MATHEMATICS · GRADES 10-12

Converting between logarithmic and exponential form

Difficulty level: Advanced

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Overview of the concept

This is how you flip between two ways of writing the same fact. Turning a growth question into a logarithm problem lets you solve for the exponent, and flipping it back lets you solve for the result. It is the same fact written two ways, and knowing both lets you pick whichever one makes the problem solvable.



Rule

Logarithmic form and exponential form say the same thing: log base b of x = y means $b^y = x$.

The base is b, the exponent is y, and the result is x. You can flip between the two forms without changing the fact.

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Worked examples

EXAMPLE 1

Q Convert $\log_3(81) = 4$ to exponential form

SOLUTION

Identify the base, the result, and the exponent: base 3, result 81, exponent 4.

Logarithmic form $\log_b(x) = y$ means exponential form $b^y = x$.

So the exponential form is $3^4 = 81$

EXAMPLE 2

Q Convert $2^5 = 32$ to logarithmic form

SOLUTION

Identify the base, the exponent, and the result: base 2, exponent 5, result 32.

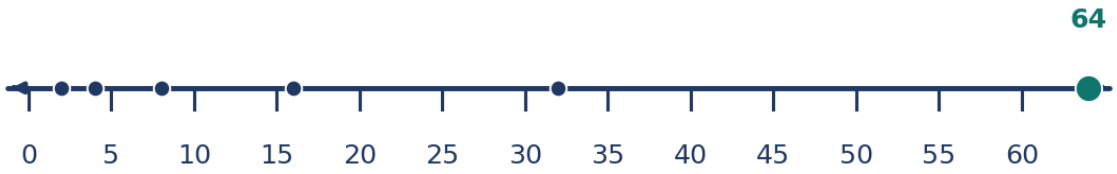
Exponential form $b^y = x$ means logarithmic form $\log_b(x) = y$.

So the logarithmic form is $\log_2(32) = 5$

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Practice questions

1 Convert $\log_2(64) = 6$ to exponential form.



A $2^6 = 64$

B $6^2 = 64$

C $2^6 = 36$

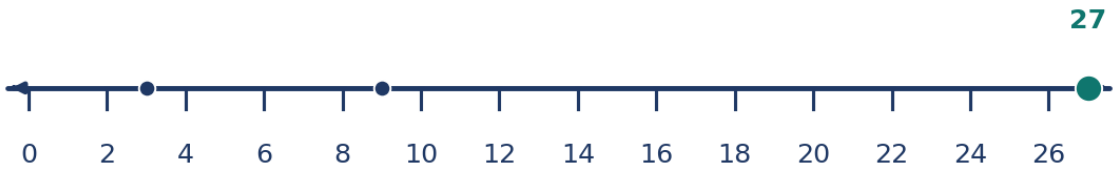
D $64^6 = 2$

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2 Convert $3^3 = 27$ to logarithmic form.



A $\log_{27}(3) = 3$

B $\log_3(27) = 3$

C $\log_3(3) = 27$

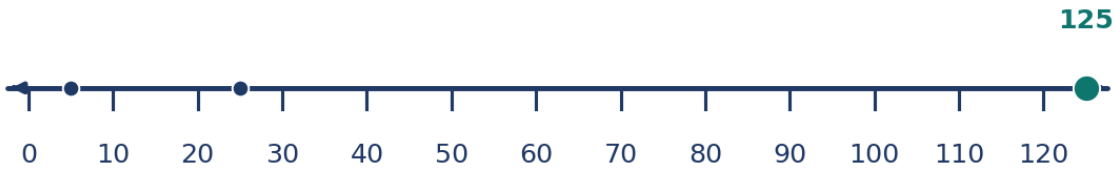
D $\log_3(27) = 27$

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3 Convert $\log_5(125) = 3$ to exponential form.



A $3^5 = 125$

B $5^3 = 15$

C $5^3 = 125$

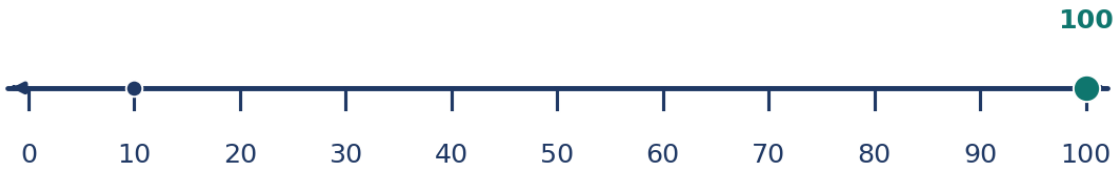
D $125^5 = 3$

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4 Convert $10^2 = 100$ to logarithmic form.



A $\log_{100}(10) = 2$

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

C $\log_{10}(100) = 10$

D $\log_{10}(100) = 2$

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5 Convert $\log_4(16) = 2$ to exponential form.



A $2^4 = 16$

B $4^2 = 16$

C $4^2 = 8$

D $16^4 = 2$

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6 Convert $2^4 = 16$ to logarithmic form.



A $\log_2(16) = 4$

B $\log_{16}(2) = 4$

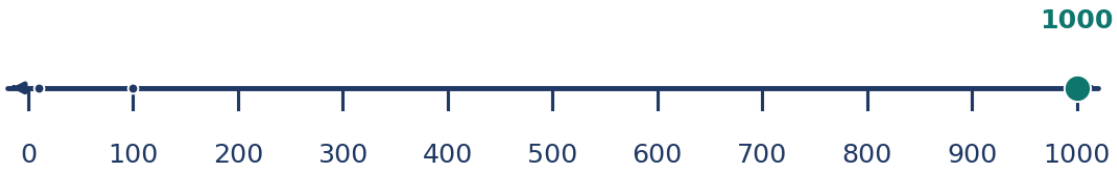
C $\log_2(4) = 16$

D $\log_2(16) = 2$

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7 Convert $\log_{10}(1000) = 3$ to exponential form.



A $3^{10} = 1000$

B $10^{3} = 100$

C $10^{3} = 1000$

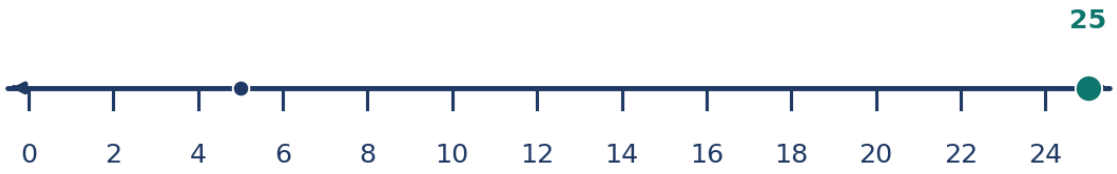
D $1000^{10} = 3$

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8 Convert $5^2 = 25$ to logarithmic form.



A $\log_{25}(5) = 2$

B $\log_5(2) = 25$

C $\log_5(25) = 5$

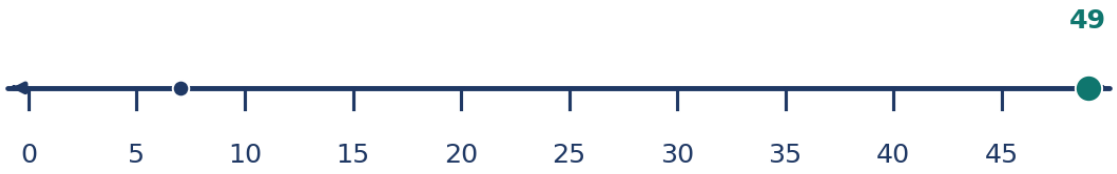
D $\log_5(25) = 2$

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9 Convert $\log_7(49) = 2$ to exponential form.



A $2^7 = 49$

B $7^2 = 49$

C $7^2 = 14$

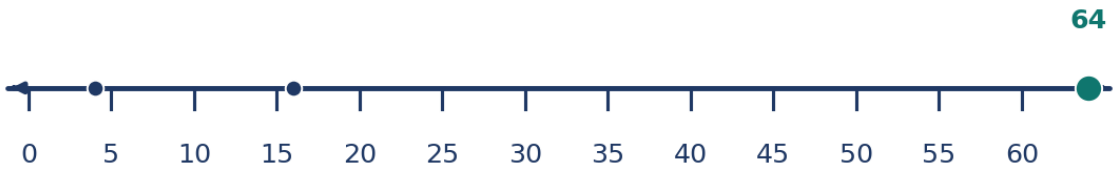
D $49^7 = 2$

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10 **Convert $4^3 = 64$ to logarithmic form.**



A $\log_4(64) = 3$

B $\log_{64}(4) = 3$

C $\log_4(3) = 64$

D $\log_4(64) = 4$

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ANSWER KEY

1. $2^6 = 64$

2. $\log_3(27) = 3$

3. $5^3 = 125$

4. $\log_{10}(100) = 2$

5. $4^2 = 16$

6. $\log_2(16) = 4$

7. $10^3 = 1000$

8. $\log_5(25) = 2$

9. $7^2 = 49$

10. $\log_4(64) = 3$

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