

Massachusetts Algebra 2 Summer Math Review

8-Week Core Review with Practice, Weekly Quizzes, and Answer Explanations

Dr. A. Nazari

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☀️ *Welcome to Summer Math Review!* ☀️

This 8-week plan reviews the Algebra 2 math students already learned this year.

How each week works

- 📅 *Monday through Thursday are short review days.*
- 💡 *Each day starts with a Lesson Review.*
- ✍️ *Each practice day has 6 problems.*
- 📋 *Friday is a 10-question quiz.*
- ✅ *Answers explain the thinking, not just the final number.*

Try your best first. Then use the answer key like a teacher.

Your 8-Week Summer Review Plan

Use this book four days a week, then take the quiz on Friday.

Weekly Schedule

| Week | Monday | Tuesday | Wednesday | Thursday | Friday |
|------|-----------------|--------------------|----------------|----------------|------------|
| 1 | Foundations | Equations | Linear | Systems | Quiz 1 |
| 2 | Functions | Transforms | Quadratics | Quad Models | Quiz 2 |
| 3 | Complex | Polynomials | Zeros | Rational Expr. | Quiz 3 |
| 4 | Rational Eq. | Radicals | Radical Eq. | Exp/Logs | Quiz 4 |
| 5 | Exp/Log Eq. | Sequences | Sigma/Binomial | Matrices | Quiz 5 |
| 6 | Unit Circle | Identities | Applied Trig | Sine/Cosine | Quiz 6 |
| 7 | Tangent/Inverse | Circles/Parabolas | Conics | Statistics | Quiz 7 |
| 8 | Probability | Regression/Finance | Mixed Algebra | Final Review | Final Quiz |

For students

Read the Lesson Review first. Try all 6 problems before checking answers. If you miss one, read the explanation and fix your work.

For parents and teachers

The daily pages are meant to be short. If a student struggles, use the answer explanation as the teaching step, then have the student correct the problem.

Goal

By the end of 8 weeks, students will have completed 192 daily practice problems and 80 quiz questions, with review across the full Algebra 2 math year.



Algebra 2 Reference Sheet



High-yield formulas to keep nearby during summer review.

Functions

Domain = allowed inputs; range = outputs.

Average rate: $\frac{f(b) - f(a)}{b - a}$

$f(x) + k$: up/down; $f(x - h)$: right/left

$a \cdot f(x)$: vertical stretch/reflection

$f(bx)$: horizontal change

Inverse: $f^{-1}(f(x)) = x$

Linear

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

Point-slope: $y - y_1 = m(x - x_1)$

Slope-intercept: $y = mx + b$

Standard: $Ax + By = C$

Parallel: same m ; perpendicular: $m_1 m_2 = -1$

Systems

Solutions are intersections.

Substitution: solve one equation, plug in.

Elimination: align terms, add/subtract.

No solution: parallel lines.

Infinitely many: same line.

Quadratics

Standard: $y = ax^2 + bx + c$

Vertex: $y = a(x - h)^2 + k$

Factored: $y = a(x - r_1)(x - r_2)$

Axis: $x = -\frac{b}{2a}$

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

Discriminant: $b^2 - 4ac$

Roots: $r_1 + r_2 = -\frac{b}{a}$, $r_1 r_2 = \frac{c}{a}$

Polynomials

Remainder: divide by $x - a$, remainder $f(a)$.

Factor: $x - a$ factor iff $f(a) = 0$.

Zeros and factors: $x = r \leftrightarrow (x - r)$

Even degree: same end behavior.

Odd degree: opposite end behavior.

Even multiplicity touches; odd crosses.

Complex Numbers

$i^2 = -1$, $i^3 = -i$, $i^4 = 1$

$(a + bi) + (c + di) = (a + c) + (b + d)i$

$(a + bi)(c + di) = (ac - bd) + (ad + bc)i$

Conjugates: $a + bi$, $a - bi$

Real polynomials have conjugate complex roots.

Rational

Excluded values come from original denominator.

Factor first; cancel common factors.

Vertical asymptotes: uncanceled denominator zeros.

Holes: canceled denominator zeros.

Horizontal asymptote compares degrees.

Rational inequality: use sign chart.

Radicals

$a^{m/n} = \sqrt[n]{a^m} = (\sqrt[n]{a})^m$

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

$\frac{a^m}{a^n} = a^{m-n}$

Power function: $f(x) = ax^p$

Radical equations: isolate, power, check.

Even roots need nonnegative radicands.

Exponential

Model: $y = ab^x$

Growth: $b > 1$; decay: $0 < b < 1$

Compound: $A = P(1 + \frac{r}{n})^{nt}$

Continuous: $A = Pe^{rt}$

Half-life/decay: $A = A_0(1 - r)^t$

Logarithms

$\log_b(x) = y \leftrightarrow b^y = x$

$\log_b(MN) = \log_b M + \log_b N$

$\log_b(M/N) = \log_b M - \log_b N$

$\log_b(M^p) = p \log_b M$

Change base: $\log_b x = \frac{\log x}{\log b}$

Log domain: argument > 0 .

Sequences

Arithmetic: $a_n = a_1 + (n - 1)d$

Arithmetic recursive: $a_n = a_{n-1} + d$

Arithmetic sum: $S_n = \frac{n(a_1 + a_n)}{2}$

Geometric: $a_n = a_1 r^{n-1}$

Geometric recursive: $a_n = r a_{n-1}$

Finite sum: $S_n = \frac{a_1(1 - r^n)}{1 - r}$

Infinite sum: $S = \frac{a_1}{1 - r}$, $|r| < 1$

Matrices

Matrix size: rows \times columns.

Add/subtract only same dimensions.

Multiply $A_{m \times n} B_{n \times p} = C_{m \times p}$.

Identity: $AI = IA = A$

For 2×2 , determinant $ad - bc$.



Algebra 2 Reference Sheet



Trig, conics, data, probability, and modeling reminders

Trigonometry

Unit point: $(\cos \theta, \sin \theta)$

$$\sin^2 \theta + \cos^2 \theta = 1$$

$$1 + \tan^2 \theta = \sec^2 \theta$$

$$\sin = \frac{\text{opp}}{\text{hyp}}, \cos = \frac{\text{adj}}{\text{hyp}}, \tan = \frac{\text{opp}}{\text{adj}}$$

Sine/cosine period: $\frac{2\pi}{|b|}$

Tangent period: $\frac{\pi}{|b|}$

$$\text{Law of Sines: } \frac{\sin A}{a} = \frac{\sin B}{b} = \frac{\sin C}{c}$$

$$\text{Law of Cosines: } c^2 = a^2 + b^2 - 2ab \cos C$$

Trig Graphs

$$y = A \sin(B(x - C)) + D$$

Amplitude: $|A|$

Period: $\frac{2\pi}{|B|}$ for sine/cosine

Period: $\frac{\pi}{|B|}$ for tangent

Phase shift: C

Midline: $y = D$

Max/min: $D \pm |A|$

Special Angles

$$30^\circ = \frac{\pi}{6}, 45^\circ = \frac{\pi}{4}, 60^\circ = \frac{\pi}{3}$$

$$\sin 30^\circ = \frac{1}{2}, \cos 30^\circ = \frac{\sqrt{3}}{2}$$

$$\sin 45^\circ = \cos 45^\circ = \frac{\sqrt{2}}{2}$$

$$\sin 60^\circ = \frac{\sqrt{3}}{2}, \cos 60^\circ = \frac{1}{2}$$

Quadrant signs: ASTC.

Conics

$$\text{Circle: } (x - h)^2 + (y - k)^2 = r^2$$

$$\text{Parabola: } (x - h)^2 = 4p(y - k)$$

$$\text{or } (y - k)^2 = 4p(x - h)$$

$$\text{Ellipse: } \frac{(x - h)^2}{a^2} + \frac{(y - k)^2}{b^2} = 1$$

$$\text{Hyperbola: } \frac{(x - h)^2}{a^2} - \frac{(y - k)^2}{b^2} = 1$$

Conic Details

Circle center (h, k) , radius r .

Parabola vertex (h, k) , focus is $|p|$ away.

Ellipse: larger denominator gives major axis.

$$\text{Ellipse: } c^2 = a^2 - b^2$$

$$\text{Hyperbola: } c^2 = a^2 + b^2$$

Asymptotes guide hyperbola branches.

Statistics

$$\text{Mean: } \bar{x} = \frac{\sum x}{n}$$

$$z = \frac{x - \mu}{\sigma}$$

Residual = actual - predicted

Correlation r is between -1 and 1 .

Normal: about 68%, 95%, 99.7% within 1, 2, 3 SDs.

Data Displays

$$\text{IQR: } Q_3 - Q_1$$

$$\text{Outlier fence: } Q_1 - 1.5(IQR), Q_3 + 1.5(IQR)$$

Median resists outliers.

Mean is pulled by outliers.

Standard deviation measures typical distance from mean.

Regression

Residual: actual - predicted.

Positive r : as x rises, y tends to rise.

Negative r : as x rises, y tends to fall.

Strong linear fit: $|r|$ close to 1.

R^2 is percent of variation explained.

Probability

$$P(A | B) = \frac{P(A \cap B)}{P(B)}$$

Independent: $P(A \cap B) = P(A)P(B)$

Either/or: $P(A \cup B) = P(A) + P(B) - P(A \cap B)$

$$\text{Permutations: } {}_n P_r = \frac{n!}{(n-r)!}$$

$$\text{Combinations: } {}_n C_r = \frac{n!}{r!(n-r)!}$$

$$\text{Binomial: } {}_n C_r p^r (1-p)^{n-r}$$

Counting

Fundamental counting principle: multiply choices.

Permutation: order matters.

Combination: order does not matter.

With replacement: choices stay the same.

Without replacement: choices decrease.

Finance

$$\text{Simple interest: } I = Prt$$

$$\text{Future amount: } A = P + I$$

$$\text{Compound: } A = P(1 + \frac{r}{n})^{nt}$$

$$\text{Continuous: } A = Pe^{rt}$$

$$\text{Depreciation: } A = P(1 - r)^t$$

$$\text{Percent change: } \frac{\text{new} - \text{old}}{\text{old}}$$

Modeling Checks

Linear: constant first differences.

Quadratic: constant second differences.

Exponential: constant ratios.

Domain should match the context.

Round only at the end unless directed.

Summer Progress Tracker

Check off each day as you finish it.

| Week | Mon | Tue | Wed | Thu | Fri Quiz |
|------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| 1 | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 2 | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
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Small practice adds up.

Four short days and one quiz each week is enough to keep Algebra 2 math fresh all summer.

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Your 8-week summer review plan

Answer Key **4**

PREVIEW

Day 1 Real Numbers, Properties, and Expressions

Algebra 2 review works best when you name the structure before you calculate.

- Number sets are nested: natural, whole, integer, rational, and real.
- Interval notation uses brackets for included endpoints and parentheses for excluded endpoints.
- Order of operations controls simplifying; properties justify equivalent rewrites.
- Negative exponents move a factor across the fraction bar; they do not make a value negative.
- Evaluate by substituting with parentheses, then simplify carefully.
- Combine only like terms with exactly the same variable part.

 **Practice**

1. Classify $\sqrt{81}$ as precisely as possible.
2. Write $\{x \mid -2 \leq x < 5\}$ in interval notation. _____
3. Evaluate $4 + 3(2^3 - 5)$. _____
4. Simplify $(2x^3y^{-2})(5x^{-1}y^5)$ with positive exponents.
5. Evaluate $2a^2 - 3b$ when $a = -4$ and $b = 5$. _____
6. Simplify $4(3x - 2) - 5x$. _____



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Day 2 Equations, Inequalities, and Absolute Value

Algebra 2 review works best when you name the structure before you calculate.

- Use inverse operations to isolate the variable in equations.
- Do the same operation to both sides to preserve equality or the solution set.
- Reverse an inequality sign when multiplying or dividing by a negative number.
- Compound inequalities describe overlap with “and” or separated regions with “or.”
- Absolute value measures distance from 0, so $|A| = c$ gives two cases.
- For $|A| < c$, keep the expression between $-c$ and c .

 Practice

1. Solve $3x - 7 = 20$. _____
2. Solve $\frac{m + 4}{5} = -2$. _____
3. Solve $2(3p - 1) \leq 16$. _____
4. Write $-1 < x \leq 6$ in interval notation. _____
5. Solve $|x - 5| = 9$. _____
6. Solve $|2x + 1| < 7$. _____



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 Week 1 Quiz

Foundations and Linear Models Check

Name: _____

Date: _____

Score: _____/10

- Which is the most precise classification of $-\sqrt{36}$?
A. natural
B. whole
C. integer
D. irrational
- Write $x > 3$ in interval notation. _____
- Simplify $2(4x - 1) - 3x$. _____
- True or False: Solving $-2x < 8$ gives $x < -4$. True False
- Solve $|x + 2| = 6$. _____
- Find the slope between $(1, -2)$ and $(5, 10)$. _____
- Which line is parallel to $y = -\frac{1}{2}x + 7$?
A. $y = 2x - 1$
B. $y = -\frac{1}{2}x + 3$
C. $y = \frac{1}{2}x + 7$
D. $y = -2x$
- Solve the system $y = x + 1$ and $y = 3x - 5$.
- Does $(2, 5)$ satisfy $y \leq 2x + 1$?
- A taxi charges \$4 plus \$2.50 per mile. Write a model and find the cost for 9 miles.



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Week 1, Day 1 Answer Key Real Numbers, Properties, and Expressions

Answers

1 natural number

2 $[-2, 5)$

3 13

4 $10x^2y^3$

5 17

6 $7x - 8$
Explanations

- Evaluate the radical first: $\sqrt{81} = 9$. The smallest precise set is natural numbers, even though 9 is also whole, integer, rational, and real.
- The endpoint -2 is included, so it uses a bracket. The endpoint 5 is not included, so it uses a parenthesis.
- Use order of operations: first $2^3 = 8$, then $8 - 5 = 3$. Multiply $3 \cdot 3 = 9$ and add 4 to get 13.
- Multiply coefficients and add exponents on like bases: $2 \cdot 5 = 10$, $x^{3+(-1)} = x^2$, and $y^{-2+5} = y^3$. The result has only positive exponents.
- Substitute with parentheses: $2(-4)^2 - 3(5)$. The square gives 16, so $2 \cdot 16 - 15 = 17$.
- Distribute first to get $12x - 8 - 5x$. Combine like terms, $12x - 5x = 7x$, so the expression is $7x - 8$.

Week 1, Day 2 Answer Key Equations, Inequalities, and Absolute Value

Answers
1 $x = 9$ 2 $m = -14$ 3 $p \leq 3$ 4 $(-1, 6]$ 5 $x = -4$ or $x = 14$ 6 $-4 < x < 3$
Explanations

- Add 7 to both sides to undo subtraction: $3x = 27$. Divide by 3 to isolate the variable, so $x = 9$.
- Multiply both sides by 5 to get $m + 4 = -10$. Subtract 4 from both sides, giving $m = -14$.
- Distribute to get $6p - 2 \leq 16$. Add 2 and divide by positive 6, so the inequality direction stays the same and $p \leq 3$.
- The value -1 is excluded because the inequality is strict, so use a parenthesis. The value 6 is included because of \leq , so use a bracket.
- An absolute value equation asks for two distances: $x - 5 = 9$ or $x - 5 = -9$. Solving those gives $x = 14$ and $x = -4$.
- For an absolute value less than 7, write $-7 < 2x + 1 < 7$. Subtract 1 and divide by 2 to get $-4 < x < 3$.



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Week 1 Quiz Answer Key Foundations and Linear Models Check

Answers

- 1 C 2 $(3, \infty)$ 3 $5x - 2$ 4 False 5 $x = 4$ or $x = -8$ 6 3 7 B 8 $(3, 4)$
 9 yes 10 $C = 2.5m + 4$; \$26.50

Explanations

- 1 Since $-\sqrt{36} = -6$, the number is an integer. It is also rational and real, but integer is the most precise choice listed.
- 2 The value 3 is not included, so use a parenthesis. Infinity always uses a parenthesis.
- 3 Distribute first: $2(4x - 1) = 8x - 2$. Then combine like terms, $8x - 3x = 5x$, giving $5x - 2$.
- 4 Dividing by the negative number -2 reverses the inequality sign. The correct solution is $x > -4$, so the stated answer has the sign facing the wrong way.
- 5 An absolute value equation represents two distances from 0, so split it into $x + 2 = 6$ or $x + 2 = -6$. Solving the two linear equations gives $x = 4$ and $x = -8$.
- 6 Use $m = \frac{10 - (-2)}{5 - 1} = \frac{12}{4} = 3$. The slope is the change in y divided by the change in x .
- 7 Parallel lines have the same slope. Choice B has slope $-\frac{1}{2}$, matching the given line.
- 8 At the intersection, both equations have the same y -value, so set $x + 1 = 3x - 5$. Then $6 = 2x$, so $x = 3$, and substituting gives $y = 4$.
- 9 Substitute the point: $5 \leq 2(2) + 1 = 5$. Because equality is allowed by \leq , the point satisfies the inequality.
- 10 The fixed charge is 4 and the rate is 2.50 per mile. Substitute $m = 9$ to get $2.5(9) + 4 = 26.5$ dollars.

PREP

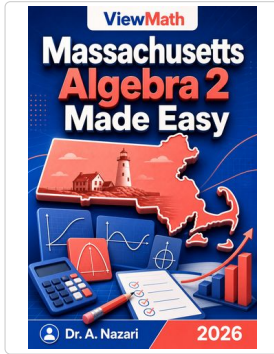


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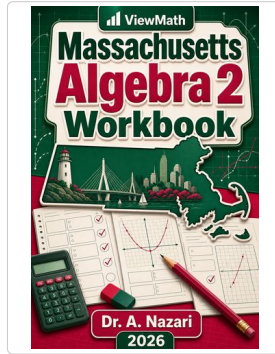
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Study Guide



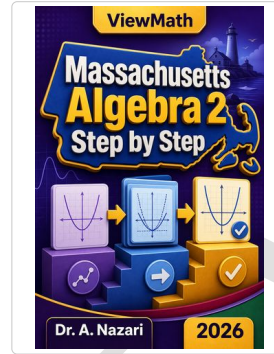
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Workbook



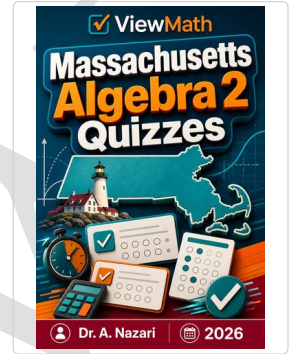
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Step-by-Step



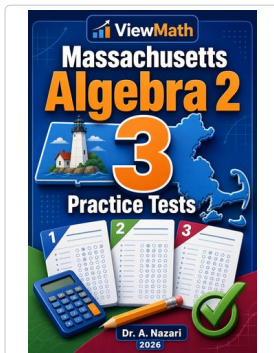
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Quizzes



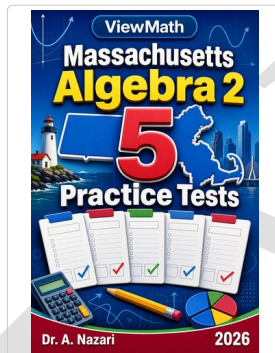
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3 Practice Tests



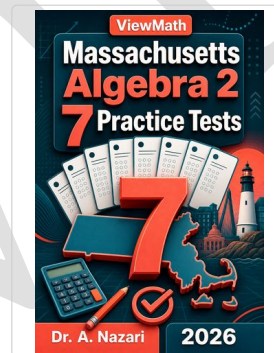
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5 Practice Tests



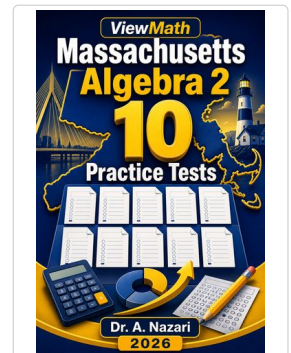
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7 Practice Tests



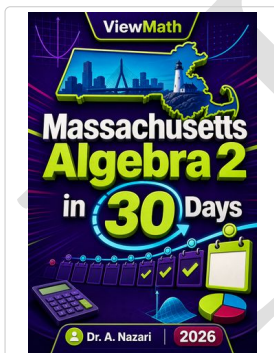
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10 Practice Tests



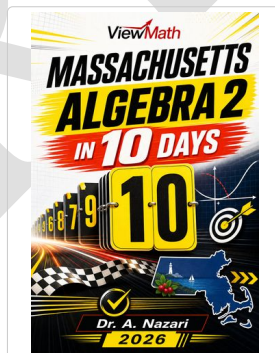
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Math in 30 Days



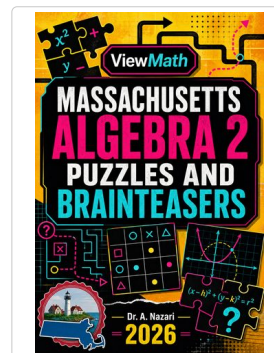
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Math in 10 Days



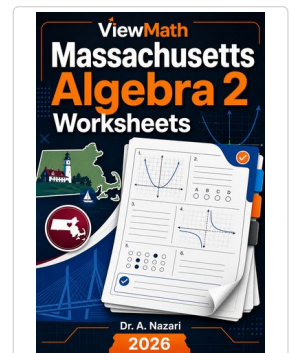
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