

Hi, I'm Greg. I'm a NYC tutor! I love helping students. I tutor many subjects, assist with homework help, etc. I mainly specialize in specialized tests.

As it turns out, I haven't been able to get to do as many livestreams as I have in past years (yet, hopefully that changes). Therefore, I thought it would be fun to start a Problem Of The Day Series. I will put up a problem and leave it running for a while. You guys will then analyze it, and come up with possible solutions and alternative solutions on your own. I'll eventually post the answer in some manner.

For now we'll play it by ear how that will happen and for how long I'll leave up a problem. But right now I'm thinking of keeping the problem up maybe 2 hours minimum and maybe even in some cases 4 or 5 hours depending upon the dynamics and my situation. Unlike my AMA (Ask Me Anything) livestream sessions, I will not be checking in every few minutes although I may from time to time join into the discussion. Again, the idea is for you guys to discuss out the problem.

Please be respectful to each other in this endeavor and let's make this fun, educational and forward-thinking. Keep the comments within the spirit of what I'm doing here. Please email me at GregsTutoringNYC@gmail.com if needed.

HERE'S THE PROBLEM: <-----
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Solve for the reciprocal of:

$$\begin{array}{r} -2 \\ X \\ \hline 1 \\ \hline -2 \\ X \end{array}$$

if $X = 2$

- A) -2 B) 0 C) 1 D) 2 E) 4 F) 8 G) 16 H) $\frac{1}{-2}$ I) -1 J) 1 K) $\frac{1}{2}$ L) $\frac{1}{4}$ M) $\frac{1}{8}$ N) $\frac{1}{16}$

HERE'S THE SOLUTION:
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Let's make sure you're aware of exponent rules for starters. That is to say:

$$X^{-y} = \frac{1}{X^y}$$

In English: a base to a negative exponent (-y is the negative exponent in our example) is the same as 1 divided by the base to a positive value of the exponent used (in our example +y, or just y).

We will also be making use of the rule that an entity divided by a fraction is the same as that entity being multiplied by the reciprocal of the fraction in question.

Given these two rules, as with many problems, there are a few ways to approach this.

Let's start by exploring the denominator:

$$\frac{1}{X^{-2}}$$

Give the above, this is the same as:

$$\frac{1}{\frac{1}{\frac{2}{X}}}$$

which when we follow the reciprocal rule is the same as X^2 , try it! 1 divided by that fraction is the same as 1 times that fraction's reciprocal (x -squared) which is x -squared.

This means we can replace that into the original problem, yielding:

$$\frac{X^{-2}}{X^2}$$

The numerator X^{-2} is the same as $\frac{1}{X^2}$

Therefore in effect we have:

$$\frac{1}{X^2} \times \frac{1}{X^2} = \frac{1}{X^4}$$

There are many ways to combine the division and exponent rules and end up with this same fraction. Try them!

$$\text{If } X=2 \text{ then } X^4 = 2^4 = 16$$

Therefore we get $1/16$. However, the question asks us to solve for the reciprocal, hence 16 Choice G. Note: the current SHSAT only provides 4 answer choices, not 14 as I did here.

As well, to solve this you could have replaced X from the get-go and not at the end, which still needs to uphold the exponent rules discussed above:

$$\therefore 2^{-2} = \frac{1}{2^2} = 1/4$$

$$\therefore \frac{1}{2^{-2}} \text{ must be } = 4/1 = 4$$

\therefore We have $1/4$ divided by 4 which is the same as $1/4 \times 1/4 = 1/16$
 \therefore The reciprocal of $1/16 = 16$

Additionally it's possible to use decimals, but that doesn't turn out to help us in this problem as all the answers are either whole numbers or fractions and therefore there is no pressing need to use say 0.25 instead of $1/4$, etc. If such a need is a consideration, by all means use decimals.

This problem may seem like it's only involving useless tricks or trivial math, but it is emphasizing aspects of exponent math which will become useful as you explore algebra, polynomials, etc. further, and math you must get right.