Finite Math → Logarithms **(ANSWERS)**

Solve for "x". Round answers that don't come out even to two decimal places.

1. $5^x = 1{,}220{,}703{,}125$

`log(1220703125)/log(5) = `**13**

2. $2^x = 524{,}288$

`log(524288)/log(2)=`**19**

3. $6^x = 100$

`log(100)/log(6)=`**2.57019**

4. $14.7^x = 135{,}900.75$

`log(135900.75)/log(14.7)=`**4.39745**

5. $4^{3x} = 268{,}435{,}456$

`log(268435456)/log(4)/3=`**4.66666…**

6. $9^{5x} = 3{,}486{,}784{,}401$

`log(3486784401)/log(9)/5=`**2**

7. $1.025^{3x} = 8000$

`log(8000)/log(1.025)/3=`**121.32099**

8. $5^{2x} = 400{,}000$

`log(400000)/log(5)/2=`**3.1016**

Answer these questions.

9. If you deposit \$300 at 4%, compounded monthly, how long will it take until the account is worth \$500?

$500 = 300\left(1+\frac{.04}{12}\right)^{12t}$ → `log(500/300)/log(1+.04/12)/12=`**12.7919 years**

10. If you deposit \$4500 at 6%, compounded daily, how long will it take until the account is worth \$20,000?

$20000 = 4500\left(1+\frac{.06}{365}\right)^{365t}$ → `log(20000/4500)/log(1+.06/365)/365=`**24.863 years**

11. If you deposit \$987,654 at 3% interest, compounded semiannually, how long will it take until the account is worth \$1,000,0000?

$1000000 = 987654\left(1+\frac{.03}{2}\right)^{2t}$ → `log(1000000/987654)/log(1+.03/2)/2 = `**.4172 years**

12. How long does it take money to double at 5% interest, compounded quarterly?

$2 = 1\left(1+\frac{.05}{4}\right)^{4t}$ → `log(2)/log(1+.05/4)/4=`**13.9494 years**

13. How long does it take money to double at 12% interest, compounded daily?

$2 = 1\left(1+\frac{.12}{365}\right)^{365t}$ → `log(2)/log(1+.12/365)/365=`**5.777 years**

14. How long does it take money to double at 9% interest, compounded monthly?

$2 = 1\left(1+\frac{.09}{12}\right)^{12t}$ → `log(2)/log(1+.09/12)/12=`**7.73 years**

15. How long does it take money to **triple** at 10% interest, compounded daily?

$3 = 1\left(1 + \frac{.1}{365}\right)^{365t}$ ➔ `log(3)/log(1+.1/365)/365=`**<u>`10.9876 years`</u>**

16. How long does it take money to **triple** at 4% interest, compounded annually?

$3 = 1\left(1 + \frac{.04}{1}\right)^{1t}$ ➔ `log(3)/log(1.04)=`**<u>`28.011 years`</u>**

Solve.

17. A bank advertises an effective rate of 7.52%. If interest is compounded daily, what is the nominal rate?

This is backwards from the previous effective rate problems we did. We're given the effective rate (r_{eff}) and we have to find the nominal rate (r). You won't have to do this on a test, but it's not all that hard to do:

$$.0752 = \left(1 + \frac{.r}{365}\right)^{365} - 1$$

To solve this, first add 1.

$$1.0752 = \left(1 + \frac{.r}{365}\right)^{365}$$

What we need to do is get rid of the 365th power. We can do this by taking both sides to the $1/365$ power (which is the same as the 365th root).

$$1.000198668 = 1 + \frac{.r}{365}$$

Now subtract 1

$$.000198668 = \frac{.r}{365}$$

Finally multiply by 365

$.0725138929 = r$ ➔ So it's about 7.25%

18. A bank advertises an effective rate of 2%. If interest is compounded quarterly, what is the nominal rate?

$$.02 = \left(1 + \frac{.r}{4}\right)^{4} - 1$$

To solve this, first add 1.

$$1.02 = \left(1 + \frac{.r}{4}\right)^{4}$$

What we need to do is get rid of the 4th power. We can do this by taking both sides to the ¼ power (which is the same as the 4th root).

$$1.004962932 = 1 + \frac{.r}{4}$$

Now subtract 1

$$.004962932 = \frac{.r}{4}$$

Finally multiply by 365

$.0198517263 = r$ ➔ So it's about 1.985%