

7-6 The Natural Base, e

In this Exploration, you will investigate the expression $\left(1 + \frac{1}{n}\right)^n$.

1. Evaluate $\left(1 + \frac{1}{n}\right)^n$ for $n = 1$.
2. Evaluate $\left(1 + \frac{1}{n}\right)^n$ for $n = 2$.
3. You can use your calculator to help you evaluate the expression for larger values of n . First enter the expression as the function **Y1**. Then press **2nd** **MODE** to return to the home screen. Press **VAR**, scroll right to **Y-VARS**, select **1:Function**, and choose **1:Y1**. Now you can evaluate the function for any input by entering a value in parentheses as shown.
4. Use your calculator to evaluate the expression for $n = 10,000$, $n = 100,000$, and $n = 1,000,000$.



THINK AND DISCUSS

5. **Describe** what happens to the value of the expression as n gets larger.
6. **Explain** what you think the graph of the function $f(n) = \left(1 + \frac{1}{n}\right)^n$ would look like.

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1. Evaluate $\left(1 + \frac{1}{n}\right)^n$ for $n = 1$. **2**
2. Evaluate $\left(1 + \frac{1}{n}\right)^n$ for $n = 2$. **2.25**
3. You can use your calculator to help you evaluate the expression for larger values of n . First enter the expression as the function **Y1**. Then press **2nd** **MODE** to return to the home screen. Press **VAR**, scroll right to **Y-VARS**, select **1:Function**, and choose **1:Y1**. Now you can evaluate the function for any input by entering a value in parentheses as shown.
4. Use your calculator to evaluate the expression for $n = 10,000$, $n = 100,000$, and $n = 1,000,000$.



THINK AND DISCUSS

5. **Describe** what happens to the value of the expression as n gets larger.
6. **Explain** what you think the graph of the function $f(n) = \left(1 + \frac{1}{n}\right)^n$ would look like.
 4. **2.718145927; 2.718268237; 2.718280469**
 5. **The value of the expression approaches 2.7182818**
 6. **The graph would curve up and right and have a horizontal asymptote at $y = 2.7182818$**