Minnesota Comprehensive Assessments-Series III

Mathematics Item Sampler
Grade 8

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 to the Student

- This test contains two segments. You will be told when to begin each segment.
- Your answers must be marked in your answer document, but you may write in this test book as scratch paper.
- This test has multiple-choice and gridded response questions.
- For each question, choose the answer you think is best. Answer each question by filling the circle in your answer document. Each circle must be filled in completely for your answer to be scored.
- The sample questions show an example of the questions that will be on the test. The sample questions show the answer filled in correctly.

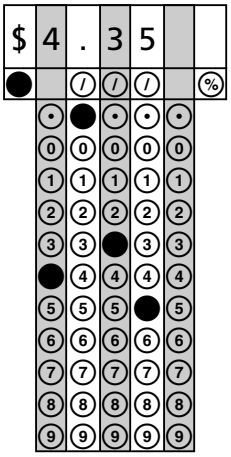
Sample Question: $20 - 8 =$

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

Sample Answer: Ⓐ Ⓑ ● Ⓓ

Sample Question: $\$3.25 + \$1.10 =$

Sample Answer:



- You **may not** use a calculator for Segment 1.
- You **may** use a calculator for Segment 2.
- 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.

NOTICE: **THESE TEST ITEMS ARE SECURE MATERIALS AND MAY NOT BE COPIED OR DUPLICATED IN ANY WAY.**

This reflects the information on the actual test. The item sampler test book may be duplicated.

STOP

Put sticker here

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. 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.

$$\frac{1.2\times10^{-6}}{4.8\times10^{4}}$$

A. 2.5×10^{-2}

B. 2.5×10^{-9}

C. 2.5×10^{-10}

D. 2.5×10^{-11}

Go on to the next page.

1

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

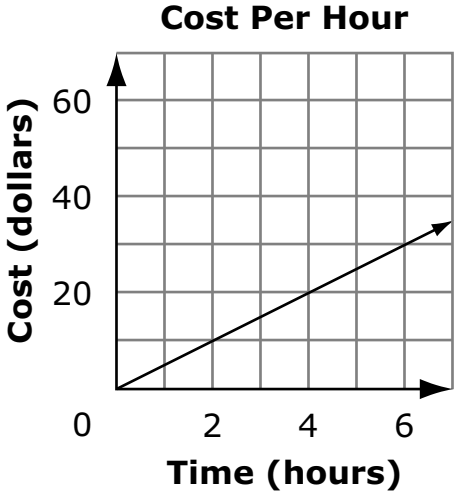
C. $f(c) = \frac{c}{12}$

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

Go on to the next page.

1

6. A graph is shown.



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. $8x + 4y \geq 100$

Go on to the next page.

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?

1

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

B. $y = 3x + 12$

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

D. $y = 2x - 5$

Go on to the next page.

Put sticker here

This is the end of Segment 1.

Check your work. Then seal this segment.

Put sticker here

Segment 2

You will be told when to begin this segment.

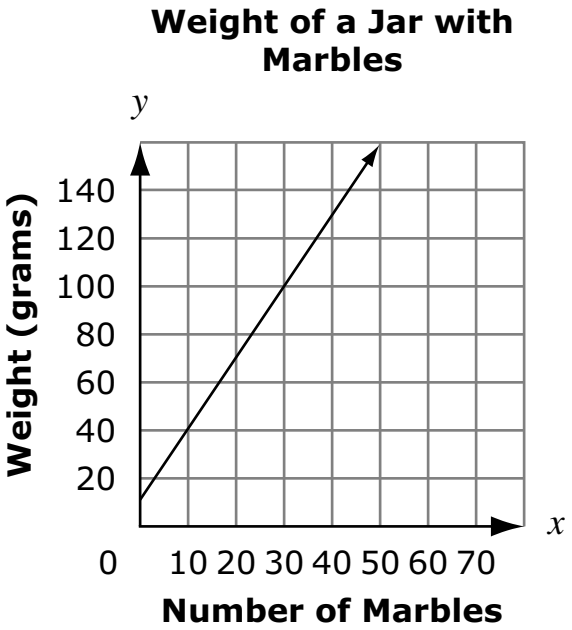
You **MAY** use a calculator for this segment.

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

Go on to the next page.

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

Go on to the next page.

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. $6x - 2y = 16$

Please fill in the grid with your answer to question 15 on page 2 of your answer document.

2

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

Go on to the next page.

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 $x = 1, 2, 3, \ldots$?

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.

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

What is the function rule for the sequence?

A. $f(x) = x - 6$

B. $f(x) = -6x$

C. $f(x) = 5x - 6$

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

Go on to the next page.

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. $t=5n+3$

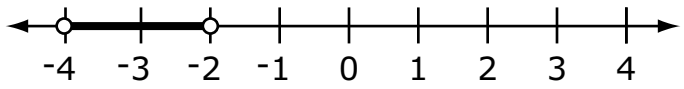
---

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

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

Go on to the next page.

23. A number line is shown.



Which equation has the solution shown on the number line?

A. $-4 > x > -2$

B. $4 < -2x < 8$

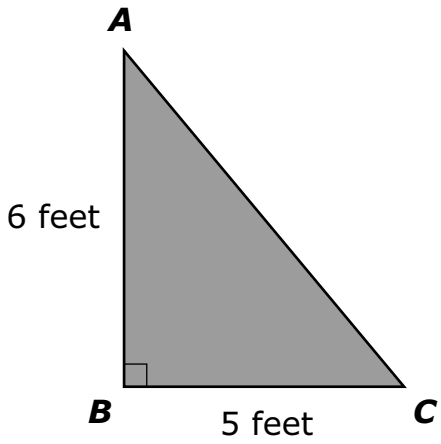
C. $4 > -2x > 8$

D. $-4 < 2x < -8$

2

Please fill in the grid with your answer to question 24 on page 2 of your answer document.

24. A triangle is shown.



What is *AC*?

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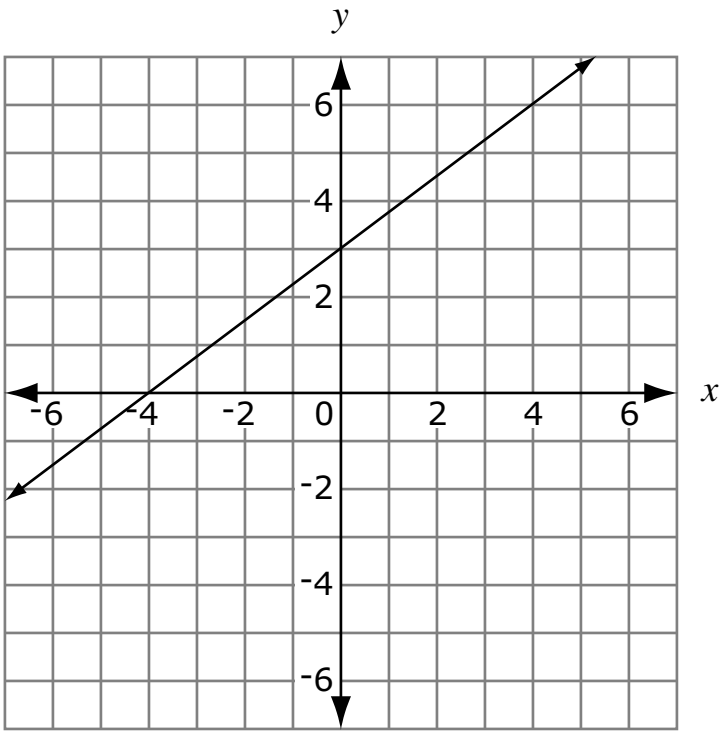
25. The graph of a line is shown.



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

A. $y = -\frac{4}{3}x - 5$

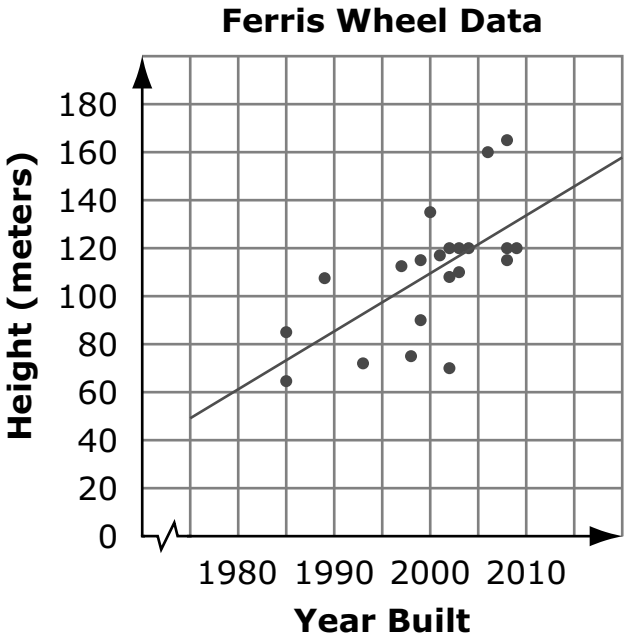
B. $y = -\frac{4}{3}x + 3$

C. $y = \frac{4}{3}x - 5$

D. $y = \frac{4}{3}x + 3$

Go on to the next page.

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.

2

Go on to the next page.

Put sticker here

This is the end of Segment 2.

Check your work. Then seal this segment.

ALIGN TOP OF LABEL HERE

555272-10801010011

SERIAL#

Grade 8 Mathematics Answer Document
Minnesota Comprehensive Assessments—Series III

Minnesota Department of Education

Spring 2012

BIRTH DATE								
MONTH	DAY		YEAR					
○ JAN								
○ FEB								
○ MAR	0	0		0	0	0		
○ APR	1	1	1		1	1		
○ MAY	2	2	2			2		
○ JUN	3	3				3		
○ JUL		4				4		
○ AUG		5				5		
○ SEP		6				6		
○ OCT		7			7	7		
○ NOV		8			8	8		
○ DEC		9		9	9	9		

GENDER	
○ Female	○ Male

- ○ Home Schooled
- ○ New-to-Country
- ○ Significant Gap in Enrollment

STUDENT'S LAST NAME	STUDENT'S FIRST NAME	MI

SCHOOL USE ONLY

TEST CODES		
○ ABS	○ ME	○ REF
○ INV	○ NE	

ACCOMMODATIONS		
PRESENTATION		RESPONSE
○ 18 ○ BR ○ MS ○ TD		○ AT
○ 24 ○ MC ○ 0A		○ SC

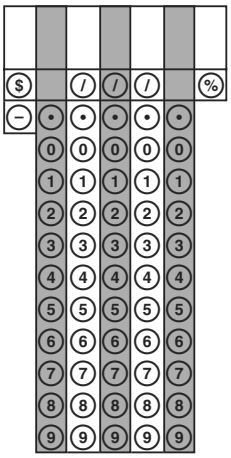
MARSS LOC DIST DATA	MARSS NUMBER
0 1 2 3 4 5 6 7 8 9	0 1 2 3 4 5 6 7 8 9

Mathematics Test — Segment 1

1.	Ⓐ	Ⓑ	Ⓒ	Ⓓ	4.	Ⓐ	Ⓑ	Ⓒ	Ⓓ	7.	Ⓐ	Ⓑ	Ⓒ	Ⓓ
2.	Ⓐ	Ⓑ	Ⓒ	Ⓓ	5.	Ⓐ	Ⓑ	Ⓒ	Ⓓ	8.	Ⓐ	Ⓑ	Ⓒ	Ⓓ
3.	Ⓐ	Ⓑ	Ⓒ	Ⓓ	6.	Ⓐ	Ⓑ	Ⓒ	Ⓓ					

Mathematics Test — Segment 2

9.	Ⓐ	Ⓑ	Ⓒ	Ⓓ	15.					16.	Ⓐ	Ⓑ	Ⓒ	Ⓓ
10.	Ⓐ	Ⓑ	Ⓒ	Ⓓ						17.	Ⓐ	Ⓑ	Ⓒ	Ⓓ
11.	Ⓐ	Ⓑ	Ⓒ	Ⓓ						18.	Ⓐ	Ⓑ	Ⓒ	Ⓓ
12.	Ⓐ	Ⓑ	Ⓒ	Ⓓ						19.	Ⓐ	Ⓑ	Ⓒ	Ⓓ
13.	Ⓐ	Ⓑ	Ⓒ	Ⓓ						20.	Ⓐ	Ⓑ	Ⓒ	Ⓓ
14.	Ⓐ	Ⓑ	Ⓒ	Ⓓ						21.	Ⓐ	Ⓑ	Ⓒ	Ⓓ
										22.	Ⓐ	Ⓑ	Ⓒ	Ⓓ
										23.	Ⓐ	Ⓑ	Ⓒ	Ⓓ



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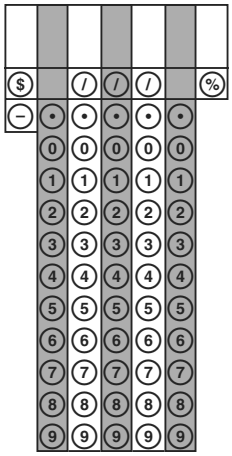


25.	Ⓐ	Ⓑ	Ⓒ	Ⓓ	26.	Ⓐ	Ⓑ	Ⓒ	Ⓓ		

Minnesota Department of Education

MCA Item Sampler Teacher's Guide

mde.testing@state.mn.us

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. In 2006, the reading and mathematics tests were aligned to the 2003 Minnesota Academic Standards and were named the Minnesota Comprehensive Assessment-Series II (MCA-II). The Science MCA-IIs became operational in 2008 and are aligned to the 2003 Minnesota Academic Standards. The grades 3–8 mathematics assessments will be operational in 2011 as the Minnesota Comprehensive Assessments-Series III (MCA-III) and are aligned to the 2007 Minnesota Academic Standards.

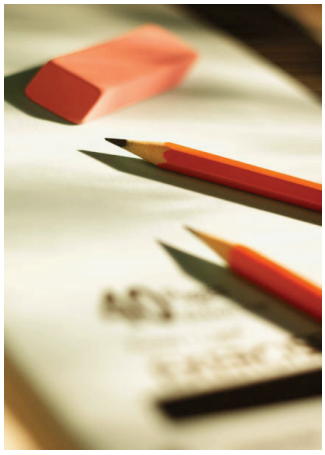
The Purpose of the MCA Item Samplers

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.



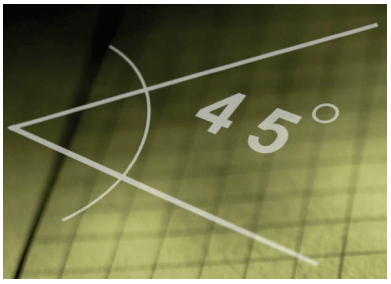
The distribution of question types and their aligned content selected for the Item Sampler generally reflects a range of items from each strand in the Minnesota Academic Standards. Whenever possible, the Item Samplers have the following designs:

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
- Two gridded-response items
- Formula sheet

The Contents of This Teacher's Guide

The Answer Key identifies the answers and solutions to the questions. It also identifies the strand/standard/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 MCA, 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),** or Gridded Response **(GR)**

Calculator Designation — CL indicated that a calculator can be used on this item, **NC** indicates a student cannot use a calculator.

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.

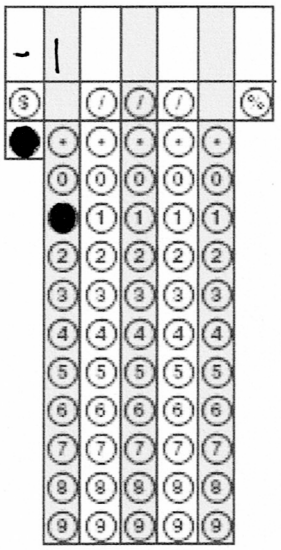
Cognitive Level — The level of cognitive demand focuses on the type and level of thinking and reasoning required of the student on a particular item. MCA-III and MCA-Modified levels of cognitive complexity are based on Norman L. Webb's Depth of Knowledge levels. See the test specifications for further explanation.

Level 1: Recall
Level 2: Skills/Concept
Level 3: Strategic Thinking

MCA-III Item Sampler
Sample Gridded Responses
Grade 8 Mathematics

Question 15 from page 16

15.



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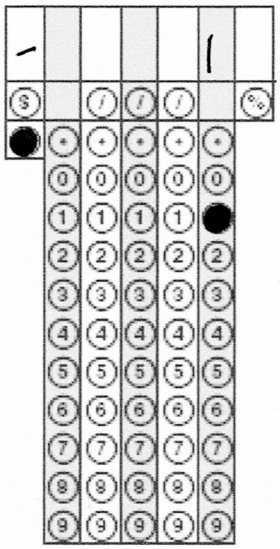

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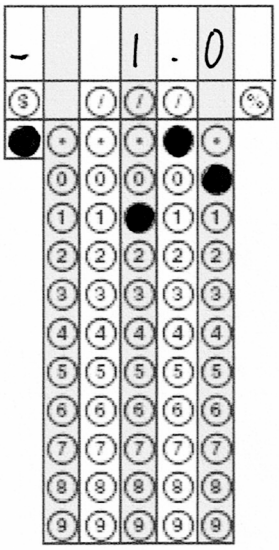

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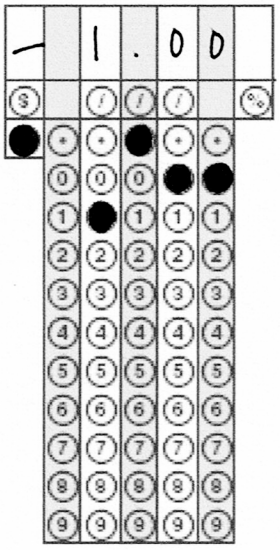
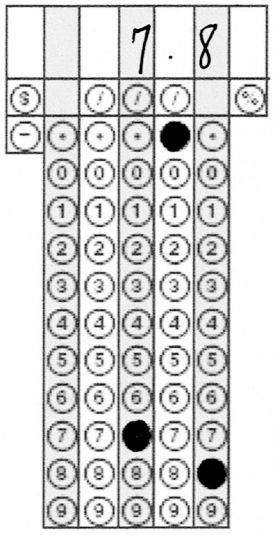


Note: the sample grids above demonstrate multiple ways to correctly solve the same problem.

MCA-III Item Sampler
Sample Gridded Responses
Grade 8 Mathematics

Question 24 from page 19

24.



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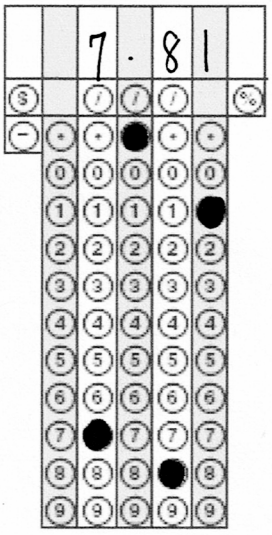

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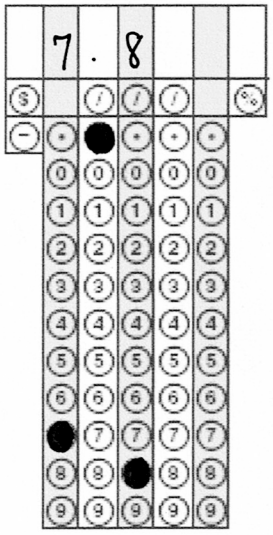

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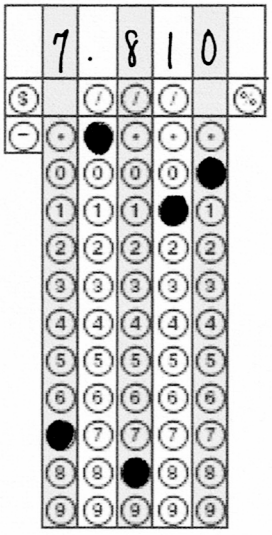

Note: the sample grids above demonstrate multiple ways to correctly solve the same problem.