

8-4 NONROUTINE PROBLEMS

OPEN MIDDLE PROBLEMS

Use any of the integers -9 to 9 at most once in each table below.

Structure:

x	□	□	□	□
y	□	□	□	□

1. Create an input-output table for:

a. any linear function

x				
y				

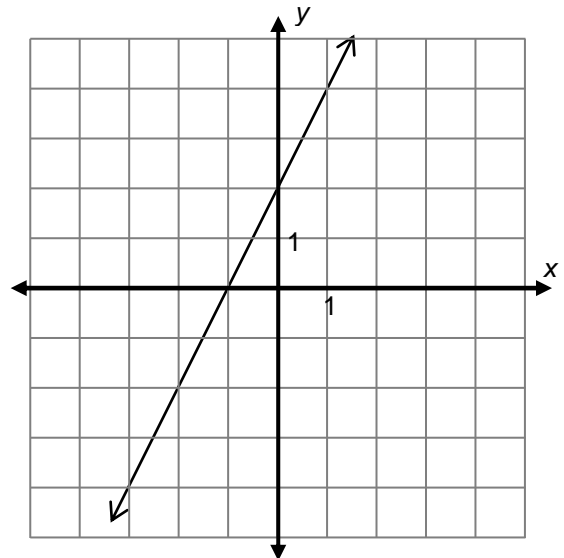
b. any non-linear function

x				
y				

2. For the given graph, create input-output values as directed and graph the new lines.

a. a line that is “steeper” than the pictured line.

x				
y				



b. a line that is “flatter” than the pictured line.

x				
y				

3. Can you create an input-output table that does not represent a function? Explain.

x				
y				

IS IT A FUNCTION?


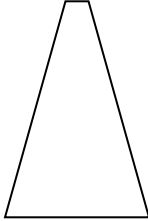
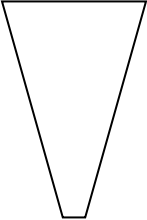
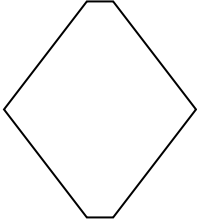
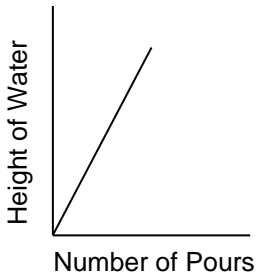
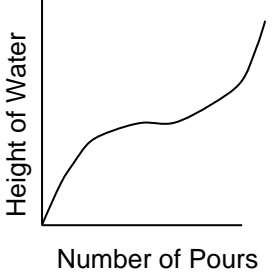
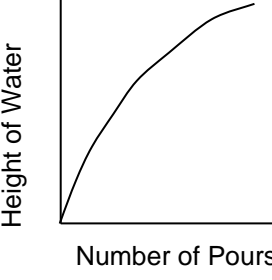
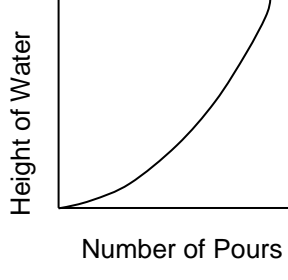
Below are different representations of sets of ordered pairs. Circle the ones that could represent functions. If it is **not** a function, change it to represent one.

<p>1.</p> <table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th style="padding: 2px 10px;">x</th> <th style="padding: 2px 10px;">y</th> </tr> </thead> <tbody> <tr> <td style="padding: 2px 10px;">1</td> <td style="padding: 2px 10px;">-2</td> </tr> <tr> <td style="padding: 2px 10px;">2</td> <td style="padding: 2px 10px;">-2</td> </tr> <tr> <td style="padding: 2px 10px;">3</td> <td style="padding: 2px 10px;">-2</td> </tr> <tr> <td style="padding: 2px 10px;">4</td> <td style="padding: 2px 10px;">-2</td> </tr> </tbody> </table>	x	y	1	-2	2	-2	3	-2	4	-2	<p>2.</p>	<p>3.</p>
x	y											
1	-2											
2	-2											
3	-2											
4	-2											
<p>4.</p>	<p>5.</p>	<p>6.</p> <p style="text-align: center;">(6,3), (3,6), (-3, -6), (-6, -3)</p>										
<p>7.</p> <p style="text-align: center;">{(4,3), (4,4), (4,5), (4,6)}</p>	<p>8.</p>	<p>9.</p> <table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th style="padding: 2px 10px;">x</th> <th style="padding: 2px 10px;">y</th> </tr> </thead> <tbody> <tr> <td style="padding: 2px 10px;">5</td> <td style="padding: 2px 10px;">4</td> </tr> <tr> <td style="padding: 2px 10px;">5</td> <td style="padding: 2px 10px;">4</td> </tr> <tr> <td style="padding: 2px 10px;">6</td> <td style="padding: 2px 10px;">7</td> </tr> <tr> <td style="padding: 2px 10px;">7</td> <td style="padding: 2px 10px;">8</td> </tr> </tbody> </table>	x	y	5	4	5	4	6	7	7	8
x	y											
5	4											
5	4											
6	7											
7	8											
<p>10.</p>	<p>11.</p> <table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th style="padding: 2px 10px;">x</th> <th style="padding: 2px 10px;">y</th> </tr> </thead> <tbody> <tr> <td style="padding: 2px 10px;">-2</td> <td style="padding: 2px 10px;">1</td> </tr> <tr> <td style="padding: 2px 10px;">2</td> <td style="padding: 2px 10px;">4</td> </tr> <tr> <td style="padding: 2px 10px;">-2</td> <td style="padding: 2px 10px;">3</td> </tr> <tr> <td style="padding: 2px 10px;">0</td> <td style="padding: 2px 10px;">-6</td> </tr> </tbody> </table>	x	y	-2	1	2	4	-2	3	0	-6	<p>12.</p> <p style="text-align: center;">(4,3), (2,5), (1,8), (0,3)</p>
x	y											
-2	1											
2	4											
-2	3											
0	-6											

POURING WATER

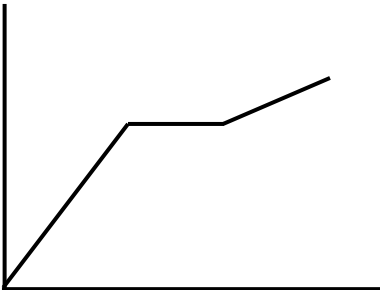
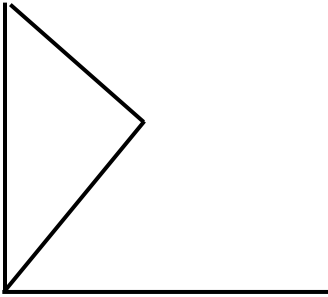
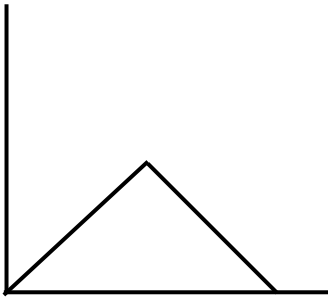
Imagine pouring water into each of these containers at a constant rate.

- Match each container with an appropriate graph below.
- Write one or two sentences to justify each choice.

<p>1. Container 1</p> <div style="text-align: center; margin: 10px 0;">  </div> <p>Graph: _____ Explain: _____</p>	<p>2. Container 2</p> <div style="text-align: center; margin: 10px 0;">  </div> <p>Graph: _____ Explain: _____</p>		
<p>3. Container 3</p> <div style="text-align: center; margin: 10px 0;">  </div> <p>Graph: _____ Explain: _____</p>	<p>4. Container 4</p> <div style="text-align: center; margin: 10px 0;">  </div> <p>Graph: _____ Explain: _____</p>		
<p>A.</p> <div style="text-align: center;">  </div>	<p>B.</p> <div style="text-align: center;">  </div>	<p>C.</p> <div style="text-align: center;">  </div>	<p>D.</p> <div style="text-align: center;">  </div>

RUNNING STORIES

Create stories about walking or running that each graph could represent. If the situation is not possible, explain. Include appropriate scales if numbers help to describe the story.

Graph	Story
<p>A.</p> <div style="display: flex; align-items: center;"> <div style="writing-mode: vertical-rl; transform: rotate(180deg); margin-right: 10px;">Distance From Home</div>  </div> <p style="text-align: center; margin-top: 10px;">Time</p>	
<p>B.</p> <div style="display: flex; align-items: center;"> <div style="writing-mode: vertical-rl; transform: rotate(180deg); margin-right: 10px;">Distance From Home</div>  </div> <p style="text-align: center; margin-top: 10px;">Time</p>	
<p>C.</p> <div style="display: flex; align-items: center;"> <div style="writing-mode: vertical-rl; transform: rotate(180deg); margin-right: 10px;">Distance From Home</div>  </div> <p style="text-align: center; margin-top: 10px;">Time</p>	

MIXED PROBLEMS

1. The table below represents a function where x is the input value and y is the output value.

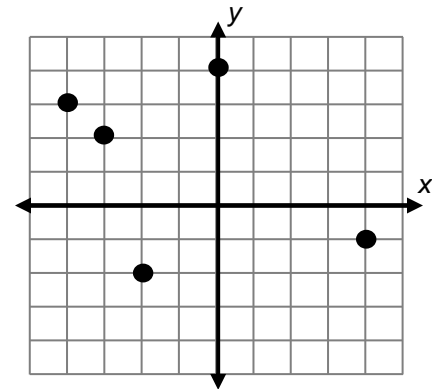
x	-3	-2	0	2
y	7	5	1	-3

Select all ordered pairs that could be included in the table so that it remains a function?

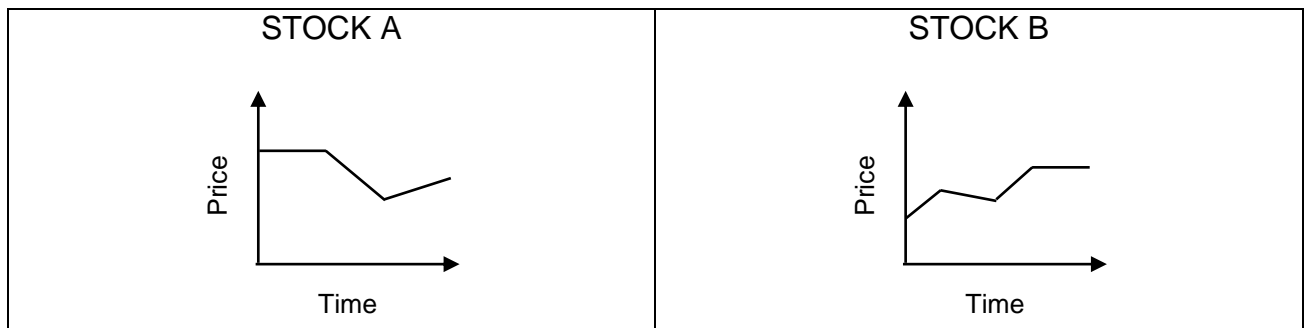
- a. (0, 0) b. (5, -2) c. (1, 1)
 d. (2, 3) e. (7, 0) f. (-3, 4)

2. The graph represents y as a function of x . Which additional point can be plotted so that the graph continues to represent y as a function of x ?

- a. (0,1) b. (1,0) c. (4,2) d. (-2, 4)



3. The graphs below show the prices of two stocks during one day.



- a. Make two comparisons from the graphs.
- b. If you were to recommend one of the stocks, which one would you say is doing better? Explain.

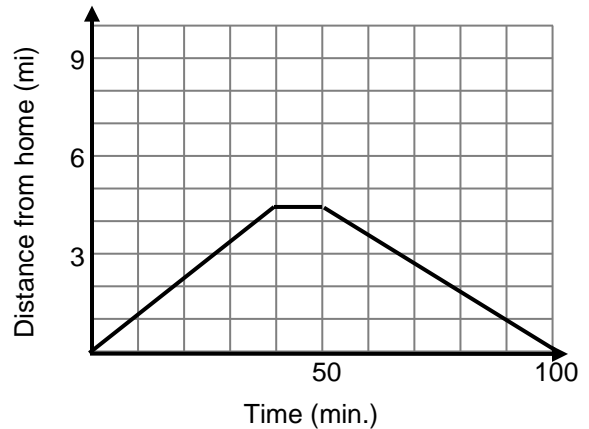
MIXED PROBLEMS
Continued

4. Determine which equations define y as a linear function of x , and which equations define y as a non-linear function of x . Consider using a table of values or a graphing calculator.

Equation	Linear Function	Non-Linear Function
$y = 1.2x^2$		
$2y = x$		
$x + y = 7$		
$y = 4x + 3^2$		
$y = 4 + 3x^2$		
$y = 2x^3 - 1$		
$y = \frac{x}{5}$		

5. The graph shows a runner's distance from home over time.

Based on the graph, determine whether each statement is true or false.



- a. The runner's distance from home is increasing between 40 minutes and 50 minutes.
- b. The runner's distance from home is increasing from 10 minutes to 40 minutes.
- c. The runner's distance from home is increasing from 50 minutes to 100 minutes.
- d. The runner ran at a constant speed the entire time.

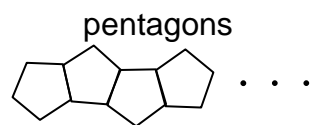
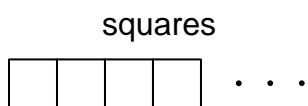
FROM THE MATH OLYMPIAD

1. A cricket chirps 6 times every 8 seconds. At that rate, how many times does the cricket chirp in 2 minutes?

2. If 4 people can paint 2 fences in 5 hours, how many hours in all will it take for 8 people to paint 8 fences?

3. Suppose that toothpicks are used to make rows of 100 figures. There is one toothpick per side, and the first 4 figures of each pattern are pictured below.

How many toothpicks are needed for each row of shapes?



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