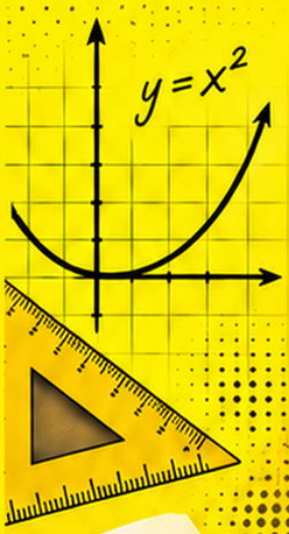
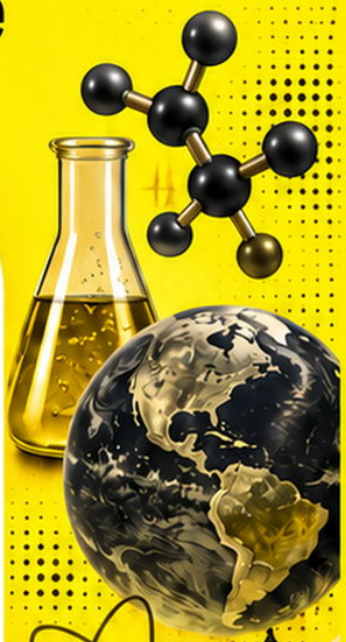
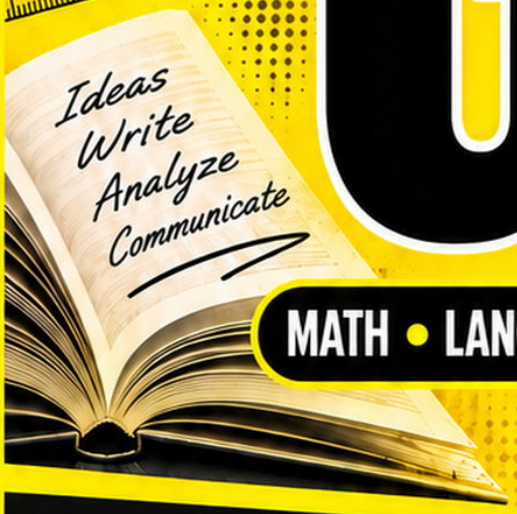
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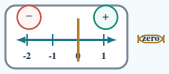
GED Math

Foundation Skills

The Basics of Math

1

Number sense, operations, estimation, and the habits that make GED Math feel manageable.



Part 1 ▪ Your online study companion

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Build confidence from number sense and algebra to graphs, geometry, data, and calculator strategy—one clear skill at a time.

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Scan and start

Chapter 1 builds the arithmetic and number-sense skills used throughout GED Math. You will practice reading numbers, choosing operations, estimating, calculating with signed numbers, and checking whether an answer fits the question. Write the setup before using a calculator; that habit makes errors easier to find and correct.

Use this chapter to build these core skills:

- place and compare numbers on a number line
- use absolute value as distance from zero
- read place value and round to a requested place
- estimate before or after calculating
- add, subtract, multiply, and divide integers
- use order of operations correctly
- evaluate simple powers and square roots
- find factors, multiples, GCF, and LCM
- convert and compare fractions, decimals, and percents
- translate short word problems into mathematical operations
- check an answer using estimation, signs, and units

Quick Starting Check

Try these mentally. The results will show you where to slow down as you work through the chapter.

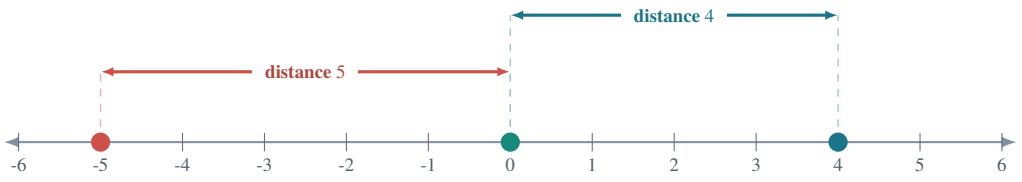
1. Which is greater: -3 or -8?
2. What is $7 + 6$?
3. What is 4×9?
4. What is half of 30?
5. Write 0.5 as a percent.
6. Round 347 to the nearest ten.

Answers: 1. -3; 2. 13; 3. 36; 4. 15; 5. 50%; 6. 350.
Questions 1 and 6 check number sense, Questions 2–4 check basic operations, and Question 5 checks decimal–percent conversion. If you missed an item, pay particular attention when that skill appears in the lessons ahead.

1.1 Numbers Live on a Line

The number line turns arithmetic into distance and direction. It is the fastest way to understand negative numbers, absolute value, and comparing numbers.

A number line shows both order and distance. Values farther right are greater, so among negative numbers the value closer to zero is greater: $-3 > -8$. Absolute value measures distance from zero, which is why $|-8| = 8$ and why an absolute value is never negative. To find the distance between two numbers, count the units between their positions or subtract and take the absolute value. When the signs are easy to confuse, draw a quick line with zero and the relevant values clearly labeled.



Example 1

One freezer is at $-8°$F. Another freezer is at $-3°$F. Which freezer is warmer?

Warmer means a greater temperature. On the number line, -3 is to the right of -8, so $-3 > -8$. Both temperatures are below zero, but $-3°$F is the warmer of the two.

$-3°$F

Absolute Value Means Distance

Absolute value tells how far a number is from zero. We write it with two vertical bars, one on each side of the number or expression. For example, $|-9| = 9$ and $|9| = 9$. Both numbers are 9 units from zero. Absolute value is never negative because distance is never negative. The distance between any two numbers a and b is $|a - b|$. The absolute value makes the order of subtraction irrelevant: $|a - b| = |b - a|$.

Example 2

Find the distance between -5 and 4.

From -5 to 0 is 5 units, and from 0 to 4 is 4 more, so the distance is $5 + 4 = 9$ units. You can check with the distance formula: $|4 - (-5)| = |9| = 9$.

9 units

Comparing the absolute values alone does not compare the original numbers. Although $8 > 3$, the point -8 lies to the left of -3, so $-8 < -3$.

Quick Check 1 Which is smaller, -7 or -3? Which has the greater absolute value?
Try it before looking at the Math Quick Check Answers.

1.2 Place Value and Estimation

GED problems often use real-world numbers. Place value helps you read them, round them, and notice unreasonable answers before they cost you points.

Place value tells what each digit is worth, and estimation uses that structure to produce a nearby, useful number. Read a number by grouping ones, tens, hundreds, thousands, tenths, and hundredths rather than treating its digits as a string. To round, identify the place you want to keep and inspect the digit immediately to its right. For an estimate, choose friendly values that preserve the original size of the problem. After calculating, compare the result with your estimate; an answer ten times too large or too small often signals a place-value or decimal error.

Place	hundred-thousands	ten-thousands	thousands	hundreds	tens	ones
Value	100,000	10,000	1,000	100	10	1
Number	3	4	8	2	7	5

The number in the table is 348,275. The value of each digit depends on its position. The 4 represents 40,000, and the 8 represents 8,000. When a number is multiplied or divided by 10, its digits shift one place relative to the decimal point: multiplication by 10 makes each digit worth ten times as much, while division by 10 makes each digit worth one-tenth as much.

How to Round a Whole Number

Rounding does not mean guessing wildly. It means replacing a number with a nearby number that is easier to use.
To round: underline the place you are keeping, look one digit to the right, and decide whether the underlined digit stays the same or increases by 1. Digits after the rounded place become zeros in a whole number.

Number	Round to nearest ten	Round to nearest hundred
348,275	348,280	348,300
6,941	6,940	6,900
19,960	19,960	20,000

Example 1

A used car costs $18,975. Fees are $1,124. About how much is the total?

The car price, $18,975, is close to $19,000, and the fees, $1,124, are close to $1,100. Add those friendlier numbers: $19{,}000 + 1{,}100 = 20{,}100$. The question asks for an estimate, so a nearby total is appropriate; an exact receipt total is not required. **About $20,100**

Example 2

Round $684{,}951$ to the nearest thousand.

The thousands digit is 4. Inspect the hundreds digit immediately to its right, which is 9. Since 9 is at least 5, raise the thousands digit to 5 and replace the later digits with zeros: 684,951 rounds to 685,000. The answer remains close to the original number and names an exact number of thousands.

685,000

Why This Matters on the GED

Many wrong multiple-choice answers are unreasonable. If your estimate is about $20,000, an answer like $2,010 or $200,100 should feel suspicious immediately.

Quick Check 2 Estimate 49.8×6.1 using compatible rounded values.
Try it before looking at the Math Quick Check Answers.

1.3 The Four Operations

Each operation represents a different relationship. Before calculating, decide whether the quantities are being combined, compared, grouped, or divided into equal parts.

Addition combines quantities, subtraction finds a difference or removes an amount, multiplication makes equal groups, and division separates a total into equal groups or finds a rate. Signed numbers add one more decision: determine the sign before calculating the size. Keep the units attached, estimate the likely result, and use the inverse operation to check. For example, a division answer can be checked by multiplying the quotient by the divisor.

Operation	What it usually means	Everyday signal words
Addition	combine amounts	total, altogether, increased by, plus
Subtraction	compare or remove	difference, fewer, left, change, decreased by
Multiplication	equal groups or scaling	each, per, times as many, area
Division	sharing or rate	split, per one, average, how many groups

Math Tip

Division by zero is **undefined**. No number satisfies $0 \cdot q = 12$, so $\frac{12}{0}$ has no quotient. By contrast, $0 \div 12 = 0$: zero divided by a nonzero number is zero. The position of zero determines which rule applies.

Example 1

A warehouse has 402 cartons and ships 178. How many remain?

Line up hundreds, tens, and ones. To subtract 8 ones from 2 ones, first trade one hundred for 10 tens, then trade one of those tens for 10 ones. The 402 is now 3 hundreds, 9 tens, and 12 ones. Subtract by place: $12 - 8 = 4$ ones, $9 - 7 = 2$ tens, and $3 - 1 = 2$ hundreds. Check with the inverse operation: $224 + 178 = 402$.

224 cartons

Example 2

A worker puts 156 labels into packets of 12. How many full packets result?

Break 156 into convenient multiples of 12: $156 = 120 + 36$. Since $120 \div 12 = 10$ and $36 \div 12 = 3$, the total is $10 + 3 = 13$ packets. Multiplication checks both the quotient and the absence of a remainder: $13 \times 12 = 156$.

13 packets

Integer Addition With Chips

A positive and a negative can cancel because together they make zero.



$5 + (-3) = 2$

because three zero-pairs disappear.

Same signs: add the absolute values and keep the common sign. For example, $-6 + (-4) = -10$.
Different signs: subtract the smaller absolute value from the larger one and keep the sign of the number with the larger absolute value. For example, $-9 + 14 = 5$.
Subtraction: add the opposite. Thus $7 - 13 = 7 + (-13) = -6$.

Example 3

Simplify $-7 + 12 - 5$.

Start at -7. Adding 12 moves 12 units to the right, so $-7 + 12 = 5$. The expression is now $5 - 5$, which equals 0. A quick check confirms that the positive 12 exactly offsets the two negative amounts, 7 and 5.

0

Multiplying and Dividing Signed Numbers

Signs	Product or quotient	Example
same signs	positive	$(-4)(-6) = 24$
different signs	negative	$(-28) \div 7 = -4$

The rule for adding signed numbers is not the same as the rule for multiplying signed numbers: $-8 + 3 = -5$, while $(-8)(3) = -24$. For

2.2 Simplifying Fractions

Simplifying a fraction means renaming the same value with a smaller numerator and denominator.

A fraction is simplified when its numerator and denominator share no factor greater than 1. Find a common factor—ideally the greatest common factor—and divide both parts by that same number. Dividing only the numerator would change the fraction's value. Confirm the result by multiplying numerator and denominator by the canceled factor; you should recover the original fraction. The simplified fraction names the same quantity with smaller numbers.

Simplification Check
Divide the numerator and denominator by the same nonzero number. The amount stays the same because both parts changed together.

Example 1

Simplify $\frac{42}{56}$ completely.

The greatest common factor of 42 and 56 is 14, so divide both parts of the fraction by 14: $\frac{42}{56} = \frac{42\div14}{56\div14} = \frac{3}{4}$. The numbers 3 and 4 have no common factor greater than 1, which confirms that the fraction is in lowest terms. $\frac{3}{4}$

Example 2

Simplify $\frac{36}{60}$ completely.

Divide both numbers by 6 to get $\frac{36}{60} = \frac{6}{10}$. The numerator and denominator are smaller, but the fraction is not yet simplified because 6 and 10 still share a factor of 2. Divide both parts by 2: $\frac{6}{10} = \frac{3}{5}$. Since 3 and 5 share no factor greater than 1, the work is complete. $\frac{3}{5}$

Quick Check 10 Simplify $\frac{18}{24}$.
Try it before looking at the Math Quick Check Answers.

2.3 Equivalent Fractions: Same Value, Different Name

Equivalent fractions are different names for the same value. The amount does not change; the number and size of the equal pieces change together.

Equivalent fractions describe the same point on a number line even though their numerators and denominators look different. Multiply or divide the numerator and denominator by the same nonzero number to create an equivalent name. To simplify, divide by a shared factor until none remains. To build a requested denominator, determine what multiplied the old denominator, then apply that identical multiplier to the numerator. A requested denominator must be a whole-number multiple of the original denominator when you are multiplying; for example, $3/5$ can become twentieths but not eighteenths by multiplying top and bottom by one whole number. Use cross products only as a check for equivalence, not as a substitute for showing the factor that creates the new fraction.

Move	What it means
Multiply top and bottom by the same number	cut each piece into more equal pieces
Divide top and bottom by the same number	group smaller pieces into larger pieces

Example 1

Write a fraction equivalent to $\frac{3}{5}$ with denominator 20.

The denominator changes from 5 to 20 by multiplication by 4. Multiply the numerator by that same 4 so the fraction keeps its value: $\frac{3}{5} = \frac{3\times4}{5\times4} = \frac{12}{20}$. Both parts changed by the same factor, so the new fraction names the same point on the number line. $\frac{12}{20}$

Example 2

Reduce $\frac{24}{36}$ to lowest terms.

Both 24 and 36 are divisible by 12. Divide the numerator and denominator by 12: $\frac{24}{36} = \frac{24\div12}{36\div12} = \frac{2}{3}$. Because 2 and 3 share no factor greater than 1, the reduction is complete. $\frac{24}{36} = \frac{2}{3}$

Do not change only the numerator or only the denominator when making an equivalent fraction. That changes the value. When you multiply or divide to make an equivalent fraction, whatever you do to the numerator, you must also do to the denominator.

Quick Check 11 Complete $\frac{3}{5} = \frac{\square}{20}$.
Try it before looking at the Math Quick Check Answers.

2.4 Compare Fractions Without Guessing

When two fractions have different denominators, they are measured in different-sized pieces. Before comparing, make the pieces the same size or change both fractions to decimals.

Fractions can be compared by using a common denominator, cross products, or a familiar benchmark such as $\frac{1}{2}$. A common denominator makes the pieces the same size, so only the numerators need comparison. Cross products are efficient when the numbers are manageable, but keep the products attached to the correct fractions. If the fractions are close, convert only after preserving enough decimal places to make a reliable decision.

Example 1

Which is greater: $\frac{2}{3}$ or $\frac{5}{8}$?

The denominators name different-sized pieces, so compare the fractions using twenty-fourths:

$$\frac{2}{3} = \frac{16}{24} \quad \text{and} \quad \frac{5}{8} = \frac{15}{24}.$$

Once the pieces have the same size, the larger numerator identifies the larger fraction. Since $16 > 15$, $\frac{2}{3} > \frac{5}{8}$. **$\frac{2}{3}$**

Example 2

Which is greater: $\frac{7}{15}$ or $\frac{1}{2}$?

Half of 15 is 7.5, so a fraction with denominator 15 would need a numerator of 7.5 to equal $\frac{1}{2}$. Because 7 is less than 7.5, $\frac{7}{15}$ is slightly below one-half. A common- denominator check gives $\frac{7}{15} = \frac{14}{30}$ and $\frac{1}{2} = \frac{15}{30}$. **$\frac{1}{2}$**

Choose One Comparison Form

When a question mixes fractions, decimals, and percents, convert every value to the same form before ordering them. Decimals are often convenient, but a common denominator may be faster when the fractions convert cleanly.

Quick Check 12 Which is greater, $\frac{5}{8}$ or $\frac{2}{3}$?
Try it before looking at the Math Quick Check Answers.

2.5 Add and Subtract Fractions

Adding and subtracting fractions is really about matching piece sizes. You can only add the numerators directly when the denominators already match.

Fractions may be added or subtracted only after their pieces have the same size. Find a common denominator, rewrite each fraction as an equivalent fraction, and then combine the numerators while keeping the denominator. Simplify at the end. With mixed numbers, work with improper fractions or handle whole and fractional parts carefully; when subtracting, regroup one whole if the top fractional part is too small.

Same Denominator, Same Size Pieces

If the denominators match, the pieces are the same size. Add or subtract the numerators and keep the denominator: $\frac{2}{9} + \frac{5}{9} = \frac{7}{9}$ and $\frac{7}{10} - \frac{3}{10} = \frac{4}{10} = \frac{2}{5}$.

Example 1

Calculate the following sum: $\frac{3}{8} + \frac{1}{4}$.

Eighths and fourths are different-sized pieces, so rename $\frac{1}{4}$ as $\frac{2}{8}$. The fractions now have a common denominator: $\frac{3}{8} + \frac{1}{4} = \frac{3}{8} + \frac{2}{8} = \frac{5}{8}$. The numerator and denominator of $\frac{5}{8}$ share no common factor greater than 1, so the answer is already simplified. **$\frac{5}{8}$**

Example 2

Calculate the following difference: $2\frac{1}{3} - \frac{5}{6}$.

Use sixths because $\frac{1}{3} = \frac{2}{6}$. Then $2\frac{1}{3} = 2\frac{2}{6} = \frac{14}{6}$, so

$$\frac{14}{6} - \frac{5}{6} = \frac{9}{6} = \frac{3}{2} = 1\frac{1}{2}.$$

The answer is smaller than $2\frac{1}{3}$, as subtraction requires. $1\frac{1}{2}$

Do not add denominators. The denominator names the size of the pieces. If you add $\frac{1}{3} + \frac{1}{6}$, the answer is not $\frac{2}{9}$. First rewrite $\frac{1}{3}$ as $\frac{2}{6}$, then add: $\frac{2}{6} + \frac{1}{6} = \frac{3}{6} = \frac{1}{2}$.

Quick Check 13 Calculate $\frac{5}{6} - \frac{1}{4}$.
Try it before looking at the Math Quick Check Answers.

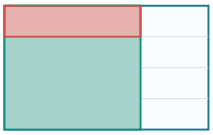
2.6 Multiply and Divide Fractions

Multiplying fractions often means taking part of a part. Dividing by a fraction asks how many fraction-sized groups fit.

To multiply fractions, multiply numerators, multiply denominators, and simplify; canceling common factors before multiplying keeps the arithmetic smaller. To divide, keep the first fraction, multiply by the reciprocal of the second, and then simplify. The reciprocal belongs only to the divisor. Use size as a check: multiplying by a positive fraction less than 1 should make a positive quantity smaller, while dividing by that fraction should make it larger.

Picture the Move

Multiply: part of a part



$\frac{1}{4}$ of $\frac{2}{3}$ means the shared part

$\frac{1}{4} \times \frac{2}{3} = \frac{1}{6}$

Divide: how many fit?



$\frac{3}{4} \div \frac{1}{8} = 6$ six eighth-size pieces fit

Example 1

A garden is $\frac{2}{3}$ planted with vegetables. Of the vegetable section, $\frac{1}{4}$ is tomatoes. What fraction of the whole garden is tomatoes?

Tomatoes occupy only part of the vegetable section, so this is a part-of-a-part calculation. Translate "$\frac{1}{4}$ of $\frac{2}{3}$" as multiplication:

$$\frac{1}{4} \times \frac{2}{3} = \frac{1 \cdot 2}{4 \cdot 3} = \frac{2}{12} = \frac{1}{6}.$$

The product is smaller than $\frac{2}{3}$, which fits the situation. $\frac{1}{6}$

Example 2

A ribbon is $\frac{3}{4}$ yard long. Each small piece is $\frac{1}{8}$ yard. How many small pieces can be cut?

The question asks how many $\frac{1}{8}$-yard lengths fit inside $\frac{3}{4}$ yard, so write $\frac{3}{4} \div \frac{1}{8}$. Multiply by the reciprocal of the divisor: $\frac{3}{4} \div \frac{1}{8} = \frac{3}{4} \times \frac{8}{1} = \frac{24}{4} = 6$. Six pieces are reasonable because $\frac{3}{4} = \frac{6}{8}$. **6 small pieces**

When to Use a Reciprocal

When dividing fractions, take the reciprocal of the divisor. For multiplication, multiply the numerators and denominators directly, canceling common factors when helpful.

Quick Check 14 Calculate $\frac{3}{4} \div \frac{2}{5}$.
Try it before looking at the Math Quick Check Answers.