# SLOPE INTERCEPT

## Tower Activity

This activity is designed for students to complete BEFORE learning about slope-intercept form. The hands-on, cooperative learning activity introduces students to the notion of slope-intercept form and shows them how it can be used in a real-life situation. You will be impressed with how well the students will work toward finding a solution to the challenging problems in the Tower Activity.

**Materials:**

- 1 ruler per group (must have centimeters)
- 1 small (3x3-inch) piece of cardboard per group
- Styrofoam cups (or any disposable cups that fit into each other and have *large* lips) -- Label these cups with a "U"
- Plastic cups (or any disposable cups that fit into each other and have *small* lips) -- Label these cups with a "V"
- Empty soda cans
- Crayons, colored pencils, or markers

*You need six of each type of cup/can *per group*!

**What Students Will Do**

Students will determine the height of one Styrofoam cup by placing the cardboard on top of the cup and measuring with a ruler. They will place another cup on top of it and measure again, continuing until there are five cups on top of the original. The activity will ask students to make predictions about how many cups would be needed to create an 8672cm tower, as well as how tall a 1000-cup tower would be. It will lead them through determining the slope and yintercept, and students will be able to test their predictions by using substitution with the equations that they create. Of course, they will graph results, as well.

**Teacher Preparation**

Label all Styrofoam cups with a "U" and plastic cups with a "V". (These cups are referred to as "U-cups" and "V-cups" throughout the activity.) Place six Ucups, six V-cups, six soda cans, a few crayons, a small piece of cardboard, and a ruler (with centimeters) into a bag for each group. Assign students to groups of 2-4, preferably with one strong student in each group. This is a low-maintenance activity for teachers. Walk around and assist students when necessary. Be sure to demonstrate how to measure the cups before they begin the activity.

# TOWER ACTIVITY

Name: _____

Period: _____ Date: _____

In honor of your Uncle Harold, cup-stacking champion of Southeast North Dakota, you decide to make a tower of cups. Begin with one "U" cup.

1. Before stacking any cups, how many cm tall do you predict your tower would be if you used 1,000 "U" cups?

   _____ cm

2. How many cups do you think it would take to create a tower that is 8,672cm tall?

   _____"U" cups

3. Complete the table below by measuring the height of the cup stack, compared to the number of cups <u>on top of the base cup</u>.

**"U" Cup Tower**

| # of cups on top of base (x) | 0 | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|---|
| Total height of stack (y) | | | | | | |

4. Plot the points on the graph provided.

5. What are the first and last points? (0, ___ ) & (5, ___ )

6. Use a colored pencil or crayon to connect these two points with a straight line. Extend this line through the entire graph. (Use the legend at the bottom of the graph to label which color you chose to use.)

7. Find the slope between the two points. Remember that mathematicians call this "m". (Show work!)

   m = _____

8. What does this slope represent? _____ _____ per _____
   # (word) (word)

9. The y-intercept is the y value where the line touches the y-axis. Mathematicians call this "b". What is the y-intercept? _____

10. What is the x value of the y-intercept? _____

11. What rule can you give for the x value of all y-intercepts?

_____

_____

12. Slope-intercept equations are written in the form y = mx + b. Fill in the slope (m) and the y-intercept (b) to obtain the "U-cup Tower" equation. y = _____ x + _____
    m b

13. What letter in your equation represents the number of cups that you use? _____

14. Using the "U-cup Tower" equation, predict how high your tower will be if you use 1000 cups. (Show all work below.)

total tower height: _____

15. Why is this prediction so different than your prediction in #1?

_____

_____

16. What letter in your equation represents the height of your tower? _____

17. Using your "U-cup Tower" equation, predict how many cups you will need to use if you hope to build a tower that is as tall as the 8,672cm-tall Soldiers & Sailors Monument. (Show all work below.)

total # of cups: _____

18. Why do you or don't you believe that this prediction is more accurate than your prediction in #2?

19. Now, take a "V" cup. Study it. What do you predict about the slope of this cup's graph, compared to that of the "U" cup?

20. Why do you believe this will be true?

21. What do you predict about the y-intercept of this cup's graph, compared to that of the "U" cup?

22. Why do you believe this will be true?

23. Complete the table below by measuring the height of the cup stack, compared to the number of cups <u>on top of the base cup</u>.

**V-Cup Tower**

| # of cups on top of base (x) | 0 | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|---|
| Total height of stack (y) | | | | | | |

24. Plot the points on the graph provided.

25. What are the first and last points? (0, ___ ) & (5, ___ )

26. Use a DIFFERENT colored pencil or crayon to connect these two points with a straight line. Extend this line through the entire graph. (Use the legend at the bottom of the graph to label which color you chose to use.)

27. Find the slope between the two points. Remember that mathematicians call this "m". (Show work!)

m = _____

28. What does this slope represent? _____ _____ per _____
(# (word) (word))

29. The y-intercept is the y value where the line touches the y-axis. Mathematicians call this "b". What is the y-intercept? _____

30. Slope-intercept equations are written in the form y = mx + b. Fill in the slope (m) and the y-intercept (b) to obtain the equation. y = _____ x + _____
(m b)

31. Why is this slope similar or different from the slope for the U-cup Tower?

_____

_____

32. Why is this y-intercept similar or different from the y-intercept of the U-cup Tower?

_____

_____

33. If you stack 1000 "U" cups next to 100 "V" cups, which tower will be taller? _____

34. WHY will this tower be taller? _____

_____

35. Using the "V-cup Tower" equation, predict how high your tower will be if you use 1000 cups. Look back to #13-14 for help. (Show all work below.)

total tower height: _____

36. Using your "V-cup Tower" equation, predict how many cups you will need to use if you hope to build a tower that is as tall as the 8,672cm-tall Soldiers & Sailors Monument. (Show all work below.)

total # of cups: _____

In honor of your Uncle Harley, CAN-stacking champion of the southwestern east part of Northwest South Dakota, you decide to make a tower of cans. Begin with one can.

37. Before stacking any cans, how many cm tall do you predict your tower would be if you used 1,000 cans? (Use the U Tower & V Tower heights in #14 & #35 to help your prediction.)

_____ cm

38. Why will this answer be much different than your answers for the U & V Tower heights?

_____

_____

39. How many cans do you think it would take to create a tower that is 8,672cm tall?

_____ cans

40. Complete the table below by measuring the height of the cup stack, compared to the number of cans <u>on top of the base can</u>.

**CAN Tower**

| # of cans on top of base (x) | 0 | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|---|
| Total height of stack (y) | | | | | | |

41. Plot the points on the graph provided.

42. What are the first and last points? (0, ___ ) & (5, ___ )

43. Use a different colored pencil or crayon to connect these two points with a straight line. Extend this line through the entire graph. {Warning: your points may go off the graph! Just plot whatever fits.} (Use the legend at the bottom of the graph to label which color you chose to use.)

44. Find the slope between the two points. Remember that mathematicians call this "m". (Show work!)

m = _____

45. The y-intercept is the y value where the line touches the y-axis. Mathematicians call this "b". What is the y-intercept? _____

46. Slope-intercept equations are written in the form y = mx + b. Fill in the slope (m) and the y-intercept (b) to obtain the Can Tower equation. y = _____ x + _____
    m b

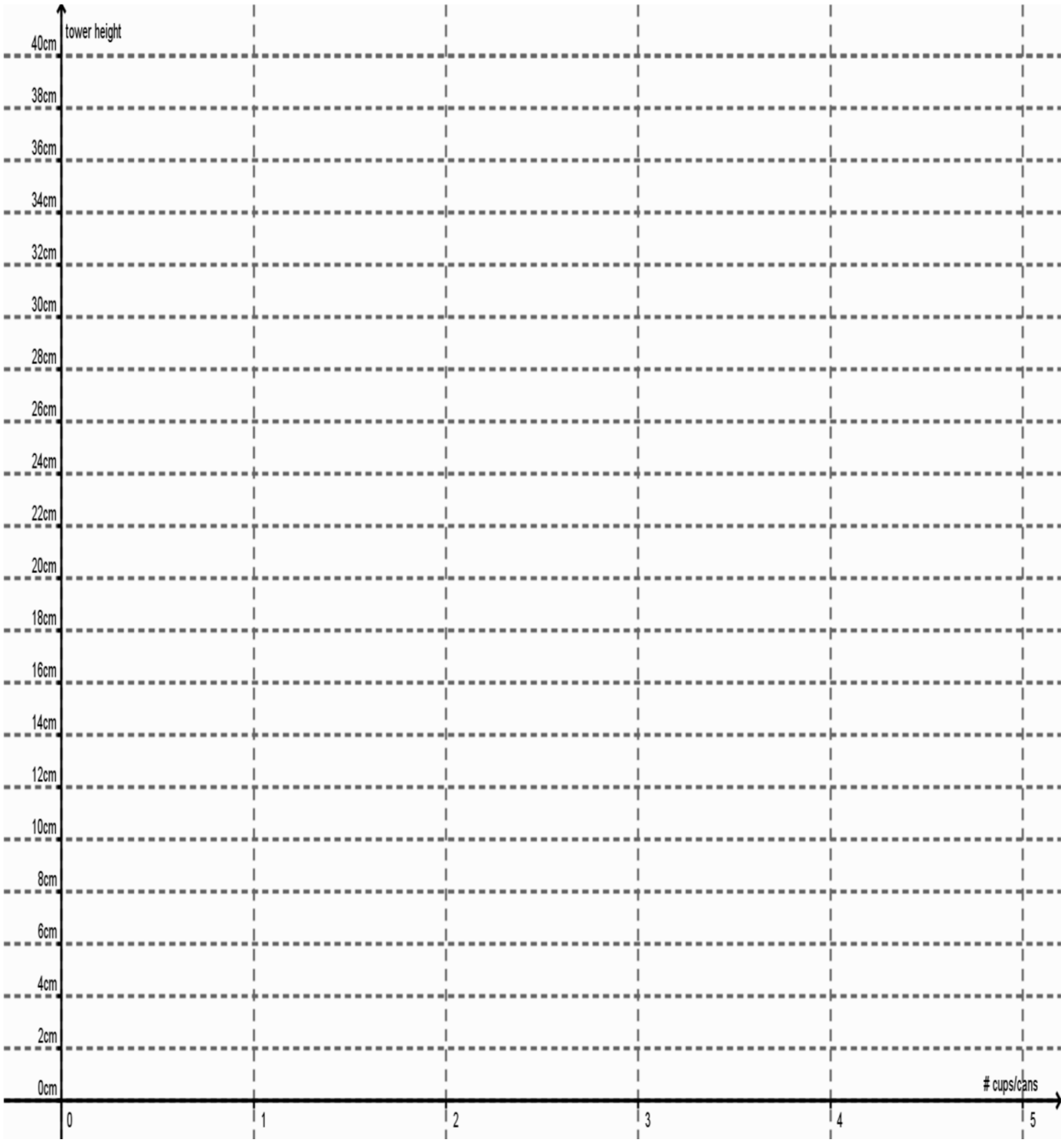
47. Using the "Can Tower" equation, predict how high your tower will be if you use 1000 cups. Look back to #13-14 & #35 for help. (Show all work below.)

total tower height: _____

48. Using your "Can Tower" equation, predict how many cups you will need to use if you hope to build a tower that is as tall as the 8,672cm-tall Soldiers & Sailors Monument. (Show all work below.)

total # of cups: _____

# TOWER Data




**COLOR KEY** : (Fill in each circle with the color that you used to represent each data set.)

◎ = "U" Tower

◎ = "V" Tower

◎ = "Can " Tower