

Σ Terms and expressions

- ✓ **Term:** a number, a variable, or a number times a variable
- ✓ **Like terms** have the same variables to the same powers, and only they combine: $2x^3 + 3x^3 = 5x^3$, but not $3x^2$
- ✓ **Coefficient:** the number in front of a variable: $3x = x + x + x$
- ✓ **Exponent:** repeated multiplication: $x^3 = x \cdot x \cdot x$
- ✓ Distribute a minus sign to every term: $-(12 + 5p^5) = -12 - 5p^5$

⚖ Solving equations

- ✓ Do the same thing to **both sides**
- ✓ Undo each operation with its opposite: add and subtract, multiply and divide
- ✓ $x - 12 = 36$: add 12 to both sides, so $x = 48$
- ✓ **Isolate** a variable: $2x + 3y = 6$ gives $y = \frac{-2x + 6}{3}$
- ✓ **Substitute** a given value: if $x = 6$, then $x^2 - 17 = 36 - 17 = 19$

↔ Absolute value

- ✓ The distance from zero, so never negative: $|4| = |-4| = 4$
- ✓ $|\dots| = a$ with $a > 0$ has **two** cases: the inside equals a or $-a$
- ✓ $|-6x| = 30$: $-6x = 30$ or $-6x = -30$, so $x = -5$ or $x = 5$

= Proportions

- ✓ Two equal ratios: solve by **cross-multiplying**
- ✓ $\frac{2}{5} = \frac{x}{10}$: $5x = 20$, so $x = 4$

X¹ Exponent rules

Rule	In symbols	Example
Zero exponent	$a^0 = 1$ ($a \neq 0$)	$2^0 = 1$
Product	$a^b \cdot a^c = a^{b+c}$	$2^3 \cdot 2^4 = 2^7$
Quotient	$\frac{a^b}{a^c} = a^{b-c}$	$\frac{2^4}{2^3} = 2^1$
Power of a power	$(a^b)^c = a^{bc}$	$(2^4)^3 = 2^{12}$
Power of a product	$(ab)^c = a^c b^c$	$(2b)^3 = 2^3 b^3$
Negative exponent	$a^{-b} = \frac{1}{a^b}$	$2^{-3} = \frac{1}{2^3}$

$$(x^2 y^{-2})^4 = x^8 y^{-8} = \frac{x^8}{y^8}$$

√x Roots

- ✓ **Roots as exponents:** $\sqrt{a} = a^{1/2}$ and $\sqrt[n]{a^b} = a^{b/n}$; $4^{2/3} = \sqrt[3]{16}$
- ✓ Square roots to memorize:
 - $\sqrt{1} = 1$ • $\sqrt{4} = 2$ • $\sqrt{9} = 3$
 - $\sqrt{16} = 4$ • $\sqrt{25} = 5$ • $\sqrt{36} = 6$
 - $\sqrt{49} = 7$ • $\sqrt{64} = 8$ • $\sqrt{81} = 9$
 - $\sqrt{100} = 10$ • $\sqrt{121} = 11$ • $\sqrt{144} = 12$
- ✓ Cube roots to memorize:
 - $\sqrt[3]{1} = 1$ • $\sqrt[3]{8} = 2$ • $\sqrt[3]{27} = 3$
 - $\sqrt[3]{64} = 4$ • $\sqrt[3]{125} = 5$
- ✓ **Simplify a square root:** factor into primes and bring out one of each pair
 - $\sqrt{63} = \sqrt{3 \cdot 3 \cdot 7} = 3\sqrt{7}$
 - $\sqrt{75} = \sqrt{25 \cdot 3} = 5\sqrt{3}$
- ✓ A cube root takes groups of three, a fourth root groups of four