

Exercise 35

Find the exact value of each expression.

(a) $\log_2 32$

(b) $\log_8 2$

Solution

Logarithms are exponents.

Part (a)

Here 2 is the base, and 32 is the result.

$$x = \log_2 32$$

$$2^x = 32$$

Take the natural logarithm of both sides.

$$\ln 2^x = \ln 32$$

Bring x down from the exponent.

$$x \ln 2 = \ln 32$$

Solve for x .

$$x = \frac{\ln 32}{\ln 2} = 5$$

Therefore,

$$\log_2 32 = 5.$$

Part (b)

Here 8 is the base, and 2 is the result.

$$x = \log_8 2$$

$$8^x = 2$$

Take the natural logarithm of both sides.

$$\ln 8^x = \ln 2$$

Bring x down from the exponent.

$$x \ln 8 = \ln 2$$

Solve for x .

$$x = \frac{\ln 2}{\ln 8} = \frac{1}{3}$$

Therefore,

$$\log_8 2 = \frac{1}{3}.$$