Results for 4111
(Comp+ Syn Exam)

100 - 1 Yay Nathalie!

90's - 5

80's - 3

70's - 4

60's - 3

↓60 - 4

Exponents + Radicals

2^3 ← exponent

2 ← base

$(-2)^3 = (-2)(-2)(-2) = -2^3$

$(-2)^4 = 2^4$

* If the exponent applying to a negative base is

(i) even → then result will be positive

(ii) odd → then result will be negative

$(-1x)^2 = x^2$

$(-x)^5 = -x^5$

$-x^2 = -x^2$

* The base can be a letter or a number

e.g. 3^8 ↑ base $\quad y^8$ ↑ base

$3y^8$ ← exponent only applies to y.

3 ← coefficient, y^8 ← base

First Law of Exponents

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

e.g. $x^2 \cdot x^3 = x^5$

$x \cdot x \quad x \cdot x \cdot x = x^5$

e.g.s. ① $t^5 \cdot t^3 = t^8$

② $2^3 \cdot 2^4 \cdot 2^1 = 2^8$

③ $(-x)^3 \cdot (-x)^6 = (-x)^9 = -x^9$

④ $y^{\frac{1}{2}\cdot\frac{3}{3}} \cdot y^{\frac{1}{3}\cdot\frac{2}{2}} =$

$y^{\frac{3}{6}} \cdot y^{\frac{2}{6}} = \boxed{y^{\frac{5}{6}}}$

⑤ $-4z^3 \cdot 3z^4 = -12z^7$

↑ Multiply Coefficients in regular way

⑥ $(-3)^3 \cdot 3^7 =$

$-3^3 \cdot 3^7 =$

$(-1)3^3 \cdot 3^7 = -3^{10}$

Second Law of Exponents

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

e.g. ① $\frac{x^5}{x^3} = \frac{\cancel{x}\cdot\cancel{x}\cdot\cancel{x}\cdot x\cdot x}{\cancel{x}\cdot\cancel{x}\cdot\cancel{x}} = x^2$

② $\frac{y^2}{y^6} = y^{2-6} = y^{-4} = \left(\frac{1}{y}\right)^4$

$= \frac{1^4}{y^4}$

$= \frac{1}{y^4}$

③ $\frac{3x^{-2}}{6x^3} = \frac{1x^{-2-3}}{2}$

$= \frac{x^{-5}}{2} = \frac{1}{2x^5}$

④ $\frac{a^{\frac{2}{3}}}{a^{\frac{1}{4}}} = a^{\frac{5}{12}}$

$\frac{2\cdot4}{3\cdot4} - \frac{1\cdot3}{4\cdot3}$

$\frac{8}{12} - \frac{3}{12} = \frac{5}{12}$

(5) $\dfrac{3^4}{3^4} = 3^{4-4} = 3^0 = 1$

(6) $\dfrac{2x^8}{6x^6} \overset{\div 2}{\underset{\div 2}{}} = \dfrac{1x^2}{3} = \dfrac{x^2}{3}$

(7) $\dfrac{2x^6}{6x^8} = \dfrac{1}{3x^2}$

Third Law of Exponents

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

① $a^{-2} = \frac{1}{a^2}$

② $\frac{x^3}{x^7} = x^{3-7} = x^{-4} = \frac{1}{x^4}$

③ $3^{-2} = \frac{1}{3^2}$

④ $\left(\frac{1}{7}\right)^{-4} = 7^4$

⑤ $\left(-\frac{1}{3}\right)^{-4}$

$(-3)^4 = 3^4$

$\frac{5}{3} \cdot \frac{5}{3} \cdot \frac{5}{3} \cdot \frac{5}{3}$

⑥ $\left(\frac{3}{5}\right)^{-3} = \left(\frac{5}{3}\right)^3 = \frac{5^3}{3^3}$

⑦ $4x^{-4} = \frac{4}{x^4}$

Which of the following statements is true?

a) $3^{-1} = -3$

b) $(-2)^{-1} = 2$

c) $\left(\frac{7}{3}\right)^{-1} = \frac{-3}{7}$

d) $\left(\frac{-5}{4}\right)^{-2} = \frac{-16}{25}$

T e) $\left(\frac{-2}{5}\right)^{-3} = \frac{-125}{8}$

f) $(-1)^{-1} = 1$

$\left(-\frac{2}{5}\right)^{-3}$

$\left(-\frac{5}{2}\right)^{3} = \left(\frac{-5}{2}\right)\left(\frac{-5}{2}\right)\left(\frac{-5}{2}\right)$

$-\frac{5^3}{2^3} = -\frac{125}{8}$

⑧ $\dfrac{x^{-4}}{x^{-9}} = \dfrac{x^{9}}{x^{4}} = x^{5}$

$x^{-4+9} = x^{5}$

⑨ $y \cdot y^{-4} = \dfrac{y}{y^{4}} = \dfrac{1}{y^{3}}$

OR $y^{1} \cdot y^{-4}$

↳ $y^{-3} = \dfrac{1}{y^{3}}$

Fourth Law of Exponents

$$a^0 = 1$$

e.g. $5^0 = 1$ $\quad (-3)^0 = 1$

$x^0 = 1$ $\quad -3^0 = -1$

$-1(3^0) = -1$

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

$$= 5^0 = 1$$

You try:

① $\left(\frac{3}{5}\right)^5 \cdot \left(\frac{3}{5}\right)^{-7} = \left(\frac{3}{5}\right)^{-2} = \left(\frac{5}{3}\right)^2 = \frac{5^2}{3^2}$

② $x^3 \cdot x^{\frac{1}{3}} = x^{3\frac{1}{3}} = x^{\frac{10}{3}}$

③ $3x^{-4} \cdot 5x^3 = 15x^{-1} = \frac{15}{x}$

④ $(-2)^{\frac{3}{4}} \cdot (-2)^{\frac{5}{4}} = (-2)^{\frac{8}{4}} = (-2)^2 = 2^2$

⑤ $4x^4 \cdot 1x^{-5} \cdot 3x^1 = 12x^0 = 12$ ($x^0 = 1$)

⑥ $\left(\frac{1}{4}\right)y^3 \cdot \left(\frac{-1}{3}y^2\right) \cdot 6y^{-5} = \frac{-1}{2}y^0 = \frac{-1}{2}$

$\left(\frac{1}{4}\right)\left(\frac{-1}{3}\right)\left(\frac{6}{1}\right) = \frac{-2}{4} = \frac{-1}{2}$

⑦ $\frac{(-y)^6}{(-y)^3} = (-y)^3 = -y^3$

⑧ $\frac{3t^{\frac{5}{3}}}{6t^{\frac{2}{3}}} = \frac{1t^{\frac{5}{3}-\frac{2}{3}}}{2} = \frac{t^{\frac{3}{3}}}{2} = \frac{t}{2}$

Fifth Law of Exponents

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

e.g.s ① $(3^4)^5 = 3^{20}$

② $-2(t^3)^4 = -2t^{12}$

③ $\left((-2)^2\right)^{-2}$

Illegal to leave negative exponent!

$$(2^2)^{-2} = 2^{-4} = \frac{1}{2^4}$$

④ $-(7^2)^3 = -7^6$

⑤ $(-7^2)^3 = -7^6$

⑥ $(-7^2)^4 = 7^8$

Sixth Law of Exponents

$$(abc)^m = a^m b^m c^m$$

e.g. ① $(abc)^2 = a^2 b^2 c^2$

② $(b^3 x^2)^4 = b^{12} x^8$

③ $(2x^3 y^{\frac{1}{4}})^4 = 2^4 x^{12} y$

④ $(a^3 b^{-2})^2 = a^6 b^{-4} = \frac{a^6}{b^4}$

⑤ $(-a^3 b)^3 = -a^9 b^3$

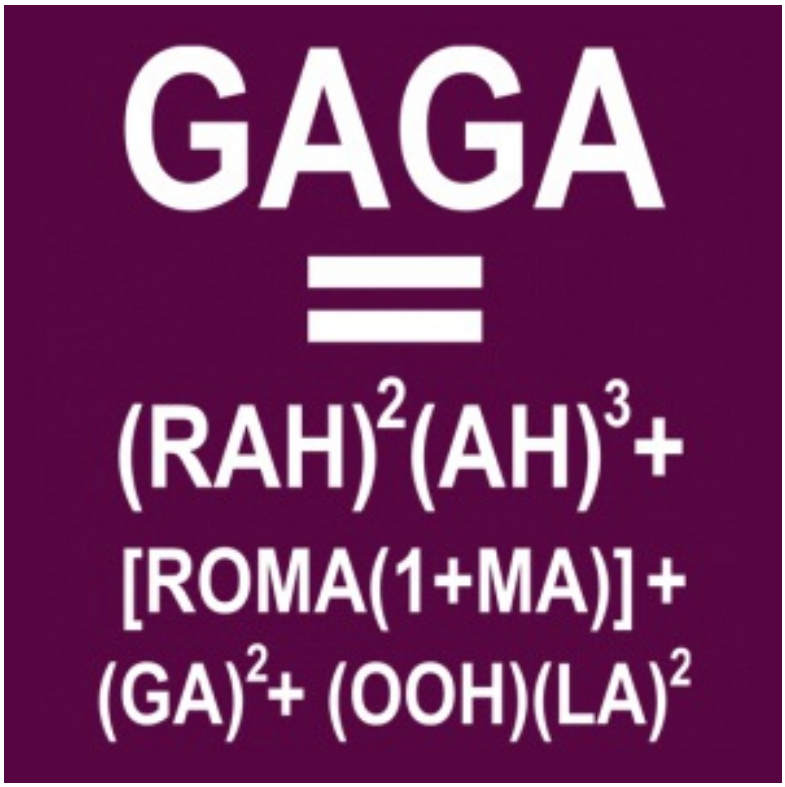
⑥ $(-x^3 b^4)^2 = x^6 b^8$

⑦ $(3a^3 2b^{-3} 3c^2)^{-3}$

$$\frac{3^{-3} a^{-9} 2^{-3} b^9 3^{-3} c^{-6}}{1}$$

$$= \frac{b^9}{3^3 a^9 2^3 3^3 c^6}$$

$$= \boxed{\frac{b^9}{2^3 3^6 a^9 c^6}}$$


GAGA
=
(RAH)2(AH)3+
[ROMA(1+MA)]+
(GA)2+ (OOH)(LA)2

Seventh Law

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

e.g. ① $\left(\frac{a^2}{b}\right)^4 = \frac{a^8}{b^4}$

② $\left(\frac{2x^3}{3b^2}\right)^4 = \frac{2^4 x^{12}}{3^4 b^8}$

③ $\left(\frac{a^{-3}}{b^2}\right)^{-4} = \frac{a^{12}}{b^{-8}} = a^{12}b^8$

④ $\left[\frac{x^3}{(-y)^5}\right]^3 = \frac{x^9}{(-y)^{15}} = \frac{x^9}{-y^{15}}$

$= \frac{-x^9}{y^{15}}$

Bases

2

$2^2 = 4$

$2^3 = 8$

$2^4 = 16$

$2^5 = 32$

$2^6 = 64$

$2^7 = 128$

$2^8 = 256$

3

$3^2 = 9$

$3^3 = 27$

$3^4 = 81$

$3^5 = 243$

5

$5^2 = 25$

$5^3 = 125$

$5^4 = 625$

6

$6^2 = 36$

7

$7^2 = 49$

Convert each expression to one with a single base:

① $(3 \cdot 27^3)^4$

$(3 \cdot (3^3)^3)^4$

$(3^1 \cdot 3^9)^4$

$(3^{10})^4 = 3^{40}$

② $(2 \cdot 32^2)^3$

$(2 \cdot (2^5)^2)^3$

$(2 \cdot 2^{10})^3$

$(2^{11})^3 = 2^{33}$

(3) $\left(16^3 \cdot 32^2\right)^4$

$\left(\left(2^4\right)^3 \cdot \left(2^5\right)^2\right)^4$

$\left(2^{12} \cdot 2^{10}\right)^4$

$\left(2^{22}\right)^4 = 2^{88}$

④ $\left(3^4 \cdot 27^2\right)^{-2}$

$\left(3^4 \cdot \left(3^3\right)^2\right)^{-2}$

$\left(3^4 \cdot 3^6\right)^{-2}$

$\left(3^{10}\right)^{-2}$

$3^{-20} = \frac{1}{3^{20}}$

⑤ $\left(8^2 \cdot 32^3 \cdot 5^2\right)^2$

$\left(\left(2^3\right)^2 \cdot \left(2^5\right)^3 \cdot 5^2\right)^2$

$\left(2^6 \cdot 2^{15} \cdot 5^2\right)^2$

$\left(2^{21} \cdot 5^2\right)^2$

$2^{42} 5^4$

(5) $\left[\left(\frac{1}{3}\right)^2 \cdot \frac{1}{9}\right]^3$

$\left[\left(3^{-1}\right)^2 \cdot 3^{-2}\right]^3$

$\left[3^{-2} \cdot 3^{-2}\right]^3$

$\left(3^{-4}\right)^3$

$3^{-12} = \frac{1}{3^{12}}$

(7) $\left(16^{\frac{1}{2}} \cdot 32^{\frac{1}{4}}\right)^{\frac{1}{3}}$

$\left(\left(2^4\right)^{\frac{1}{2}} \cdot \left(2^5\right)^{\frac{1}{4}}\right)^{\frac{1}{3}}$

$\left(2^2 \cdot 2^{\frac{5}{4}}\right)^{\frac{1}{3}}$

$2^{\frac{2}{3}} \cdot 2^{\frac{5}{12}} = \boxed{2^{\frac{13}{12}}}$

$\frac{2 \cdot 4}{3 \cdot 4} + \frac{5}{12}$

$\frac{8}{12} + \frac{5}{12}$

$\frac{13}{12}$