

## 2.5 Powerful Tens

### A Practice Understanding Task

#### Table Puzzles

1. Use the tables to find the missing values of  $x$ :

a.

$x$	$y = 10^x$
-2	$\frac{1}{100}$
1	10
	50
	100
3	1000



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b.

$x$	$y = 3(10^x)$
	0.3
0	3
	94.87
2	300
	1503.56

c. What equations could be written, in terms of  $x$  only, for each of the rows that are missing the  $x$  in the two tables above?

d.

$x$	$y = \log x$
0.01	-2
	-1
10	1
	1.6
100	2

e.

$x$	$y = \log(x + 3)$
	-2
-2.9	-1
	0.3
7	1
	3

f. What equations could be written, in terms of  $x$  only, for each of the rows that are missing the  $x$  in the two tables above?

2. What strategy did you use to find the solutions to equations generated by the tables that contained exponential functions?

3. What strategy did you use to find the solutions to equations generated by the tables that contained logarithmic functions?

## Graph Puzzles

4. The graph of  $y = 10^{-x}$  is given below. Use the graph to solve the equations for  $x$  and label the solutions.

a.  $40 = 10^{-x}$

$x = \underline{\hspace{2cm}}$

Label the solution with an A on the graph.

b.  $10^{-x} = 10$

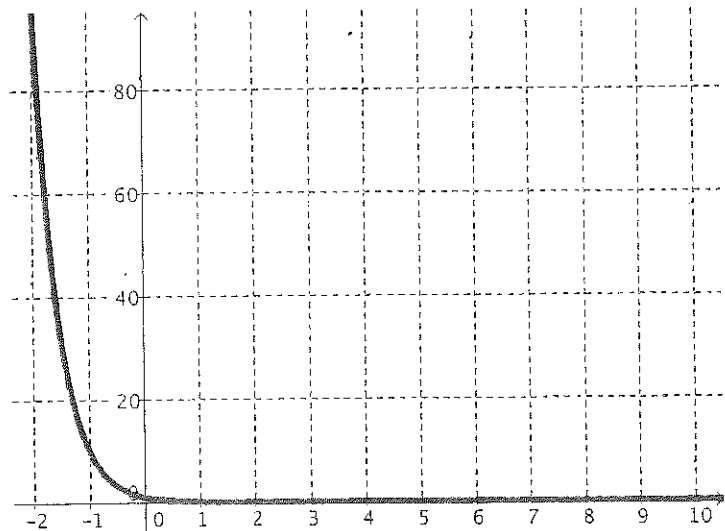
$x = \underline{\hspace{2cm}}$

Label the solution with a B on the graph.

c.  $10^{-x} = 0.1$

$x = \underline{\hspace{2cm}}$

Label the solution with a C on the graph.



5. The graph of  $y = -2 + \log x$  is given below. Use the graph to solve the equations for  $x$  and label the solutions.

a.  $-2 + \log x = -2$

$x = \underline{\hspace{2cm}}$

Label the solution with an A on the graph.

b.  $-2 + \log x = 0$

$x = \underline{\hspace{2cm}}$

Label the solution with a B on the graph.

c.  $-4 = -2 + \log x$

$x = \underline{\hspace{2cm}}$

Label the solution with a C on the graph.

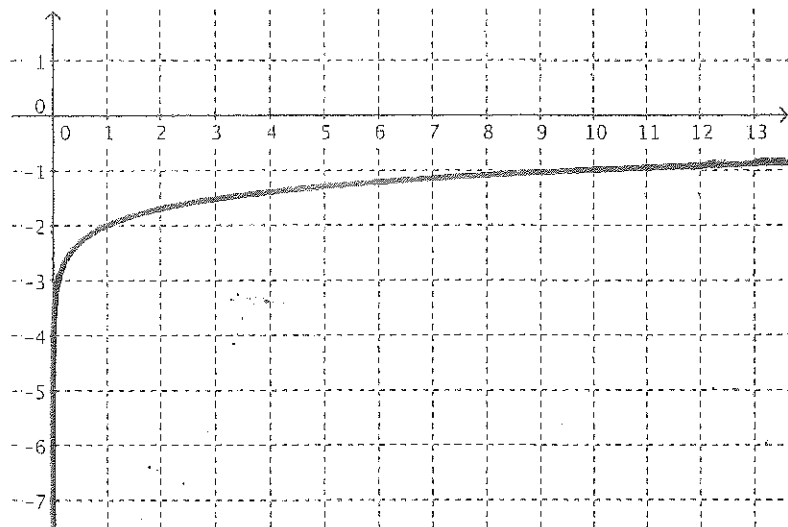
d.  $-1.3 = -2 + \log x$

$x = \underline{\hspace{2cm}}$

Label the solution with a D on the graph.

e.  $1 = -2 + \log x$

$x = \underline{\hspace{2cm}}$



6. Are the solutions that you found in #5 exact or approximate? Why?

### Equation Puzzles:

Solve each equation for  $x$ :

7.  $10^x = 10,000$

8.  $125 = 10^x$

9.  $10^{x+2} = 347$

10.  $5(10^{x+2}) = 0.25$

11.  $10^{-x-1} = \frac{1}{36}$

12.  $-(10^{x+2}) = 16$

**READY, SET, GO!**

Name \_\_\_\_\_

Period \_\_\_\_\_

Date \_\_\_\_\_

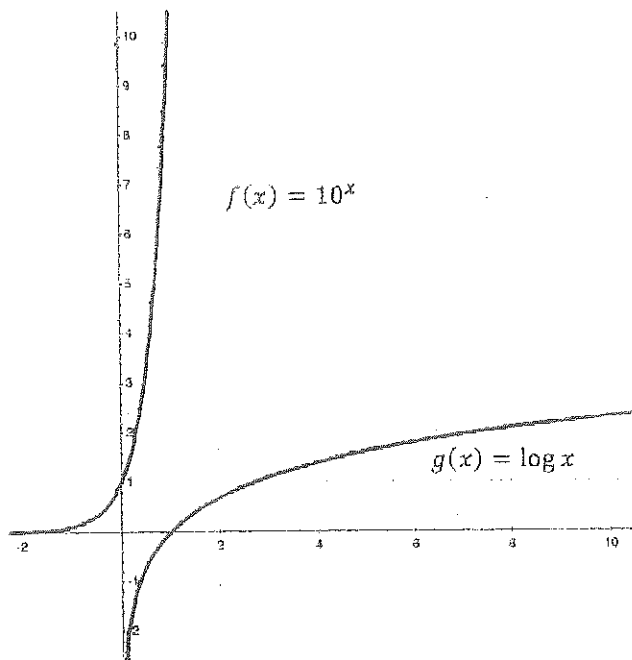
**READY**

Topic: Comparing the graphs of the exponential and logarithmic functions

The graphs of  $f(x) = 10^x$  and  $g(x) = \log x$  are shown in the same coordinate plane.

Make a list of the characteristics of each function.

1.  $f(x) = 10^x$



2.  $g(x) = \log x$

Each question below refers to the graphs of the functions  $f(x) = 10^x$  and  $g(x) = \log x$ . State whether they are true or false. If they are false, correct the statement so that it is true.

- \_\_\_\_\_ 3. Every graph of the form  $g(x) = \log x$  will contain the point  $(1, 0)$ .
- \_\_\_\_\_ 4. Both graphs have vertical asymptotes.
- \_\_\_\_\_ 5. The graphs of  $f(x)$  and  $g(x)$  have the same rate of change.
- \_\_\_\_\_ 6. The functions are inverses of each other.
- \_\_\_\_\_ 7. The range of  $f(x)$  is the domain of  $g(x)$ .
- \_\_\_\_\_ 8. The graph of  $g(x)$  will never reach 3.

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SET

Topic: Solving logarithmic equations (base 10) by taking the log of each side

Evaluate the following logarithms

9.  $\log 10$                       10.  $\log 10^{-7}$                       11.  $\log 10^{75}$                       12.  $\log 10^x$   
13.  $\log_3 3^5$                       14.  $\log_8 8^{-3}$                       15.  $\log_{11} 11^{37}$                       16.  $\log_m m^n$

You can use this property of logarithms to help you solve logarithmic equations.

*\*Note: This property only works when the base of the logarithm matches the base of the exponent.*

Solve the equations by inserting  $\log_n$  on both sides of the equation. (You will need a calculator.)

17.  $10^n = 4.305$                       18.  $10^n = 0.316$                       19.  $10^n = 14,521$                       20.  $10^n = 483.059$

GO

Topic: Solving equations involving compound interest

**Formula for compound interest:** If  $P$  dollars is deposited in an account paying an annual rate of interest  $r$  compounded (paid)  $n$  times per year, the account will contain  $A = P \left(1 + \frac{r}{n}\right)^{nt}$  dollars after  $t$  years.

21. How much money will there be in an account at the end of 10 years if \$3000 is deposited at 6% annual interest compounded as follows: (Assume no withdrawals are made.)  
a.) annually  
b.) semiannually  
c.) quarterly  
d.) daily (Use  $n = 365$ .)
22. Find the amount of money in an account after 12 years if \$5,000 is deposited at 7.5% annual interest compounded as follows: (Assume no withdrawals are made.)  
a.) annually  
b.) semiannually  
c.) quarterly  
d.) daily (Use  $n = 365$ .)

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