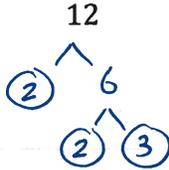


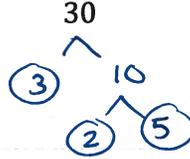
13 - 5.2 Common factors

Part 1: Prime Factorization using Factor Trees

Q1: Prime factor the following:



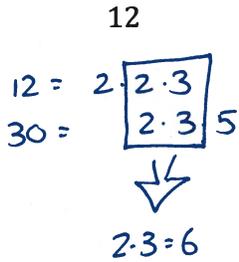
$$12 = 2^2 \cdot 3$$



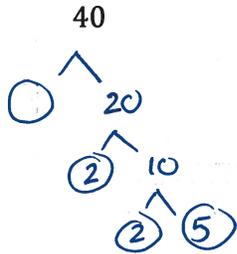
$$30 = 2 \cdot 3 \cdot 5$$

Part 2: Prime Factorization and Common Factors

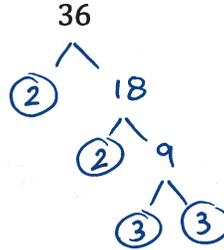
Q2: What is the largest divisor of both numbers?



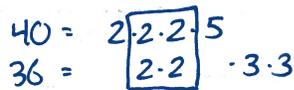
6 is the largest divisor of both.
6 is the "Greatest Common Factor", or GCF



$$40 = 2^3 \cdot 5$$



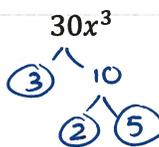
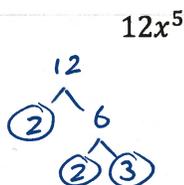
$$36 = 2^2 \cdot 3^2$$



4 is the "Greatest Common Factor"

Part 3: Finding the Common Factor

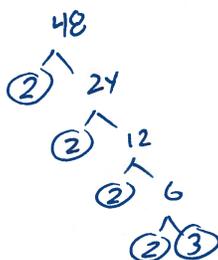
Q3: Use prime factorization to determine the largest common factor of both numbers:



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

$$30x^3 = \boxed{2 \cdot 3} \cdot \boxed{5} \cdot \boxed{x \cdot x \cdot x}$$

\Rightarrow GCF is $2 \cdot 3 \cdot x \cdot x \cdot x = \boxed{6x^3}$



$48x^6y^2$

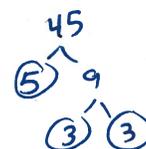
$$2^4 \cdot 3 \cdot x^6 y^2$$

$$3^2 \cdot 5 \cdot x^3 y$$

\Rightarrow GCF is $\boxed{3x^3y}$

This is the "most" that can be taken from both terms.

$45x^3y$



Part 4: Common Factoring an Expression

Common factor the following expressions:

Q4: $16x^2y + 24x^2y^2$

GCF = $8x^2y$

$$\frac{16x^2y}{8x^2y} = 2$$

$$\frac{24x^2y^2}{8x^2y} = 3y$$



$\boxed{8x^2y(2 + 3y)}$

Q5: $7a^2b - 28ab + 14ab^2$

GCF = $7ab$

$$\frac{7a^2b}{7ab} = a$$

$$\frac{-28ab}{7ab} = -4$$

$$\frac{14ab^2}{7ab} = 2b$$



$\boxed{7ab(a - 4 + 2b)}$

■ 187 ■

Q6: $-4np^2 - 10n^4p - 14np$

GCF = $-2np$

$$\frac{-4np^2}{-2np} = 2p$$

$$\frac{-10n^4p}{-2np} = -5n^3$$

$$\frac{-14np}{-2np} = +7$$



$$\boxed{-2np(2p - 5n^3 + 7)}$$

Q7: $6x^2 - 12x + 3$

GCF = 3

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

$$\frac{-12x}{3} = -4x$$

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



$$\boxed{3(2x^2 - 4x + 1)}$$

Q8: $4x^3 - 16x^2 + 6x$

GCF = $2x$

$$\frac{4x^3}{2x} = 2x^2$$

$$\frac{-16x^2}{2x} = -8x$$

$$\frac{6x}{2x} = 3$$



$$\boxed{2x(2x^2 - 8x + 3)}$$

Q9: $3x^3y + 6x^2y + 3xy$

GCF = $3xy$

$$\frac{3x^3y}{3xy} = x^2$$

$$\frac{6x^2y}{3xy} = 2x$$

$$\frac{3xy}{3xy} = 1$$



$$\boxed{3xy(x^2 + 2x + 1)}$$

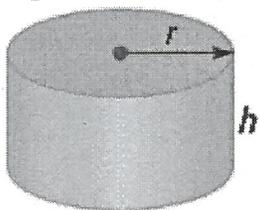
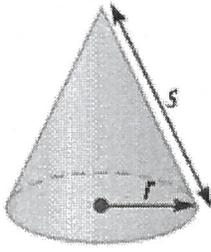
Part 5: Finding a Common Factor *versus* Common Factoring an Expression

What is the difference between a question that asks "What is the Common Factor" and a question that asks you to "Common Factor the Expression"?

Expression	What is the Greatest Common Factor (GCF)?	Common Factor the Expression
$2x^6 - 8x^4$	$2x^4$	$2x^4(x^2 - 4)$
$x^3 - 5x^2 + 3x$	x	$x(x^2 - 5x + 3)$
$4x^3 - 6x^2 + 8x$	$2x$	$2x(2x^2 - 3x + 4)$
$3x^2y^5 - 15x^7y^3$	$3x^2y^3$	$3x^2y^3(y^2 - 5x^5)$
$3x^2 - 6x + 12$	3	$3(x^2 - 2x + 4)$
$98x^3 - 18xy^2$	$2x$	$2x(49x^2 - 9y^2)$

Part 5: Harder Questions

Q10: Common factor the following surface area equations:

Shape	Formula #1	Formula #2
Right prism 	$SA = 2lw + 2lh + 2wh$	$SA = 2(LW + LH + WH)$
Right cylinder 	$SA = 2\pi r^2 + 2\pi rh$	$SA = 2\pi r(r+h)$
Right cone 	$SA = \pi r^2 + \pi rs$	$SA = \pi r(r+s)$

Q11: Common factor $4p(2p - 1) - (2p - 1)$

$$\underline{4p(2p-1)} - \underline{1(2p-1)} \quad \text{2 terms both have } (2p-1) \text{ in common}$$

$$(2p-1)(4p-1)$$

Q12: Common factor $5ax - 15a - 3x + 9$

$$(5ax - 15a) + (-3x + 9)$$

\uparrow
 Always
 a plus
 inbetween

$$\underline{5a(x-3)} - \underline{3(x-3)}$$

$$(x-3)(5a-3)$$

Q13: Common factor $6ax - 8a + 9x - 12$

$$\begin{aligned} & (6ax - 8a) + (9x - 12) \\ & \underline{2a(3x - 4)} + \underline{3(3x - 4)} \\ & (3x - 4)(2a + 3) \end{aligned}$$

Q14: Common factor $3ax - 15a - 2x + 10$

$$\begin{aligned} & (3ax - 15a) + (-2x + 10) \\ & \quad \uparrow \\ & \quad \text{Always} \\ & \quad \text{a plus.} \\ & \underline{3a(x - 5)} - \underline{2(x - 5)} \\ & (x - 5)(3a - 2) \end{aligned}$$

Q15: A fruit basket contains apples and oranges. Each basket will have the same quantity of apples, and the same quantity of oranges. If there are 10 apples and 15 oranges available, how many fruit baskets can be made? How many apples and oranges are in each basket?

Let $x =$ apple
Let $y =$ orange

$$\begin{aligned} & 10x + 15y \\ & \quad \swarrow \quad \searrow \\ & 5(2x + 3y) \\ & \quad \swarrow \quad \searrow \\ & 5 \text{ baskets of...} \quad 2 \text{ apples and} \\ & \quad \quad \quad \quad \quad 3 \text{ oranges} \end{aligned}$$

Part 6: Textbook Practice