AP Precalc

# 2.9 Logarithic Expressions

**2.9 Notes**

Write your questions and thoughts here!

## BIG IDEA

$$\log_b c = a$$
if and only if
$$b^a = c$$
$$b > 0 \text{ and } b \neq 1$$

Let's rewrite the following logarithms as exponents.

Ex 1: $\log_3 81 = 4$

Ex 2: $\log_{16} 4 = \frac{1}{2}$

Let's rewrite the following exponents as logarithms.

Ex 3: $125^{\frac{1}{3}} = 5$

Ex 4: $10^3 = 1000$

Find the value of each log.

Ex 5: $\log 100$

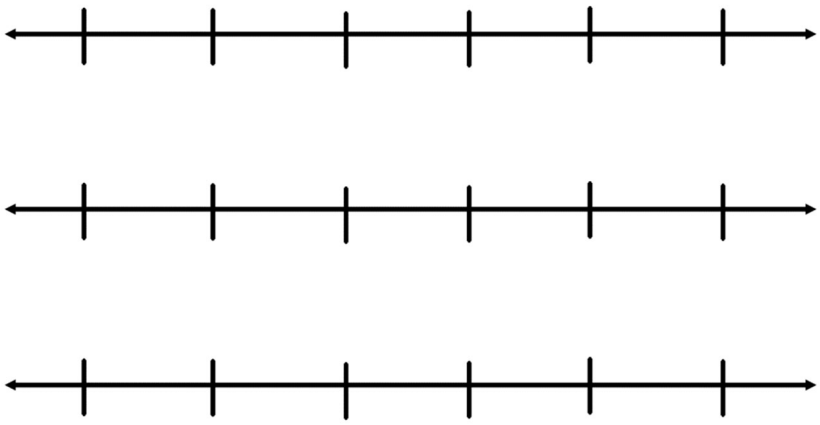
Ex 6: $\log_2 \frac{1}{32}$

Ex 7: $\log_4 25$

Ex 8: $\log 39$

Write your questions and thoughts here!

| Algebro | Average Length of Video in seconds |
|---|---|
| Sully | 505 seconds |
| Brust | 830 seconds |
| Bean | 1,440 seconds |
| Kelly | 10,160 seconds |



Try These:

Rewrite the exponent as a log.

1. $16^{\frac{3}{4}} = 8$

Rewrite the log as an exponent

2. $\log_{32} 4 = \frac{2}{5}$

Evaluate each log

3. $\log_{25} x$ when $x = 5$

4. $\log_6 x$ when $x = 12$

## 2.9 Logarithmic Expressions

AP Precalculus

**2.9 Practice**

| **Rewrite the following logarithms as exponents.** | | |
|---|---|---|
| 1. $\log_2 64 = 6$ | 2. $\log_4 \frac{1}{64} = -3$ | 3. $\log_{25} 125 = \frac{3}{2}$ |
| **Rewrite the following exponents as logarithms.** | | |
| 4. $10^3 = 1000$ | 5. $16^{\frac{5}{2}} = 1024$ | 6. $10^{-2} = \frac{1}{100}$ |

**WITHOUT using a CALCULATOR, find the value of logarithm. SHOW WORK.**

| | | |
|---|---|---|
| 7. $\log_5 625$ | 8. $\log 100{,}000$ | 9. $\log_{27} 81$ |

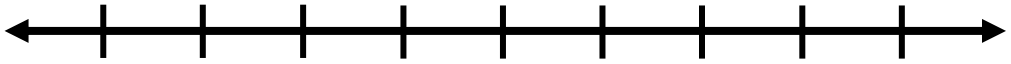
**Use a CALCULATOR to find the value of logarithm. Round to three decimal places.**

| | | |
|---|---|---|
| 10. $\log 140$ | 11. $\log_9 120$ | 12. $\log_3 18$ |

**For the given data construct a plot using a LOGARITHMIC scale using the given bases. Be sure to label your axis and show your math.**

12. Logarithmic Scale of base 10.

| Person | Midichlorians Found in Cells |
|---|---|
| Chewbacca | 1 |
| Han Solo | 330 |
| Luke Skywalker | 125,000 |
| Yoda | 2,750,000 |
| Anakin Skywalker | 20,000 |



13. Logarithmic Scale of Base 2.

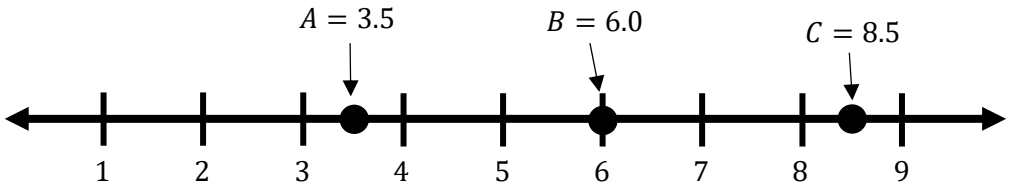
| Person | Errors Per Section |
|---|---|
| Bean | 5 |
| Brust | 68 |
| Sullivan | 24 |
| Kelly | 15 |
| New Teacher | 300 |

## 2.9 Logarithmic Expressions

**2.9 Test Prep**

The Richter Scale is a common way of measuring earthquakes around the world. The scale measures the amplitude of the waves from seismic activity. The Richter Scale uses a logarithmic scale of base 10. This means each order of magnitude is 10 times greater than the previous one. A 6.0 earthquake is ten times more intense than a 5.0 earthquake.

Use the scale below to answer the questions that follow.




14. Which statement most accurately describes how much more intense Earthquake C was than Earthquake A.

(A) Earthquake C is 5 times more intense.

(B) Earthquake C is 50 times more intense.

(C) Earthquake C is $10^5$ more intense.

(D) Earthquake C is $\log 5$ times more intense.

---

15. Which of the following statements is true.

(A) The increase in intensity from Earthquake A to B is greater than the increase in intensity from Earthquake B to C.

(B) The increase in intensity from Earthquake A to B is less than the increase in intensity from Earthquake B to C.

(C) Earthquake B is as many times more intense to Earthquake A, as Earthquake C is as many times more intense to Earthquake B.