

## Short Answer

7. Determine the value of  $x$ .

- a)  $\log_9 x = -2$       b)  $\log_x 125 = \frac{3}{2}$   
 c)  $\log_3 (\log_x 125) = 1$     d)  $7^{\log_3 3} = x$   
 e)  $\log_2 8^{x-3} = 4$

a)  $\log_9 x = -2$   
 $\uparrow$   
 $9^{-2} = x$   
 $x = \frac{1}{9^2} = \frac{1}{81}$   $x = \frac{1}{81}$  ✓

b)  $\log_x 125 = \frac{3}{2}$        $\frac{125}{10} \frac{5}{25}$        $125 := 5 \times 25$   
 $\frac{10}{25}$        $= 5 \times 5 \times 5$   
 $= 5^3$

$\log_x 5^3 = \frac{3}{2}$   $x$  must be:  $> 0, \neq 1$

$3 \log_x 5 = \frac{3}{2} \quad | :3$

$\log_x 5 = \frac{1}{2} \Rightarrow x^{\frac{1}{2}} = 5 \Rightarrow \sqrt{x} = 5$  square  
 $(\sqrt{x})^2 = 5^2$   
 $x = 25$  ✓

c)  $\log_3 (\log_x 125) = 1$        $125 = 5^3$

$\log_3 \square = 1 \Rightarrow 3^1 = \square$       but  $\square = \log_x 125$   
 $\square = \log_x 5^3$

$\Rightarrow 3 = \log_x 5^3$   
 $3 = 3 \log_x 5 \quad | :3$   
 $1 = \log_x 5$   
 $\log_x 5 = 1 \Rightarrow x^1 = 5$   
 $x = 5$  ✓

d)  $7^{\log_3 3} = x \rightarrow$  check your formula sheet  
 $\Rightarrow x = 3$   $a = b$   
 but we can show this differently

$$\boxed{7} = \boxed{x} \quad | \log_7 \text{ both sides}$$

$$\log_7(\log_7 7) = \log_7(x)$$

$$\log_7 7 = \log_7 x$$

↓  
this = 1

$$(\log_7 7)(1) = \log_7 x$$

$$\log_7 7 = \log_7 x$$

same base.

for the  
to be  
equal the  
parts of the  
bases must  
equal

$$\Rightarrow \boxed{x=7} \checkmark$$

$$e) \log_2(8^{x-3}) = 4$$

$$(x-3) \log_2 8 = 4$$

$$\leftarrow 8 = 2^3$$

$$(x-3) \log_2 2^3 = 4$$

$$(x-3)(3) \log_2 2 = 4$$

↓  
= 1

$$3(x-3) = 4$$

$$3x - 3 \cdot 3 = 4$$

$$3x - 9 = 4$$

$$3x = 4 + 9$$

$$3x = 13 \quad | \div 3$$

$$\boxed{x = \frac{13}{3}} \checkmark$$

[end of file]