

EXPONENTS AND SURDS: SIMPLIFYING EXPRESSIONS

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Lesson Description

In this lesson we:

- Simplify expressions using the laws of exponents
- Add, subtract, multiply and divide simple surds



Summary

Exponential Laws

1. $a^m \times a^n = a^{m+n}$

2. $\frac{a^m}{a^n} = a^{m-n}$

3. $(a^m)^n = a^{mn}$

4. $(ab)^m = a^m b^m$

5. $a^0 = 1$

6. $a^{-n} = \frac{1}{a^n}$

7. $\frac{a^m}{a^n} = \sqrt[n]{a^m}$ where $a > 0$ and $\frac{m}{n}$ is a rational number

Please note

Exponential Laws are applied when working with products and quotients. There are no laws for the sum and difference of exponential terms.

For example:

Is $(a + b)^2 = a^2 + b^2$?

Tips for answering questions:

Analyse all the questions first and scan for the type of expressions they contain.

Think through the laws which you will use and why.

For example:

What is the difference between the two questions given below?

1 $\sqrt{a^{3n}} \cdot \left(a^{\frac{-n}{4}}\right)^2$

2 $\frac{2^{n+4} - 6 \cdot 2^{n+1}}{5 \cdot 2^{n+2}}$



Test Yourself

Question 1

Is the equation True or False?

$$(a + b)^{-1} = a^{-1} + b^{-1}$$

Question 2

Is the equation True or False?

$$2x^{-2} = \frac{1}{2x^2}$$

Question 3

Is the equation True or False?

$$\left(9^{\frac{1}{2}} - 4^{\frac{1}{2}}\right)^2 = 5$$

Question 4

Choose the correct answer

$2^1 - 2^{-1}$ is equal to

- A. 4 B. $\frac{3}{2}$ C. 2^0 D. $\frac{2}{3}$

Question 5

Choose the correct answer

$(2^{(x+y)})^2$ is equal to

- A. 2^{x+y+2} B. $2^{x^2+y^2}$ C. $4^{x^2+y^2}$ D. 2^{2x+2y}

Question 6

Choose the correct answer

$3^x + 3^x + 3^x$ is equal to

- A. 9^x B. 27^x C. 3^{x+1} D. 6^x

Question 7

Choose the correct answer

$\frac{3^{x+2} - 3^{x+1}}{3^{x+1}}$ is equal to

- A. 3^{x+2} B. 2 C. $3 - 3^{x+1}$ D. 1

Question 8

Choose the correct answer

Simplify without using a calculator

$(\sqrt{2} - \frac{1}{\sqrt{2}})^2$

- A. $2\frac{1}{2}$ B. $\frac{1}{2}$ C. $1\frac{1}{2}$ D. 1

Question 9

Choose the correct answer

If $(10^{12} + 25)^2 - (10^{12} - 25)^2 = 10^n$, the value of n is

- A. 10 B. 11 C. 14 D. 24

Question 10

Choose the correct answer

If $a + \frac{1}{a} = 5$ then $a^2 + \frac{1}{a^2}$ is equal to

- A. 25 B. 24 C. 27 D. 23



Improve your Skills

Question 1

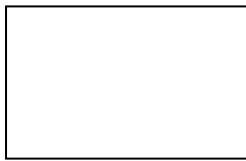
Given: $A = \frac{3^n - 4}{6^n - 2^{n+2}}$

1.1 Simplify A

1.2 Hence determine $\sqrt[n]{A}$

Question 2

$$\sqrt{5} - 1$$



$$\sqrt{5} + 1$$

A rectangle has sides $\sqrt{5} + 1$ and $\sqrt{5} - 1$, calculate the length of the diagonal, leaving the answer in simplest surd form

Question 3

Without a calculator, simplify

$$\frac{2x + 7\sqrt{x} - 15}{x^{\frac{1}{2}} + 5}$$