

MathLinks

PROFICIENCY CHALLENGES GRADE 8 SETS 5-8

Proficiency Challenges are sets of interesting, mixed-topic problems. It may take a lot of time to complete each set, so consider doing only one or two parts at a time.

PROFICIENCY CHALLENGE 5

Complete each problem on your own paper. Show all work. Use graph paper if needed.

1. Solve the equation. Check your solution. Show your work.

$$2(x - 3) = 3x + 2 + x$$

2. Explain why the following equation has infinitely many solutions. Use pictures of cups and counters if desired.

$$3(x + 1) = 3 + 3x$$

3. Explain why the following equation has no solutions. Use pictures of cups and counters if desired.

$$3x - 2 = x + 7 + 2x$$

4. Choose an expression from the choices at the right to make each equation true.

Equations

Expressions

a. $3 \square = 3x - 9$

$x - 3$

$x + 3$

$4x - 4$

$4x + 4$

b. $0.6 \square = 0.6x + 1.8$

c. $\frac{3}{4} \square = 12x - 3$

$4x - 16$

$16x - 4$

$4x - 1$

$4x + 1$

5. Deyanara's car can travel $358\frac{3}{4}$ miles with $10\frac{1}{4}$ gallons of gas. How far can the car go with 1 gallon of gas?

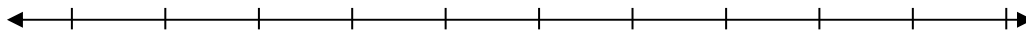
6. Place each number on its correct position on the number line.

$A = 2.5$

$B = -\frac{1}{4}$

$C = -1.75$

$D = \frac{9}{5}$



7. Wally owns a car wash. He charges \$25 for every 2 hours he works.

- Write an equation that models the relationship between the total charge (y) and the number of hours worked (x).
- Graph the relationship. Be sure to label the axes and title your graph.
- Explain how to use your graph to show how much Wally will earn if he works 5 hours.

Name _____

Period _____

Date _____

PROFICIENCY CHALLENGE 6

Complete each problem on your own paper. Show all work. Use graph paper if needed.

1. Put numbers into the boxes to complete each equation with the given number of solutions.

a. An equation with no solutions: $8x - (3x + 2) + x = \square x + \square$

b. An equation with one solution: $8x - (3x + 2) + x = \square x + \square$

c. An equation with infinitely many solutions: $8x - (3x + 2) + x = \square x + \square$

2. A company sells shirts and hats. The shirts regularly cost \$8 and the hats regularly cost \$6. Today shirts are selling for 10% off, and hats are selling for \$1.50 off. Is \$120 enough money for a team to purchase shirts and hats for 10 players? Show your work.

3. Solve for x : $\frac{-1}{4} = \frac{3}{2x}$

4. Zacky says, "two negatives make a positive".

a. Under what conditions is Zacky correct?

b. Under what conditions is Zacky incorrect?

c. Rephrase Zacky's statement so that it is mathematically precise.

5. Gan thinks that the following equation has infinitely many solutions. Is Gan correct? Explain.

$$3.4x + 2.1 = 2(1.7x - 4)$$

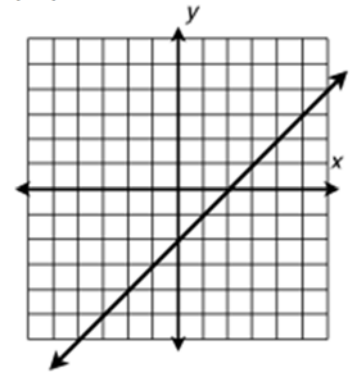
PROFICIENCY CHALLENGE 7

Complete each problem on your own paper. Show all work. Use graph paper if needed.

1. The graph of a function is to the right.

a. Is this function linear? Explain.

b. Which one of the following tables of values (I-IV) could represent this function? Explain your reasoning.



I.

x	y
0	-2
1	-2
2	-2
3	-2
4	-2

II.

X	y
-2	3
-1	4
0	5
-1	6
-2	7

III.

x	y
-2	-4
-1	-3
0	-2
1	-1
2	0

IV.

x	y
0	0
1	1
2	4
3	9
4	16

c. Which one of the tables above represents a function whose graph is NOT a straight line? Explain.

d. Which one of the tables above represents a relationship that is not a function?

2. Daniel and Suzette collected data about how far they move from a starting point after each step. The both let n represent the number of steps taken and D represent the distance (in meters) from the start.

Daniel put his data in the table to the right.

Daniel's Data				
n	0	1	2	3
D	0	1.1	2.2	3.3

Suzette found the following linear equation to model her data:

$$D = 0.5n.$$

a. On a graph paper, draw a vertical axis, label it "Distance from the start" and scale appropriately. Draw a horizontal axis on and label it "step number" and scale appropriately. Give your graph a title.

b. Make a graph of Daniel's data and label it. Then write a linear equation for Daniel's data.

c. Make a graph of Suzette's equation and label it.

d. Who took bigger steps, Daniel or Suzette? Defend your answer using evidence from both the graphs and the equations.

PROFICIENCY CHALLENGE 7 (Continued)

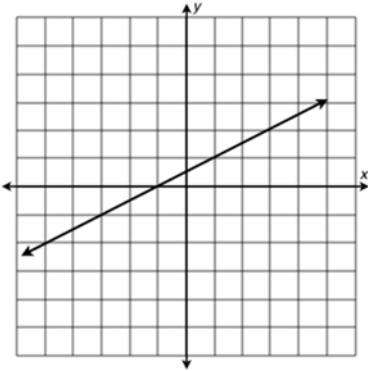
3. The park is 200 meters from Sandy's house. The following describes his most recent trip.
- He walked 50 meters toward the park in 2 minutes. He realized that he left his soccer ball at home.
 - He turned around and walked home at the same speed.
 - He spent 3 minutes looking for the ball.
 - He ran all the way to the park in 2 minutes.
- a. What was Sandy's rate of speed when he ran to the park?
- b. Make a time-distance graph that accurately represents Sandy's trip. Be sure to label your axes and title your graph.
4. Bananas cost \$0.50 per pound. Create a table that shows the relationship between the number of pounds of bananas purchased and the total cost. Graph the values in the table. Label your axes and title your graph.
- a. Find the value of y when $x = 0$. What does this coordinate represent in the context of this problem?
- b. Find the value of y when $x = 1$. What does this coordinate represent in the context of the problem.
5. Examine the table below. Insert a pair of input and output values so that the relationship is NOT a function.

x (input)	-2	0	2	3	
y (output)	3	5	7	8	

PROFICIENCY CHALLENGE 8

Complete each problem on your own paper. Show all work. Use graph paper if needed.

1. Information is given about 5 different linear functions in the table below.

Line A	Line B	Line C								
$y = -2x + 7$	<table border="1" style="margin: auto;"> <tr> <td style="padding: 2px 5px;">x</td> <td style="padding: 2px 5px;">-2</td> <td style="padding: 2px 5px;">0</td> <td style="padding: 2px 5px;">2</td> </tr> <tr> <td style="padding: 2px 5px;">y</td> <td style="padding: 2px 5px;">3</td> <td style="padding: 2px 5px;">4</td> <td style="padding: 2px 5px;">5</td> </tr> </table>	x	-2	0	2	y	3	4	5	
x	-2	0	2							
y	3	4	5							
Line D	Line E									
A linear function whose graph passes through the points $(-3, 8)$ and $(-1, 8)$	To move from one point to another on the graph, count 4 units down and 5 units to the right.									

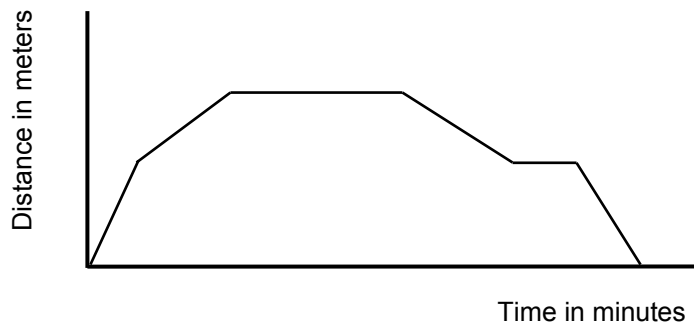
- a. Find the slope of each linear function. Show any calculations you make. Make sure you label each answer.
 - b. Which functions (when graphed) are parallel? Explain why you know these lines are parallel.
 - c. Find the y -intercept for the following lines A, B, and C. Make sure you label each answer.
 - d. Is Line D horizontal or vertical? Explain your reasoning.
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2. Ella thinks that the following equation has infinitely many solutions because the expressions on both sides of the equation are equivalent. Is Ella correct? Explain.

$$4.8x - 4 = 4(1.2x - 1)$$

PROFICIENCY CHALLENGE 8 (Continued)

3. The entry fee to the community fair is \$5. Each ride ticket costs \$0.50.
- Write an equation that models the relationship between the total amount spent (y) and the number of ride tickets purchased (t).
 - Graph the relationship. Be sure to label the axes and title your graph.
 - Is this a linear function? If so, what does the slope of the line represent?
4. A vertical line goes through the point $(-1, 3)$.
- Name another point on this line.
 - What is the equation of this vertical line?
 - Does this equation represent a function of x ?
5. A horizontal line goes through the point $(-4, -5)$.
- Name another point on this line.
 - What is the equation of this horizontal line?
 - Does this equation represent a function of x ?
6. The market is 500 meters from Lando's house. It took him 40 minutes to walk there and back.
- Describe a reasonable trip to the market for Lando based on the graph below. Label and scale the axes appropriately.



- Could the graph of Lando's trip represent a function? Explain.