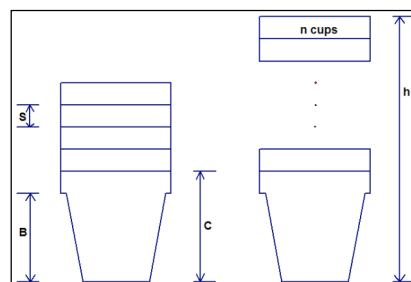


**TASK 2.2.2: DESCRIBE STACKING CUPS****Solutions**

Make a scatter plot of the data. Write a symbolic function rule and a verbal description of the situation.

1.

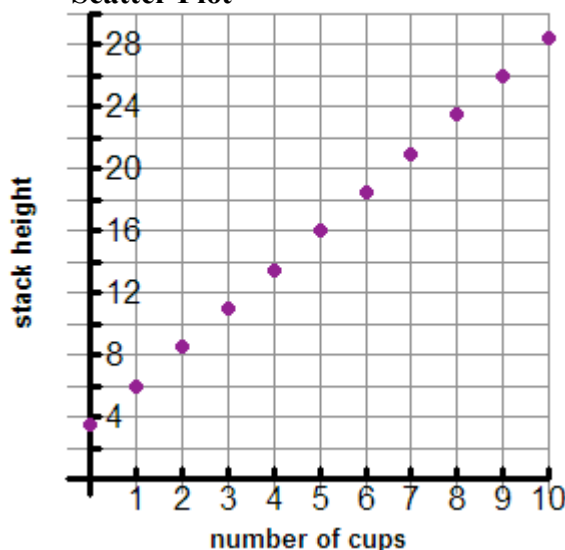


**Table**

Number of Cups	Height
0	3.5
1	6.0
2	8.5
3	11.0

Annotations: On the left, three '1' labels with arrows point to the rows for 1, 2, and 3 cups. On the right, three '2.5' labels with arrows point to the vertical distance between the rows for 0 to 1, 1 to 2, and 2 to 3 cups.

**Scatter Plot**



- Function rule:**  $h = 2.5n + 3.5$
- Verbal description:** The height of a stack of cups has a base height of 3.5 cm and for each cup added to the stack, the height increases by 2.5 cm.
- What are the coordinates of the y-intercept? What does the y-intercept mean with respect to the situation?  $(0, 3.5)$  The height of the base of one cup without the stick-up portion.
- Compare how the rate of change in your table is represented as the slope on the graph and by words in your verbal description.  
**Graph:** To move from one point to the next point, move 1 unit horizontally to add a cup and 2.5 cm vertically to increase the height.  
**Verbal Description:** The height increases by 2.5 cm for each cup added to the stack.

**Teacher Note:** Encourage participants to work finite differences on the table.

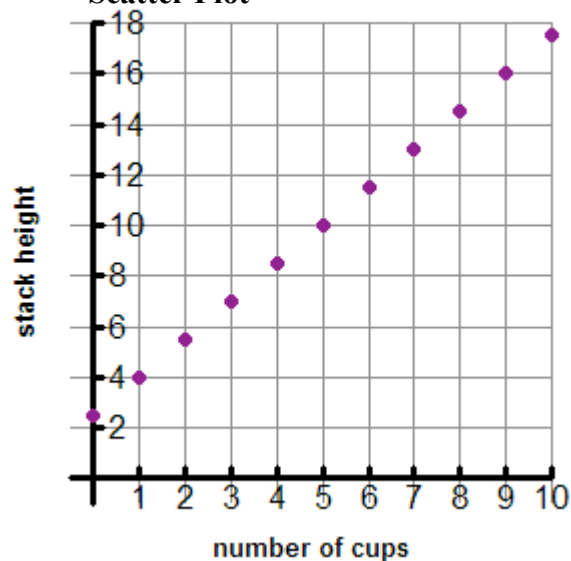
Algebra I: Strand 2. Linear Functions; Topic 2. Formalizing Slope and y-Intercept; Task 2.2.2

2.

**Table**

Number of Cups	Height
0	2.5
2	5.5
4	8.5
6	11.5

**Scatter Plot**



- Function rule:**  $h = 1.5n + 2.5$
- Verbal description:** The height of a stack of cups has a base height of 2.5 cm and for each cup added to the stack the height increases by 1.5 cm.
- What are the coordinates of the y-intercept? What does the y-intercept mean with respect to the situation?  $(0, 2.5)$ ; The height of the base of one cup without the stick-up portion.
- Compare how the rate of change in your table is represented as the slope on the graph and by words in your verbal description.  
**Graph:** To move from one point to the next point, move 1 unit horizontally to add a cup and 1.5 cm vertically to increase the height.  
**Verbal Description:** The height increases by 1.5 cm for each cup added to the stack.

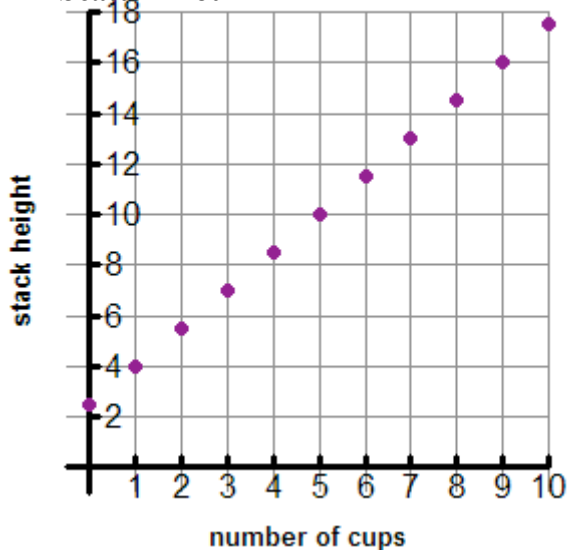
3.

Table

Number of Cups	Height
0	2.5
3	7.0
6	11.5
9	16.0

Diagrammatic annotations: Three arrows on the left point from the 'Number of Cups' column to the rows (0, 3), (3, 7.0), and (6, 11.5). Three arrows on the right point from the 'Height' column to the rows (0, 2.5), (3, 7.0), and (6, 11.5).

Scatter Plot

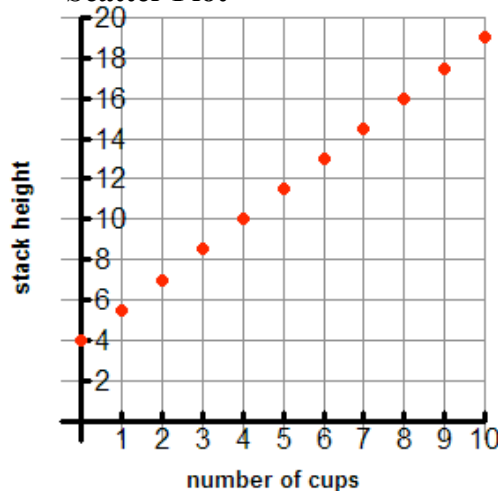


- a. **Function rule:**  $h = 4.5n + 2.5$
- b. **Verbal description:** The height of a stack of cups has a base height of 2.5 cm and for each cup added to the stack, the height increases by 4.5 cm.
- c. How did you use the scatter plot to create the verbal description? Identify where the function intersects the y-axis. This is the base height. Select two points. Determine the ratio from the first point to the second point of the vertical distance to the horizontal distance. This is the increase in height for each cup added.
- d. What are the coordinates of the y-intercept? What does the y-intercept mean with respect to the situation?  $(0, 2.5)$ ; The height of the base of one cup without the stick-up portion.
- e. What is the slope? Explain how the slope helped you to complete the table.  
 $4.5 \frac{\text{cm}}{\text{cup}}$ ; Identify where the function intersects the y-axis. This is the y-intercept. Then, to find the value of the dependent value that corresponds to 3 cups, multiply the slope by 3 and add it to the height of 0 cups (y-intercept). To find the dependent height value that corresponds to 6 cups, multiply the slope by 3 and add it to the height for 3 cups. Do the same for 9 cups.

4.

**Table**

Number of Cups	Height
2	7
6	13
10	19
14	25

**Scatter Plot**

a. Function **Rule:**  $h = \frac{3}{2}n + 4$

b. **Verbal description:** The height of a stack of cups has a base height of 4 cm and for each set of 2 cups added to the stack the height increases by 3 cm.

c. How did you use the scatter plot to create the verbal description? Identify where the function intersects the y-axis. This is the base height. Select two points. Determine the ratio from the first point to the second point of the vertical distance to the horizontal distance. This is the increase in height for each cup added.

d. What are the coordinates of the y-intercept? What does the y-intercept mean with respect to the situation?  $(0, 4)$ ; the height of the base of one cup without the stick-up portion.

e. What is the slope? Explain how the slope helped you to complete the table.

$\frac{3}{2} \frac{\text{cm}}{\text{cup}}$ ; Identify where the function intersects the y-axis. This is the y-intercept.

Then, to find the value of the dependent value that corresponds to 2 cups, multiply the slope by 2 and add it to the height of 0 cups (y-intercept). To find the dependent height value that corresponds to 6 cups, multiply the slope by 4 and add it to the height for 2 cups. To find the dependent height value that corresponds to 10 cups, multiply the slope by 4 and add it to the height for 6 cups. To find the dependent height value that corresponds to 14 cups, multiply the slope by 4 and add it to the height for 10 cups.

**Teaching notes**

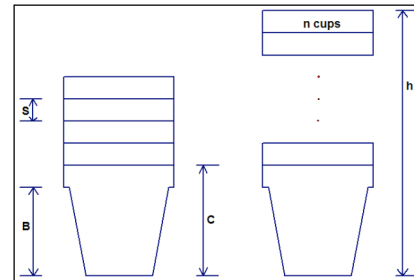
As in Task #1, each of these problems have a different focus.

*Algebra I: Strand 2. Linear Functions; Topic 2. Formalizing Slope and y-Intercept; Task 2.2.2*

- The first one provides a complete table, with  $x$ 's starting at 0 and increasing by 1.
- The second problem provides students a complete table, with the  $x$ 's increasing by 2.
- The third and fourth give a scatter plot with a  $y$ -intercept and asks for the corresponding table, rule, etc.

**TASK 2.2.2: DESCRIBE STACKING CUPS**

Make a scatter plot of the data. Write a symbolic function rule and a verbal description of the situation.



1.

**Table**

Number of Cups	Height
0	3.5
1	6.0
2	8.5
3	11.0

**Scatter Plot**

- a. **Function rule:**
- b. **Verbal description:**
- c. What are the coordinates of the  $y$ -intercept? What does the  $y$ -intercept mean with respect to the situation?
- d. Compare how the rate of change in your table is represented as slope on the graph and by words in your verbal description.

*Algebra I: Strand 2. Linear Functions; Topic 2. Formalizing Slope and y-Intercept; Task 2.2.2*

2.

**Table**

Number of Cups	Height
0	2.5
2	5.5
4	8.5
6	11.5

**Scatter Plot**



a. **Function rule:**

b. **Verbal description:**

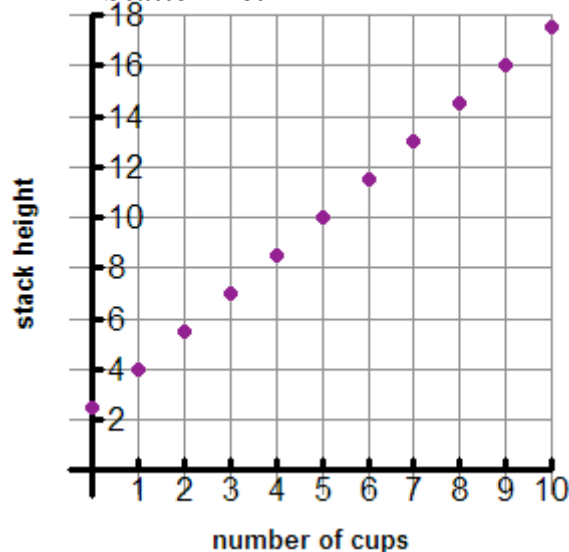
c. What are the coordinates of the  $y$ -intercept? What does the  $y$ -intercept mean with respect to the situation?

d. Compare how the rate of change in your table is represented as slope on the graph and by words in your verbal description.

3. **Table**

Number of Cups	Height

**Scatter Plot**



a. **Function rule:**

b. **Verbal description:**

c. How did you use the scatter plot to create the verbal description?

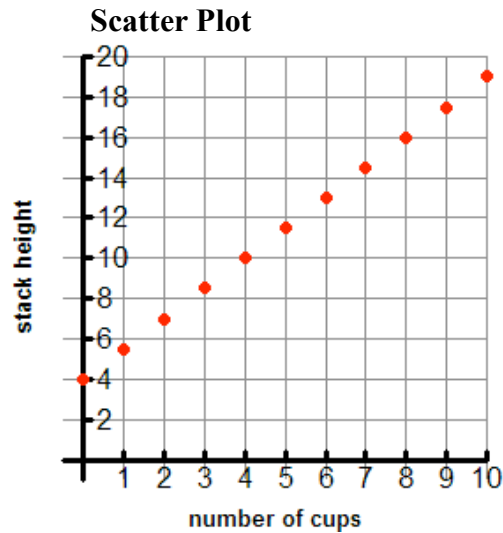
d. What are the coordinates of the  $y$ -intercept? What does the  $y$ -intercept mean with respect to the situation?

*Algebra I: Strand 2. Linear Functions; Topic 2. Formalizing Slope and y-Intercept; Task 2.2.2*

- e. What is the slope? Explain how the slope helped you to complete the table.

4. **Table**

Number of Cups	Height



- a. **Function rule:**
- b. **Verbal description:**
- c. How did you use the scatter plot to create the verbal description?
- d. What are the coordinates of the  $y$ -intercept? What does the  $y$ -intercept mean with respect to the situation?
- e. What is the slope? Explain how the slope helped you to complete the table.