Below the Line

EX07-V1 · storyboard · EX07 Negative exponents. Read each picture with its sentences.

Picture 1

Keep dividing by 2.

$$2^3 = 8 \qquad 2^2 = 4 \qquad 2^1 = 2 \qquad 2^0 = 1$$

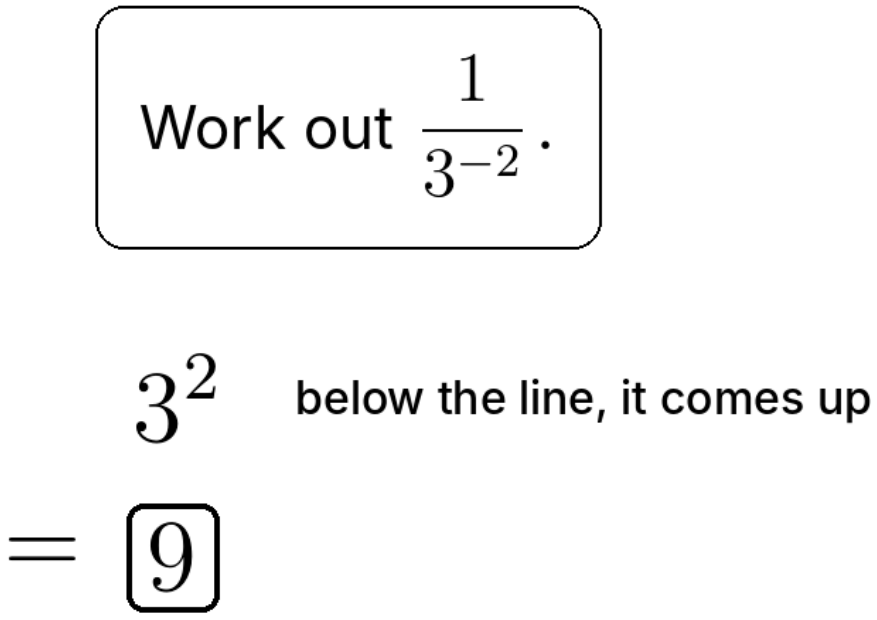
$$2^{-1} = \frac{1}{2} \qquad 2^{-2} = \frac{1}{4} \qquad 2^{-3} = \frac{1}{8}$$

A negative exponent

$$a^{-p} = \frac{1}{a^p}$$

1. Keep dividing by two.
2. 2^3 is eight.
3. Divide by two each time: four, two, one.
4. So $2^0 = 1$.
5. Keep going past zero: one half, one quarter, one eighth.
6. So a negative exponent means one over the power: 2^{-3} is one over 2^3.
7. It makes a fraction, never a negative number.

Picture 2



8. Now work out one over 3^{-2}.
9. The power below the line has a negative exponent, so it comes up to the top: 3^2.
10. That is nine.

Picture 3

Write $\dfrac{2x^{-3}}{x^5}$ without negative exponents.

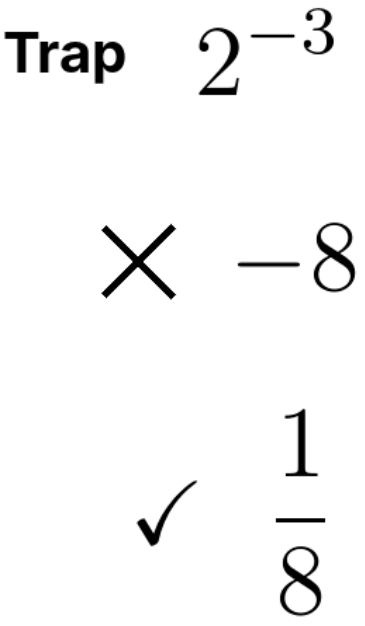
$$2x^{-3-5}$$ dividing: subtract the exponents

$$= 2x^{-8} \quad -3-5=-8$$

$$= \boxed{\frac{2}{x^8}}$$ only x^8 moves

11. Write $2x^{-3}$ over x^5 without negative exponents.
12. Dividing subtracts the exponents: negative three, take away five.
13. That is negative eight.
14. Only x^8 moves below the line.
15. The two stays on top.

Picture 4



16. Watch for the trap: a negative answer.
17. 2^{-3} is not -8.
18. It is a fraction: one eighth.

Picture 5

Trap $2x^{-3}$

$$\times \frac{1}{2x^3}$$

$$\checkmark \frac{2}{x^3}$$

19. And only the power moves.
20. $2x^{-3}$ is not one over $2x^3$.
21. The exponent belongs to x, so it is two over x^3.