2.9 Logarithmic Expressions
AP Precalculus

Directions: Rewrite the following logarithms as exponents.

1) $log_2 64 = 6$ $2^6 = 64$	2) $log_4 \frac{1}{64} = -3$ $4^{-3} = \frac{1}{64}$	3) $log_{25} 125 = \frac{3}{2}$ $25^{\frac{3}{2}} = 125$

Directions: Rewrite the following exponents as logarithms.

4) $10^3 = 1000$ $log\,1000 = 3$	5) $16^{\frac{5}{2}} = 1024$ $log_{16} 1024 = \frac{5}{2}$	6) $10^{-2} = \frac{1}{100}$ $log\,\frac{1}{100} = -2$

Directions: WITHOUT using a CALCULATOR, find the value of logarithm.

7) $log_5 625 = x$ $5^x = 625$ $5^x = 5^4$ $\boxed{x = 4}$	8) $log\,100,000 = x$ $10^x = 100\,000$ $10^x = 10^5$ $\boxed{x = 5}$	9) $log_{27} 81 = x$ $27^x = 81$ $3^{3x} = 3^4$ $3x = 4$ $\boxed{x = \frac{4}{3}}$

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

|		
10) $log\,140$ 2.146	11) $log_9 120$ 2.179	12) $log_3 18$ 2.631

Directions: For the given data construct a plot using a LOGARITHMIC scale using the given bases. Be sure to label your axis.
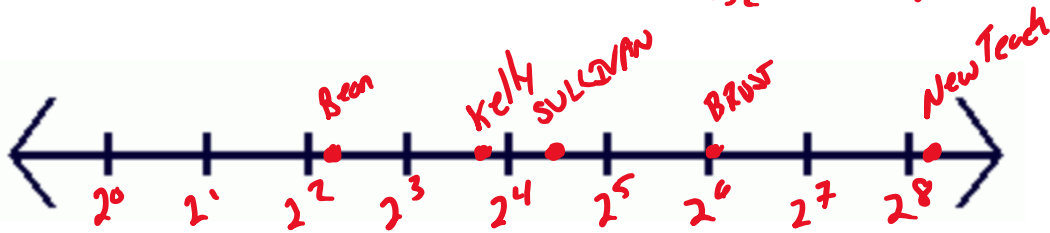
12) Logarithmic Scale of base 10.

| Person	Midichlorians Found in Cells	
Chewbacca	1	$log\,1 = 0$
Han Solo	330	$log\,330 = 2.519$
Luke Skywalker	125,000	$log\,125000 = 5.097$
Yoda	2,750,000	$log\,2,750,000 = 6.439$
Anakin Skywalker	20,000	$log\,20,000 = 4.3$
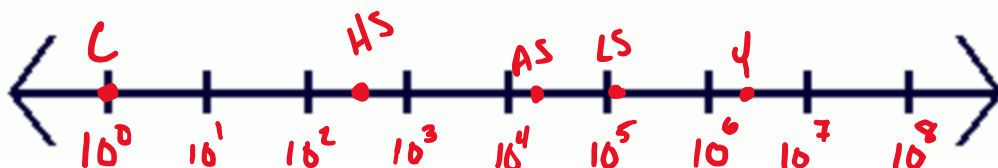
13) Logarithmic Scale of Base 2

Person	Errors Per Section	
Bean	5	$\log_2 5 = 2.232$
Brust	68	$\log_2 68 = 6.087$
Sullivan	24	$\log_2 24 = 4.585$
Kelly	15	$\log_2 15 = 3.907$
New Teacher	300	$\log_2 300 = 8.229$

2.9 Logarithmic Expressions

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

A
3.5

B
6.0

C
8.5
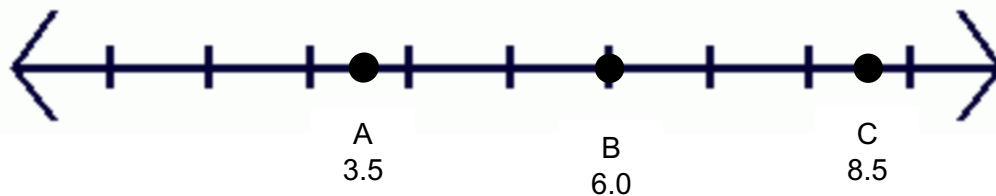
14.   Which statements most accurately describes how much more intense Earthquake C was than Earthquake A.

   a.   Earthquake C is 5 times more intense.
   b.   Earthquake C is 5 x 10 or 50 times more intense.
   c.   Earthquake C is 10^5 or 100,000 more intense.
   d.   Earthquake C is log 5 times more intense.

$8.5 - 3.5 = 5$
BUT IT IS 10 times
more for each
so its   10·10·10·10·10
or $10^5 = 100,000$

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.

$A \to B$
$6 - 3.5 = 2.5$
so $10^{2.5}$

$B \to C$
$8.5 - 6.0 = 2.5$
so $10^{2.5}$

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