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MAH-CET 2024

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Basic MATHS

INDICES

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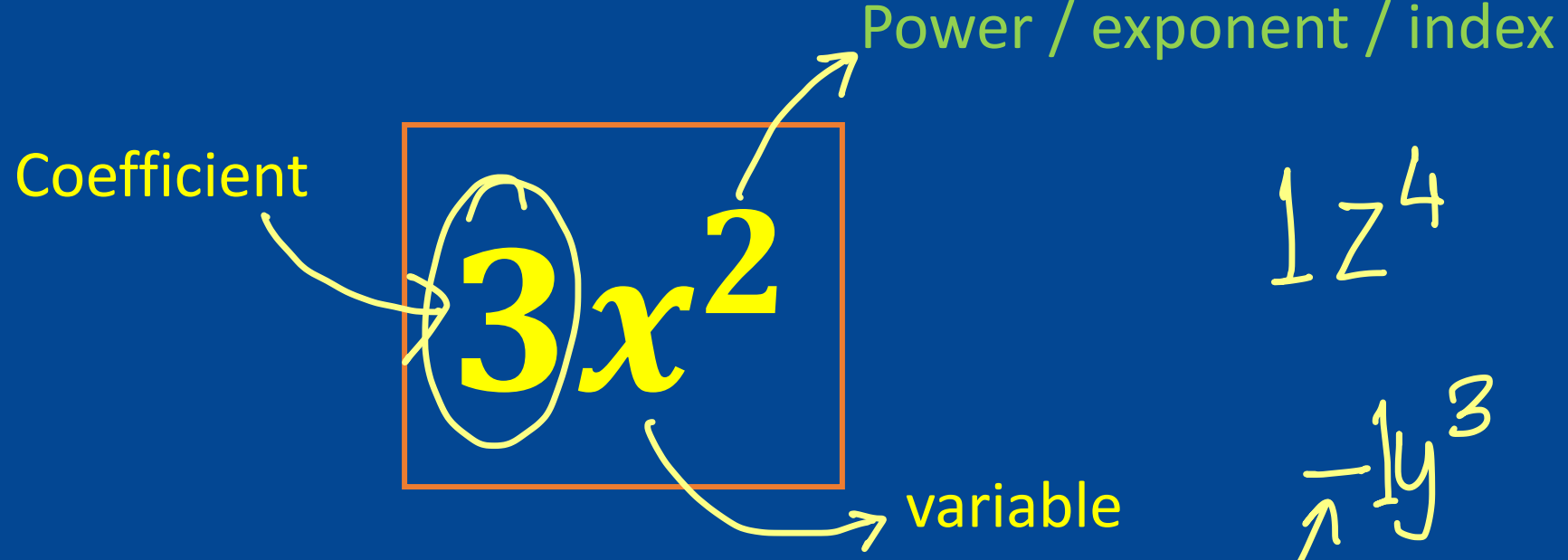
Term

Variable / coefficient



$1z^4$

$-1y^3$

-1

What does exponent means?

$4^2 = 4 \times 4 = 16$

square

$x^5 = x \times x \times x \times x \times x$

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Negative exponent

$4^2 = 4 \times 4$

$$4^{-2} = \frac{1}{4^2} = \frac{1}{4 \times 4} = \frac{1}{16}$$

4 raised to 2

$$x^{-5} = \frac{1}{x^5}$$ ✓

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What is the value of 10^{-1}

$$10^{-1} = \frac{1}{10^1} = \frac{1}{10}$$

$$= 0.1$$

$0.\overline{251}$

$= 25 \times 0.01$

$= 25 \times \frac{1}{100}$

$0.1 = \frac{1}{10}$

$0.01 = \frac{1}{100}$

$0.001 = \frac{1}{1000}$

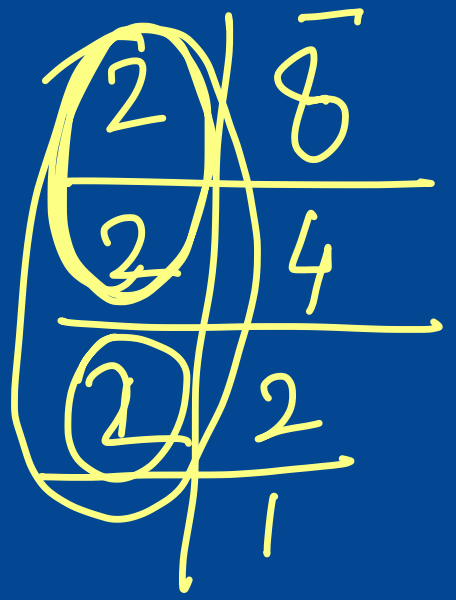
$0.0001 = \frac{1}{10000}$

Square and Square root

$4^2 = 4 \times 4 = 16$ → square

$\sqrt{4} = \sqrt{2 \times 2} = 2$

$\sqrt{8} = \sqrt{2 \times 2 \times 2} = 2\sqrt{2}$



Find square root of $\sqrt{400}$

Step

$$\sqrt{400} = \sqrt{2 \times 2 \times 2 \times 2 \times 5 \times 5}$$

$$= 2 \times 2 \times 5$$

$$= 4 \times 5 = 20$$

2	400
2	200
2	100
2	50
5	25
5	5
	1

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Find square (-12)

$$(-12)^2 = -12 \times -12 = \boxed{+144}$$

Cube and cube root

$3^3 = 3 \times 3 \times 3 = 27$

$\sqrt[3]{64} = \sqrt[3]{2 \times 2 \times 2 \times 2 \times 2 \times 2}$

$= 2 \times 2 = 4$

2	64
2	32
2	16
2	8
2	4
2	2
	1

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Find cube of 5 *and* -7

$5^3 = 5 \times 5 \times 5 = 25 \times 5 = 125$

$-7^3 = -7 \times -7 \times -7 = +49 \times -7$

$= -343$

$(-2)^2 = +ve$

$(-2)^3 = -ve$

Find cube root of -2744

$$\sqrt[3]{-2744} = -\sqrt{2\times2\times2\times7\times7\times7}$$

$$= -2\times7$$

$$= -14$$

2	2744
2	1372
2	686
7	343
7	49
7	7
	1

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Fractional Exponent / power

$$4^{\frac{1}{2}} = \sqrt[2]{4}$$

$$y^{1/4} = \sqrt[4]{y}$$

$$x^{1/3} = \sqrt[3]{x}$$

$$z^{1/6} = \sqrt[6]{z}$$

(1) Fifth root of 13

$\sqrt[5]{13}$

$13^{1/5}$

(2) Sixth root of 9

$\sqrt[6]{9}$

$9^{1/6}$

(3) Square root of 256

$\sqrt{256}$

$256^{1/2}$

Laws of Indices / exponents

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

$$y^2 \times y^3 = y^{2+3} = y^5$$

$$4^2 \times 4^1 = 4^{2+1} = 4^3$$

Laws of Indices / exponents

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

$$a^m \div a^n = a^{m-n}$$

$$\frac{y^5}{y^2} = y^{5-2} = y^3$$

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

Laws of Indices / exponents

$$(a^m)^n = a^{m \times n}$$

$$(2^3)^2 = 2^{3 \times 2}$$

$$= 2^6$$

$$= 2 \times 2 \times 2 \times 2 \times 2 \times 2$$

Laws of Indices / exponents

$$a^m \times b^m = (ab)^m$$

$(42)^2$ ✗

$4^2 \times 2^2 = 16 \times 4 = 64$

$= (4 \times 2)^2$

$= 8^2 = 64$

Laws of Indices / exponents

$$\frac{a^m}{b^m} = \left(\frac{a}{b}\right)^m$$

$$\frac{4^3}{2^3} = \left(\frac{2\cancel{4}}{\cancel{2}}\right)^3$$

$$= 2^3$$

$$= 2 \times 2 \times 2$$

$$= 8$$

Laws of Indices / exponents

$a^0 = 1$

$4^1 = 4$

$4^0 = 1$

$x^0 = 1$

$z^0 = 1$

Laws of Indices / exponents

$$\sqrt[n]{a} = a^{\frac{1}{n}}$$

$$a^{\frac{1}{n}} = \sqrt[n]{a}$$

$$5^{\frac{1}{2}} = \sqrt[2]{5}$$

$$7^{1/6} = \sqrt[6]{7}$$

IMPORTANT NOTE:

$(-a)^m = a^m$ ➔ If m is EVEN number

$(-a)^m = -a^m$ ➔ If m is ODD number

$(-2)^2 = -2 \times -2 = 4$ (even)

$(-2)^3 = -2 \times -2 \times -2 = -8$

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Simplify the expression

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

$$y = x^{a-b} \times x^{b-c} \times x^{c-a} \times x^{-a-b}$$

$$y = x^{a-b+b-c+c-a+(-a-b)}$$

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

$$\boxed{y = x^{-a-b}}$$

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(i) $(-4)^5 \times (-4)^{-10}$

$$-4^{5+(-10)} = -4^{5-10} = -4^{-5}$$

$$= \frac{1}{-4^5}$$

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(ii) $2^5 \div 2^{-6}$

$$\frac{2^5}{2^{-6}} = 2^{5-(-6)}$$

$$= 2^{5+6}$$

$$= 2^{11}$$

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(ii) $2^5 \div 2^{-6}$

Repeat

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If $\sqrt[3]{729} = 9$ then $\sqrt[3]{0.000729} = ?$

$\sqrt[3]{729} = 9$

$\sqrt[3]{0.000729} = \sqrt[3]{\frac{729}{1} \times \frac{1}{1000000}}$

$= \sqrt[3]{\frac{729}{10,00,000}}$

$= \frac{\sqrt[3]{729}}{\sqrt[3]{1000000}} = \frac{9}{100}$

$= 0.09$

0.25

$25 \times \frac{1}{100}$

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$$a^m \times b^m = (ab)^m$$

$\sqrt{(ab)^2} = ?$

A. a^2b^2 B. a b C. ab^2 D. a^2b^4

$$\sqrt{a^2 b^2} = \sqrt{a \times a \times b \times b}$$

$$= a \times b = ab$$

NOTE

$$\sqrt{a^2} = a$$

$$\sqrt[3]{a^3} = a$$

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$(243)^{0.12} \times (243)^{0.08} = ?$

A. 243 B. 3 C. 9 D. 6

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

REVISE

$243^{(0.12+0.08)}$

$0.\overline{20}$

$20 \times \frac{1}{100} = \frac{20}{100}$

3	243
3	81
3	27
3	9
	3

3
1

$= (243)^{0.20}$

$= (243)^{\frac{20}{100}}$

$= (243)^{\frac{1}{5}}$

$= \sqrt[5]{243}$

$= \sqrt[5]{3 \times 3 \times 3 \times 3 \times 3}$

$= 3$

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