

Week 3 Challenge of the Week for Math 150

Factor If

$$72^x \cdot 48^y = 6^{xy}$$
$$(3^2)^x (2^3)^x \cdot (3)^y (2^4)^y = 2^{xy} \cdot 3^{xy}$$

Then find the value of

$$x + 6y$$

As a single term.

base
twos

$$3x + 4y = xy$$

base
threes

$$2x + y = xy$$

Set both = 0, BUT make one xy positive, other negative
(or set left xy equal to right xy)

$$3x + 4y = 2x + y$$

$$x = -3y$$

Substitute this into one eqn above

$$3(-3y) + 4y = (-3y)y$$

$$-9y + 4y = -3y^2$$

$$3y^2 - 5y = 0$$

$$y(3y - 5) = 0$$

$$y = 0 \quad \left\{ \begin{array}{l} 3y - 5 = 0 \\ y = 5/3 \end{array} \right.$$

when
 $y = 0$
 $x = 0$

when
 $y = 5/3$
 $2x + 5/3 = 5/3 x$
 $5/3 = -1/3 x$
 $x = -5$