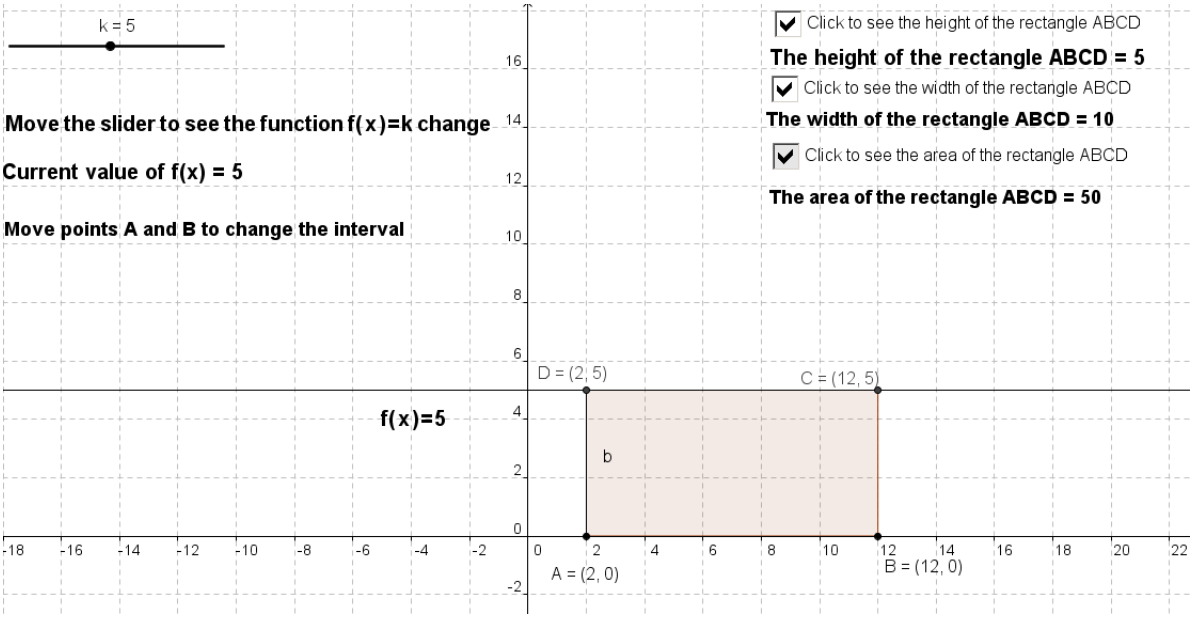
Student Activity: To investigate the Average Value of a Constant Function

Use in connection with the interactive file, 'Average Value 1', on the Student's CD.



1. In the interactive file, move the slider *k*, so that f(x) = 5 and move the points, A to (2, 0) and B to (12, 0).
   a. Find the height of the rectangle ABCD.

   b. Find the width of the rectangle ABCD.

   c. Find the area of the rectangle ABCD.

   d. Using integration, find the area between f(x) = 5 and the x-axis in the interval [2, 12].

   e. What do you notice about the area of the rectangle ABCD and the area between the function f(x) = 5 and the x-axis?

   f. What is the average value of f(x) = 5 in the interval [2, 12]? Hint: Check the values of f(x) for different values of x.

2.

a. What is the average value of the function f(x) = k in the interval [A, B]?

b. Let *a* be equal to the x co-ordinate of A and *b* be equal to the x co-ordinate of B. Write the area of the rectangle ABCD in the interactive file in terms of the average value of the function f(x) = k, *a* and *b*.

c. Write the area of ABCD in the interactive file in terms of the integral of f(x) = k, *a* the x co-ordinate of A and *b* the x co-ordinate of B.

d. Given that the answers to **b.** and **c.** both give the area of the rectangle ABCD, when f(x) = k and the interval is [A, B], derive a formula for the average value of f(x) = k in the interval [A, B]?

3. Find the integral of f(x) = 8 in the interval [2, 7]. Hence find the average value of the function f(x) = 8 in the interval [2, 7].

4. Find the average value of the function f(x) = 5 in the interval [1, 9] by two different methods. Show your calculations.

5. Find the average value of the function f(x) = 5 in the interval [1, 12] by two different methods. Show your calculations.

6. Find the average value of the function f(x) = k in the interval [1, 12] by two different methods. Show your calculations.

7. Given that the average value of the function f(x) = k in the interval [1, 5] is equal to 12, find k. Show your calculations.

8. Given that the average value of the function f(x) = k in the interval [2, 10] is equal to 12, find k. Show your calculations.

9. Explain in your own words what is meant by the average value of the function f(x) = k.