

Name _____

Minnesota Comprehensive Assessments-Series III

Mathematics Item Sampler
Grade 8



ITEM SAMPLERS ARE NOT SECURE TEST MATERIALS. THIS ITEM
SAMPLER TEST BOOK MAY BE COPIED OR DUPLICATED.

Minnesota Department of
Education

Grade 8 Formula Sheet

You may use the following formulas to solve problems on this test.

Pythagorean theorem	$a^2 + b^2 = c^2$
Distance formula	$d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$
Slope of a line	$m = \frac{y_2 - y_1}{x_2 - x_1}$
Slope-intercept form	$y = mx + b$
Point-slope form	$y - y_1 = m(x - x_1)$
Standard form	$Ax + By = C$
Arithmetic sequence	$f(x) = mx + b$
Geometric sequence	$f(x) = a(b)^x$

Mathematics Test General Directions

- This test contains four segments.
- You may write in this test book as scratch paper. Grid paper is also provided at the back of the test book.
- You will find a formula sheet at the beginning of this test book. You may tear it out of your test book to use while taking the test.
- For each question, choose the answer you think is best.
- Look at the samples that show how to answer the questions.

Sample Question Answered in Test Book:

$$20 - 8 =$$

- A. 8
- B. 10
- C. 12
- D. 16

Sample Question Answered in Test Book:

$$4 - 12 = -8$$

- You **may not** use a calculator for Segment 1.
- You **may** use a calculator for Segments 2, 3, and 4.
- When you finish a segment of the test, stop and check your answers. Then use the sticker given to you to seal it. Once you seal a segment, you cannot go back to it. Each segment must be sealed before you move on to the next segment.



Segment 1

You will be told when to begin this segment.

You **MAY NOT** use a calculator for this segment.



Mathematics Test — Segment 1



1

1. Which expression results in a rational number?

A. $1.5 + \sqrt{1.5}$

B. $12 - \sqrt{12}$

C. $\frac{3}{4} \cdot \sqrt{\frac{3}{4}}$

D. $25 \div \sqrt{25}$

2. Simplify.

$$(4x)^2 - 4x^3$$

A. x^{-1}

B. $12x^{-1}$

C. $16x^2 - 4x^3$

D. $16x^2 - 64x^3$

3. Simplify.

$$\frac{1.2 \times 10^{-6}}{4.8 \times 10^4}$$

A. 2.5×10^{-2}

B. 2.5×10^{-9}

C. 2.5×10^{-10}

D. 2.5×10^{-11}



4. Which table of values does **not** represent a function?

A.

x	y
-1	0
0	0
1	2

B.

x	y
-1	-2
0	0
1	2

C.

x	y
-1	-2
0	0
0	2

D.

x	y
-1	-1
0	0
1	1

5. The number of cakes needed for a party, c , is dependent upon the number of guests at the party, g . Which equation shows the number of cakes as a function of the number of guests?

A. $f(c) = \frac{g}{12}$

B. $f(g) = \frac{g}{12}$

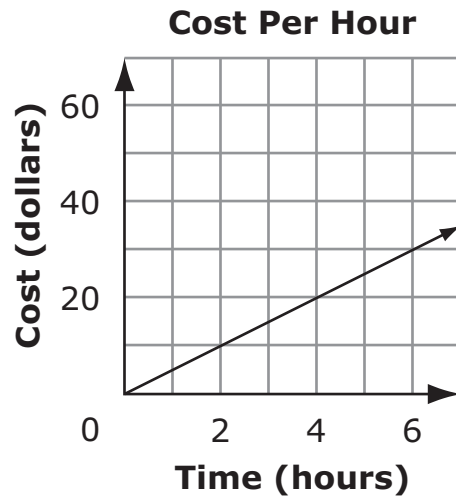
C. $f(c) = \frac{c}{12}$

D. $f(g) = \frac{c}{12}$



6. A graph is shown.

1



Which situation is represented by the graph?

- A. It costs \$2 per hour to rent a bike for 10 hours.
- B. It costs \$60 to rent a boat for 8 hours.
- C. It costs \$5 per hour to rent ice skates.
- D. It costs \$40 to rent a snowboard.

7. Ann sells bracelets for \$4 each and necklaces for \$8 each. Which inequality shows x , the number of bracelets, and y , the number of necklaces Ann must sell to make at least \$100?

- A. $4x + 8y \leq 100$
- B. $4x + 8y \geq 100$
- C. $8x + 4y \leq 100$
- D. $8x + 4y \geq 100$



8. A rectangle is drawn on a coordinate grid. The equation for 1 side of the rectangle is $3x - 2y = 12$. Which could be an equation for another side of the rectangle?

A. $y = \frac{3}{2}x + 5$

B. $y = 3x + 12$

C. $y = -\frac{3}{2}x - 12$

D. $y = 2x - 5$

Put sticker
here

This is the end of Segment 1.
Check your work. Then seal this segment.

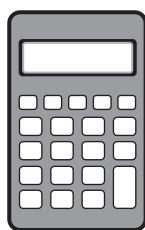


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Segment 2

You will be told when to begin this segment.

You **MAY** use a calculator for this segment.



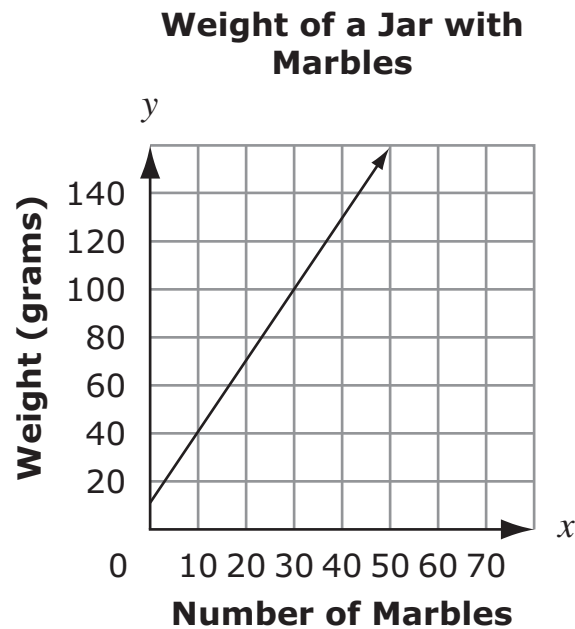


Mathematics Test — Segment 2

9. Which sequence is arithmetic?
- A. 4 8 16 32 64
 - B. 11 12 14 17 21
 - C. 28 15 2 -11 -24
 - D. 30 -25 20 -15 10

2

10. Jayda makes a graph to show the weight of a jar when it contains different numbers of marbles.



What does the y -intercept represent?

- A. The weight of each marble
- B. The weight of the jar by itself
- C. The number of marbles when the weight is 0 grams
- D. The number of marbles when the weight is 10 grams



11. An equation is shown.

$$m = 4p + 3$$

When p is increased by 2, how much does m increase?

- A. 2
- B. 4
- C. 7
- D. 8

2

12. A sequence is shown.

1.5 4.5 13.5 40.5

What is the seventh term in the sequence?

- A. 121.5
- B. 364.5
- C. 1,093.5
- D. 3,280.5

13. Which property is used in the equation $mg + mh = m(g + h)$?

- A. Associative
- B. Commutative
- C. Distributive
- D. Identity



14. Which is the equation of the same line as $y = 3x - 8$?

- A. $3x - 2y = 8$
- B. $-3x - 2y = -8$
- C. $6x - y = 16$
- D. $6x - 2y = 16$

2

Please write your answer in the space below the question. You may use the digits: 0-9 and the symbols: slash for a fraction bar (/), a decimal (.) and a negative sign (-).

15. An equation is shown.

$$|2x - 4| = 6$$

The equation has 2 solutions. One solution is $x = 5$. What is the other solution?

16. Lisa has 5 more green marbles than blue marbles. She has a total of 40 green and blue marbles. Which system of equations represents this situation if x is the number of green marbles and y is the number of blue marbles?

A. $\begin{cases} y = x + 5 \\ x + y = 40 \end{cases}$

B. $\begin{cases} x = y + 5 \\ x + y = 40 \end{cases}$

C. $\begin{cases} y = x + 5 \\ y = x + 40 \end{cases}$

D. $\begin{cases} x = y + 5 \\ x = y + 40 \end{cases}$



17. What is the distance between $(4, 7)$ and $(-3, 9)$ on a coordinate grid?

- A. $\sqrt{5}$
 - B. $\sqrt{45}$
 - C. $\sqrt{53}$
 - D. $\sqrt{305}$
-

18. Which function forms a geometric sequence when $x = 1, 2, 3, \dots$?

- A. $f(x) = x + 2$
 - B. $f(x) = x^2$
 - C. $f(x) = x^2 + 2$
 - D. $f(x) = 2^x$
-

19. A sequence is shown.

$-1 \quad -7 \quad -13 \quad -19 \quad -25 \quad \dots$

What is the function rule for the sequence?

- A. $f(x) = x - 6$
- B. $f(x) = -6x$
- C. $f(x) = 5x - 6$
- D. $f(x) = -6x + 5$



20. What is the value of $-3|-2x - y|$ when $x = -4$ and $y = 5$?

- A. -27
 - B. -9
 - C. 9
 - D. 27
-

2

21. Leon plants 3 rows of tomatoes with n plants in each row. He also plants 1 row of beans with 5 plants in the row. Which equation can be used to find t , the total number of plants Leon planted?

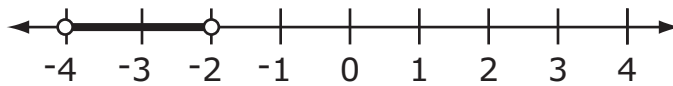
- A. $t = n + 8$
 - B. $t = 3n + 1$
 - C. $t = 3n + 5$
 - D. $t = 5n + 3$
-

22. What is the value of p when $2p + 10 = 24$?

- A. $p = 7$
- B. $p = 12$
- C. $p = 17$
- D. $p = 28$



23. A number line is shown.



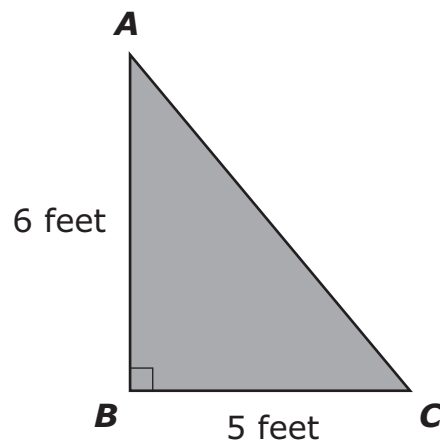
Which equation has the solution shown on the number line?

- A. $-4 > x > -2$
- B. $4 < -2x < 8$
- C. $4 > -2x > 8$
- D. $-4 < 2x < -8$

2

Please write your answer in the space below the question. You may use the digits: 0-9 and the symbols: slash for a fraction bar (/), a decimal (.) and a negative sign (-).

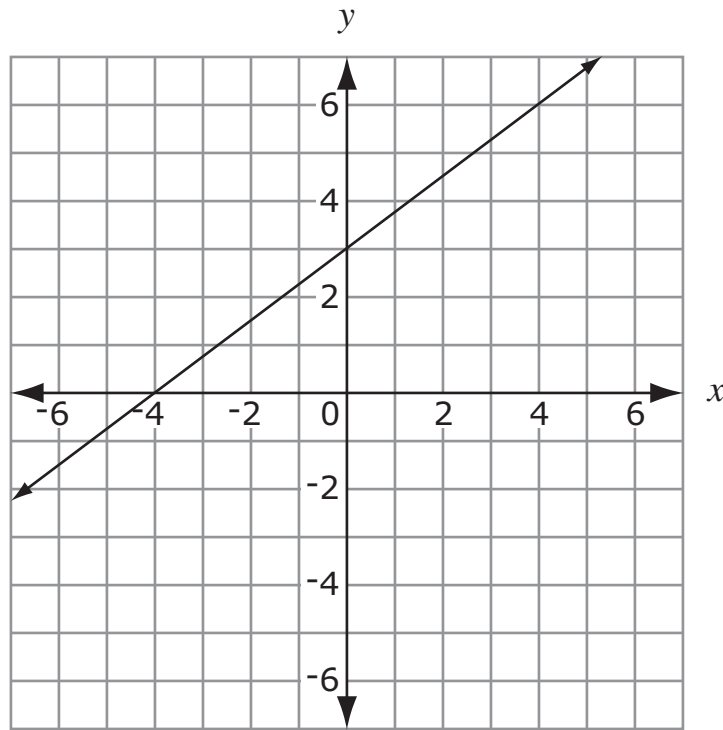
24. A triangle is shown.



What is AC?



25. The graph of a line is shown.



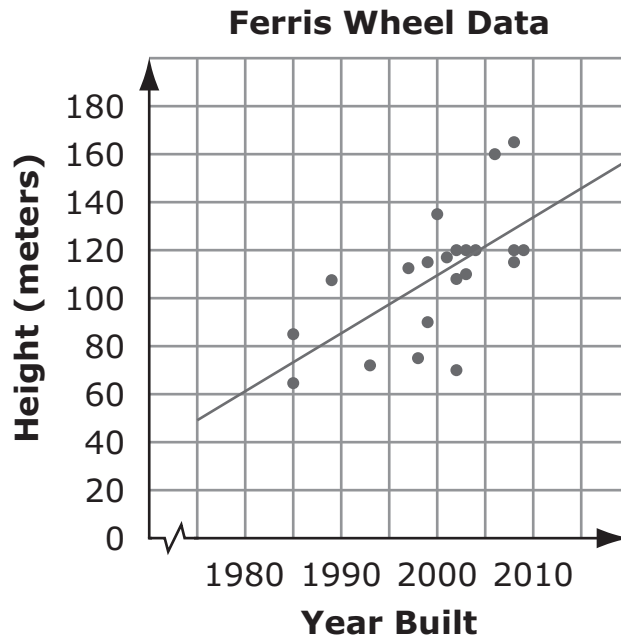
What is the equation of a line that is perpendicular to the line shown and goes through the point $(3, -1)$?

- A. $y = -\frac{4}{3}x - 5$
- B. $y = -\frac{4}{3}x + 3$
- C. $y = \frac{4}{3}x - 5$
- D. $y = \frac{4}{3}x + 3$

2



26. The scatterplot shows the heights of Ferris wheels and the years they were built.



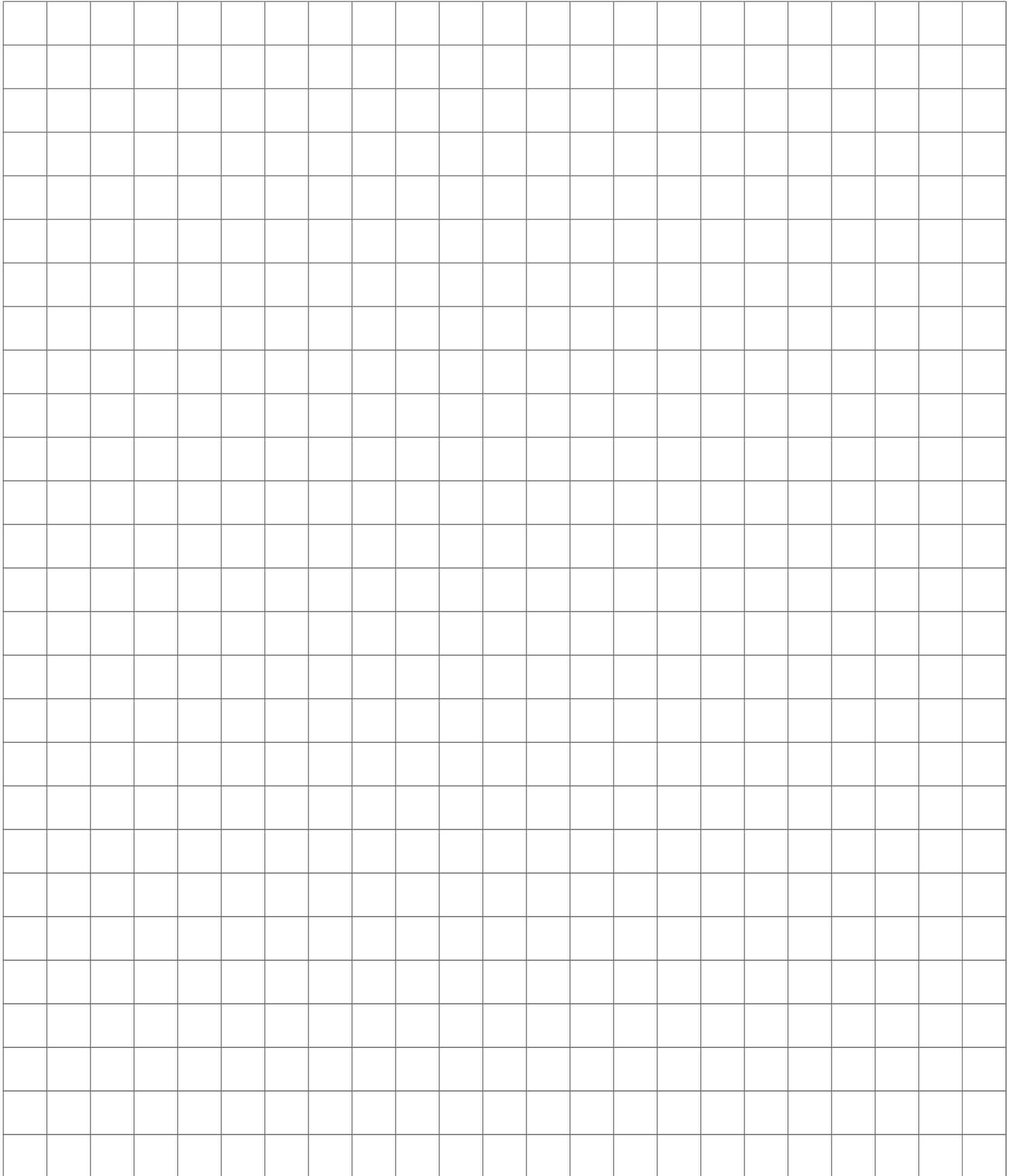
Which statement is true about the scatterplot?

- A. All Ferris wheels built before 1980 must have been less than 60 meters high.
- B. Based on the line of best fit, Ferris wheel heights increase about 25 meters every 10 years.
- C. Each Ferris wheel is taller than all Ferris wheels that were built earlier.
- D. Each year, more Ferris wheels were built than the year before.

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here

This is the end of Segment 2.
Check your work. Then seal this segment.





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Grade 8 Teacher's Guide



MCA Item Sampler Teacher's Guide

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An Introduction to the MCA

The Minnesota Comprehensive Assessments are reading, mathematics and science tests that help schools and districts measure student progress toward the state's academic standards. The grades 3–8 mathematics assessments became operational in 2011 as the Minnesota Comprehensive Assessments-Series III (MCA-III) and are aligned to the 2007 Minnesota Academic Standards. In 2012, the science assessments became operational as the Minnesota Comprehensive Assessments-Series III (MCA-III) and are aligned to the 2009 Minnesota Academic Standards. In 2013, the grades 3-8 and 10 reading assessments are aligned to the 2010 Minnesota Academic Standards as the Minnesota Comprehensive Assessments-Series III (MCA-III). In 2014, the grade 11 mathematics assessment is aligned to the 2007 Minnesota Academic Standards as the Minnesota Comprehensive Assessments-Series III (MCA-III).

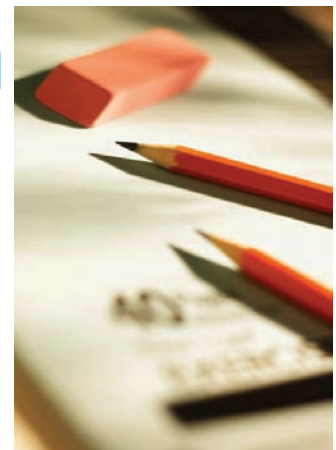
The Purpose of the MCA Item Samplers

An item sampler is not a complete test. It contains a smaller number of the items that students will see on a full-length test in the spring. The MCA Item Samplers were developed to familiarize students and teachers with the format of the MCA and the kinds of items that will appear on them.

This MCA Item Sampler is not a real test. It should not be used to predict how well students will do on the tests. However, students may feel more comfortable with the tests if they have reviewed the Item Samplers prior to the test.

How the MCA Item Samplers Were Created

The Item Samplers mirror the format of the MCA. The student directions, segment layouts, and answer sheet each reflect the way the test will look in the spring, except that the Item Sampler is shorter than the actual test. As with all MCAs, the reading passages and the math and reading questions have been thoroughly reviewed by Minnesota teachers prior to testing. Minnesota students have answered these questions on previous tests.



Grade 8 Teacher's Guide

The distribution of question types and their aligned content selected for the Item Sampler generally reflects a range of items from each strand in the Minnesota Academic Standards. Whenever possible, the Item Samplers have the following designs:

Math:

- Two segments
 - Segment One does not allow a student to use a calculator.
 - The actual MCA has four segments
- Approximately twenty-four multiple-choice items

The Contents of This Teacher's Guide

The Answer Key identifies the answers and solutions to the questions. It also identifies the strand/sub-strand/benchmark from the Minnesota Academic Standards for the question.

State Standards & Test Specifications

The Item Samplers are primarily intended to familiarize teachers and students with the **format** of the MCA. The best preparation for the **content** of the MCA is done as a part of your curriculum planning. When doing that, reference the Minnesota Academic Standards and the test specifications for the MCA. For further questions about the MCAs, email us at mde.testing@state.mn.us.

Grade 8 Teacher's Guide

Mathematics MCA Item Sampler Answer Key Grade 8 Math

Item #	Correct Answer	Item Type	Strand	Standard	Benchmark
1	D	MC	1	1	01
2	C	MC	1	1	04
3	D	MC	1	1	05
4	C	MC	2	1	01
5	B	MC	2	1	02
6	C	MC	2	2	01
7	B	MC	2	4	04
8	A	MC	3	2	02
9	C	MC	2	1	04
10	B	MC	2	2	02
11	D	MC	2	2	03
12	C	MC	2	2	05
13	C	MC	2	3	02
14	D	MC	2	4	03
15	Grid	GR	2	4	06
16	B	MC	2	4	07
17	C	MC	3	1	02
18	D	MC	2	1	05
19	D	MC	2	2	04
20	B	MC	2	3	01
21	C	MC	2	4	01
22	A	MC	2	4	02
23	B	MC	2	4	05
24	Grid	GR	3	1	01
25	B	MC	3	2	03
26	B	MC	4	1	02

Grade 8 Teacher's Guide

Item # — The number of the question in the Item Sampler.

Correct Answer — Answers to multiple-choice questions are listed.

Item Type — Multiple Choice (**MC**) and Gridded Response (**GR**)

Strand — In mathematics, the MCA-III measures four strands:

1. Number and Operation
2. Algebra
3. Geometry and Measurement
4. Data Analysis and Probability

Standard — Each strand has one or more standards

Benchmark — Each standard has one or more benchmarks. See the Academic Standards or test specification for further explanation of each benchmark.