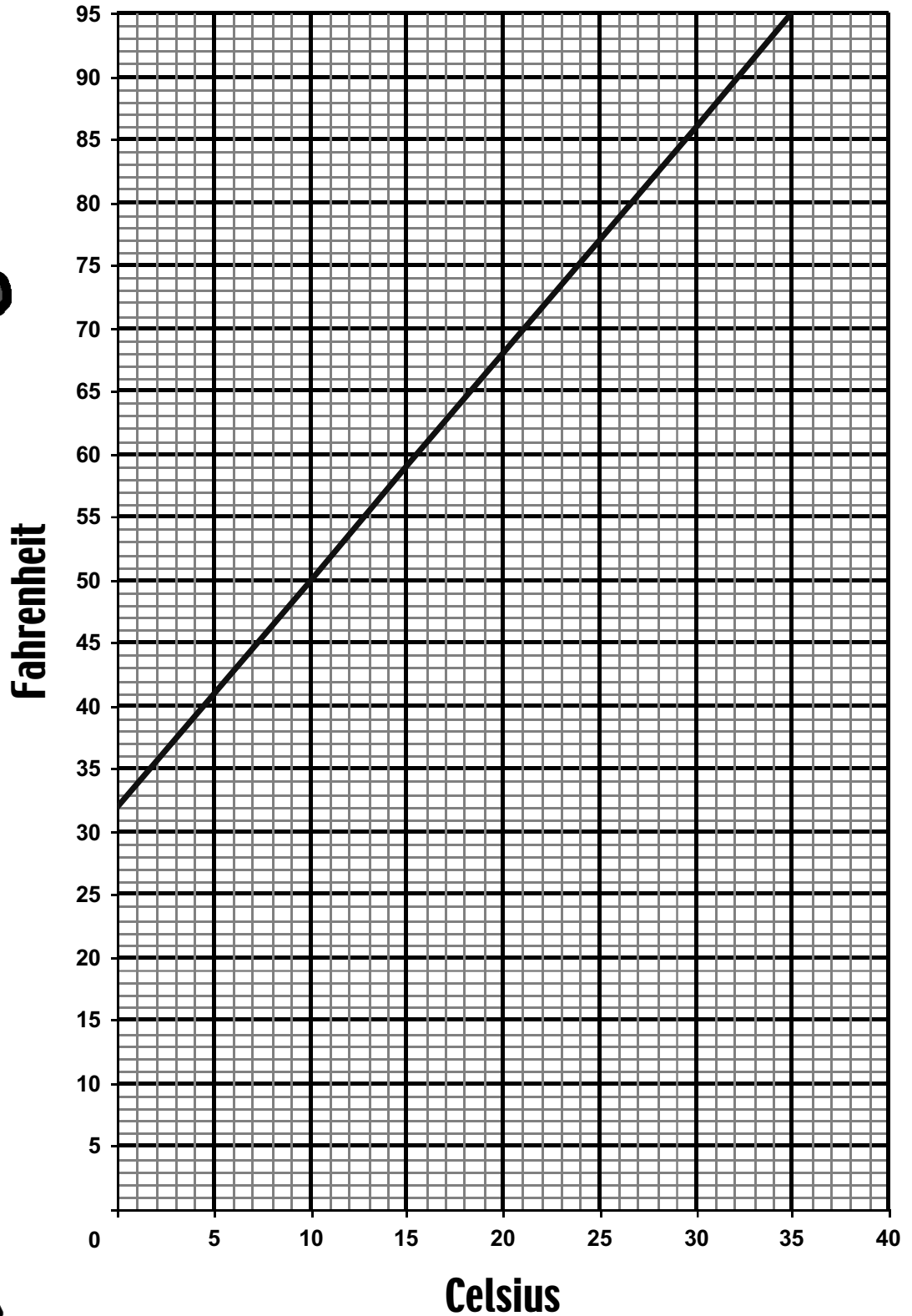
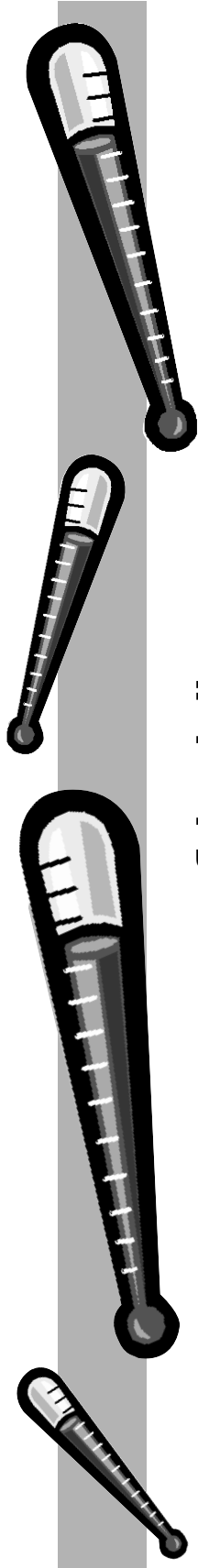
 Show me on the graph where those points are and explain what the numbers in the T-table represent.

 Were you able to perform operations so that the numbers in both columns were equal?

 How did you decide what operations to use?

Name: _____

Fahrenheit vs. Celsius Graph



Fahrenheit vs. Celsius Graph

Teacher Directions

Have students circle all the points on the line graph that have whole numbers for both their Fahrenheit temperature and Celsius temperature. Tell students to choose at least three of those points to compare for the purpose of finding a formula for Fahrenheit/Celsius conversion. Tell students they will be writing those temperatures in the T-tables on the BLM *Finding a Formula for Fahrenheit/Celsius Conversion*. Allow students to discuss the activity with other nearby students for ideas. Tell students they may not need to use all of the T-tables and have them draw more on the back of the BLM if they need more.

Answer Key

The following points should be circled:

(0, 32), (5, 41), (10, 50), (15, 59), (20, 68), (25, 77), (30, 86)

Finding a Formula for Fahrenheit/Celsius Conversion

Write the temperatures represented by the points that you circled on the *Fahrenheit vs. Celsius Graph* in the first T-table below. The first point is given. Look for similarities in the numbers in each column to determine an operation to perform on them so that the values in one column are closer to the values in the other column. Write the operation that you perform in the box at the top of the T-table. Continue performing operations until the values in one column are equal to the values in the other column. If you need more T-tables, write them on the back.

1.	2.	3.	4.
Numbers from Graph	Subtract 32 from F		
F	F	F	F
C	C	C	C
32	0		

5.	6.	7.	8.
F	F	F	F
C	C	C	C

Finding a Formula for Fahrenheit/Celsius Conversion

Teacher Directions

Have students circle all the points on the line graph that have whole numbers for both their Fahrenheit temperature and Celsius temperature. Tell students to choose at least three of those points to compare for the purpose of finding a formula for Fahrenheit/Celsius conversion. Instruct students to write the temperatures in the appropriate places in the first T-table below the graph. Tell students they will be looking for similarities in the numbers in each column and performing operations on them to bring the values in one column equal to the values in the other column. Have the students write the operation that was performed in the box above the T-table and the new numbers that were produced by performing that operation in the columns. Tell them the first operation has been written for them. When students have “equalized” both columns of numbers (i.e. performed operations so that the numbers in both columns are equal), develop the formula for Fahrenheit/Celsius conversion following the directions in the activity.

Answer Key

Answers will vary, however, one possible solution is below.

1.		2.		3.		4.	
Numbers from Graph		Subtract 32 from F		Divide F by 9		Divide C by 5	
F	C	F	C	F	C	F	C
32	0	0	0	0	0	0	0
77	25	45	25	5	25	5	5
41	5	9	5	1	5	1	1
50	10	18	10	2	10	2	2

Example of using the operations above to create a formula for Fahrenheit/Celsius conversion:

$$\begin{aligned}
 F &= C \\
 F - 32 &= C \\
 (F - 32) \div 9 &= C \\
 (F - 32) \div 9 &= C \div 5 \\
 (F - 32) \times 1/9 &= C \times 1/5 \\
 (F - 32) \times 1/9 \times 5 &= C \times 1/5 \times 5 \\
 C &= 5/9(F - 32)
 \end{aligned}$$

(Use Algebra principles to write the formula $F = 9/5C + 32$)