

# Michigan MI Standards Grade 8 Math

## Summer Review

*8-Week Review with Practice and Weekly Quizzes*

**Dr. A. Nazari**

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# Grade 8 Summer Math Review

8-week core review with practice and weekly quizzes

This 8-week plan reviews the Grade 8 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.

**Complete the questions before checking the answer key.**

# 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    | Day 1  | Day 2   | Day 3     | Day 4    | Quiz       |
| 2    | Day 1  | Day 2   | Day 3     | Day 4    | Quiz       |
| 3    | Day 1  | Day 2   | Day 3     | Day 4    | Quiz       |
| 4    | Day 1  | Day 2   | Day 3     | Day 4    | Quiz       |
| 5    | Day 1  | Day 2   | Day 3     | Day 4    | Quiz       |
| 6    | Day 1  | Day 2   | Day 3     | Day 4    | Quiz       |
| 7    | Day 1  | Day 2   | Day 3     | Day 4    | Quiz       |
| 8    | Day 1  | Day 2   | Day 3     | Day 4    | 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 Grade 8 math year.

# 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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| 8    | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

## Small practice adds up.

Four short days and one quiz each week is enough to keep Grade 8 math fresh all summer.



# Grade 8 Reference Sheet



High-yield formulas and reminders for quick review

## Exponents

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

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

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

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

$$a^0 = 1 \text{ for } a \neq 0$$

$$a^{-n} = \frac{1}{a^n}$$

## Scientific Notation

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

Multiply: multiply decimals, add exponents.

Divide: divide decimals, subtract exponents.

Positive exponent: number is large.

Negative exponent: number is small.

## Roots and Real Numbers

Perfect squares: 1, 4, 9, 16, 25, 36

49, 64, 81, 100, 121, 144

Perfect cubes: 1, 8, 27, 64, 125

$$\sqrt{2} \approx 1.414, \sqrt{3} \approx 1.732, \pi \approx 3.14159$$

Irrational numbers are nonrepeating, nonterminating decimals.

## Slope and Lines

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

Slope-intercept form:  $y = mx + b$

$m$  is slope,  $b$  is the  $y$ -intercept.

Proportional relationship:  $y = mx$  and graph passes through  $(0, 0)$ .

## Systems of Equations

A solution is the point where two graphs meet.

One solution: different slopes.

No solution: same slope, different intercepts.

Infinitely many solutions: same line.

Use substitution or elimination to solve exactly.

## Functions

Each input has exactly one output.

Use the vertical line test on graphs.

Linear functions have a constant rate of change.

In  $y = mx + b$ , the initial value is  $b$ .

Compare functions by rate of change and initial value.

## Transformations

Translation: slide. Reflection: flip. Rotation: turn.

These rigid motions keep lengths and angle measures.

Dilation: resize by scale factor  $k$ .

$k > 1$  enlarges;  $0 < k < 1$  reduces.

Congruent figures are same size and shape. Similar figures have proportional sides.

## Angle Relationships

Triangle angle sum:  $180^\circ$

Exterior angle = sum of the two remote interior angles.

Vertical angles are congruent.

With parallel lines, alternate interior angles are congruent.

Same-side interior angles sum to  $180^\circ$ .

## Pythagorean Theorem

For a right triangle,  $a^2 + b^2 = c^2$ .

$c$  is the hypotenuse, the longest side.

$$\text{Distance formula: } d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$$

Use the theorem to check whether a triangle is right.

## Volume

$$\text{Cylinder: } V = \pi r^2 h$$

$$\text{Cone: } V = \frac{1}{3} \pi r^2 h$$

$$\text{Sphere: } V = \frac{4}{3} \pi r^3$$

Use the same cubic unit as the dimensions.

If dimensions scale by  $k$ , volume scales by  $k^3$ .

## Scatter Plots

Positive association: points trend upward.

Negative association: points trend downward.

No association: no clear pattern.

A line of fit models the trend.

Slope describes the average rate of change.

## Two-Way Tables

Rows and columns group categorical data.

Relative frequency = part divided by total.

Use row, column, or table totals depending on the question.

Compare percentages, not just counts.

## Variability and Probability

Mean absolute deviation measures typical distance from the mean.

$$\text{MAD} = \frac{\text{sum of absolute deviations}}{\text{number of values}}$$

Probability:  $0 \leq P(\text{event}) \leq 1$

Experimental probability uses results. Theoretical probability uses equally likely outcomes.

# WEEK

1

## The Number System

### This Week's Days

|   |   |
|---|---|
| Week 1 Day 1: Rational and Irrational Numbers ..... | 2 |
| Week 1 Day 2: Estimating Irrational Numbers .....   | 3 |
| Week 1 Quiz: Number System Check .....              | 4 |



## 🏠 Week 1 Day 1 Rational and Irrational Numbers

A rational number can be written as  $\frac{a}{b}$ , where  $a$  and  $b$  are integers and  $b \neq 0$ . Irrational numbers cannot be written that way.

- Integers, fractions, terminating decimals, and repeating decimals are rational.
- A decimal that never terminates and never repeats is irrational.
- $\sqrt{n}$  is rational when  $n$  is a perfect square, such as 25 or 64.
- To convert  $0.\overline{ab}$ , multiply by 100, subtract, and solve for the fraction.
- Always check whether a square root simplifies before classifying it.

Use the decimal pattern or fraction form as evidence for the classification.

### Practice

1. Classify  $\sqrt{49}$  as rational or irrational. \_\_\_\_\_
2. Classify  $\sqrt{18}$  as rational or irrational. \_\_\_\_\_
3. Convert  $0.\overline{6}$  to a fraction. \_\_\_\_\_
4. Convert  $0.2\overline{7}$  to a fraction. \_\_\_\_\_
5. Which number is irrational?
 

|                   |                      |
|-------------------|----------------------|
| A. $\frac{11}{4}$ | B. $\sqrt{36}$       |
| C. $\pi$          | D. $0.\overline{18}$ |
6. True or False: Every repeating decimal is rational.

 True

 False


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## Week 1 Day 2 Estimating Irrational Numbers

Estimate square roots by trapping the number between nearby perfect squares. Then decide which endpoint it is closer to.

- If  $a^2 < n < b^2$ , then  $\sqrt{n}$  is between  $a$  and  $b$ .
- Perfect squares such as 49, 64, 81, 100, 121 are useful landmarks.
- Use a number line to compare an irrational number with decimals or fractions.
- For a nearest tenth estimate, test tenths by squaring them.
- Estimates should make sense:  $\sqrt{80}$  is near 9, not near 40.

The square root symbol asks, 'What number squared gives this value?'



### Practice

1.  $\sqrt{50}$  is between which two whole numbers? \_\_\_\_\_
2. Estimate  $\sqrt{120}$  to the nearest whole number. \_\_\_\_\_
3. Estimate  $\sqrt{20}$  to the nearest tenth. \_\_\_\_\_
4. Fill in  $<$ ,  $>$ , or  $=$ .  $\sqrt{30}$  \_\_\_\_\_ 5.4
5. Which is the best estimate for  $\sqrt{2}$ ?
 

|               |               |
|---------------|---------------|
| <b>A.</b> 0.7 | <b>B.</b> 1.4 |
| <b>C.</b> 2.2 | <b>D.</b> 4.0 |
6. A square garden has area  $70 \text{ ft}^2$ . Estimate its side length to the nearest tenth.



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 Week 1 Quiz

## Number System Check

Name: \_\_\_\_\_ Date: \_\_\_\_\_ Score: \_\_\_\_\_/10

1. Which number is irrational?

A.  $\sqrt{81}$

B.  $-4$

C.  $\sqrt{7}$

D.  $0.25$

2. Convert  $0.\bar{4}$  to a fraction. \_\_\_\_\_3. Estimate  $\sqrt{90}$  to the nearest whole number. \_\_\_\_\_4. True or False:  $\sqrt{64}$  is irrational because it has a radical sign. True False5. Simplify  $(a^2)(a^5)$ . \_\_\_\_\_6. Write  $3^{-3}$  with a positive exponent. \_\_\_\_\_7. Order from least to greatest:  $\sqrt{20}$ ,  $4.6$ ,  $\sqrt{30}$ .8. Estimate  $3 + \sqrt{28}$  to the nearest tenth. \_\_\_\_\_9. Which expression equals  $10^2$ ?

A.  $\frac{10^5}{10^3}$

B.  $10^5 \cdot 10^3$

C.  $(10^2)^2$

D.  $10^{-2}$

10. A square has area  $48 \text{ ft}^2$ . Is its side length rational or irrational?

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WEEK

2

## Proportional Graphs

 This Week's Days 

Week 2 Day 4: Graphing Proportional Relationships ... 6



## Week 2 Day 4 Graphing Proportional Relationships

A proportional relationship has the form  $y = kx$ . Its graph is a straight line through the origin, and  $k$  is the constant of proportionality.

- The ratio  $\frac{y}{x}$  stays the same for every nonzero  $x$ .
- The graph must pass through  $(0, 0)$ .
- The constant  $k$  is also the slope of the line.
- Tables, equations, and graphs can all show the same relationship.
- If an equation has an added constant, such as  $y = 3x + 2$ , it is not proportional.

Look for both clues: constant ratio and a graph through the origin.



### Practice

1. In a table,  $x = 2, 4, 6$  and  $y = 5, 10, 15$ . What is the constant of proportionality?
2. A proportional graph contains the point  $(8, 12)$ . What is the unit rate?
3. Does a line through  $(0, 0)$  and  $(3, 7)$  show a proportional relationship? \_\_\_\_\_
4. Which equation represents a proportional relationship?
 

|                |                 |
|----------------|-----------------|
| A. $y = 4x$    | B. $y = 4x + 1$ |
| C. $y = x - 4$ | D. $y = 4$      |
5. If  $y = 18$  when  $x = 6$  in a proportional relationship, what is  $y$  when  $x = 10$ ?
6. True or False:  $y = x + 2$  is proportional because it is a line.
 

True     False



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WEEK

6

Geometry and the  
Pythagorean Theorem

 This Week's Days 

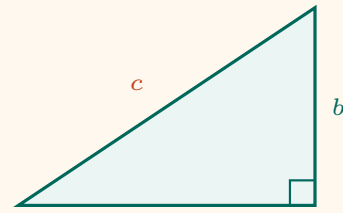
Week 6 Day 4: The Pythagorean Theorem ..... 8



## Week 6 Day 4 The Pythagorean Theorem

In a right triangle, the legs  $a$  and  $b$  and hypotenuse  $c$  satisfy  $a^2 + b^2 = c^2$ . The hypotenuse is always the longest side.

- Use  $a^2 + b^2 = c^2$  to find a missing hypotenuse.
- Use  $c^2 - a^2 = b^2$  to find a missing leg.
- The converse checks whether three side lengths form a right triangle.
- Always put the longest side in the  $c$  position.
- Round only at the end when an answer is not exact.



$$a^2 + b^2 = c^2$$

longest side =  $c$

The theorem works only for right triangles.

### Practice

1. A right triangle has legs 5 and 12. Find the hypotenuse.
2. A right triangle has hypotenuse 17 and one leg 8. Find the other leg.
3. Do side lengths 7, 24, 25 form a right triangle?
4. A ladder is 10 ft long and its foot is 4 ft from a wall. How high does it reach? Round to the nearest tenth.
5. Do side lengths 6, 8, 11 form a right triangle?
6. A rectangular box is 3 cm by 4 cm by 12 cm. Find the space diagonal.



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# Answer Key & Explanations

Check each answer, then use the explanations to correct missed work.

## Week 1 Day 1 Rational and Irrational Numbers

1 Rational

2 Irrational

3  $\frac{2}{3}$

4  $\frac{5}{18}$

5 C

6 True

### Explanations

1  $\sqrt{49} = 7$ , and 7 can be written as  $\frac{7}{1}$ . A number that can be written as a ratio of integers is rational.

2 18 is not a perfect square, so  $\sqrt{18}$  does not simplify to an integer or fraction. Its decimal continues without repeating, which makes it irrational.

3 Let  $x = 0.\bar{6}$ , so  $10x = 6.\bar{6}$ . Subtract to get  $9x = 6$ , so  $x = \frac{6}{9} = \frac{2}{3}$ .

4 Let  $x = 0.2777\dots$ . Then  $100x = 27.777\dots$  and  $10x = 2.777\dots$ , so  $90x = 25$  and  $x = \frac{25}{90} = \frac{5}{18}$ .

5  $\pi$  has a decimal that does not terminate or repeat. The other choices are a fraction, a perfect-square root, and a repeating decimal, so they are rational.



- 6 A repeating decimal can be converted to a fraction by multiplying by a power of 10 and subtracting. Because it can be written as a ratio of integers, it is rational.

## Week 1 Day 2 Estimating Irrational Numbers

1 7 and 8

2 11

3 4.5

4  $>$

5 B

6 8.4 ft

### Explanations

1 Since  $7^2 = 49$  and  $8^2 = 64$ , 50 lies between those perfect squares. Therefore  $\sqrt{50}$  is between 7 and 8, and it is very close to 7.

2 120 is between  $100 = 10^2$  and  $121 = 11^2$ . It is much closer to 121, so  $\sqrt{120}$  rounds to 11.

3  $4.4^2 = 19.36$  and  $4.5^2 = 20.25$ . Since 20 is closer to 20.25,  $\sqrt{20}$  is about 4.5.

4  $5.4^2 = 29.16$ , which is less than 30. Since the square is too small,  $\sqrt{30}$  must be greater than 5.4.

5  $1^2 = 1$  and  $2^2 = 4$ , so  $\sqrt{2}$  must be between 1 and 2. The nearest tenth is about 1.4, so choice B is best.

6 The side length is  $\sqrt{70}$  because area of a square is  $s^2$ . Since  $8.4^2 = 70.56$ , the side length is about 8.4 ft.



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## Week 1 Quiz Number System Check

1 C

2  $\frac{4}{9}$ 

3 9

4 False

5  $a^7$ 6  $\frac{1}{27}$ 7  $\sqrt{20}$ , 4.6,  $\sqrt{30}$ 

8 8.3

9 A

10 Irrational

### Explanations

1 7 is not a perfect square, so  $\sqrt{7}$  is irrational. The other numbers can be written as fractions.

2 Let  $x = 0.\bar{4}$ , so  $10x = 4.\bar{4}$ . Subtract to get  $9x = 4$ , so  $x = \frac{4}{9}$ .

3 90 is between  $81 = 9^2$  and  $100 = 10^2$ . It is closer to 81, so  $\sqrt{90}$  rounds to 9.

4  $\sqrt{64} = 8$ , which is an integer. A radical can still be rational when the radicand is a perfect square.

5 Multiplying powers with the same base means add exponents.  $2 + 5 = 7$ , so the product is  $a^7$ .

6 A negative exponent means move the power to the denominator. Since  $3^3 = 27$ ,  $3^{-3} = \frac{1}{3^3} = \frac{1}{27}$ .

7  $\sqrt{20} \approx 4.5$ , and  $\sqrt{30} \approx 5.5$ . Therefore the order is  $\sqrt{20}$ , 4.6,  $\sqrt{30}$ .

8  $\sqrt{28} \approx 5.3$  because it is between  $\sqrt{25}$  and  $\sqrt{36}$ . Then  $3 + 5.3 = 8.3$ .

9 Using the quotient rule,  $10^5/10^3 = 10^{5-3} = 10^2$ . The other choices give different powers.



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10 The side length is  $\sqrt{48} = 4\sqrt{3}$ . Since  $\sqrt{3}$  is irrational, the side length is irrational.

## Week 2 Day 4 Graphing Proportional Relationships

1 2.5

2 1.5

3 Yes

4 A

5 30

6 False

### Explanations

1 Divide  $y$  by  $x$  for each pair:  $5/2 = 10/4 = 15/6 = 2.5$ . The constant of proportionality is  $k = 2.5$ .

2 For a proportional relationship, the unit rate is  $y/x$ . Using  $(8, 12)$ ,  $12/8 = 1.5$ .

3 A straight line through the origin represents  $y = kx$ . The constant is  $7/3$ , so the relationship is proportional.

4 A proportional relationship has no added or subtracted constant.  $y = 4x$  has the form  $y = kx$ , so choice A is proportional.

5 The constant is  $18/6 = 3$ , so  $y = 3x$ . When  $x = 10$ ,  $y = 3(10) = 30$ .

6 A proportional line must pass through the origin and have the form  $y = kx$ . The  $+2$  shifts the line up, so it is linear but not proportional.



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**Week 6 Day 4**  **The Pythagorean Theorem**

1 13

2 15

3 Yes

4 9.2 ft

5 No

6 13 cm

 **Explanations**

1 Use  $c^2 = 5^2 + 12^2 = 25 + 144 = 169$ . Since  $\sqrt{169} = 13$ , the hypotenuse is 13.

2 Use  $b^2 = 17^2 - 8^2 = 289 - 64 = 225$ . Since  $\sqrt{225} = 15$ , the missing leg is 15.

3 The longest side is 25. Check  $7^2 + 24^2 = 49 + 576 = 625$ , and  $25^2 = 625$ , so the triangle is right.

4 The ladder is the hypotenuse, so  $h^2 + 4^2 = 10^2$ . Then  $h^2 = 84$ , and  $\sqrt{84} \approx 9.2$  ft.

5 The longest side is 11. Since  $6^2 + 8^2 = 36 + 64 = 100$  but  $11^2 = 121$ , the converse is not satisfied.

6 First find the base diagonal:  $\sqrt{3^2 + 4^2} = 5$ . Then use that with height 12:  $\sqrt{5^2 + 12^2} = 13$  cm.

**Answer review complete.**

Use missed questions as a short reteach list.

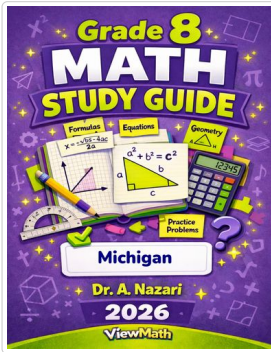


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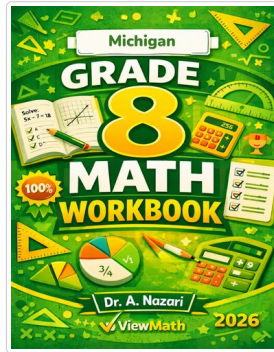
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Study Guide



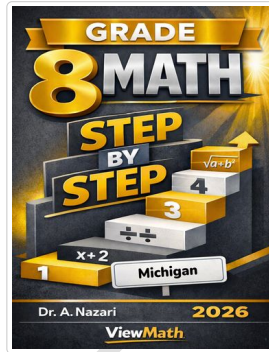
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Workbook



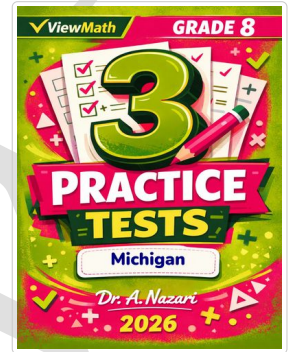
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Step-by-Step



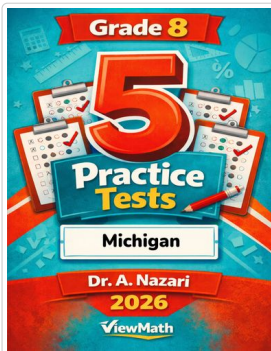
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3 Practice Tests



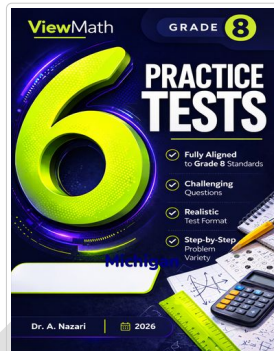
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5 Practice Tests



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6 Practice Tests



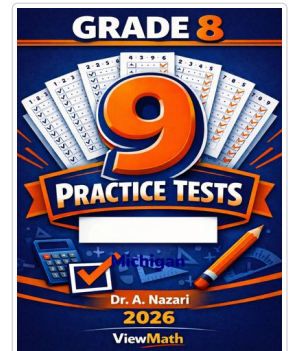
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7 Practice Tests



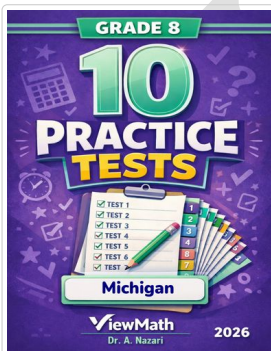
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9 Practice Tests



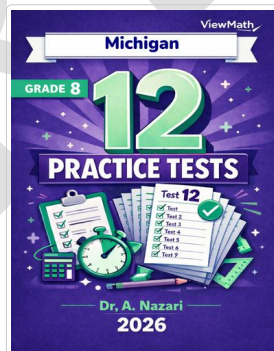
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10 Practice Tests



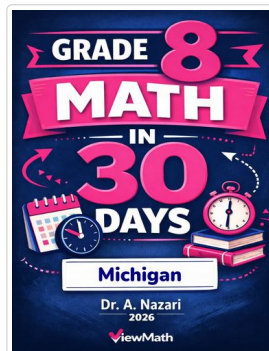
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12 Practice Tests



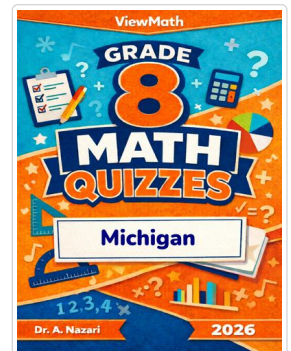
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Math in 30 Days



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