

Exponents

$$\frac{y^{1/2} \cdot (x^3 y^5)^{2/3} \cdot x^{-4}}{x^{3/5} y^{-1/5}}$$

P  
3  
D  
D  
A  
S

$$(x^3 y^5)^{2/3}$$

$$x^{3 \cdot (2/3)} y^{5 \cdot (2/3)}$$

$$x^2 y^{10/3}$$

$$\frac{y^{1/2} \cdot x^2 y^{10/3} \cdot x^{-4}}{x^{3/5} y^{-1/5}}$$

$$\frac{1}{2} + \frac{10}{3} + \frac{1}{5}$$

$$\frac{15}{30} + \frac{100}{30} + \frac{6}{30} = \frac{121}{30}$$

$$\frac{y^{1/2 + 10/3 + 1/5} \cdot x^2}{x^{3/5 + 4}}$$

$$\frac{3}{5} + \frac{4}{1}$$

$$\frac{3}{5} + \frac{20}{5} = \frac{23}{5}$$

$$\frac{y^{121/30} \cdot x^2}{x^{23/5 - 2}}$$

$$23/5 - 2/1$$

$$23/5 - 10/5 = 13/5$$

$$\frac{y^{121/30}}{x^{13/5}}$$

$2^3 = 8$        $8^2 = 16^{5x}$        $2^4 = 16$

$(2^3)^2 = (2^4)^{5x}$

~~$2^6 = 2^{20x}$~~   
 ~~$6 = 20x$~~   
 $6/20 = x$   
 $3/10 = x$

$(\frac{1}{4}) = 16^x$   
 $4^{-1} = 16^x$   
 ~~$4^{-1} = (4^2)^x$~~   
 $-\frac{1}{2} = 2 \times \frac{1}{2}$   
 $(\frac{1}{4})^{-1}$   
 $-\frac{1}{2} = x$   
 $(\frac{1}{4})^{-1} = (\frac{4}{1})^{-1}$   
 $4^{-1} = (\frac{4^{-1}}{1}) = \frac{1}{4}$

$4^2 = 16^x$   
 $4^2$

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

$$(2^{-1})^x = 4^5$$

$$(2^{-1})^x = (2^2)^5$$

~~$$2^{-x} = 2^{10}$$~~

$$-x = 10$$

$$x = -10$$

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

opposite  
location  
to make  
positive

$$5^{x+3} = \boxed{25}^{4x-5}$$

$$5^{x+3} = (5^2)^{(4x-5)}$$

~~$$5^{x+3} = 5^{2(4x-5)}$$~~

~~$$5^{x+3} = 5^{8x-10}$$~~

$$x+3 = 8x-10$$

$$3 = 7x-10$$

$$13 = 7x$$

$$\frac{13}{7} = x$$

$$12^{4x} = 144^{x-5}$$

$$12^{4x} = \underline{(12^2)^{(x-5)}}$$

$$4x = 2x - 10$$

$$2x = -10$$

$$x = -5$$

$$12^{-20} = 144^{-10}$$

$$12^{-20} = 12^{2(-10)}$$

$$12^{-20} = 12^{-20}$$

Get Rid of the 25

$$\frac{3^x \cdot \cancel{25}}{\cancel{25}} = \frac{75}{25}$$

$$3^x = 3$$

$$x = 1$$

$$3x \cdot 25 = 125$$

$$\frac{3x(\cancel{25})}{\cancel{25}} = \frac{125}{25}$$

To solve exponents

• SAME BASE

Find the same base  
\*Go to smallest base

$$5^x = 5^3$$

$$5^3 = 5^3$$

$$x = 3$$

$$5^x = 25^3$$

↑ change  
to

$$5^x = (5^2)^3$$

$$5^x = 5^6$$

$$x = 6$$

$$5^x = 25$$

↑ change  
to

$$5^x = 5^2$$

$$x = 2$$

P  
E  
M  
D  
A  
S

$$\frac{y^{1/2} (x^3 y^5)^{2/3} \cdot x^{-4}}{x^{3/5} y^{-1/5}}$$

$$(x^3 y^5)^{2/3}$$

$$x^{3 \cdot 2/3} y^{5 \cdot 2/3}$$

$$x^2 y^{10/3}$$

$$\frac{y^{1/2} \cdot x^2 \cdot y^{10/3} \cdot x^{-4}}{x^{3/5} y^{-1/5}}$$

move negative exponents

$$\frac{y^{1/2} \cdot x^2 \cdot y^{10/3} \cdot y^{1/5}}{x^{3/5} \cdot x^4} = \frac{x^2 \cdot y^{1/2 + 10/3 + 1/5}}{x^{3/5 + 4}}$$

$$\frac{x^2 \cdot y^{121/30}}{x^{23/5 - 2}}$$

$$\frac{1}{2} + \frac{10}{3} + \frac{1}{5}$$

$$\frac{15}{30} + \frac{100}{30} + \frac{6}{30} = \frac{121}{30}$$

$$\frac{3}{5} + \frac{4}{1}$$

$$\frac{3}{5} + \frac{20}{5} = \frac{23}{5}$$

answer →

$$\frac{y^{121/30}}{x^{13/5}}$$

$$\frac{23}{5} - \frac{2}{1}$$

$$\frac{23}{5} - \frac{10}{5} = \frac{13}{5}$$

Solve Exponents with SAME BASE

$$5^x = 5^1$$

$$x = 1$$

$$5^x = 25$$

$$x = 2$$

$$5^x = \boxed{25}^3$$

$$5^x = (\boxed{5^2})^3$$

~~$$5^x = 5^6$$~~

$$x = 6$$

> why?

mathematically

$$5^x = 25$$

~~$$5^x = (5^2)$$~~

$$x = 2$$

change to  
the smaller  
base or  
same base



$$2^{?} = 8 \quad 8^x = 32^5 \quad 2^{?} = 32$$

$$(2^3)^x = (2^5)^5$$

~~$$2^{3x} = 2^{25}$$~~

$$3x = 25$$

$$x = \frac{25}{3}$$

First: can  $8^? = 32$ ?

Second: change both bases.

$$27^{x+2} = 243^5$$

$$(3^{3 \cdot (x+2)}) = (3^5)^5$$

~~$$3^{3x+6} = 3^{25}$$~~

$$3x+6 = 25$$

$$3x = 19$$

$$x = \frac{19}{3}$$

$$5^{-1} = \frac{5^{-1}}{1} \xrightarrow{\text{opposite location}} = \frac{1}{5}$$

$$2^{-1} = \frac{2^{-1}}{1} \xrightarrow{\text{opposite location}} = \frac{1}{2}$$

$$4^{-1} = \frac{4^{-1}}{1} \xrightarrow{\text{make positive exponent}} = \frac{1}{4}$$

$$\frac{1}{6} = 6^{-1}$$

$$\frac{1}{7} = 7^{-1}$$

$$\left(\frac{1}{4}\right)^x = 16^3$$

$$\downarrow$$

$$(4^{-1})^x = (4^2)^3$$

$$\cancel{(4^{-1})^x} = \cancel{(4^2)^3}$$

$$-x = 6$$

$$x = -6$$

$$\left(\frac{1}{2}\right) = 32^{x+5}$$

$$2^{-1} = 32^{(x+5)}$$

$$\cancel{2^{-1}} = \cancel{(2^5)^{(x+5)}}$$

$$-1 = 5(x+5)$$

$$-1 = 5x + 25$$

$$-26 = 5x$$

$$\frac{-26}{5} = x$$

$$\frac{3^x \cdot \cancel{25}}{\cancel{25}} = \frac{75}{\cancel{25}}$$

$$3^x = 3$$

$$x = 1$$

what would you do?

$$\frac{3x \cdot \cancel{25}}{\cancel{25}} = \frac{75}{\cancel{25}}$$

$$3x =$$

$$\frac{y^{1/2} (x^3 y^5)^{2/3} x^{-4}}{x^{3/5} y^{-1/5}}$$

$$(x^3 y^5)^{2/3}$$

$$x^{3 \cdot \frac{2}{3}} y^{5 \cdot \frac{2}{3}}$$

$$x^2 y^{10/3}$$

~~P~~  
 F  
 M  
 D  
 A  
 S

$$\frac{y^{1/2} \cdot x^2 \cdot y^{10/3} \cdot x^{-4}}{x^{3/5} y^{-1/5}}$$

move negative exponents to top/bottom  
 \* opposite location

$$\frac{y^{1/2} \cdot x^2 \cdot y^{10/3} \cdot y^{1/5}}{x^{3/5} \cdot x^4}$$

$$\frac{x^2 \cdot y^{\frac{1}{2} + \frac{10}{3} + \frac{1}{5}}}{x^{\frac{3}{5} + 4}}$$

$$\frac{x^2 y^{\frac{121}{30}}}{x^{23/5}}$$

$$\frac{y^{\frac{121}{30}}}{x^{13/5}}$$

$$\frac{1}{2} + \frac{10}{3} + \frac{1}{5}$$

$$\frac{3}{30} + \frac{100}{30} + \frac{6}{30} = \frac{121}{30}$$

$$\frac{3}{5} + \frac{4}{1} \cdot \frac{5}{5}$$

$$\frac{3}{5} + \frac{20}{5} = \frac{23}{5}$$

$$\frac{23}{5} - \frac{2}{1}$$

$$\frac{23}{5} - \frac{10}{5} = \frac{13}{5}$$

Solve Exponents with same base

$$5^x = 5^1$$

$$x = 1$$

$$5^x = 25$$

$$x = 2$$

Why?

Explain Mathematically

$$5^x = 25$$

$$5^x = 5^2$$

$$x = 2$$

$$5^x = \boxed{25}^3 \text{ multiply}$$

$$5^x = \left( \underline{5^2} \right)^3$$

~~$$5^x = 5^6$$~~

~~$$x = 6$$~~

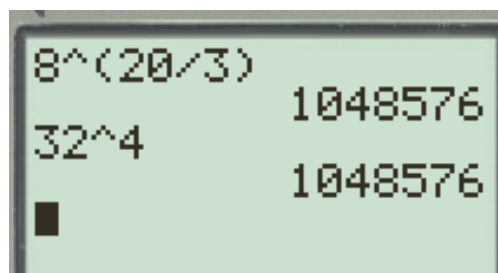
$$2^3 = 8$$
$$8^x = 32^4$$
$$2^5 = 32$$

$$(2^3)^x = (2^5)^4$$

~~$$2^{3x} = 2^{20}$$~~

$$3x = 20$$

$$x = \frac{20}{3}$$



$8^{(20/3)}$	1048576
$32^4$	1048576

$$\frac{3^x \cdot \cancel{25}}{\cancel{25}} = \frac{75}{25}$$

$$3^x = 3$$

$$x = 1$$



$$3^{-1} = \text{move to opposit location}$$

$$\frac{1}{3}$$

$$\left\{ \frac{3^{-1}}{1} \right\} = \frac{1}{3}$$

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

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

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

$$\frac{1}{16} = 16^{-1}$$

$$\left(\frac{1}{4}\right) = 16^x$$

↑  
change

$$4^{-1} = 16^x$$

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

$$-1 = 2x$$

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

$$\left(\frac{1}{3}\right)^{2x} \cdot 2 = 54$$

$$\left(\frac{1}{3}\right)^{2x} = 27$$

$$(3^{-1})^{2x} = 27$$

$$(3^{-1})^{2x} = (3^3)$$

$$\cancel{3^{-2x}} = \cancel{3^3}$$

$$-2x = 3$$

$$x = -\frac{3}{2}$$

$$8^{6x-4} = 2^{x+3}$$
$$(2^3)^{(6x-4)} = 2^{(x+3)}$$

Goal:  
SAME BASE

$$\cancel{2}^{18x-12} = \cancel{2}^{x+3}$$

$$18x - 12 = x + 3$$

$$17x - 12 = 3$$

$$17x = 15$$

$$x = 15/17$$