Simplifying Log Functions Notes

Remember: In exponential form $a^b = c$ is written as $\log_a c = b$ in logarithmic form and (b)log a = log c.
Therefore, $b = \frac{\log c}{\log a}$

Express each in exponential form.

A) $\log_2 8 = 3$

$$2^3 = 8$$

B) $\log_{10} 100 = 2$

$$10^2 = 100$$

C) $\log_{10} 0.001 = -3$

$$10^{-3} = 0.001$$

Express in logarithmic form.

D) $2^4 = 16$

$$\log_2 16 = 4$$

E) $16^{3/4} = 8$

$$\log_{16} 8 = 3/4$$

F) $27^{-2/3} = 1/9$

$$\log_{27} \tfrac{1}{9} = -\tfrac{2}{3}$$

Evaluate.

G) $\log_6 36$

$$\text{If} = x: \quad \frac{\log 36}{\log 6} = x$$

$$x = 2$$

H) $\log_2 \frac{1}{16}$

$$\frac{\log 1/16}{\log 2}$$

I) $\log_3 3\sqrt{3}$

$$\frac{\log 3\sqrt{3}}{3}$$

J) $\log_2 64$

$$\frac{\log 64}{\log 2}$$

K) $\log_2 8\sqrt{2}$

$$\frac{\log 8\sqrt{2}}{\log 2}$$

Solve for x.

L) $\log_3 81 = x + 2$

$$3^{x+2} = 81$$
$$3^{x+2} = 3^4$$
$$x + 2 = 4$$
$$\boxed{x = 2}$$

OR

$$\frac{\log 81}{\log 3} = x + 2$$
$$4 = x + 2$$
$$\boxed{x = 2}$$

M) $\log_x 125 = 3$

$$x^3 = 125$$
$$\sqrt[3]{x^3} = \sqrt[3]{125}$$
$$\boxed{x = 5}$$

N) $\log_2 x = 4$

$$2^4 = x$$
$$\boxed{x = 16}$$

O) $\log_x \frac{1}{81} = -2$

$$x^{-2} = \frac{1}{81}$$
$$x^{-2} = 81^{-1}$$
$$x^{-2} = (9^2)^{-1}$$
$$x^{-2} = 9^{-2}$$
$$x = 9$$

P) $\log_6 \frac{1}{216} = x$

$$6^x = \frac{1}{216}$$
$$6^x = 216^{-1}$$
$$6^x = (6^3)^{-1}$$
$$\boxed{x = -3}$$

OR

$$\frac{\log \frac{1}{216}}{\log 6} = x$$
$$\boxed{x = -3}$$

Q) $\log_4 \frac{1}{16} = -x - 5$

$$4^{-x-5} = \frac{1}{16}$$
$$4^{-x-5} = 16^{-1}$$
$$4^{-x-5} = (4^2)^{-1}$$
$$-x - 5 = -2$$
$$-x = 3$$
$$\boxed{x = -3}$$

OR

$$\frac{\log \frac{1}{16}}{\log 4} = -x - 5$$
$$-2 = -x - 5$$
$$3 = -x$$
$$\boxed{-3 = x}$$