

Boost Free Lessons - Year 9 Maths

Lesson 9: Negative Indices

Name: _____ Grade: _____ Date: _____

Worked Example 1

Write 3^{-2} as a fraction.

1. A negative index means take the reciprocal: $a^{-n} = \frac{1}{a^n}$.
2. So $3^{-2} = \frac{1}{3^2}$.
3. $3^2 = 9$, so the answer is $\frac{1}{9}$.
4. The answer is a fraction, not a negative number.

$$= \frac{1}{9}$$

Worked Example 2

Simplify $12x^5 \div 4x^8$, giving your answer with a positive index.

1. Numbers first: $12 \div 4 = 3$.
2. Subtract the indices: $5 - 8 = -3$, giving $3x^{-3}$.
3. Now rewrite with a positive index: $x^{-3} = \frac{1}{x^3}$.
4. The 3 stays on the top, because only the x had the negative index.

$$= \frac{3}{x^3}$$

Remember: $a^{-n} = \frac{1}{a^n}$. A negative index moves the term to the denominator; it does **not** make the answer negative.



Question 1: Write each of these as a fraction.

1. 2^{-1}

2. 2^{-3}

3. 5^{-2}

4. 10^{-2}

5. 4^{-1}

6. 3^{-3}

7. 10^{-3}

8. 6^{-2}

9. 1^{-5}

10. 2^{-4}



Question 2: Simplify each of these, giving your answer with a positive index.

1. x^{-2}

2. $3a^{-1}$

3. $x^3 \div x^7$

4. $10m^2 \div 5m^6$

5. $(2x)^{-2}$

6. $y^{-5} \times y^3$

7. $6p^{-3}$

8. $8a^4 \div 2a^9$



Question 3: Answer the following questions.

1. Evaluate $2^{-2} + 2^{-1}$.
2. Write $\frac{1}{16}$ as a power of 2 with a negative index.
3. Simplify $(3x^2)^{-1}$.
4. Evaluate $\frac{1}{2}^{-1}$.
5. Explain why 5^{-1} is not equal to -5 .





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Answers: Negative Indices**Question 1**

1. $\frac{1}{2}$

2. $\frac{1}{8}$

3. $\frac{1}{25}$

4. $\frac{1}{100}$

5. $\frac{1}{4}$

6. $\frac{1}{27}$

7. $\frac{1}{1000}$

8. $\frac{1}{36}$

9. 1

10. $\frac{1}{16}$

Question 2

1. $\frac{1}{x^2}$

2. $\frac{3}{a}$

3. $\frac{1}{x^4}$

4. $\frac{2}{m^4}$

5. $\frac{1}{4x^2}$

6. $\frac{1}{y^2}$

7. $\frac{6}{p^3}$

8. $\frac{4}{a^5}$

Question 3

1. $\frac{3}{4}$

2. 2^{-4}

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

4. 2

5. A negative index means the reciprocal, so $5^{-1} = \frac{1}{5}$. It never makes the value negative.

