

The Pattern

$$\text{power}_2(8) = 3$$

$$\text{power}_2(32) = 5$$

$$\text{power}_3(9) = 2$$

$$\text{power}_3(81) = 4$$

$$\text{power}_5(25) = 2$$

Verbal story:

You are citizens of the kingdom of Erishdom where peace and prosperity has reigned for thousands of years. The neighboring Kingdom of Orodruin has risen to power with King Melkor as their king. He has demanded a tribute of 100,000 gold pieces per day. If Eshiredom does not begin paying tribute to King Melkor, he will invade the wonderful peaceful land of Erishdom with his army of orcs.

A group of spies has managed to capture an encoded message that king Melkor wishes to remain a secret. The king of Erishdom has made a call to any citizens who understand the wizardry of mathematics. Stories of how the members of your group can add numbers in their heads has reached the ears of the King of Eshiredom and you have been tasked with decoding the intercepted secret message.

THE CODE

A	1.5
B	1
C	0.5
D	0.75
E	2
F	1.25
G	17
H	0
I	5
J	23
K	-1
L	3
M	4
N	6
O	-3
P	0.25
Q	8
R	9
S	-2
T	64
U	2.5
V	7
W	12
X	61
Y	-4
Z	-5

THE SECRET MESSAGE

1. $\text{POWER}_2(16) =$
2. $\text{POWER}_6(36) =$
3. $\text{POWER}_5(125) =$
4. $\text{POWER}_2(0.5) =$
5. $\text{POWER}_{10}(0.001) =$
6. $\text{POWER}_{\text{BLANK}}(81) = 2$
7. $\text{POWER}_6(7776) =$
8. $\text{POWER}_2(0.25) =$
9. $\text{POWER}_5(0.04) =$
10. $\text{POWER}_{16}(\text{BLANK}) = 1.5$
11. $\text{POWER}_{0.5}(0.25) =$
12. $\text{POWER}_{\text{BLANK}}(3) = 0.5$
13. $\text{POWER}_{\text{BLANK}}(0.008) = -3$
14. $\text{POWER}_{0.5}(0.125) =$
15. $\text{POWER}_{100}(10000) =$
16. $\text{POWER}_{17}(1) =$
17. $\text{POWER}_{\text{BLANK}}(1024) = 10$
18. $\text{POWER}_{25}(5) =$
19. $\text{POWER}_9(27) =$
20. $\text{POWER}_3(729) =$
21. $\text{POWER}_{\text{BLANK}}(2) = 1/6$
22. $\text{POWER}_5(625) =$
23. $\text{POWER}_{16}(1024) =$
24. $\text{POWER}_7(343) =$
25. $\text{POWER}_{32}(\text{BLANK}) = 1.2$
26. $\text{POWER}_{\text{BLANK}}(0.2) = -1$
27. $\text{POWER}_{16}(2) =$
28. $\text{POWER}_8(512) =$
29. $\text{POWER}_2(0.0625) =$

Note POWER has been substituted for log as in logarithms. The task is designed as an introduction to logarithms without the need for helping students make the connection that log essentially means what is the exponent or the power.

After the students decode the message which reads:

“MELKOR/IS/STERILE/HE/CANT/
MULTIPLY”

(Note the names of everything in the verbal story can be changed except for MELKOR as it is part of the decoded message. And you might have that one student who has read J.R.R. Tolkien’s The Silmarillion and gets the reference.)

At the consolidation stage, (while writing the addition problem) ask students would you rather add 0.5397 and 0.7338 by hand Or multiply (while writing the multiplication problem) 3.465 by 5.418 by hand.

LOG MEANS POWER

The pattern is written again on the board and the word power is erased from each of the examples and replaced with log.

Talk about how John Napier developed tables for logarithms in which

$$\log_{10}(3.465) \approx 0.5397$$

$$\log_{10}(5.418) \approx 0.7338$$

Add the numbers to get 1.2735

Then write

$$3.465 \times 5.418 \approx 10^{0.5397} \times 10^{0.7338}$$

$$18.77 \approx 10^{1.2735}$$

Review the two forms for the equations and show several examples based on the problems in the secret message, but now use log instead of power.

$$\log_{base}(value) = exponent$$

$$value = base^{exponent}$$