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| **QuestionPack - Math Basic** |
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[Basics 3](#_Toc188015276)

[signs for Multiplication and DIVISION 3](#_Toc188015277)

[Logarithm 3](#_Toc188015278)

[Logarithm multiplication 3](#_Toc188015279)

[Logarithm Division 3](#_Toc188015280)

[Logarithm POWER 3](#_Toc188015281)

[Logarithm CHANGE oF BASES 4](#_Toc188015282)

# Basics

## signs for Multiplication and DIVISION

The following rules are observed during multiplication and division.

* Multiplying (or dividing) two numbers with opposite signs will result in negative number. (e.g.) 2 X -3= -6.
* Multiplying (or dividing) of two numbers with same signs will result in a positive number. (e.g.) -2 X -3 = 6.

# Logarithm

Logarithm of a value is the power, such that when base is raised to power it equals the value.

$$log\_{b}(X)=x, is same as$$

$$b^{x}=X$$

In the above b is called the base. (e.g.) $log\_{10}1000=3$

Note

* Base cannot be 0 or 1
* $log\_{b}1=0$, this is because anything raised to zero is one.
* $log\_{b}b=1$
* If the base is omitted it usually means 10.

## Logarithm multiplication

$$log\_{b}(XY)=log\_{b}\left(X\right)+log\_{b}\left(Y\right)$$

Proof

$$Let X=b^{x} and Y=b^{y}$$

$$log\_{b}\left(X\right)=x and log\_{b}\left(Y\right)=y $$

$$XY=b^{x}b^{y}=b^{(x+y)}$$

$$log\_{b}(XY)=x+y$$

$$∴log\_{b}(XY)=log\_{b}\left(X\right)+log\_{b}\left(Y\right)$$

## Logarithm Division

Similarly it can be shown

$$log\_{b}(X/Y)=log\_{b}\left(X\right)-log\_{b}\left(Y\right)$$

## Logarithm POWER

$$log\_{b}(X^{Y})=Ylog\_{b}\left(X\right)$$

## Logarithm CHANGE oF BASES

$$log\_{b}(X)=\frac{log\_{a}(X)}{log\_{a}(b)}$$

Proof

$$Let x=log\_{b}(X)$$

$$b^{x}=X$$

Take $log\_{a}$ on both sides.

$$log\_{a}(b^{x})=log\_{a}(X)$$

$$xlog\_{a}(b)=log\_{a}(X)$$

$$x=\frac{log\_{a}(X)}{log\_{a}(b)}$$

$$∴log\_{b}(X)=\frac{log\_{a}(X)}{log\_{a}(b)}$$