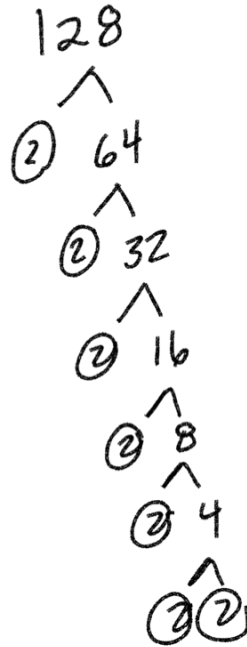
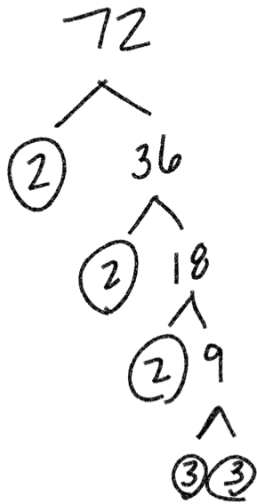


72, 128

$72: 3 \cdot 3 \cdot 2 \cdot 2 \cdot 2 = 3^2 \cdot 2^3$

$128: 2 \cdot 2 \cdot 2 \cdot 2 \cdot 2 \cdot 2 \cdot 2 = 2^7$

① Prime Factorization



Greatest Common Factor

GCF: $72: 3 \cdot 3 \cdot \cancel{2} \cdot \cancel{2} \cdot \cancel{2}$
 $128: \cancel{2} \cdot \cancel{2} \cdot \cancel{2} \cdot \cancel{2} \cdot \cancel{2} \cdot \cancel{2} \cdot \cancel{2}$

Find pairs, keep one of each.

$GCF: 2 \cdot 2 \cdot 2 = \boxed{8}$

Lowest Common Multiple

$LCM: 72: 3 \cdot 3 \cdot \cancel{2} \cdot \cancel{2} \cdot \cancel{2} = 9$
 $\boxed{128} \cdot \cancel{2} \cdot \cancel{2} \cdot \cancel{2} \cdot \cancel{2} \cdot \cancel{2} \cdot \cancel{2}$

Find pairs, then multiply the remaining terms.

$LCM: 128 * 9 = \boxed{1152}$

Reduce

$\frac{72}{128} = \frac{72}{128} \frac{3 \cdot 3 \cdot \cancel{2} \cdot \cancel{2} \cdot \cancel{2}}{\cancel{2} \cdot \cancel{2} \cdot \cancel{2} \cdot \cancel{2} \cdot \cancel{2} \cdot \cancel{2} \cdot \cancel{2}}$

Find pairs, eliminate them
 $= \boxed{\frac{9}{16}}$

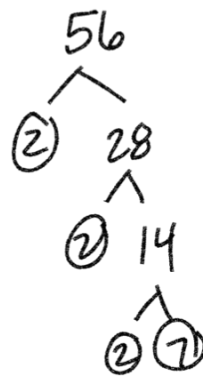
56, 64

1.) Prime Factorize ✓

2.) GCF

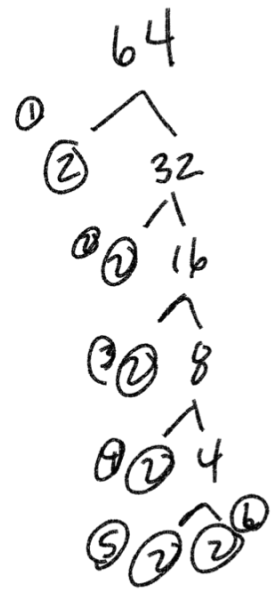
3.) LCM

4.) Reduce $\frac{56}{64}$



56: 7 · 2 · 2 · 2

64: 2 · 2 · 2 · 2 · 2 · 2



2.) GCF: 56: 7 · 2 · 2 · 2
 64: 2 · 2 · 2 · 2 · 2 · 2

GCF: 2 · 2 · 2 = 8

3.) LCM: 56: ~~7 · 2 · 2 · 2~~
 64: 2 · 2 · 2 · 2 · 2 · 2

Thanos

LCM: 7 * 64
 = 448

56: 56, 112, 168, 224, ...

64: 64, 128, 192, 256, ...

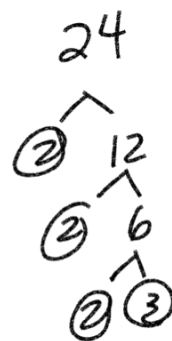
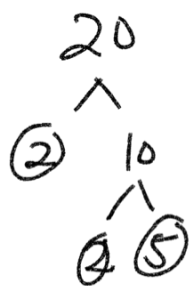
4.) Reduce

$\frac{56}{64}$

$\frac{56}{64} = \frac{7 \cdot \cancel{2} \cdot \cancel{2} \cdot \cancel{2}}{\cancel{2} \cdot \cancel{2} \cdot \cancel{2} \cdot 2 \cdot 2}$

= $\frac{7}{8}$

$$20x^3y^4, 24x^2y^6$$



$$20x^3y^4 = 5 \cdot 2 \cdot 2 \cdot x \cdot x \cdot x \cdot y \cdot y \cdot y \cdot y$$

$$24x^2y^6 = 3 \cdot 2 \cdot 2 \cdot 2 \cdot x \cdot x \cdot y \cdot y \cdot y \cdot y \cdot y \cdot y$$

GCF

$$20x^3y^4 = 5 \cdot 2 \cdot 2 \cdot x \cdot x \cdot x \cdot y \cdot y \cdot y \cdot y$$

$$24x^2y^6 = 3 \cdot 2 \cdot 2 \cdot 2 \cdot x \cdot x \cdot y \cdot y \cdot y \cdot y \cdot y \cdot y$$

$$\text{GCF} = 2 \cdot 2 \cdot x \cdot x \cdot y \cdot y \cdot y \cdot y$$

$$4x^2y^4$$

choose the smaller ones

$$20x^3y^4, 24x^2y^6$$

$$4x^2y^4$$

Reduce

$$\frac{20x^3y^4}{24x^2y^6} = \frac{5 \cdot 2 \cdot 2 \cdot x \cdot x \cdot x \cdot y \cdot y \cdot y \cdot y}{3 \cdot 2 \cdot 2 \cdot 2 \cdot x \cdot x \cdot y \cdot y \cdot y \cdot y \cdot y \cdot y} = \frac{5x}{6y^2}$$

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

$$\frac{y^4}{y^6} = y^{4-6} = y^{-2} = \frac{1}{y^2}$$

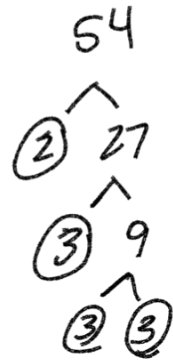
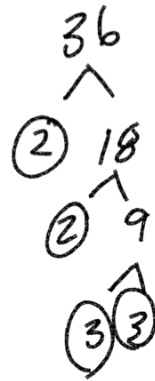
$$36a^5b^3c^{10}, 54a^7b^1c^5$$

$$36 = 3 \cdot 3 \cdot 2 \cdot 2 \cdot a^5 b^3 c^{10}$$

$$\text{GCF: } 54 = 3 \cdot 3 \cdot 3 \cdot 2 \cdot a^7 \cdot b \cdot c^5$$

$$3 \cdot 3 \cdot 2 \cdot a^5 b c^5$$

$$\boxed{18a^5bc^5}$$



$$2+7=9$$

Reduce

$$\frac{36a^5b^3c^{10}}{54a^7bc^5} = \frac{\cancel{3} \cdot \cancel{3} \cdot \cancel{2} \cdot \cancel{2} \cdot a^5 b^3 c^{10}}{\cancel{3} \cdot \cancel{3} \cdot \cancel{3} \cdot \cancel{2} \cdot a^7 \cdot b \cdot c^5}$$

$$\frac{2b^2c^5}{3a^2}$$

$$\frac{a^5}{a^7} = a^{5-7} = a^{-2} = \frac{1}{a^2}$$

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

$$\frac{c^{10}}{c^5} = c^{10-5} = c^5$$

$$4^5 = 4 \cdot 4 \cdot 4 \cdot 4 \cdot 4$$

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

$$a \cdot a \cdot a \cdot a \cdot a \cdot a \cdot a \cdot a = a^8$$

exponents ~~before~~ multiplication

↓ ↓
PEMPAS

$$3X^5 \quad X=2$$

$$3(2)^5 = 3(32) = \textcircled{96}$$

$$\begin{array}{cccccc} 3 & \cdot & X & \cdot & X & \cdot & X & \cdot & X & \cdot & X \\ \downarrow & & \downarrow & & \downarrow & & \downarrow & & \downarrow & & \downarrow \\ 3 & \cdot & 2 & \cdot & 2 & \cdot & 2 & \cdot & 2 & \cdot & 2 \end{array}$$

$$\begin{array}{l} 6 \cdot 2 \\ 12 \cdot 2 \\ 24 \cdot 2 \\ 48 \cdot 2 = \textcircled{96} \end{array}$$

$$a^4 b^2 c * a^2 b^2 c^4$$

$$\boxed{a \cdot a \cdot a \cdot a} \cdot \boxed{b \cdot b} \cdot \boxed{c} * \boxed{a \cdot a} \cdot \boxed{b \cdot b} \cdot \boxed{c \cdot c \cdot c \cdot c} \quad \boxed{a^6 b^4 c^5}$$

$$\begin{array}{l} a^4 * a^2 = a^{4+2} = \textcircled{a^6} \\ b^2 * b^2 = b^{2+2} = \textcircled{b^4} \\ c^1 * c^4 = c^{1+4} = \textcircled{c^5} \end{array}$$

when you multiply exponents, you add them!

$$X^7 y^8 z^2 * X^3 y^5 z^7 = \boxed{X^{10} y^{13} z^9}$$

$$X^7 * X^3 = X^{7+3} = X^{10}$$

$$y^8 * y^5 = y^{8+5} = y^{13}$$

$$z^2 * z^7 = z^{2+7} = z^9$$

$$\frac{X^9 y^6 z^4}{X^7 y^8 z^8} = \boxed{\frac{X^2 y^5}{z^4}}$$

$$\frac{X^9}{X^7} = X^{9-7} = X^2$$

$$\frac{y^6}{y^8} = y^{6-8} = y^{-2}$$

$$\frac{z^4}{z^8} = z^{4-8} = z^{-4} = \frac{1}{z^4}$$

Dividing exponents
is subtracting

$$\frac{a^4}{a^4} = a^{4-4} = a^0 = 1$$

$$\frac{a^4}{a^4} = \frac{\overset{1}{a} \cdot \overset{1}{a} \cdot \overset{1}{a} \cdot \overset{1}{a}}{\underset{1}{a} \cdot \underset{1}{a} \cdot \underset{1}{a} \cdot \underset{1}{a}} = \frac{1}{1} = 1$$

$$3^0 = 1 \quad 1,027^0 = 1$$

Anything raised to
power is 1

$$5^0 = 1 \quad \left(\text{unicorn} \right)^0 = 1$$

$$\left(a^2 \right)^3 = a^2 \cdot a^2 \cdot a^2 = a^{2+2+2} = a^6$$

when you raise an exponent by
another exponent, you multiply

$$\left(a^2 \right)^3 = a^{2 \cdot 3} = \boxed{a^6}$$

$$\left(3a^4b^7 \right)^2 = 3^{2 \cdot 1} a^{4 \cdot 2} b^{7 \cdot 2} = \boxed{3^2 a^8 b^{14}} = \boxed{9 a^8 b^{14}}$$

