Name _____

Minnesota Comprehensive Assessments-Series III

Mathematics Item Sampler
Grade 8

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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.

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. $25\div\sqrt{25}$

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2. Simplify.

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

A. x^{-1}

B. $12x^{-1}$

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

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

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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.

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

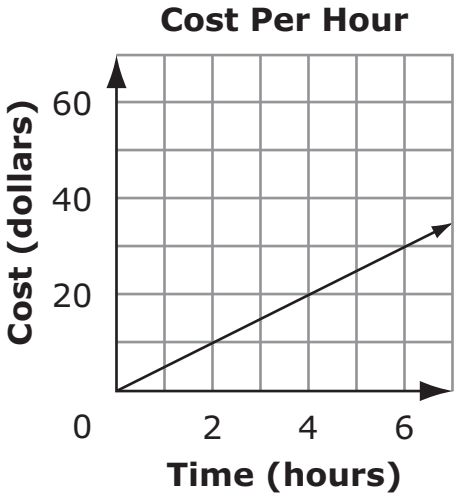
B. $f(g) = \frac{g}{12}$

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

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

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.

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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. $8x + 4y \geq 100$

1

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

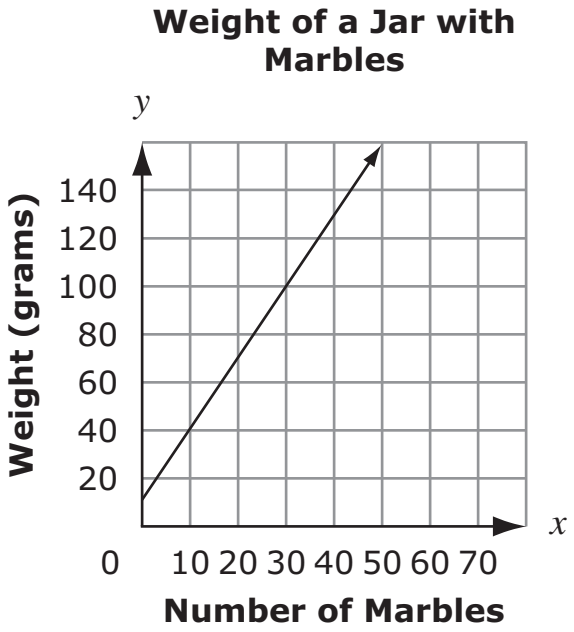
D. $y = 2x - 5$

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

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 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 (-).

2

15. An equation is shown.

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

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

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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. $\sqrt{305}$

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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. $t=5n+3$

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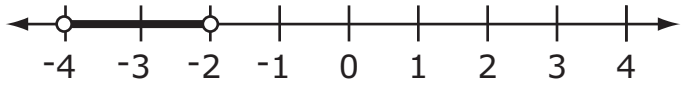
22. What is the value of p when $2p+10=24$?

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. $4 < -2x < 8$

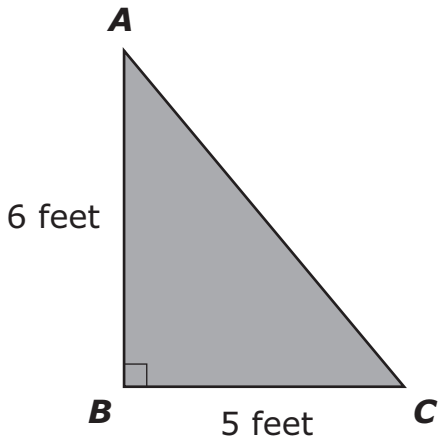
C. $4 > -2x > 8$

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

2

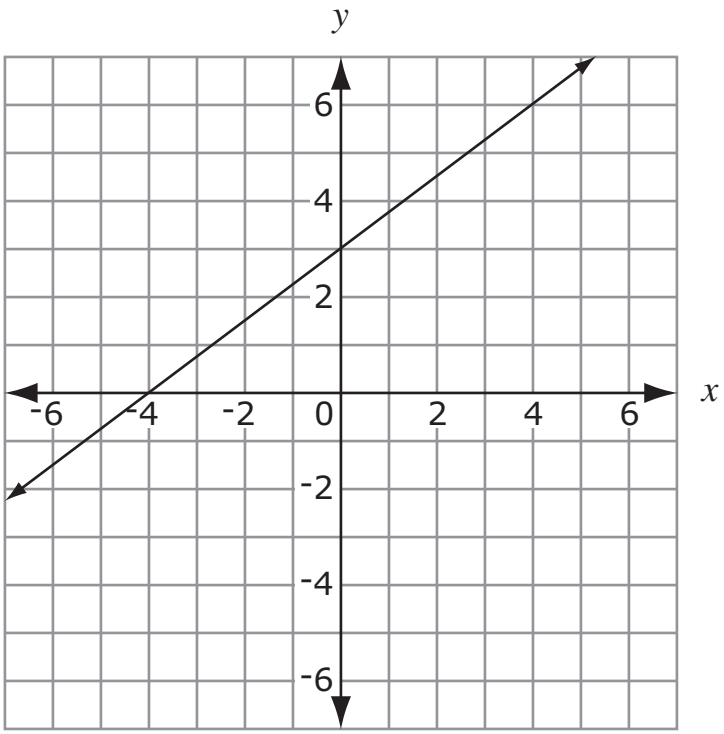
Please write your answer in the space below the question. You may use the digits: 0-9 and the symbols: slash for a fraction bar (/), a decimal (.) and a negative sign (-).

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)?

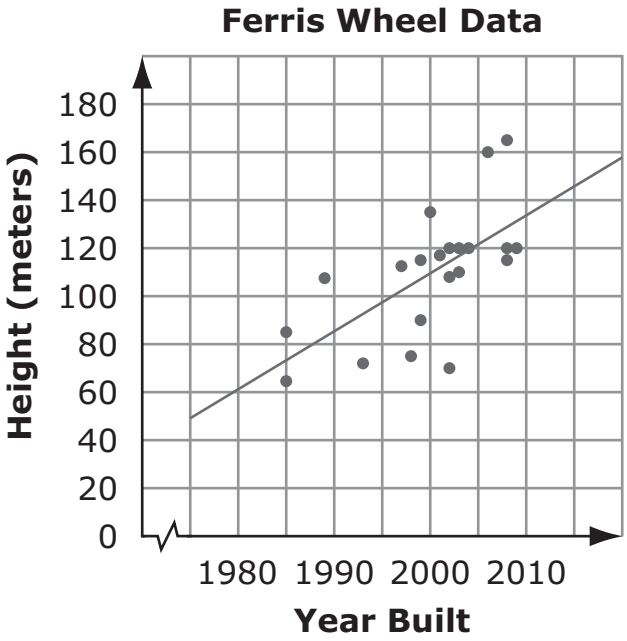
A. $y = -\frac{4}{3}x - 5$

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

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

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

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

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

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.