Unit 2 · Equations and Expressions Cheat Sheet

Unit 2 focus: expressions with exponents and roots, writing linear equations

1 KEY VOCABULARY

expression	Numbers, variables and operations; no equals sign.	$3x^2 - 5$
equation	Two expressions that are equal.	$2x + 1 = 9$
like terms	Same variable raised to the same power.	$4x$ and $-7x$
coefficient	The number multiplying a variable.	6 in $6y$
solution	A value that makes the equation true.	$x = 4$ in $2x + 1 = 9$

2 EXPRESSIONS WITH EXPONENTS

Use the order of operations: parentheses, exponents, multiply/divide, add/subtract. Use the exponent rules to simplify.

Example: Evaluate $2x^3 - 4x^{-1}$ for $x = 2$.
Substitute: $2(2)^3 - 4(2)^{-1}$
Simplify: $2(8) - 4 \cdot \frac{1}{2} = 16 - 2$
Answer: 14

3 EXPRESSIONS WITH ROOTS

Expression	Simplified
$\sqrt{x^2}$	$\lvert x \rvert$ (a root is never negative)
$\sqrt{25x^4}$	$5x^2$
$\sqrt[3]{27y^3}$	$3y$
$\sqrt{16} + \sqrt[3]{-8}$	$4 + (-2) = 2$

Square roots undo squaring; cube roots undo cubing.

4 WRITING LINEAR EQUATIONS

Name the unknown, translate the words, then solve. Key words: "is" =, "per/each" ×, "more than" +.

Example: A gym charges $25 to join plus $15 per month. Sam paid $130. How many months?
Equation: $25 + 15m = 130$
Solve: $15m = 105$
Answer: $m = 7$ **months**

5 COMBINING LIKE TERMS

Collect like terms on each side first, then solve with inverse operations.

Example: $5x - 3 + 2x + 8 = 26$
Combine: $7x + 5 = 26$
Subtract 5, divide by 7: $7x = 21$
Answer: $x = 3$

6 QUICK REMINDERS & COMMON MISTAKES

✔ Do remember

- Do the same thing to both sides.
- Distribute to every term inside the parentheses.
- Check by substituting your answer.

✘ Common mistakes

- $-2(x - 3) = -2x - 6$: it is $-2x + 6$
- Combining $3x + 2 = 5x$: 3x and 2 are not like terms
- $x^2 = 16 \Rightarrow x = 8$: take the square root: $x = \pm 4$

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More practice: variables on both sides, the distributive property and the number of solutions

1 VARIABLES ON BOTH SIDES

Move the variable terms to one side and the numbers to the other.

Example: $7x - 4 = 3x + 12$
Subtract $3x$: $4x - 4 = 12$
Add 4, divide by 4: $4x = 16$

Answer: $x = 4$

2 THE DISTRIBUTIVE PROPERTY

$a(b + c) = ab + ac$. Distribute first, then combine like terms.

Example: $3(2x - 5) = 4(x + 1) + 3$
Distribute: $6x - 15 = 4x + 4 + 3$
Combine: $6x - 15 = 4x + 7$
Solve: $2x = 22$

Answer: $x = 11$

3 ONE, NONE OR INFINITELY MANY

Simplifies to	Solutions
$x = 5$ (a number)	**one** solution
$4 = 9$ (false)	**no** solution
$4 = 4$ (always true)	**infinitely many**

$2(x + 3) = 2x + 6 \rightarrow 6 = 6$: infinitely many. $2x + 3 = 2x - 1 \rightarrow 3 = -1$: none.

4 EXPONENT EQUATIONS

Equation	Solution
$x^2 = 81$	$x = \pm 9$
$x^3 = 125$	$x = 5$
$2x^2 = 50$	$x^2 = 25,\ x = \pm 5$
$x^2 = -4$	no real solution
$x^2 = 7$	$x = \pm\sqrt{7}$

Get the power alone first, then take the square root (two answers) or the cube root (one answer).

5 FRACTIONS IN EQUATIONS

Multiply every term by the least common denominator to clear the fractions.

Example: $\frac{x}{3} + \frac{1}{2} = \frac{5}{6}$
Multiply by 6: $2x + 3 = 5$
Solve: $2x = 2$

Answer: $x = 1$

6 CHECK YOURSELF

- Did I distribute the sign as well as the number?
- Did I combine like terms on each side before moving terms?
- If the variable disappeared, is the statement true (infinitely many) or false (none)?
- Did I substitute my answer back into the original equation?