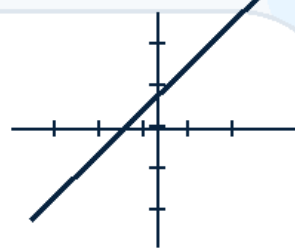


PASS  
WITH  
FOCUS

$$y = mx + b$$



# HiSET MATH

## FORMULA REVIEW

Complete formulas. Clear concepts. Confident review.



ESSENTIAL  
FORMULAS



COVER ALL  
TOPICS



QUICK  
REFERENCE



PASS WITH  
CONFIDENCE

CLEAR.  
CONCISE.  
COMPLETE.

### HiSET Math

- ✓ Numbers & Operations
- ✓ Algebra
- ✓ Geometry
- ✓ Data Analysis
- ✓ Problem Solving

YOU GOT THIS!

Review. Remember. Succeed.

# HiSET MATH

## Formula Review Guide

HiSET Math foundations plus the Algebra 1 formulas students need for HiSET Mathematics: equations, graphs, geometry, data, and word problems.

### Formula Snapshot

#### GEOMETRY

$$A_{\Delta} = \frac{1}{2}bh, \quad a^2 + b^2 = c^2$$

area and right triangles

#### ALGEBRA

$$y = mx + b, \quad x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

lines and quadratics

#### DATA

$$\text{mean} = \frac{\text{sum}}{\text{count}}$$

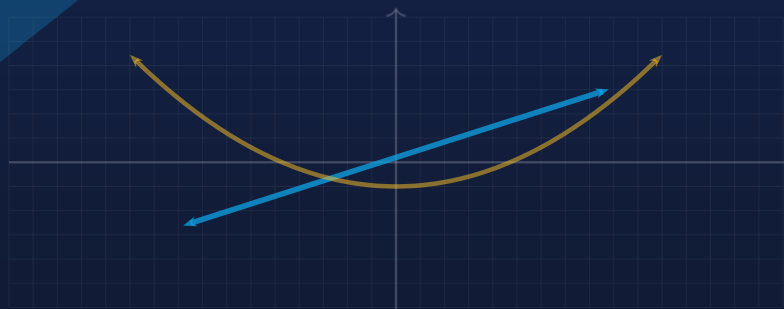
summaries and probability

HiSET Test Focus

Official Sheet + Must-Know Extra

Word-Problem Ready

Basic Math • Geometry • Algebra • Graphs & Functions • Data • Probability



# Welcome to the HiSET Math Formula Review

HiSET Math starts with strong Pre-Algebra: number sense, fractions, decimals, percents, ratios, integers, units, geometry, and data. This guide keeps that full base and then adds the Algebra 1 formulas HiSET students need for equations, graphs, functions, polynomials, quadratics, and word problems.

### USE FIRST Formula

Read the rule before starting practice.

### WATCH FOR Restrictions

Denominators, signs, units, and the correct whole matter.

### THEN TRY Example

Check one worked example before doing ten problems.

### FINISH WITH Practice

Scan the hub when a topic needs another pass.




#### HOW TO STUDY


Use this guide in loops: review the base formula, study the HiSET algebra add-on, then try a mixed HiSET-style problem. When a formula is given on the test, your job is still to recognize it, label the quantities, match units, substitute carefully, and check whether the answer makes sense.


### How to read every section

Each topic uses the same color-coded blocks.

  
**Formula table**  
the rules

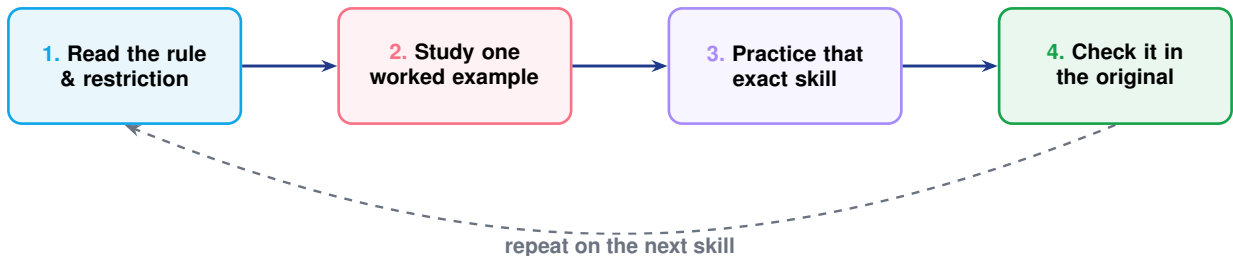
  
**Tutor's Note**  
plain English

  
**Example**  
worked problem

  
**Visual**  
see the idea

### The study loop

Run this cycle on each skill until it feels automatic.



# What's Inside

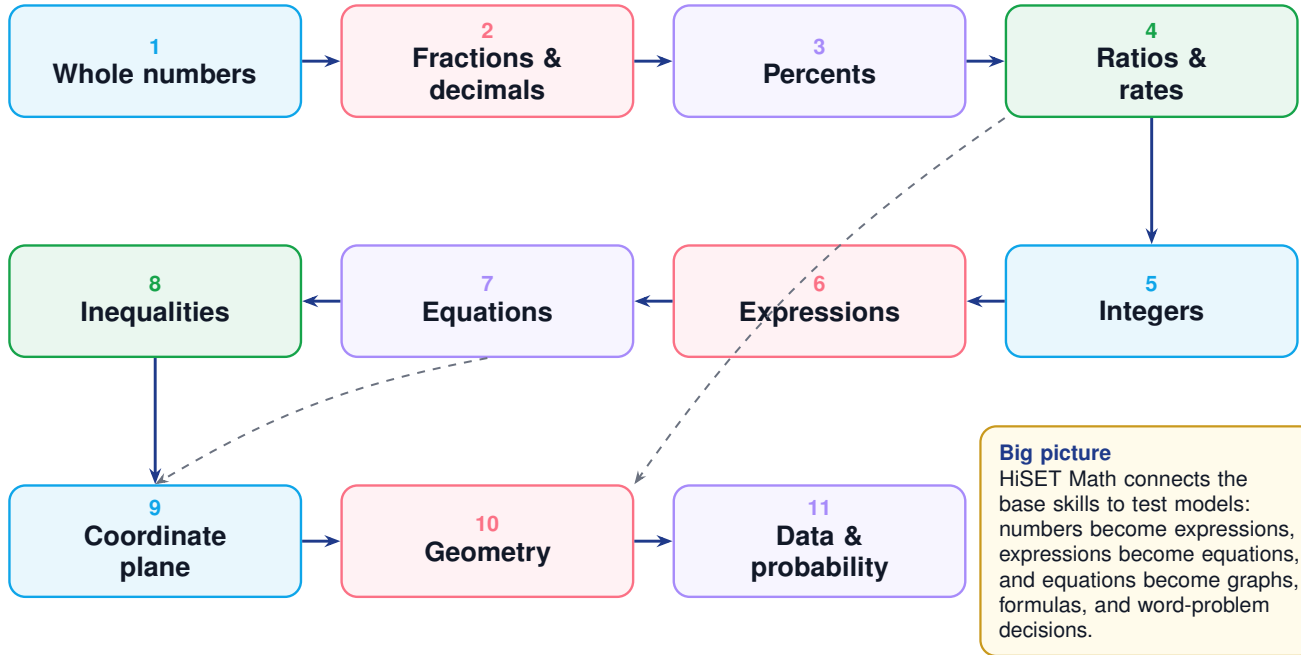
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Each section pairs the **formula** with a plain-English **Tutor's Note**, a worked example, and quick watch-outs.



# HiSET Math Formula Roadmap

HiSET Math starts with Pre-Algebra fluency, then adds the Algebra 1 formulas that appear in HiSET Mathematics. Move from number sense into equations, graphs, geometry, data, and word-problem models.



**Big picture**  
 HiSET Math connects the base skills to test models: numbers become expressions, expressions become equations, and equations become graphs, formulas, and word-problem decisions.



If an algebra step feels hard, check the earlier skill: signs, fractions, order of operations, or choosing the correct whole in a percent problem.

**Every number lives on the number line** Whole numbers, integers, fractions, and decimals are all points on one line — negatives to the left of 0, positives to the right.



# 1 Whole Numbers, Properties & Order

## Number rules

### Place value

A digit's value depends on its position: ones, tens, hundreds, tenths, hundredths, and so on.

### Order of operations

Parentheses, exponents, multiply or divide left to right, then add or subtract left to right.

### Commutative property

$$a + b = b + a \text{ and } ab = ba.$$

### Associative property

$$(a + b) + c = a + (b + c) \text{ and } (ab)c = a(bc).$$

### Distributive property

$$a(b + c) = ab + ac.$$

### Identity properties

$$a + 0 = a \text{ and } a \cdot 1 = a.$$

### Inverse properties

$$a + (-a) = 0 \text{ and } a \cdot \frac{1}{a} = 1 \text{ when } a \neq 0.$$

## Tutor's Note

Order of operations keeps everyone evaluating expressions the same way. Multiplication and division are a team: do whichever appears first from left to right. Addition and subtraction work the same way.

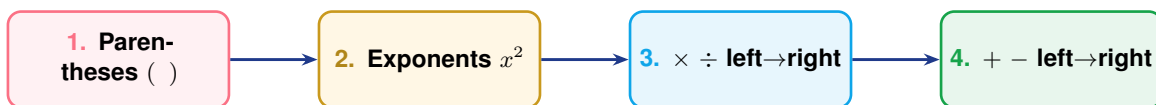
**Example**  
 $18 - 3(2 + 4)^2 \div 6$ . Parentheses: 6. Exponent: 36. Multiply/divide:  $3 \cdot 36 \div 6 = 18$ . Then  $18 - 18 = 0$ .



PEMDAS

PEMDAS does not mean all multiplication before all division. Work multiplication and division left to right.

**Order of operations (PEMDAS)** Work top to bottom, but multiply/divide share a step (left to right) and so do add/subtract.



## 2 Factors, Multiples & Number Types

### Factors and number sense

<b>Factor</b>	A whole number that divides another whole number evenly.
<b>Multiple</b>	A result of multiplying a number by a whole number.
<b>Prime number</b>	A whole number greater than 1 with exactly two factors: 1 and itself.
<b>Composite number</b>	A whole number greater than 1 with more than two factors.
<b>GCF</b>	Greatest common factor: the largest factor shared by numbers.
<b>LCM</b>	Least common multiple: the smallest positive multiple shared by numbers.
<b>GCF-LCM connection</b>	For positive integers $a, b$ : $\text{gcd}(a, b) \cdot \text{lcm}(a, b) = ab$ .
<b>Divisibility: 2, 5, 10</b>	By 2 if even; by 5 if ending in 0 or 5; by 10 if ending in 0.
<b>Divisibility: 3, 4, 6, 9</b>	By 3 or 9 if the digit sum is divisible by 3 or 9; by 4 if the last two digits form a multiple of 4; by 6 if divisible by 2 and 3.

#### Tutor's Note

GCF helps you simplify and factor. LCM helps you build common denominators. Prime factorization is the cleanest way to find both.

$24 = 2^3 \cdot 3$  and  $36 = 2^2 \cdot 3^2$ .  $\text{GCF} = 2^2 \cdot 3 = 12$  and  $\text{LCM} = 2^3 \cdot 3^2 = 72$ .

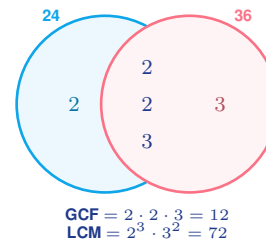
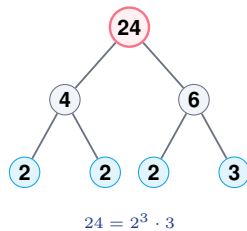
**Example**



Zero is a multiple of every nonzero whole number, but it is not used as the least positive common multiple.

#### Prime factor trees & the GCF/LCM Venn

Break each number into primes, then share them: the overlap is the GCF and the whole picture is the LCM.



### 3 Fractions & Mixed Numbers

#### Fraction operations

<b>Equivalent fractions</b>	$\frac{a}{b} = \frac{ak}{bk}$ when $b \neq 0$ and $k \neq 0$ .
<b>Simplify</b>	$\frac{a}{b}$ is simplified by dividing numerator and denominator by their GCF, with $b \neq 0$ .
<b>Add/subtract</b>	$\frac{a}{b} + \frac{c}{d} = \frac{ad + bc}{bd}$ , with $b, d \neq 0$ .
<b>Multiply</b>	$\frac{a}{b} \cdot \frac{c}{d} = \frac{ac}{bd}$ , with $b, d \neq 0$ .
<b>Divide</b>	$\frac{a}{b} \div \frac{c}{d} = \frac{a}{b} \cdot \frac{d}{c}$ , with $b, c, d \neq 0$ .
<b>Reciprocal</b>	The reciprocal of $\frac{a}{b}$ is $\frac{b}{a}$ , with $a, b \neq 0$ .
<b>Mixed to improper</b>	$a\frac{b}{c} = \frac{ac + b}{c}$ for positive mixed numbers; keep a negative sign outside until the end.
<b>Part of a whole</b>	A fraction $\frac{a}{b}$ means $a$ parts out of $b$ equal parts.

#### Tutor's Note

To add or subtract fractions, the denominators must name the same size pieces. To multiply, go straight across. To divide, keep the first fraction, change division to multiplication, and flip the second fraction.

$$\frac{2}{3} + \frac{5}{6} = \frac{4}{6} + \frac{5}{6} = \frac{9}{6} = \frac{3}{2} = 1\frac{1}{2}.$$

Example

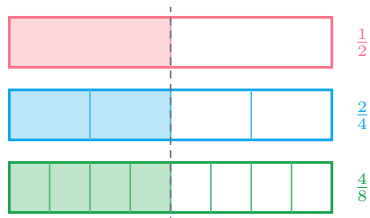


#### DENOMINATORS

A denominator can never be 0. Division by zero is undefined.

#### Fraction models: equivalent fractions

The same amount can be cut into more, smaller pieces. Each bar below is shaded *half*, so  $\frac{1}{2} = \frac{2}{4} = \frac{4}{8}$ .

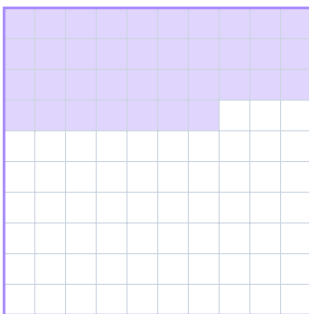


## 4 Decimals, Percents & Money Math

### Decimal and percent formulas

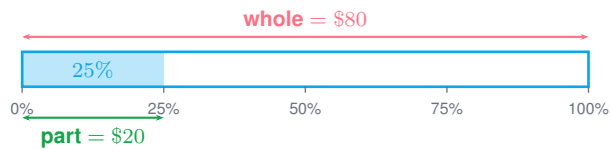
<b>Add/subtract decimals</b>	Line up the decimal points, then add or subtract as usual.
<b>Multiply decimals</b>	Multiply as whole numbers, then place the point so the answer has the total number of decimal places.
<b>Divide decimals</b>	Move both decimals right until the divisor is whole, then divide.
<b>Decimal to percent</b>	Move the decimal two places right: $0.37 = 37\%$ .
<b>Percent to decimal</b>	Move the decimal two places left: $85\% = 0.85$ .
<b>Percent to fraction</b>	$p\% = \frac{p}{100}$ , then simplify if possible.
<b>Percent equation</b>	part = percent · whole, using percent as a decimal.
<b>Percent change</b>	$\frac{\text{new} - \text{old}}{\text{old}} \cdot 100\%$ , where $\text{old} \neq 0$ .
<b>Simple interest</b>	$I = Prt$ and $A = P + I = P(1 + rt)$ .
<b>Tax / tip / markup</b>	Total = original amount $\times (1 + r)$ , where $r$ is the rate as a decimal.
<b>Discount / markdown</b>	Sale price = original price $\times (1 - r)$ , where $r$ is the discount rate.

**Percent means “out of 100”** Shade a  $10 \times 10$  grid: each little square is 1%. The same value is a fraction over 100 and a decimal.



$$37\% = 0.37 = \frac{37}{100}$$

**Percent bar: part = percent  $\times$  whole**



$$0.25 \times 80 = 20$$

#### Tutor's Note

The most common percent mistake is choosing the wrong whole. The whole is the original or total amount that the percent is based on.



A jacket costs \$80 and is discounted 25%. Discount =  $0.25(80) = 20$ , so the sale price is \$60. **Example**



MONEY

Round money to the nearest cent only at the end unless the problem tells you to round earlier.

## 5 Ratios, Rates & Proportions

### Proportion tools

<b>Ratio</b>	$a : b$ , $a$ to $b$ , and $\frac{a}{b}$ all compare two quantities.
<b>Rate</b>	A ratio with different units, such as miles per hour.
<b>Unit rate</b>	A rate with denominator 1.
<b>Proportion</b>	$\frac{a}{b} = \frac{c}{d}$ means $ad = bc$ , with $b, d \neq 0$ .
<b>Scale factor</b>	scale factor = $\frac{\text{new length}}{\text{original length}}$ .
<b>Similar figures</b>	Corresponding side lengths are proportional and corresponding angles match. $y = kx$ , where $k = \frac{y}{x}$ when $x \neq 0$ .
<b>Constant of proportionality</b>	A proportional relationship graphs as a straight line through $(0, 0)$ .
<b>Proportional graph</b>	
<b>Unit price</b>	unit price = $\frac{\text{total cost}}{\text{number of units}}$ .
<b>Distance, rate, time</b>	$d = rt$ ; so $r = \frac{d}{t}$ and $t = \frac{d}{r}$ .
<b>Percent proportion</b>	$\frac{\text{part}}{\text{whole}} = \frac{\text{percent}}{100}$ , with whole $\neq 0$ .

### Tutor's Note

A proportion is two equal ratios. Cross-multiplication works because multiplying both sides by the denominators clears the fractions.

If 3 notebooks cost \$7.50, the unit rate is  $7.50 \div 3 = \$2.50$  per notebook. **Example**

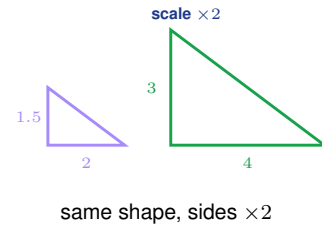
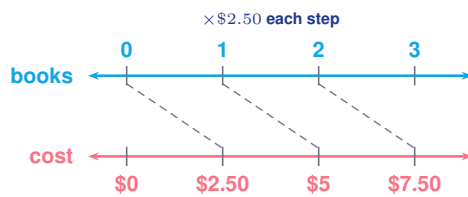


UNITS

Ratios compare. Rates compare with units. Keep units attached until the answer makes sense.



**Ratio tables & similar figures** Scale both quantities by the same number and the ratio stays the same.



**6 Integers & Absolute Value**

**Signed number rules**

**Add same signs**

Add absolute values and keep the common sign.

**Add different signs**

Subtract absolute values and keep the sign of the number farther from 0.

**Subtract**

$$a - b = a + (-b).$$

**Multiply/divide signs**

Same signs give positive; different signs give negative.

**Zero pairs**

$$a + (-a) = 0; \text{ opposites cancel in addition.}$$

**Absolute value**

$|a|$  is the distance from 0, so  $|a| \geq 0$ .

**Opposites**

$a$  and  $-a$  are the same distance from 0 in opposite directions.

**Coordinate distance on a line**

Distance between  $a$  and  $b$  is  $|a - b|$ .

**Tutor's Note**

For multiplying or dividing, count negatives: an even number of negative signs gives a positive result; an odd number gives a negative result.

$-7 + 12 = 5$  because the signs are different, so subtract  $12 - 7$  and keep the sign of 12.

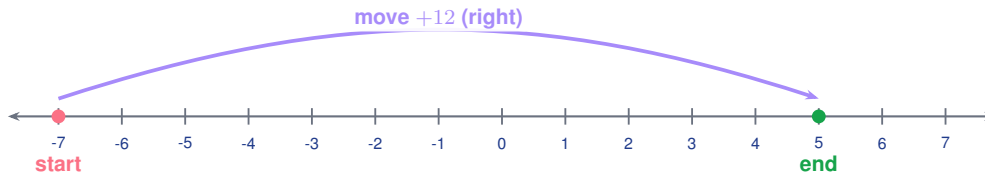
**Example**



Do not treat subtraction like multiplication. For  $5 - (-3)$ , add the opposite:  
 $5 + 3 = 8$ .



**Adding integers on a number line** Start at the first number, then *move*: right to add a positive, left to add a negative.



$-7 + 12 = 5$ . The two points are  $|-7 - 5| = 12$  apart.

## 7 Expressions, Equations & Inequalities

### Algebra basics

**Expression**

Numbers, variables, and operations without an equals sign.

**Equation**

A statement that two expressions are equal.

**Evaluate**

Substitute a number for a variable and simplify.

**Substitution**

Replace a variable with a given value, then use order of operations.

**Combine like terms**

Add/subtract coefficients of terms with the same variable part.

**Distribute**

$$a(b + c) = ab + ac.$$

**One-step equation**

$$x + a = b \Rightarrow x = b - a \text{ and } ax = b \Rightarrow x = \frac{b}{a} \text{ when } a \neq 0.$$

**Two-step equation**

For  $ax + b = c$ , subtract  $b$  first, then divide by  $a$  when  $a \neq 0$ .

**Inequality rule**

If multiplying or dividing by a negative number, flip the inequality symbol.

### Tutor's Note

Solving means keeping the equation balanced while isolating the variable. Whatever you do to one side, do to the other side.

Solve  $3x + 5 = 20$ . Subtract 5:  $3x = 15$ . Divide by 3:  $x = 5$ .

**Example**

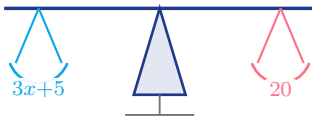


CHECK

A solution should make the original equation true. For inequalities, test a number in the solution region if you are unsure.



**An equation is a balance scale** Whatever you do to one side, do to the other, and the scale stays level until  $x$  is alone.



Solve  $3x + 5 = 20$ :

1. Subtract 5 from *both* sides:  $3x = 15$ .
2. Divide *both* sides by 3:  $x = 5$ .
3. Check:  $3(5) + 5 = 20$ . ✓

## 8 Exponents, Roots & Scientific Notation

### Powers and roots

**Exponent meaning**

$a^n$  means multiply  $a$  by itself  $n$  times for positive integer  $n$ .

**Product of powers**

$$a^m \cdot a^n = a^{m+n}$$

**Power of a power**

$$(a^m)^n = a^{mn}$$

**Power of a product**

$$(ab)^n = a^n b^n$$

**Power of a quotient**

$$\left(\frac{a}{b}\right)^n = \frac{a^n}{b^n} \text{ when } b \neq 0.$$

**Quotient of powers**

$$\frac{a^m}{a^n} = a^{m-n} \text{ when } a \neq 0.$$

**Zero exponent**

$$a^0 = 1 \text{ when } a \neq 0.$$

**Negative exponent**

$$a^{-n} = \frac{1}{a^n} \text{ when } a \neq 0.$$

**Square root**

$$\sqrt{x} = a \text{ means } a^2 = x \text{ and } a \geq 0.$$

**Cube root**

$$\sqrt[3]{x} = a \text{ means } a^3 = x.$$

**Perfect squares**

1, 4, 9, 16, 25, 36, 49, 64, 81, 100, ... are squares of whole numbers.

**Perfect cubes**

1, 8, 27, 64, 125, 216, 343, 512, 729, 1000, ... are cubes of whole numbers.

**Scientific notation**

$a \times 10^n$ , where  $1 \leq a < 10$  and  $n$  is an integer.

**Powers of ten**

Multiplying by  $10^n$  moves the decimal  $n$  places right if  $n > 0$  and left if  $n < 0$ .



**Tutor's Note**

Scientific notation keeps very large and very small numbers readable. The exponent on 10 tells how many places the decimal moved.

$0.00042 = 4.2 \times 10^{-4}$  because the decimal moves 4 places right to make 4.2.

**Example**



ROOTS

The square root symbol means the principal, nonnegative square root. So  $\sqrt{49} = 7$ , not  $\pm 7$ .

**Exponents & scientific notation** The exponent counts how many times the base is multiplied. Scientific notation moves the decimal so one nonzero digit sits in front.

base  $\rightarrow$  2 3 — exponent  
 $= 2 \cdot 2 \cdot 2 = 8$

$4200 = 4.2 \times 10^3$   
 3 places left

$0.0042 = 4.2 \times 10^{-3}$   
 3 places right

**Power checkpoint** Before graphing, make exponents automatic.

**Same base**

$2^3 \cdot 2^4 = 2^7 = 128$ . Add exponents when multiplying.

**Power of a power**

$(x^2)^5 = x^{10}$ . Multiply the exponents.

**Scientific form**

$0.0063 = 6.3 \times 10^{-3}$ . Small decimals use negative powers.

**Square roots**

$\sqrt{64} = 8$  because  $8^2 = 64$ . Use the principal root.

**Perfect squares**

Know  $1^2$  through  $15^2$ ; they make roots and geometry faster.

**Fast check**

If the answer gets huge, the exponent should usually be positive. If it gets tiny, negative.



## 9 Coordinate Plane & Linear Patterns

### Graphing basics

#### Ordered pair

$(x, y)$  gives horizontal movement first, vertical movement second.

#### Quadrants

I: (+, +), II: (-, +), III: (-, -), IV: (+, -).

#### Slope

$$m = \frac{\text{change in } y}{\text{change in } x} = \frac{y_2 - y_1}{x_2 - x_1}, \text{ with } x_2 \neq x_1.$$

#### Rate of change

Another name for slope: how much  $y$  changes for each 1 unit of  $x$ .

#### $y$ -intercept

The point where a graph crosses the  $y$ -axis.

#### $x$ -intercept

The point where a graph crosses the  $x$ -axis.

#### Linear pattern

$y = mx + b$ , where  $m$  is slope and  $b$  is the  $y$ -intercept.

#### Direct variation

$y = kx$  is a proportional linear pattern through the origin.

#### Horizontal line

$y = c$  has slope 0.

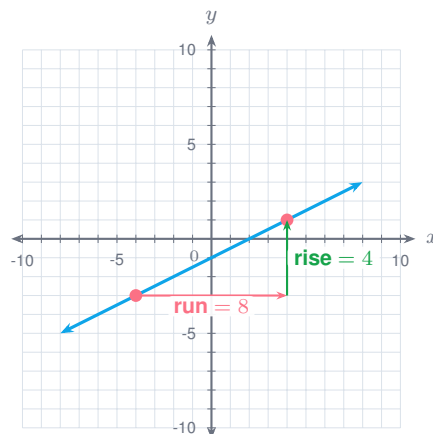
#### Vertical line

$x = c$  has undefined slope.

### Tutor's Note

The coordinate plane is a map. The  $x$ -axis moves left and right; the  $y$ -axis moves down and up. Slope tells how much  $y$  changes for each 1 step in  $x$ .

### Visual: slope is rise over run





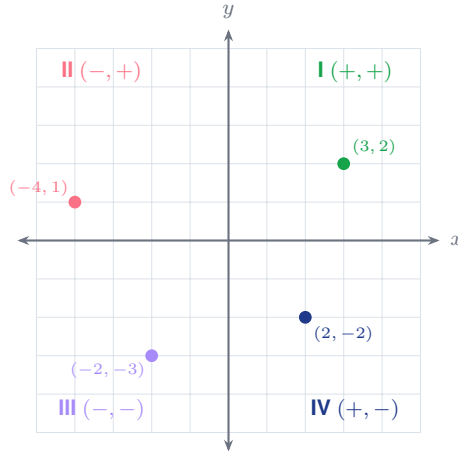
GRAPH

A vertical line fails the function test because one input has many outputs.

**The coordinate plane: quadrants & plotting**

An ordered pair  $(x, y)$  moves right/left first, then up/down.

The signs tell you the quadrant.



**HiSET graph formula route**

Match the representation before calculating.

**Two points**

Use slope first, then find the intercept.

**Table**

Check whether the change in  $y$  is constant for equal changes in  $x$ .

**Equation**

Identify  $m$  and  $b$ , or set one variable to 0 for intercepts.

**Word problem**

Treat slope as a unit rate and the intercept as the starting amount.

Mini-formulas HiSET students use on graphs

**Slope from points**

$$m = \frac{y_2 - y_1}{x_2 - x_1}$$

If the run is negative, keep the sign in the denominator.

**Line from a graph**

Find  $m$  from two clear grid points, then read where the line crosses the  $y$ -axis.

**Intercepts**

For an  $x$ -intercept, set  $y = 0$ . For a  $y$ -intercept, set  $x = 0$ .

**Prediction**

Substitute the given  $x$  or  $y$  value, then check whether the answer fits the graph scale.



**Common HiSET graph traps** Fix these before selecting an answer.

**Scale**

Count by the axis labels, not just by grid boxes.

**Sign**

A line that falls left to right has a negative slope.

**Units**

Slope often means per hour, per mile, or per item.

**Answer type**

Decide whether the question asks for a point, rate, intercept, or estimate.

**Final HiSET check: mark the input, output, rate, and units before choosing an answer.**



**Graphing checkpoint** Read the plane like a map: horizontal first, vertical second.

**Ordered pair**

$(-4, 3)$  means left 4, then up 3. The  $x$ -move comes first.

**Quadrant signs**

I (+, +), II (-, +), III (-, -), IV (+, -).

**Slope**

$m = \frac{\text{rise}}{\text{run}}$ . Up/right is positive; down/right is negative.

**Intercepts**

$y$ -intercept: where the graph crosses the  $y$ -axis.  $x$ -intercept: where it crosses the  $x$ -axis.

**Line patterns**

$y = mx + b$  shows slope  $m$  and starting value  $b$ .

**Fast check**

A vertical line has undefined slope because its run is 0.

**Table pattern**

Equal  $x$ -steps with equal  $y$ -changes show a linear pattern.

**Rate meaning**

Slope units come from the axis labels, such as dollars per hour.

**HiSET answer check**

Estimate from the graph before choosing an answer.

Use this order on HISET graph questions:

**Read the labels**

Decide what  $x$ ,  $y$ , slope, and intercept mean in the problem.

**Check the scale**

Axes may count by 2, 5, 10, 100, or decimals.

**Find anchor points**

Use clear grid points before estimating slope or intercepts.

**Connect to algebra**

A line, table, equation, and word model can all describe the same relationship.

**HiSET graph formula mini-review:**

**Slope from points**

$m = \frac{y_2 - y_1}{x_2 - x_1}$ ; subtract in the same order.

**Intercepts**

In  $Ax + By = C$ , set  $x = 0$  for the  $y$ -intercept and  $y = 0$  for the  $x$ -intercept.

**Table example**

If  $x$  goes 0, 2, 4 and  $y$  goes 3, 7, 11, then  $m = 2$  and  $y = 2x + 3$ .

**Function value**

$f(5)$  means use  $x = 5$  in the rule or read the output when input is 5.

**Common HISET graph traps:**

**Wrong scale**

Count the grid marks before reading a point.

**Wrong direction**

A negative slope falls from left to right, even if both points are positive.

**Wrong variable**

The horizontal axis usually gives the input, time, or quantity chosen.

**Wrong answer type**

A graph may ask for a rate, an intercept, a coordinate, or a prediction.

**30-second HISET graph workout:**

**From a table**

Use two clean rows to find slope, then check every row.

**From a line**

Pick two grid points, count rise and run, then simplify the slope.

**From  $y = mx + b$**

Name the starting value  $b$  and rate  $m$  before substituting.

**From words**

Decide whether the graph is about cost, time, distance, score, or quantity.

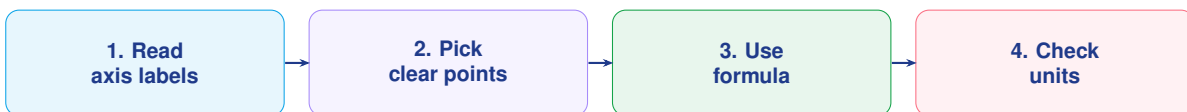
**Prediction**

Substitute the new input or extend the constant rate.

**Reasonableness**

The answer should match the graph direction and the axis units.

**Mini mixed example:** A gym charges \$18 to join and \$7 per visit, so  $C = 7v + 18$ . The graph starts at 18, rises by 7 each visit, and the point  $(4, 46)$  means 4 visits cost \$46.

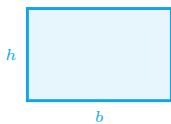


## 10 Geometry & Measurement

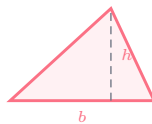
### Plane geometry

<b>Rectangle perimeter</b>	$P = 2l + 2w.$
<b>Rectangle area</b>	$A = lw.$
<b>Square perimeter / area</b>	$P = 4s$ and $A = s^2.$
<b>Triangle area</b>	$A = \frac{1}{2}bh.$
<b>Parallelogram area</b>	$A = bh.$
<b>Trapezoid area</b>	$A = \frac{1}{2}(b_1 + b_2)h.$
<b>Circle circumference</b>	$C = 2\pi r = \pi d.$
<b>Circle area</b>	$A = \pi r^2.$
<b>Pythagorean theorem</b>	$a^2 + b^2 = c^2$ for right triangles, where $c$ is the hypotenuse.

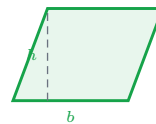
**Area formulas you can see** Area is the flat space inside a figure; the height is always perpendicular to the base.



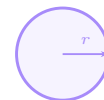
**Rectangle**  
 $A = bh$



**Triangle**  
 $A = \frac{1}{2}bh$



**Parallelogram**  
 $A = bh$



**Circle**  
 $A = \pi r^2$

**Geometry checkpoint** Name the measurement before choosing a formula.

**Perimeter**

Add side lengths around the outside. Units stay linear.

**Circles**

$C = 2\pi r = \pi d$  and  $A = \pi r^2$ . Diameter is twice the radius.

**Area**

Covering a flat region uses square units. Rectangle:  $A = lw$ .

**Pythagorean check**

Use  $a^2 + b^2 = c^2$  only for right triangles;  $c$  is the hypotenuse.

**Triangle area**

$A = \frac{1}{2}bh$ . The height must be perpendicular to the base.

**Fast check**

Area and volume answers should include square or cubic units.



**Solid geometry: volume & surface area**

**Rectangular prism**

$$V = lwh; \text{ surface area } SA = 2lw + 2lh + 2wh.$$

**Cube**

$$V = s^3; \text{ surface area } SA = 6s^2.$$

**Cylinder**

$$V = \pi r^2 h; \text{ surface area } SA = 2\pi r^2 + 2\pi r h.$$

**Triangular prism**

$$V = \left(\frac{1}{2}bh\right)L; \text{ SA} = \text{two triangle ends} + \text{three rectangle faces.}$$

**Cone**

$$V = \frac{1}{3}\pi r^2 h.$$

**Pyramid**

$$V = \frac{1}{3}(\text{base area})h.$$

**Sphere**

$$V = \frac{4}{3}\pi r^3; \text{ surface area } SA = 4\pi r^2.$$

**Surface area idea**

Add the areas of every outside face or curved surface; nets help organize the faces.

**Tutor's Note**

Area is measured in square units because it covers a flat region. Volume is measured in cubic units because it fills space. Make sure all measurements use the same unit before using a formula.

**Example**

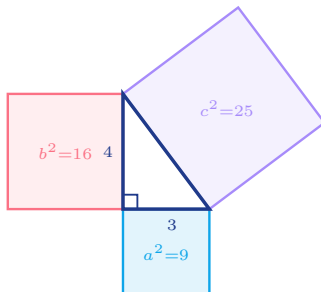
A triangle with base 10 cm and height 7 cm has area  $A = \frac{1}{2}(10)(7) = 35$  square centimeters.



GEOMETRY

For the Pythagorean theorem,  $c$  is always the longest side, across from the right angle.

**The Pythagorean theorem:**  $a^2 + b^2 = c^2$  For a right triangle, the square built on the hypotenuse equals the two squares on the legs added together.



The legs are  $a = 3$  and  $b = 4$ , so  $c^2 = a^2 + b^2 = 9 + 16 = 25$ , which gives  $c = \sqrt{25} = 5$ .

The hypotenuse  $c$  is always the longest side, opposite the right angle.



## 11 Measurement & Unit Conversions

### Customary (U.S.) units

**Length**

12 in = 1 ft; 3 ft = 1 yd; 5280 ft = 1 mi.

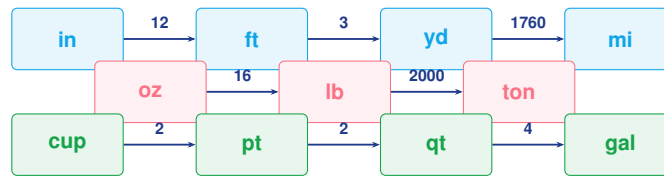
**Weight**

16 oz = 1 lb; 2000 lb = 1 ton.

**Capacity**

8 fl oz = 1 cup; 2 cups = 1 pt; 2 pt = 1 qt; 4 qt = 1 gal.

**Unit conversion checkpoint** Write the unit you want to cancel on the bottom.



**Length path**

1 yd = 3 ft and 1 ft = 12 in, so  
2 yd = 72 in.

**Fraction setup**

$5 \text{ ft} \times \frac{12 \text{ in}}{1 \text{ ft}}$ : feet cancel.

**Weight path**

1 lb = 16 oz; multiply pounds by 16 to  
get ounces.

**Reasonableness**

Smaller units make larger numbers;  
larger units make smaller numbers.

**Capacity path**

1 gal = 4 qt = 8 pt = 16 cups.

**Fast check**

Keep units attached until the final  
answer. They show whether the setup  
is right.

**Try it** 4 ft = 48 in   3 lb = 48 oz   2 gal = 8 qt = 32 cups   Smaller units make the number larger.



**Metric units & time**

**Metric length**

10 mm = 1 cm; 100 cm = 1 m; 1000 m = 1 km.

**Metric mass**

1000 mg = 1 g; 1000 g = 1 kg.

**Metric capacity**

1000 mL = 1 L.

**Metric prefixes**

kilo = 1000, hecto = 100, deca = 10, deci =  $\frac{1}{10}$ , centi =  $\frac{1}{100}$ , milli =  $\frac{1}{1000}$ .

**Time**

60 s = 1 min; 60 min = 1 hr; 24 hr = 1 day; 7 days = 1 wk.

**Temperature**

$F = \frac{9}{5}C + 32$  and  $C = \frac{5}{9}(F - 32)$ .

**Converting units: multiply by a fraction equal to 1** Write the conversion so the *old* unit cancels and the *new* unit is left.

$$5 \text{ ft} \times \frac{12 \text{ in}}{1 \text{ ft}} \Rightarrow 60 \text{ in}$$

the "ft" units cancel, leaving inches

**Tutor's Note**

To convert, multiply by a fraction that equals 1 (the same amount written two ways). Put the unit you want to cancel on the bottom and the unit you want to keep on top.

**Example**

Convert 3 yards to inches:  $3 \text{ yd} \times \frac{3 \text{ ft}}{1 \text{ yd}} \times \frac{12 \text{ in}}{1 \text{ ft}} = 108 \text{ in}$ .



UNITS

Metric prefixes move the decimal by powers of 10: from km to m multiply by 1000; from m to cm multiply by 100.

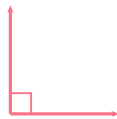
**12 Angles, Lines & Polygons**

**Types of angles** Angles are measured in degrees. A right angle is exactly  $90^\circ$ ; a straight angle is  $180^\circ$ .



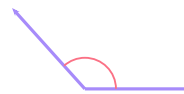
**Acute**

less than  $90^\circ$



**Right**

exactly  $90^\circ$



**Obtuse**

between  $90^\circ$  and  $180^\circ$



**Straight**

exactly  $180^\circ$



**Angle & figure facts**

**Right / straight angle**

A right angle is  $90^\circ$ ; a straight angle is  $180^\circ$ ; a full turn is  $360^\circ$ .

**Complementary angles**

Two angles whose measures add to  $90^\circ$ .

**Supplementary angles**

Two angles whose measures add to  $180^\circ$  (a straight line).

**Vertical angles**

When two lines cross, opposite angles are equal.

**Triangle angle sum**

The three interior angles of a triangle add to  $180^\circ$ .

**Quadrilateral angle sum**

The four interior angles of a quadrilateral add to  $360^\circ$ .

**Polygon angle sum**

For  $n$  sides, interior angles add to  $(n - 2) \cdot 180^\circ$ .

**Regular polygon angle**

Each interior angle is  $\frac{(n-2)180^\circ}{n}$ .

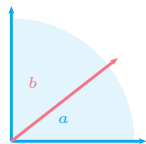
**Exterior angles**

One exterior angle at each vertex adds to  $360^\circ$ ; regular exterior angle is  $\frac{360^\circ}{n}$ .

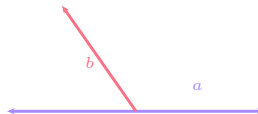
**Parallel lines**

Lines in a plane that never meet; a crossing line makes equal matching angles.

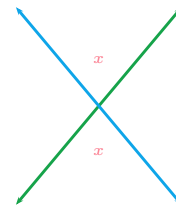
**Angle pairs** Complementary angles add to  $90^\circ$ , supplementary angles add to  $180^\circ$ , and vertical angles (across an X) are equal.



**Complementary**  
 $a + b = 90^\circ$



**Supplementary**  
 $a + b = 180^\circ$



**Vertical**  
opposite angles equal

**Tutor's Note**

Most angle problems are just addition. If two angles form a right angle, they are complementary; if they form a straight line, they are supplementary. Set the known sum equal to the parts and solve.

If one angle of a complementary pair is  $35^\circ$ , the other is  $90^\circ - 35^\circ = 55^\circ$ .

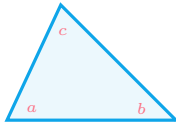
**Example**



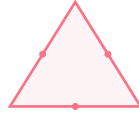
The angles of a triangle always total  $180^\circ$ , so two angles determine the third:  
 $c = 180^\circ - a - b$ .



**Triangle angle sum & figure types** The three angles of any triangle add to  $180^\circ$ ; the four angles of any quadrilateral add to  $360^\circ$ .



$a + b + c = 180^\circ$



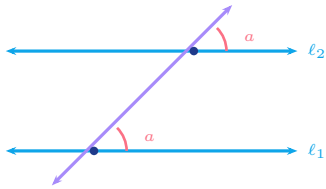
equilateral: all sides =



rectangle

4 right angles

**Parallel lines cut by a transversal** A line crossing two parallel lines makes equal matching angles.



**Corresponding angles** (same position at each crossing) are **equal**.

**Alternate interior angles** (opposite sides, between the lines) are **equal**.

**Co-interior angles** (same side, between the lines) are **supplementary** — they add to  $180^\circ$ .

**Interior angle sums:**  $(n - 2) \times 180^\circ$  Every extra side adds another  $180^\circ$  to the total.



Triangle

3 sides =  $180^\circ$



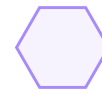
Quadrilateral

4 sides =  $360^\circ$



Pentagon

5 sides =  $540^\circ$



Hexagon

6 sides =  $720^\circ$

**Angle checkpoint** Most angle questions are sum facts plus simple equations.

**Pairs**

$a + b = 90^\circ$  for complementary;  
 $a + b = 180^\circ$  for supplementary.

**Polygons**

Interior sum =  $(n - 2)180^\circ$ . Divide by  $n$  only for regular polygons.

**HiSET setup**

Draw a line through the known angle pair, then write the sum fact.

**Triangles**

$a + b + c = 180^\circ$ . Two angles determine the third.

**Parallel lines**

Corresponding and alternate interior angles match; same-side interior angles add to  $180^\circ$ .

**Equation habit**

For angles with variables, combine like terms before solving.

**Quadrilaterals**

Four interior angles add to  $360^\circ$ .

**Fast check**

A straight line is  $180^\circ$  and a full turn is  $360^\circ$ .

**Estimate**

An obtuse angle must be more than  $90^\circ$ ; an acute angle must be less.



## 13 Data, Statistics & Probability

### Statistics formulas

<b>Mean</b>	$\bar{x} = \frac{\text{sum of values}}{\text{number of values}}$
<b>Median</b>	The middle value after the data are ordered.
<b>Mode</b>	The value or values that occur most often.
<b>Range</b>	Maximum minus minimum.
<b>Quartiles</b>	$Q_1$ , median, $Q_3$ split ordered data into four equal parts.
<b>Interquartile range</b>	$IQR = Q_3 - Q_1$ , the spread of the middle half.
<b>Mean absolute deviation</b>	$MAD = \frac{\sum  x - \bar{x} }{n}$ , the average distance from the mean.
<b>Probability</b>	$P(\text{event}) = \frac{\text{favorable outcomes}}{\text{total equally likely outcomes}}$
<b>Experimental probability</b>	$\frac{\text{times event occurs}}{\text{number of trials}}$
<b>Complement</b>	$P(\text{not } A) = 1 - P(A)$ .
<b>Simple counting principle</b>	If one choice has $m$ options and another has $n$ options, together there are $mn$ outcomes.

### Tutor's Note

Statistics summarize data. Probability predicts chance. Both depend on reading the question carefully: are the outcomes equally likely, and what exactly counts as a success?

For data 4, 5, 6, 9, the mean is  $\frac{4+5+6+9}{4} = 6$  and the range is  $9 - 4 = 5$ .

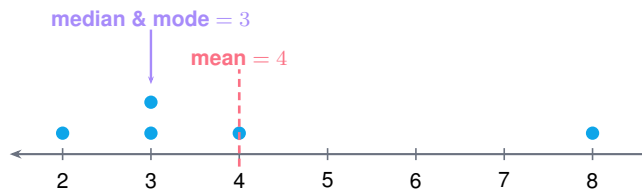
**Example**



Outliers can pull the mean more than the median. If one value is far away from the rest, compare both measures.

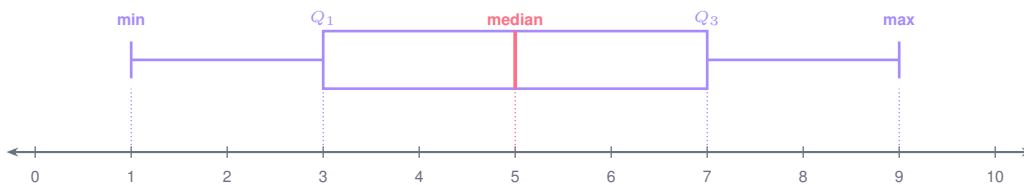


**Mean, median & mode on a dot plot** Stack a dot for each value, then read the center three ways. The mean balances the data; the median is the middle; the mode is the most common.



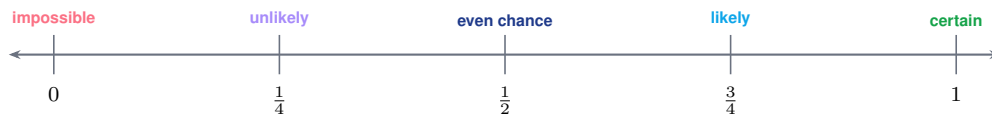
Data 2, 3, 3, 4, 8: mean  $\frac{20}{5} = 4$ , median 3, mode 3, range  $8 - 2 = 6$ .

**The five-number summary & box plot** Order the data, then mark the minimum, first quartile  $Q_1$ , median, third quartile  $Q_3$ , and maximum.



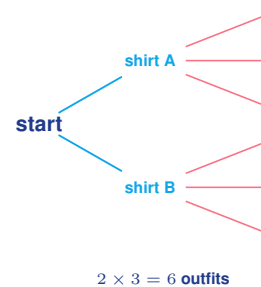
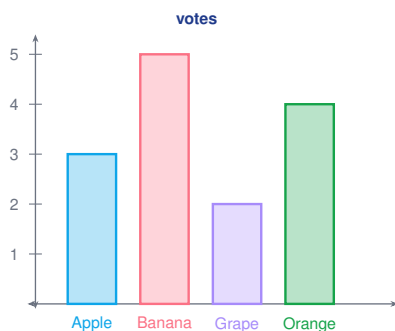
The box holds the middle half of the data; its width ( $Q_3 - Q_1$ ) is the interquartile range (IQR).

**The probability scale** Every probability is a number from 0 (impossible) to 1 (certain). Half-way is an even chance.



0% to 100% — e.g. one head on a fair coin flip is  $\frac{1}{2} = 50\%$ .

**Reading data & counting outcomes** A bar graph compares categories; the counting principle multiplies the choices at each stage.



# HiSET Algebra 1 Add-On

Add these to the Pre-Algebra base

HiSET Math is built on Pre-Algebra fluency, but the test also expects students to recognize Algebra 1 structures: linear equations, inequalities, systems, functions, polynomials, factoring, quadratics, and formulas from graphs. Keep the full base review above, then add these formulas when practicing HiSET-style algebra and word problems.

## KEEP THE BASE

### Pre-Algebra first

Fractions, percents, ratios, integers, units, geometry, and data stay in the guide.

## USE WITH WORDS

### Formula choice

Read the question type before choosing an equation.

## ADD ALGEBRA

### HiSET-ready layer

Linear models, systems, functions, polynomials, and quadratics.

## CHECK UNITS

### Answer sense

Slope, rate, area, volume, and cost all carry units.

## Linear equations, inequalities, and systems

### One-step equation

$$x + a = b \Rightarrow x = b - a, \quad ax = b \Rightarrow x = \frac{b}{a} \text{ for } a \neq 0.$$

### Two-step equation

$$ax + b = c \Rightarrow ax = c - b \Rightarrow x = \frac{c-b}{a}.$$

### Multi-step equation

Distribute, combine like terms, move variable terms to one side, then isolate.

### Literal equation

To solve a formula for one letter, use inverse operations until that letter is alone.

### Inequality rule

Reverse  $<$ ,  $>$ ,  $\leq$ ,  $\geq$  when multiplying or dividing by a negative number.

### Compound inequality

$$a < x < b \text{ means } x > a \text{ and } x < b \text{ at the same time.}$$

### Absolute value equation

$$|x - a| = b \text{ means } x - a = b \text{ or } x - a = -b \text{ when } b \geq 0.$$

### System solution

The ordered pair that makes both equations true; use substitution, elimination, or graphing.

### Elimination setup

Add or subtract equations after multiplying if needed so one variable cancels.

## Tutor's Note

Algebra on HiSET Math is often a word problem in disguise. Define the variable first, write one equation, and only then solve. If a problem gives two conditions, a system is usually cleaner than guessing.



If  $3x + 4 = 19$ , then  $3x = 15$  and  $x = 5$ . If  $-2x \leq 10$ , divide by  $-2$  and reverse:  $x \geq -5$ .

**Example**



ALGEBRA CHECK

After solving, substitute the answer back into the original equation or inequality. This catches sign mistakes quickly.

## Lines, graphs, and functions

### Slope

$$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{\Delta y}{\Delta x}; \text{ horizontal slope is } 0, \text{ vertical slope is undefined.}$$

### Slope-intercept form

$$y = mx + b, \text{ where } m \text{ is slope and } b \text{ is the } y\text{-intercept.}$$

### Point-slope form

$$y - y_1 = m(x - x_1) \text{ when a point and slope are known.}$$

### Standard form

$$Ax + By = C; \text{ intercepts come from setting the other variable equal to } 0.$$

### Parallel lines

Same slope, different intercepts.

### Perpendicular lines

Slopes are negative reciprocals:  $m_1 m_2 = -1$  for nonvertical lines.

### Distance formula

$$d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}.$$

### Midpoint formula

$$M = \left( \frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2} \right).$$

### Function notation

$f(a)$  means replace  $x$  with  $a$  in the rule for  $f(x)$ .

### Average rate of change

$$\frac{f(b) - f(a)}{b - a}, \text{ the slope between two input-output points.}$$

### Tutor's Note

For graphs, ask what the axes measure. Slope is not just a number; it is a rate such as dollars per ticket, miles per hour, points per question, or gallons per minute.

Through  $(2, 5)$  and  $(6, 13)$ , slope is  $m = \frac{13-5}{6-2} = 2$ . The line is  $y = 2x + 1$  because  $5 = 2(2) + b$  gives  $b = 1$ .

**Example**



GRAPH HABIT

Intercepts are starting values or break-even points. Always read the axis labels before interpreting them.



## Exponents, radicals, polynomials, and factoring

Product of powers

$$a^m \cdot a^n = a^{m+n}.$$

Quotient of powers

$$\frac{a^m}{a^n} = a^{m-n} \text{ for } a \neq 0.$$

Power of a power

$$(a^m)^n = a^{mn}.$$

Zero and negative exponents

$$a^0 = 1 \text{ and } a^{-n} = \frac{1}{a^n} \text{ for } a \neq 0.$$

Scientific notation

$$a \times 10^n, \text{ where } 1 \leq a < 10.$$

Simplify radicals

$$\text{Factor out perfect squares: } \sqrt{72} = 6\sqrt{2}.$$

Add polynomials

Combine like terms only.

Multiply monomials

Multiply coefficients and add exponents on matching variables.

Distribute / FOIL

$$(a + b)(c + d) = ac + ad + bc + bd.$$

GCF factoring

$$ab + ac = a(b + c).$$

Difference of squares

$$a^2 - b^2 = (a - b)(a + b).$$

Trinomial pattern

$$x^2 + bx + c = (x + m)(x + n) \text{ when } m + n = b \text{ and } mn = c.$$

## Tutor's Note

HiSET polynomial questions are usually about structure. Look first for a common factor, then for a difference of squares, then for two numbers that multiply and add correctly.

$$6x^2 + 9x = 3x(2x + 3). \text{ Also, } x^2 - 25 = (x - 5)(x + 5).$$

Example



FACTORING

Factoring is reverse distributing. Multiply your factors back together to check the answer.



### Quadratics and nonlinear patterns

**Standard quadratic form**

$$y = ax^2 + bx + c, \text{ with } a \neq 0.$$

**Quadratic equation form**

$ax^2 + bx + c = 0$  before solving by factoring or formula.

**Quadratic formula**

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}.$$

**Discriminant**

$b^2 - 4ac$  tells how many real solutions: positive two, zero one, negative none.

**Axis of symmetry**

$$x = -\frac{b}{2a}.$$

**Vertex from standard form**

Find  $x = -\frac{b}{2a}$ , then substitute to find  $y$ .

**Factored form**

$y = a(x - r_1)(x - r_2)$  shows zeros  $r_1$  and  $r_2$ .

**Exponential pattern**

$y = a \cdot b^x$  multiplies by the same factor each step.

**Direct variation**

$y = kx$ ; the constant of proportionality is  $k = \frac{y}{x}$ .

**Inverse variation**

$xy = k$  or  $y = \frac{k}{x}$  for  $x \neq 0$ .

#### Tutor's Note

HiSET Math does not usually need advanced quadratic theory, but students should know the quadratic formula, standard form, factoring, and what a graph's zeros/intercepts mean.

For  $x^2 - 5x + 6 = 0$ , factor to  $(x - 2)(x - 3) = 0$ , so  $x = 2$  or  $x = 3$ .

**Example**



#### QUADRATIC SETUP

Move everything to one side before factoring or using the quadratic formula.

### HiSET quadratic decision check

**Easy factors**

Use factoring and the zero-product property.

**Graph or table**

Look for zeros, vertex, intercepts, and increasing/decreasing behavior.

**Messy numbers**

Use the quadratic formula and estimate before choosing an answer.

**Word problem**

Define what  $x$  represents and reject answers that do not fit the situation.



**HiSET word-problem formulas that connect algebra to the base**

**Percent of a whole**

part = percent · whole, with percent as a decimal.

**Percent change**

$$\frac{\text{new} - \text{old}}{\text{old}} \times 100\%$$

**Simple interest**

$$I = Prt \text{ and } A = P + I = P(1 + rt)$$

**Distance/rate/time**

$$d = rt, r = \frac{d}{t}, t = \frac{d}{r}$$

**Total cost**

total = (number of units)(price per unit), then add tax/tip or subtract discount.

**Scale factor**

$\frac{\text{new length}}{\text{old length}}$ ; area scale factor is squared, volume scale factor is cubed.

**Probability**

$$P(A) = \frac{\text{favorable outcomes}}{\text{total outcomes}} \text{ and } P(\text{not } A) = 1 - P(A)$$

**Counting principle**

Multiply the number of choices at each stage.

**Tutor's Note**

These formulas turn the Pre-Algebra base into HiSET test work. The formula is only useful after the quantities are labeled and the units match.

**Example**

A price rises from \$80 to \$92. Percent change is  $\frac{92-80}{80} \times 100\% = 15\%$ .



**HiSET WORD PROBLEMS**

Underline what the question asks for, circle the numbers with units, choose the formula family, then calculate.

**HiSET Formula Sheet and Test-Specific Review** Preserved from the HiSET draft

This section keeps the HiSET-specific formulas from the first draft and places them after the full Pre-Algebra base and Algebra 1 add-on, so no HiSET formula coverage is lost. Use it as a final test-focused pass before downloading or printing.



## 14 HiSET Focus: Basic Number Operations

### Order of operations

NO-CALCULATOR READY MUST-KNOW SKILL

Parentheses → Exponents →  $\times, \div$  left to right →  $+, -$  left to right.

### Fraction operations

NO-CALCULATOR READY MUST-KNOW SKILL

$$\frac{a}{b} + \frac{c}{d} = \frac{ad+bc}{bd}, \quad \frac{a}{b} \cdot \frac{c}{d} = \frac{ac}{bd}, \quad \frac{a}{b} \div \frac{c}{d} = \frac{a}{b} \cdot \frac{d}{c}.$$

Denominators cannot be zero. Convert mixed numbers to improper fractions before multiplying or dividing.

### Decimal and percent conversions

NO-CALCULATOR READY MUST-KNOW SKILL

$p\% = \frac{p}{100} = 0.p$  when  $p$  is a whole percent. Move the decimal two places left to change percent to decimal; move two places right to change decimal to percent.

### Integer signs and absolute value

NO-CALCULATOR READY MUST-KNOW SKILL

$|a|$  is distance from 0. Same signs multiply/divide to positive; different signs multiply/divide to negative. For addition, same signs add; different signs subtract absolute values and keep the sign of the larger absolute value.

#### HiSET-style setup

Order  $0.07, \frac{1}{8}, \frac{1}{2}, 0.6, \frac{4}{5}$  from least to greatest. Convert to decimals: 0.07, 0.125, 0.5, 0.6, 0.8. So the order is  $0.07, \frac{1}{8}, \frac{1}{2}, 0.6, \frac{4}{5}$ .



WATCH THE FIRST PART

The no-calculator questions reward clean number sense: fractions, decimals, signs, ordering, and simple substitutions.

## 15 HiSET Focus: Ratios, Percents, Rates, and Real-Life Formulas

### Ratio and proportion

MUST-KNOW SKILL

A ratio compares quantities:  $a : b = \frac{a}{b}$ . A proportion is two equal ratios:  $\frac{a}{b} = \frac{c}{d}$ . Cross products match:  $ad = bc$ .

### Percent equation

MUST-KNOW SKILL

part = percent  $\times$  whole, using the percent as a decimal. For percent change: percent change =  $\frac{\text{new} - \text{old}}{\text{old}} \times 100\%$ .

### Simple interest

OFFICIAL SHEET

$I = Prt$ , where  $I$  is interest,  $P$  is principal,  $r$  is the annual rate as a decimal, and  $t$  is time in years. Total balance for simple interest:  $A = P + I = P(1 + rt)$ .



**Distance, rate, and time**

OFFICIAL SHEET

$d = rt$ . Rearrange as  $r = \frac{d}{t}$  and  $t = \frac{d}{r}$  when needed.

**Total cost**

OFFICIAL SHEET

total cost = (number of units)(price per unit). Add tax, fees, or tips after finding the base cost.

A 15% tip on a \$48 bill is  $0.15(48) = 7.20$ . Total cost is  $48 + 7.20 = \$55.20$ .

HiSET-style setup



UNIT CHECK

Rates carry units: miles per hour, dollars per ticket, gallons per minute. If the units do not match, convert before using the formula.

**16 HiSET Focus: Algebra Foundations****Evaluate an expression**

MUST-KNOW SKILL

Substitute each value, then use order of operations. If  $3x - 2y$  with  $x = 4, y = -1$ , then  $3(4) - 2(-1) = 14$ .

**Distributive property and like terms**

MUST-KNOW SKILL

$a(b + c) = ab + ac$ . Like terms have the same variable part, such as  $4x$  and  $-7x$ . Combine coefficients only:  
 $4x - 7x = -3x$ .

**Linear equations**

MUST-KNOW SKILL

Use inverse operations to isolate the variable. Whatever is done to one side must be done to the other. For  $ax + b = c$ , subtract  $b$ , then divide by  $a$ .

**Inequalities**

MUST-KNOW SKILL

Solve like equations, but reverse the inequality when multiplying or dividing by a negative number: if  $-2x < 8$ , then  $x > -4$ .

**Systems of equations**

MUST-KNOW SKILL

A solution to a system is the ordered pair that makes both equations true. Use substitution, elimination, or graphing.

Solve  $3(x - 4) = 2x + 7$ . Distribute:  $3x - 12 = 2x + 7$ . Subtract  $2x$ :  $x - 12 = 7$ . Add 12:  $x = 19$ .

HiSET-style setup





## ALGEBRA HABIT

Do not skip the sign. Most HiSET algebra misses come from losing a negative while distributing or moving terms.

## 17 HiSET Focus: Lines, Graphs, and Functions

### Slope of a line

OFFICIAL SHEET

$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{\text{rise}}{\text{run}}$ . Horizontal lines have slope 0; vertical lines have undefined slope.

### Slope-intercept form

OFFICIAL SHEET

$y = mx + b$ , where  $m$  is slope and  $b$  is the  $y$ -intercept.

### Point-slope form

OFFICIAL SHEET

$y - y_1 = m(x - x_1)$ . Use it when a point and slope are given.

### Distance and midpoint

MUST-KNOW SKILL

$d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$ ,  $M = \left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2}\right)$ .

### Function notation

MUST-KNOW SKILL

$f(x)$  means the output when the input is  $x$ . To evaluate  $f(3)$ , replace every  $x$  in the rule with 3.

If  $f(x) = 2x^2 - 5$ , then  $f(3) = 2(3)^2 - 5 = 18 - 5 = 13$ .

HiSET-style setup



## GRAPH CHECK

For a line, two points are enough. For a function question, ask: input, output, rate of change, or intercept?

## 18 HiSET Focus: Exponents, Radicals, Polynomials, and Quadratics

### Exponent laws

MUST-KNOW SKILL

$a^m \cdot a^n = a^{m+n}$ ,  $\frac{a^m}{a^n} = a^{m-n}$ ,  $(a^m)^n = a^{mn}$ ,  $a^0 = 1$  for  $a \neq 0$ ,  $a^{-n} = \frac{1}{a^n}$ .

### Radicals and square roots

MUST-KNOW SKILL

$\sqrt{a^2} = |a|$ . Simplify perfect squares first:  $\sqrt{72} = \sqrt{36 \cdot 2} = 6\sqrt{2}$ .



**Scientific notation**

MUST-KNOW SKILL

$a \times 10^n$  where  $1 \leq a < 10$ . Positive  $n$  means a large number; negative  $n$  means a small decimal.

**Polynomial operations**

MUST-KNOW SKILL

Add/subtract like terms. Multiply monomials by multiplying coefficients and adding exponents on matching variables. FOIL is distributive property for binomials.

**Quadratic forms and formula**

OFFICIAL SHEET

Standard form:  $y = ax^2 + bx + c$ . Quadratic formula:

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

Use it when factoring is not easy or when the problem asks for exact solutions.

**Factoring patterns**

MUST-KNOW SKILL

$a^2 - b^2 = (a - b)(a + b)$ ,  $x^2 + bx + c = (x + m)(x + n)$  when  $m + n = b$  and  $mn = c$ .

Factor  $x^2 + 7x + 12$ . Find two numbers that add to 7 and multiply to 12: 3 and 4. So  $x^2 + 7x + 12 = (x + 3)(x + 4)$ .

HiSET-style setup



QUADRATIC CHECK

If an equation has  $x^2$ , move everything to one side before factoring or using the quadratic formula.

**19 HiSET Focus: Geometry and Measurement****Area formulas**

OFFICIAL SHEET

Square:  $A = s^2$ . Rectangle:  $A = lw$ . Parallelogram:  $A = bh$ . Triangle:  $A = \frac{1}{2}bh$ . Trapezoid:  $A = \frac{1}{2}h(b_1 + b_2)$ . Circle:  $A = \pi r^2$ .

**Perimeter and circumference**

OFFICIAL SHEET

Square:  $P = 4s$ . Rectangle:  $P = 2l + 2w$ . Triangle:  $P = s_1 + s_2 + s_3$ . Circle:  $C = 2\pi r = \pi d$ .

**Pythagorean theorem**

OFFICIAL SHEET

$a^2 + b^2 = c^2$  for right triangles, where  $c$  is the hypotenuse.



**Angles**

MUST-KNOW SKILL

Complementary angles sum to  $90^\circ$ . Supplementary angles sum to  $180^\circ$ . Triangle angles sum to  $180^\circ$ . A straight line is  $180^\circ$ .

**Prisms and cylinders**

OFFICIAL SHEET

Rectangular prism:  $SA = 2lw + 2lh + 2wh$ ,  $V = lwh$ .

Right prism:  $SA = ph + 2B$ ,  $V = Bh$ .

Cylinder:  $SA = 2\pi rh + 2\pi r^2$ ,  $V = \pi r^2 h$ .

**Pyramids, cones, and spheres**

OFFICIAL SHEET

Pyramid:  $SA = \frac{1}{2}ps + B$ ,  $V = \frac{1}{3}Bh$ .

Cone:  $SA = \pi rs + \pi r^2$ ,  $V = \frac{1}{3}\pi r^2 h$ .

Sphere:  $SA = 4\pi r^2$ ,  $V = \frac{4}{3}\pi r^3$ .

A cylinder has radius 3 and height 10. Its volume is  $V = \pi r^2 h = \pi(3)^2(10) = 90\pi \approx 282.6$  cubic units. **HiSET-style setup**



GEOMETRY HABIT

If the answer choices have square units, use area or surface area. If they have cubic units, use volume.

**20 HiSET Focus: Data, Statistics, and Probability****Mean and median**

OFFICIAL SHEET

Mean =  $\frac{\text{sum of values}}{\text{number of values}}$ . Median is the middle value after ordering, or the mean of the two middle values when there are an even number of values.

**Mode, range, and outliers**

MUST-KNOW SKILL

Mode is the most frequent value. Range = maximum – minimum. An outlier is far from most values and can pull the mean more than the median.

**Probability**

MUST-KNOW SKILL

$P(\text{event}) = \frac{\text{favorable outcomes}}{\text{total outcomes}}$ . The complement rule is  $P(\text{not } A) = 1 - P(A)$ .

**Counting principle**

MUST-KNOW SKILL

If one choice has  $m$  options and another has  $n$  options, together they have  $mn$  outcomes. Use this before listing possibilities.



**Permutations and combinations**

MUST-KNOW SKILL

Permutation order matters:  $P(n, r) = \frac{n!}{(n-r)!}$ . Combination order does not matter:  $C(n, r) = \frac{n!}{r!(n-r)!}$ .

HiSET-style setup

A bag has 5 red, 3 blue, and 2 green marbles. The probability of not drawing blue is  $1 - \frac{3}{10} = \frac{7}{10}$ .



DATA CHECK

For charts and tables, read the labels before calculating. Many HiSET data questions are really unit and label questions.

**21 HiSET Focus: Word-Problem Translation**

**Operation clues**

total, sum, increased by → add  
 difference, less than, decreased by → subtract  
 of, product, times, each → multiply  
 per, quotient, split equally → divide

**Equation clues**

is, equals, gives, results in → =  
 at least → ≥  
 at most → ≤  
 fewer than → <  
 more than → >

**Percent word problems**

MUST-KNOW SKILL

Identify the whole first. “30% of 80” means  $0.30(80)$ . “24 is 30% of what number?” means  $24 = 0.30x$ .

**Mixture of formulas**

MUST-KNOW SKILL

HiSET word problems often combine steps: total cost plus tax, distance plus time, area plus unit price, or slope plus interpretation. Write one line per step.

**Reasonableness check**

MUST-KNOW SKILL

A discount should lower the price. Tax/tip should raise it. A probability must be between 0 and 1. Area must be positive. A square root length cannot be negative.

HiSET-style setup

Tile costs \$2.40 per square foot. A rectangular floor is 12 ft by 9 ft. Area =  $12(9) = 108$  sq ft. Cost =  $108(2.40) = \$259.20$ .



TRANSLATION LOOP

Underline the quantity being asked for, circle the numbers with units, choose the formula, then substitute.



## 22 HiSET Focus: Official Sheet vs. Must-Know Extras

### Formulas HiSET gives on the official formula sheet

<b>Area</b>	square, rectangle, parallelogram, triangle, trapezoid, circle
<b>Perimeter/Circumference</b>	square, rectangle, triangle, circle
<b>Solids</b>	surface area and volume for rectangular prism, right prism, cylinder, pyramid, cone, sphere
<b>Data</b>	mean and median descriptions
<b>Algebra</b>	slope, slope-intercept form, point-slope form, quadratic standard form, quadratic formula
<b>Applications</b>	Pythagorean theorem, simple interest, distance formula $d = rt$ , total cost

### Formulas and facts students should still know

<b>Arithmetic</b>	fraction operations, percent conversions, integer signs, order of operations
<b>Proportions</b>	ratios, unit rates, cross products, scale factor, percent change
<b>Algebra</b>	distributive property, like terms, equation steps, inequality sign reversal, systems
<b>Graphs</b>	distance formula, midpoint formula, function notation, intercept meaning
<b>Exponents</b>	exponent laws, radicals, scientific notation, factoring patterns
<b>Data</b>	mode, range, probability, complement rule, counting principle



**WHY THIS MATTERS**

The formula sheet reduces memorization, but it does not solve the problem. The score comes from recognizing which formula fits the situation.

### HiSET formula sheet action plan

<b>Find the formula family</b>	Geometry, algebra, data, rate, cost, or percent.
<b>Label every quantity</b>	Write units beside numbers before substituting.
<b>Use the given sheet wisely</b>	The sheet gives formulas, but the problem gives the meaning.
<b>Check the answer type</b>	Linear units, square units, cubic units, dollars, percent, or probability.



## 23 HiSET Focus: Symbols and Vocabulary

### Symbols

=	equals
≠	not equal
<, >	less than, greater than
≤, ≥	at most, at least
%	percent, per hundred
x	absolute value
$\sqrt{x}$	square root
(x, y)	ordered pair
m	slope
b	y-intercept

### Vocabulary

<b>coefficient</b>	number multiplying a variable
<b>constant</b>	number that does not change
<b>expression</b>	no equals sign
<b>equation</b>	has an equals sign
<b>solution</b>	value that makes a statement true
<b>unit rate</b>	rate per one unit
<b>scale factor</b>	multiplier from one size to another
<b>outlier</b>	data value far from the rest
<b>hypotenuse</b>	longest side of a right triangle

**Vocabulary habit:** Translate the command word: evaluate means plug in, simplify means clean up, solve means find the value, and graph means show the relationship.

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### Final HiSET formula checklist

**Number sense**

Can I order fractions/decimals and handle negative signs without rushing?

**Percent/rate**

Did I identify the whole, the rate, and the unit before multiplying?

**Algebra**

Did I distribute correctly and keep both sides balanced?

**Lines/functions**

Do I know whether the question asks for slope, intercept, input, or output?

**Geometry**

Did I choose perimeter, area, surface area, or volume and use the right units?

**Data/probability**

Did I order the data, read chart labels, and keep probability between 0 and 1?

**Last pass before practice** Read the question first, not the answer choices. Estimate the size of the answer, write one clean setup line, and only then calculate. If a formula is given on the HiSET sheet, spend your energy choosing it correctly and substituting the right values.

### High-frequency HiSET formula triggers

“How much altogether?”

total cost, tax, tip, discount, or simple interest

“How steep?”

slope  $m = \frac{\text{rise}}{\text{run}}$  or rate of change

“How much space?”

area for flat regions; volume for solids

“Around the outside?”

perimeter or circumference

“Middle or average?”

median after ordering; mean after adding

“What value works?”

equation, inequality, system, or function evaluation



# Quick Reference Tables

Memorize these to speed up everything

## Fraction = Decimal = Percent

Fraction	Decimal	Percent
$\frac{1}{2}$	0.5	50%
$\frac{1}{3}$	$0.\bar{3}$	$33\frac{1}{3}\%$
$\frac{2}{3}$	$0.\bar{6}$	$66\frac{2}{3}\%$
$\frac{1}{4}$	0.25	25%
$\frac{3}{4}$	0.75	75%
$\frac{1}{5}$	0.2	20%
$\frac{2}{5}$	0.4	40%
$\frac{1}{6}$	$0.1\bar{6}$	$16\frac{2}{3}\%$
$\frac{1}{8}$	0.125	12.5%
$\frac{1}{9}$	$0.\bar{1}$	$11\frac{1}{9}\%$
$\frac{1}{10}$	0.1	10%
$\frac{1}{20}$	0.05	5%
$\frac{1}{100}$	0.01	1%

## Perfect squares

$n$	$n^2$	$n$	$n^2$
1	1	9	81
2	4	10	100
3	9	11	121
4	16	12	144
5	25	13	169
6	36	14	196
7	49	15	225
8	64	20	400

## Divisibility rules

- By** The number is divisible if...
- 2 it is even (ends in 0, 2, 4, 6, 8).
  - 3 the digit sum is divisible by 3.
  - 4 the last two digits form a multiple of 4.
  - 5 it ends in 0 or 5.
  - 6 it is divisible by both 2 and 3.
  - 9 the digit sum is divisible by 9.
  - 10 it ends in 0.

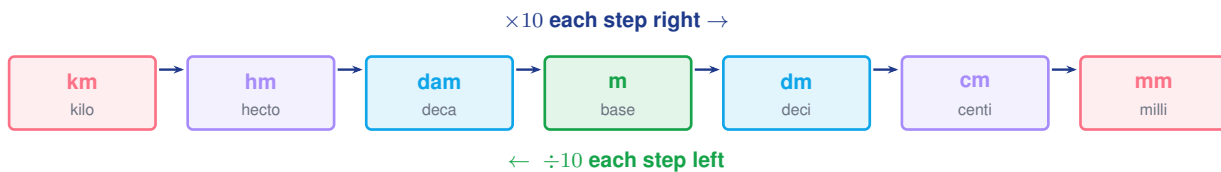
## Perfect cubes

$n$	$n^3$	$n$	$n^3$
1	1	6	216
2	8	7	343
3	27	8	512
4	64	9	729
5	125	10	1000

## Powers of ten

Power	Value
$10^0, 10^1, 10^2, 10^3$	1, 10, 100, 1000
$10^4, 10^5, 10^6$	10,000, 100,000, 1,000,000
$10^{-1}, 10^{-2}, 10^{-3}$	0.1, 0.01, 0.001

**The metric staircase** Each step is a power of 10. Moving *right* to a smaller unit multiplies by 10 (decimal moves right); moving *left* divides by 10.



# HISET Math Symbols Cheat Sheet

Symbol • Meaning • Example

## Operations & Comparisons

Symbol	Meaning	Example
=	equals	$x = 5$
$\neq$	not equal	$x \neq 0$
<	less than	$x < 7$
>	greater than	$x > 2$
$\leq$	at most	$x \leq 10$
$\geq$	at least	$x \geq 0$
+	add / positive	$3 + 4 = 7$
-	subtract / negative	$5 - 8 = -3$
$\times, \cdot$	multiply	$4 \cdot x = 4x$
$\div, /$	divide	$12 \div 3 = 4$

## Graphs & Geometry

Symbol	Meaning	Example
$(x, y)$	ordered pair	$(3, -2)$
$x$ -axis	horizontal axis	left/right
$y$ -axis	vertical axis	up/down
$m$	slope	rise/run
$b$	$y$ -intercept	$y = mx + b$
$k$	constant of proportionality	$y = kx$
$P$	perimeter	distance around
$A$	area	square units
$V$	volume	cubic units
$r, d$	radius, diameter	$d = 2r$

## Fractions, Powers & Roots

Symbol	Meaning	Example
$\frac{a}{b}$	fraction / quotient	$\frac{3}{4}$
%	percent	$25\% = 0.25$
:	ratio	$2 : 3$
$\frac{b}{a}$	reciprocal of $\frac{a}{b}$	divide fractions
$x^2$	square	$6^2 = 36$
$x^3$	cube	$2^3 = 8$
$\sqrt{x}$	square root	$\sqrt{49} = 7$
$\sqrt[3]{x}$	cube root	$\sqrt[3]{8} = 2$
$ x $	absolute value	$ -5  = 5$
$\pi$	circle constant	$C = 2\pi r$

## Data & Probability

Symbol	Meaning	Example
$\bar{x}$	mean	$\bar{x} = 6$
$n$	number of values	$n = 12$
$P(A)$	probability	$P(A) = \frac{1}{4}$
$A'$	not event $A$	complement
$\approx$	approximately	$\pi \approx 3.14$
$\infty$	continues without end	repeating decimal
$\Rightarrow$	leads to	$x + 2 = 5 \Rightarrow x = 3$
$\therefore$	therefore	final conclusion

**Symbol check** Equation symbols compare values; operation symbols change values; graph symbols name location and slope; data symbols summarize a set. Always read the symbol in context before substituting numbers.



# HISET Math Vocabulary Bank

## Numbers & Operations

**Digit** — one symbol in a number, such as 0 through 9.  
**Place value** — the value of a digit based on its position.  
**Factor** — a number that divides another number evenly.  
**Multiple** — a product of a number and a whole number.  
**Prime** — a whole number greater than 1 with exactly two factors.  
**Composite** — a whole number greater than 1 with more than two factors.  
**GCF** — the greatest common factor.  
**LCM** — the least common multiple.  
**Rational number** — a number that can be written as  $\frac{a}{b}$ , with  $b \neq 0$ .  
**Absolute value** — distance from zero on a number line.

## Fractions, Decimals & Percents

**Numerator** — the top number in a fraction.  
**Denominator** — the bottom number in a fraction; it cannot be zero.  
**Equivalent fractions** — fractions with the same value.  
**Mixed number** — a whole number plus a fraction.  
**Improper fraction** — a fraction with numerator at least as large as denominator.  
**Reciprocal** — a fraction flipped upside down; used to divide fractions.  
**Percent** — per hundred.  
**Unit rate** — a rate per one unit.  
**Proportion** — two equal ratios.  
**Proportional relationship** — a relationship that can be written as  $y = kx$ .  
**Scale factor** — the multiplier from one size to another.

## Algebra Readiness

**Variable** — a letter that represents a number.  
**Constant** — a number that does not change.  
**Coefficient** — a number multiplying a variable.  
**Expression** — numbers, variables, and operations without an equals sign.  
**Equation** — a statement that two expressions are equal.  
**Solution** — a value that makes an equation or inequality true.  
**Like terms** — terms with the same variable part.  
**Distribute** — multiply a factor by each term inside parentheses.  
**Inequality** — a comparison using  $<$ ,  $>$ ,  $\leq$ , or  $\geq$ .  
**Scientific notation** — a number written as  $a \times 10^n$ , where  $1 \leq a < 10$ .  
**Unit conversion** — rewriting a measurement with an equivalent unit.

## Graphs, Geometry & Data

**Coordinate plane** — a grid formed by the  $x$ -axis and  $y$ -axis.  
**Ordered pair** — a point written as  $(x, y)$ .  
**Slope** — change in  $y$  divided by change in  $x$ .  
**Perimeter** — distance around a figure.  
**Area** — space inside a flat figure.  
**Volume** — space inside a solid figure.  
**Mean** — the average of a data set.  
**Median** — the middle value after ordering.  
**Outlier** — a data value far from most of the data.  
**IQR** — interquartile range; the spread of the middle half.  
**Probability** — a number that describes how likely an event is.



VOCAB

Translate the action word first: evaluate plugs in a number, simplify cleans an expression, solve finds a value, and graph shows the relationship visually.

**Vocabulary check** Say the word, name the action, then write a tiny example. If a definition includes a restriction such as  $b \neq 0$  or  $a \geq 0$ , keep that restriction with the formula.



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PRACTICE

#### Worksheets

Extra reps for the exact skill that feels shaky.

REVIEW

#### Formula support

Return to formulas, examples, and quick checks.

TEST

#### Practice tests

Find strengths and weak spots before review gets random.

GUIDE

#### Study path

Move from examples to mixed practice with a clear next step.

TOOLS

#### Quick references

Use formula sheets and topic pages when memory needs support.