You invest $10,000 in an account that pays 5% interest each year. Find the number of years it will take your investment to reach $100,000. Round to the nearest tenth.

$\frac{100,000}{10000} = \frac{10,000}{10000}(1.05)^t$

$10 = 1.05^t$

$\log_{1.05}(10) = t$

$100 + 5 = 105\%$

$b = 1.05$

$t = 47.2$ yrs

The population of a city is decreasing 2.5% each year.

$100 - 2.5 = 97.5\%$

The population in 2005 was 160,000. In how many years, to the nearest hundredth, will it take for the population to reach 120,000?

$\frac{120,000}{160,000} = \frac{160,000}{160000}(.975)^t$

$.75 = (.975)^t$

$\log_{.975}(.75) = t$

$t = 11.36$ yrs

You invest $125,000 in an account that pays 8% interest compounded continuously.

$y = Pe^{rt}$

Find the number of years, to the nearest hundredth, it will take to reach $1,000,000.

$1,000,000 = 125,000e^{.08t}$

$8 = e^{.08t}$

$\ln 8 = .08t$

$t = \frac{\ln 8}{.08}$

25.99 yrs

You invest in an account that pays 6% annual interest compounded monthly.

How many years, to the nearest tenth, will it take to double your investment?

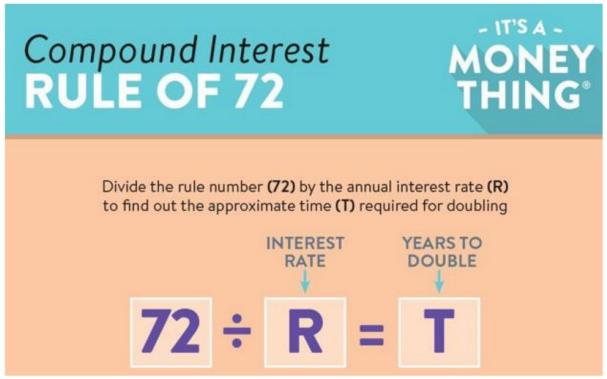
$A = P\left(1 + \frac{r}{n}\right)^{nt}$

$2 = 1\left(1 + \frac{.06}{12}\right)^{12t}$

$2 = (1.005)^{12t}$

$\log_{1.005}(2) = 12t$

$t = 11.6$ yrs



Hwk #10

Practice Sheet:
Solving exponential and logarithmic equations

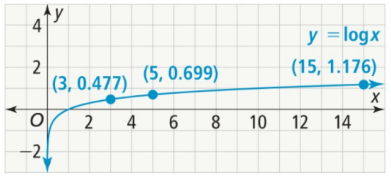
You are now prepared for Quiz #2: Sec 6-1 to 6-3

Page 157 Student Companion

EXPLORE & REASON

Answer Parts A, B, and C.

Look at the graph of $y = \log x$ and the ordered pairs shown.



A. Complete the table shown.

x	3	5	15
$\log x$	0.477	0.699	1.176

x	3	5	15
$\log x$	0.477	0.699	1.176

B. Look for Relationships What is the relationship between the numbers 3, 5, and 15? What is the relationship between the logarithms of 3, 5, and 15?

15 is the product of 3 and 5:

$3 \cdot 5 = 15$

$\log 3 + \log 5 = \log 15$

$\log 3 \cdot 5 = \log 3 + \log 5$

The log of the product of 3 and 15 equals the sum of the individual logs.

x	3	5	15
$\log x$	0.477	0.699	1.176

C. What is your prediction for the value of log 45? log 75? Explain.

$\log 45 = \log 3 \cdot 15 = \log 3 + \log 15$

$= 0.477 + 1.176$

$= 1.653$

$\log 75 = \log 5 \cdot 15 = \log 5 + \log 15$

$= 0.699 + 1.176$

$= 1.875$

HABITS OF MIND Page 157

Generalize Do you think that the relationships you found in the Explore & Reason activity would also hold for natural logarithms? Give an example.

Yes, $\ln 15 = \ln 3 \cdot 5 = \ln 3 + \ln 5$

Properties of Logarithms

For positive numbers b, m, and n with $b \neq 1$, the following properties hold.

$\log_b mn = \log_b m + \log_b n$ ..... Product Property of Logarithms

The log of the product of two quantities
equals
the sum of the individual logs.