LESSON MAKER PRO

Undo the Power

Solve with exponents and logarithms

HIGH SCHOOL · PC.F.D.29

PC.F.D.29 "Use the inverse relationship between exponents and logarithms to solve problems involving logarithms and exponents. Extend from logarithms with base 2 and 10 to a base of e."

NAME _____ DATE _____

INVERSE OPERATIONS

A logarithm asks which exponent makes a value: $\log_b(a)=x$ means $b^x=a$. For base e, write ln(a) instead of $\log_e(a)$. Rewrite an equation in the form that helps you find the unknown exponent.

WORKED EXAMPLE

Find x: $\log_7(2401)=x$.

1. Rewrite in exponential form: $7^x=2401$.
2. Write 2401 as a power: $2401=7^4$.
3. Match the exponents: x=4.

Answer: x=4

PRACTICE 6 problems

1 Find x: $\log_2(32)=x$.

ANSWER _____

2 Find x: $\log_{10}(1000)=x$.

ANSWER _____

3 Find x: $\ln(e^6)=x$.

ANSWER _____

4 Find x: $2^x=256$.

ANSWER _____

5 Find x: $10^x=1/100$.

ANSWER _____

6 Find x: $e^x=1/e^3$.

ANSWER _____

APPLY IT Show your work

1 A video has 80 views when you share it. Its view count doubles each hour. If the pattern continues, how many hours will it take to reach 640 views?

WORK SPACE

ANSWER _____

2 A phone battery's charge is modeled by $C(t)=100e^{-t/8}\%$, where t is hours since it was fully charged. When will the charge reach $100/e^{2}\%$?

WORK SPACE

ANSWER _____

CHALLENGE One step up

Find x: $\log_2(10^{\log_{10}(512)})=x$. Show how you undo the logarithms.

WORK SPACE AND ANSWER

Undo the Power

PART 1 · PRACTICE

#	PROBLEM	ANSWER
1	Find x: $\log_2(32)=x$.	**x=5**
2	Find x: $\log_{10}(1000)=x$.	**x=3**
3	Find x: $\ln(e^6)=x$.	**x=6**
4	Find x: $2^x=256$.	**x=8**
5	Find x: $10^x=1/100$.	**x=-2**
6	Find x: $e^x=1/e^3$.	**x=-3**

PART 2 · APPLY IT

1. **3 hours** Solve $80(2^x)=640$. Then $2^x=8=2^3$, so x=3.
2. **16 hours** Set $100e^{-t/8}=100/e^2=100e^{-2}$. Thus -t/8=-2, so t=16.

CHALLENGE

$10^{\log_{10}(512)}=512$, so $\log_2(512)=x$. Since $2^9=512$, x=9.

Accept equivalent exponential forms in students' work, such as $1/e^3=e^{-3}$. Exact answers do not require decimal approximations.