



Math Virtual Learning

College Prep Algebra

April 14, 2020



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Lesson: April 14, 2020

Objective/Learning Target:

Use properties of logarithms to expand and condense logarithmic expressions

Let's get started:

Recall the [video](#) from 4/13. I wonder how they would have used the charts to find $\log 1,210,000$?

Lesson:

When working with logarithmic expressions, the expression is *classified* by how much “stuff” there is to describe the logarithmic value.


The words we use to *classify* are

- **Condensed** (to make as compact as possible)
- **Expanded** (to spread out as much as possible)

The next slide will show you examples of
Condensed and Expanded logarithms.


Lesson: Here are the examples from 4/13
that you discovered!

PRODUCT
PROPERTY


$$\log_{17} 24 = \log_{17} 4 + \log_{17} 6$$


Condensed *Expanded*

QUOTIENT
PROPERTY


$$\log_{13} 3 = \log_{13} 21 - \log_{13} 7$$

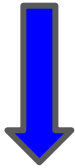
Condensed *Expanded*

POWER
PROPERTY


$$\log_4 (10)^2 = 2 \cdot \log_4 (10)$$

Condensed *Expanded*

Lesson: Condensed and Expanded Logarithms Examples



$$\begin{aligned}\log_{17} 24 &= \log_{17} 4 + \log_{17} 6 \\ &= \log_{17}(2^2) + \log_{17}(2 \cdot 3) \\ &= 2 \cdot \log_{17} 2 + \log_{17} 2 + \log_{17} 3\end{aligned}$$

Notice that **Expanded** can look many different ways, but the **Condensed** is the most simplified of all.

Lesson:

So going back to the video from 4/13, he used the pieces to calculate, not the whole thing.

That is why we EXPAND logarithms. If we were still using the logarithm charts, it would be easier to look up the pieces of the expanded version!



ANTILOGARITHMS													
	0	1	2	3	4	5	6	7	8	9	123	456	789
-00	1000	1002	1005	1007	1009	1012	1014	1016	1019	1021	001	111	222
-01	1023	1026	1028	1030	1033	1035	1038	1040	1042	1045	001	111	222
-02	1047	1050	1052	1054	1057	1059	1062	1064	1067	1069	001	111	222
-03	1072	1074	1076	1079	1081	1084	1086	1089	1091	1094	001	111	222
-04	1096	1099	1102	1104	1107	1109	1112	1114	1117	1119	011	112	222
-05	1122	1125	1127	1130	1132	1135	1138	1140	1143	1146	011	112	222
-06	1148	1151	1153	1156	1159	1161	1164	1167	1169	1172	011	112	222
-07	1175	1178	1180	1183	1186	1189	1191	1194	1197	1199	011	112	222
-08	1202	1205	1208	1211	1213	1216	1219	1222	1225	1227	011	112	222
-09	1230	1233	1236	1239	1242	1245	1247	1250	1253	1256	011	112	222
-10	1259	1262	1265	1268	1271	1274	1276	1279	1282	1285	011	112	222
-11	1288	1291	1294	1297	1300	1303	1306	1309	1312	1315	011	112	222
-12	1318	1321	1324	1327	1330	1334	1337	1340	1343	1346	011	112	222
-13	1349	1352	1355	1358	1361	1365	1368	1371	1374	1377	011	112	222
-14	1380	1384	1387	1390	1393	1396	1400	1403	1406	1409	011	112	222

Practice:

Lucky for us, we only have to show we can EXPAND and CONDENSE.

That is the technique colleges ask us to learn.

So try it yourself, expand and condense the expressions below.

EXPAND

16. $\log 10x$

17. $\ln \frac{xy}{z}$

18. $\log_b \frac{x^4}{z^2}$

19. $\log_4 4x^2$

20. $\log_3 \sqrt{x-2}$

21. $\ln \frac{x^5 z^2}{y^3}$

CONDENSE

23. $\log 7 - \log x$

24. $3 \ln x + 2 \ln y - 4 \ln z$

25. $\frac{3}{2} \ln x^6 - \frac{3}{4} \ln x^8$

26. $\log_2 5 + \log_2 x - \log_2 3$

27. $1 + 3 \log_4 x$

28. $2 \ln 8 + 5 \ln x$

Practice:

ANSWERS

EXPAND

16. $1 + \log x$

17. $\ln x + \ln y - \ln z$

18. $4 \log_b x - 2 \log_b z$

19. $1 + 2 \log_4 x$

20. $\frac{1}{2} \log_3(x - 2)$

21. $(5 \ln x + 2 \ln z) - 3 \ln y$

CONDENSE

23. $\log \frac{7}{x}$

24. $\ln \frac{x^3 y^2}{z^4}$

25. $\ln x^3$

26. $\log_2 \frac{5x}{3}$

27. $\log_4 4x^3$

28. $\ln 64x^5$

Additional Practice

Expanding and Condensing Simple Logarithms

Expanding more complicated Logarithms