

## Answer Key – Patterns

Place the plus sign on the hundreds board so that five numbers are displayed.

- In the table below, write three things about the numbers that are displayed within the plus sign.

FIVE NUMBERS DISPLAYED	THREE OBSERVATIONS	SUM OF FIVE NUMBERS
13, 22, 23, 24, 33	<p>[Observations will vary but may include:</p> <ul style="list-style-type: none"> <li>• First number is 20 less than fifth number.</li> <li>• Center number is the mean of the five numbers.</li> <li>• Center number is also the median of the five numbers.</li> <li>• The fourth number is 2 more than the second number.</li> <li>• The sum of the five numbers is a multiple of 5.</li> </ul> <p>Students may make different observations about each set of numbers. For any observation they make, ask if it applies to every group of five numbers. Some observations may not; for instance, students may observe that “every number contains the digit 5” for the set in the last row, but this observation does not apply to every group of five numbers.]</p>	105
27, 36, 37, 38, 47		185
73, 82, 83, 84, 93		415
49, 58, 59, 60, 69		295
45, 54, 55, 56, 65		275

Then, slide the plus sign to a different location on the hundreds board. Repeat four more times, and record your results in the table above.

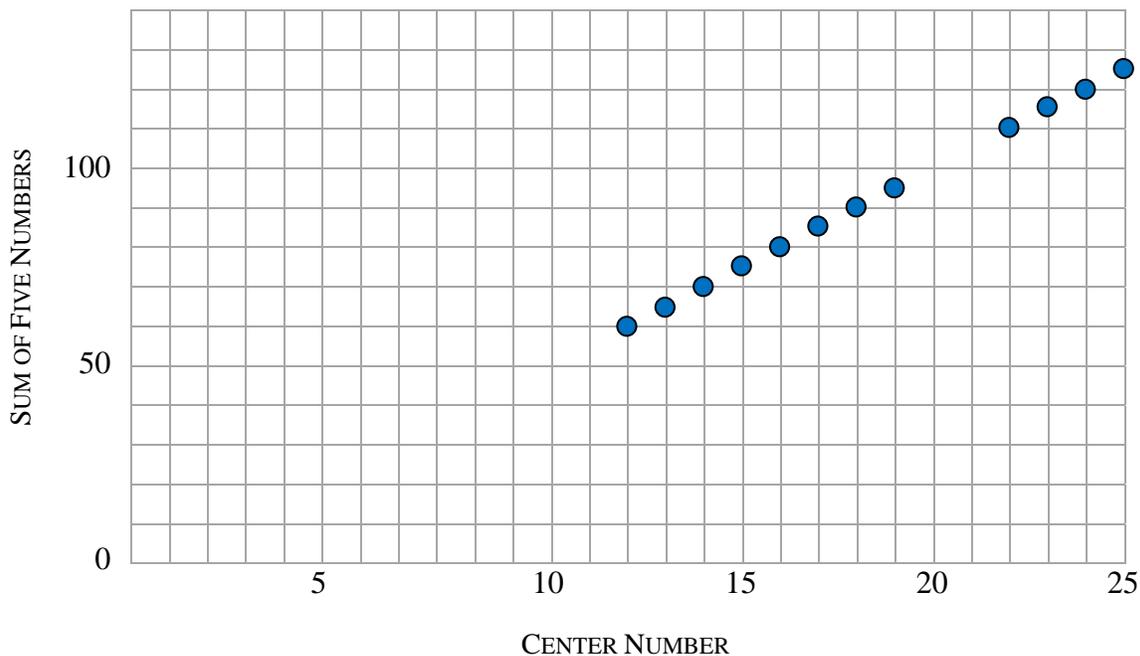
- Is there a pattern to the five numbers displayed? Explain.

Yes. The first number is 10 less than the center number, the second number is 1 less than the center number, the fourth number is 1 more than the center number, and the fifth number is 10 more than the center number.

- Write a sentence that describes what each of the sums has in common.

Each sum is a multiple of 5. Further, the sum of the five numbers is equal to five times the center number.

4. On the graph below, plot the center number on the horizontal axis, and plot the sum of the five numbers on the vertical axis.



Describe the results that appear in the graph.

The points on the graph appear to form a straight line. The slope of the line is 5, because the sum of the five numbers increases by 5 each time the center number increases by 1.

5. Numbers next to one another are called *consecutive numbers*. For example, 52 and 53 are consecutive numbers. When you move the plus sign one unit to the right, the center numbers are consecutive numbers.

Place the plus sign on the board, and note the sum of the five numbers. Then, slide the plus sign one unit to the right — that is, the center numbers of the two locations should be consecutive numbers. How does the sum of the five numbers compare when the center numbers are consecutive?

When the center numbers are consecutive, the sum of the five numbers differs by 5.

6. Does your rule from Question 5 work when the center numbers are consecutive numbers like 19 and 20 or 31 and 32? Why or why not?

No. The plus sign cannot display five numbers when the center number has units digit 0 or 1.

7. Consider the shapes below. If these shapes were placed on the hundreds board, what patterns would you observe?

Use the area below to record your observations. Remember to search for patterns that work anywhere on the hundreds board. Record your conclusions after your investigation.



The displayed numbers are consecutive.  
The sum of the two numbers is 1 more than twice the smaller number.



The bottom number is 10 more than the top number.  
The sum of the two numbers is 10 more than twice the smaller number.