

Released Items

Student Name: _____

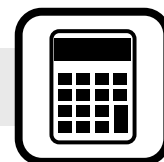
Fall 2015
NC Final Exam
Math II



Student Booklet



Public Schools of North Carolina
State Board of Education
Department of Public Instruction
Raleigh, North Carolina 27699-6314



1 Which expression is equivalent to $(8w^7x^{-5}y^3z^{-9})^{-\frac{2}{3}}$?

A $\frac{x^{\frac{10}{3}}z^6}{4w^{\frac{14}{3}}y^2}$

B $\frac{4w^{\frac{14}{3}}y^2}{x^{\frac{10}{3}}z^6}$

C $\frac{2w^{\frac{5}{3}}y^{\frac{1}{3}}}{x^{\frac{7}{3}}z^{\frac{11}{3}}}$

D $\frac{x^{\frac{7}{3}}z^{\frac{11}{3}}}{2w^{\frac{5}{3}}y^{\frac{1}{3}}}$

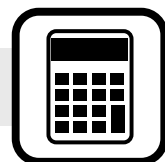
2 A marathon is roughly 26.2 miles long. Which equation could be used to determine the time, t , it takes to run a marathon as a function of the average speed, s , of the runner where t is in hours and s is in miles per hour?

A $t = 26.2 - 26.2s$

B $t = 26.2 - \frac{s}{26.2}$

C $t = 26.2s$

D $t = \frac{26.2}{s}$



- 3 The time, t , in hours, that it takes x people to plant n trees varies directly with the number of trees, and inversely with the number of people. Suppose 6 people can plant 12 trees in 3 hours. How many people are needed to plant 28 trees in 5 hours and 15 minutes?
- A 6
B 7
C 8
D 9

- 4 The force, F , acting on a charged object varies inversely to the square of its distance, r , from another charged object. When the two objects are 0.64 meter apart, the force acting on them is 8.2 Newtons. **Approximately** how much force would the object feel if it is at a distance of 0.77 meter from the other object?
- A 1.7 Newtons
B 5.7 Newtons
C 11.9 Newtons
D 12.9 Newtons

- 5 A system of equations is shown below.

$$y = x^2 + 2x + 8$$

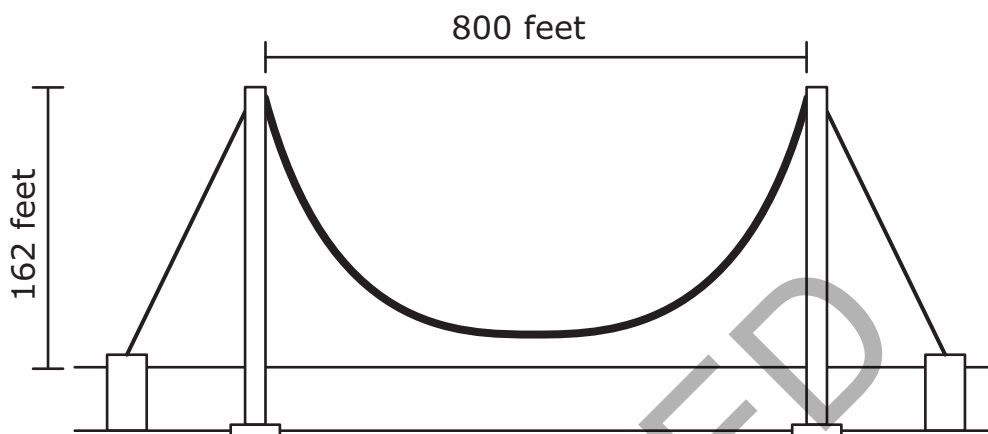
$$y = -4x$$

What is the smallest value of y in the solution set of the system?

- A -4
B -2
C 8
D 16

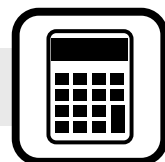


- 6 The towers of a suspension bridge are 800 feet apart and rise 162 feet higher than the road. Suppose that the cable between the towers has the shape of a parabola and is 2 feet higher than the road at the point halfway between the towers.



What is the **approximate** height of the cable 120 feet from either tower?

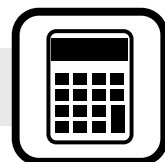
- A 80 feet
 B 74 feet
 C 22 feet
 D 16 feet
- 7 Congruent squares, with side lengths of x , are cut from the corners of a 12-inch-by-16-inch piece of cardboard to form an open box. Which equation models the surface area, y , of the open box after the corners are cut away?
- A $y = (16 - 2x)(12 - 2x)$
 B $y = (16 - 2x)(12 - 2x) + 4x^2$
 C $y = 192 - 16x^2$
 D $y = 192 - 4x^2$



- 8 The cost of a newspaper advertisement is a function of its size.
- A company wants its advertisement to have a height that is twice its width.
 - The newspaper charges a flat rate of \$50 plus an additional \$10 per square inch.
 - The company can spend no more than \$2,050 on the advertisement.

What is the maximum height of an advertisement that the company can afford?

- A 5 inches
- B 10 inches
- C 15 inches
- D 20 inches
- 9 Which function is even?
- A $f(x) = (x + 2)(x - 2)$
- B $f(x) = x(x + 2)$
- C $f(x) = (x + 1)(x - 2)$
- D $f(x) = (x - 1)(x - 1)$



- 10 Farmer Brown built a rectangular pen for his chickens using 12 meters of fence.
- He used part of one side of his barn as one length of the rectangular pen.
 - He maximized the area using the 12 meters of fence.

Farmer Johnson built a rectangular pen for her chickens using 16 meters of fence.

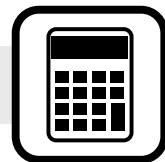
- She used part of one side of her barn as one length of the rectangular pen.
- The length of her pen was 2 meters more than the length of Farmer Brown's pen.
- The width of her pen was 1 meter more than the width of Farmer Brown's pen.

How much larger is Farmer Johnson's rectangular pen than Farmer Brown's?

- A 24 square meters
- B 18 square meters
- C 16 square meters
- D 14 square meters
- 11 The function $f(x) = \frac{85}{x}$ models the volume of a gas in a balloon under x units of pressure at a constant temperature. Which **best** describes the domain of $f(x)$?
- A $0 < x \leq 85$
- B $0 \leq x \leq 85$
- C $x > 0$
- D $x \geq 0$

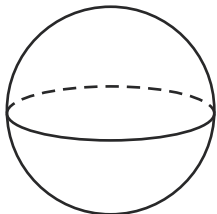


- 12 A rectangular rug is placed on a rectangular floor. The width of the floor is 4 feet greater than the length, x , of the floor. The width of the rug is 2 feet less than the width of the floor. The length of the rug is 4 feet less than the width of the rug. Which function, $R(x)$, represents the area of the floor **not** covered by the rug?
- A $R(x) = x^2 - x + 4$
- B $R(x) = 2x^2 + 4x - 4$
- C $R(x) = 12x - 4$
- D $R(x) = 4x + 4$
- 13 Which rotation will carry a regular hexagon onto itself?
- A a 30° counterclockwise rotation
- B a 90° counterclockwise rotation
- C a 120° counterclockwise rotation
- D a 270° counterclockwise rotation

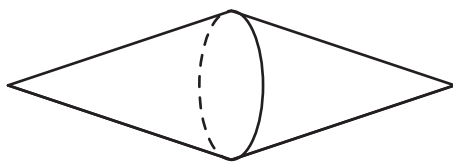


14 Kathleen rotated an isosceles trapezoid 360° around its longest base. Which choice could be the resulting solid?

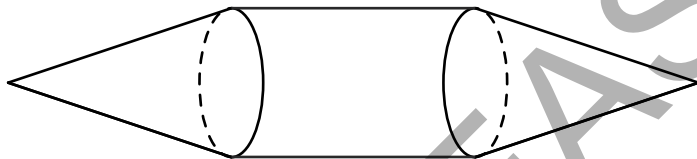
A



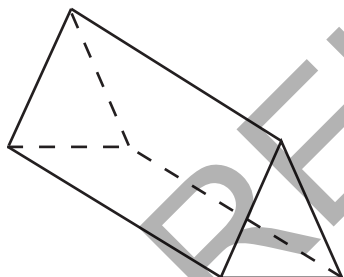
B



C



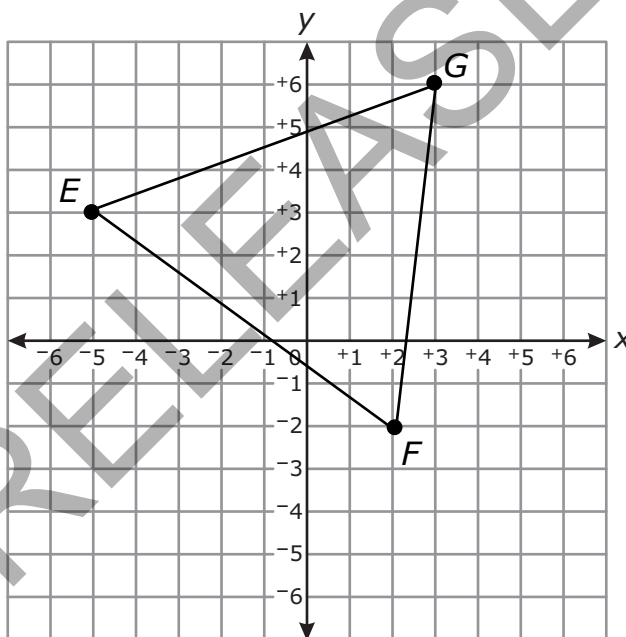
D





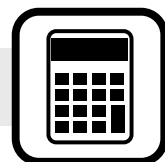
- 15 \overline{FG} has points $F(2, 4)$ and $G(6, 1)$. If \overline{FG} is dilated with respect to the origin by a factor of k , to produce $\overline{F'G'}$, which statement must be true?
- A The line that passes through F' and G' intersects the y -axis at $(0, 5.5 + k)$.
 - B The line that passes through F' and G' intersects the y -axis at $(0, 5.5)$.
 - C The line that passes through F' and G' has a slope of $\left(\frac{-3}{4}\right)k$.
 - D The line that passes through F' and G' has a slope of $\frac{-3}{4}$.

- 16 Triangle EGF is graphed below.



Triangle EGF will be rotated 90° counterclockwise around the origin and will then be reflected across the y -axis, producing an image triangle. Which additional transformation will map the image triangle back onto the original triangle?

- A rotation 270° counterclockwise around the origin
- B rotation 180° counterclockwise around the origin
- C reflection across the line $y = -x$
- D reflection across the line $y = x$



- 17 Suppose that Jamal can choose to get home from work by taxi or bus.
- When he chooses to get home by taxi, he arrives home after 7 p.m. 8 percent of the time.
 - When he chooses to get home by bus, he arrives home after 7 p.m. 15 percent of the time.
 - Because the bus is cheaper, he uses the bus 60 percent of the time.

What is the **approximate** probability that Jamal chose to get home from work by bus, given that he arrived home after 7 p.m.?

- A 0.09
B 0.14
C 0.60
D 0.74

- 18 A total of 540 customers, who frequented an ice cream shop, responded to a survey asking if they preferred chocolate or vanilla ice cream.
- 308 of the customers preferred chocolate ice cream.
 - 263 of the customers were female.
 - 152 of the customers were males who preferred vanilla ice cream.

What is the probability that a customer chosen at random is a male or prefers vanilla ice cream?

- A $\frac{419}{540}$
B $\frac{119}{180}$
C $\frac{197}{540}$
D $\frac{38}{135}$



19 What is the value of x if $x^{\frac{1}{2}} = 64^{\frac{1}{3}}$?

- A 4
- B 16
- C 96
- D 512

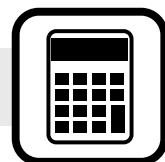
20 Line segment MN has an endpoint M at the point $(6, 8)$.

- Point P is located on line segment MN at point $(26, 20)$.
- The ratio of the length of $MP : PN$ is $4 : 1$.

What are the coordinates of point N ?

- A $(11, 11)$
- B $(31, 23)$
- C $(86, 56)$
- D $(106, 68)$

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- 21 Which expression is a factor of $49x^8 - 42x^4 + 9$?
- A $7x^4 + 3$
- B $7x^4 - 3$
- C $14x^4 + 6$
- D $14x^4 - 6$
- 22 Suppose the function $P(x) = 200x - 6x^2$ can be used by a company to model the profit, P , the company will make when it charges x dollars per item. Which notation represents the greatest profit?
- A $P\left(\frac{32}{3}\right)$
- B $P\left(\frac{38}{3}\right)$
- C $P\left(\frac{50}{3}\right)$
- D $P\left(\frac{55}{3}\right)$
- 23 The graph of $f(x) = 2x^2 - 3x + 5$ will be translated 8 units down, producing the graph of $q(x)$. Which equation represents the new function, $q(x)$?
- A $q(x) = 2x^2 - 3x - 3$
- B $q(x) = 2x^2 - 11x + 5$
- C $q(x) = 2x^2 - 3x + 13$
- D $q(x) = 2x^2 + 5x + 5$

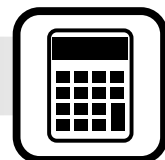


This is the end of the Math II Released Items.

Directions:

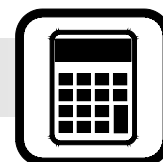
- 1. Look back over your answers for the test questions.**
- 2. Make sure all your answers are entered on the answer sheet. Only what is entered on your answer sheet will be scored.**
- 3. Put all of your papers inside your test book and close the test book.**
- 4. Place your calculator on top of the test book.**
- 5. Stay quietly in your seat until your teacher tells you that testing is finished.**
- 6. Remember, teachers are not allowed to discuss items from the test with you, and you are not allowed to discuss with others any of the test questions or information contained within the test.**

RELEASED



**Math II
RELEASED Items¹
Fall 2015
Answer Key**

Item Number	Type²	Key	Percent Correct³	Standard
1	MC	A	37%	N.RN.2
2	MC	D	67%	A.CED.2
3	MC	C	44%	A.REI.2
4	MC	B	40%	A.REI.2
5	MC	C	33%	A.REI.7
6	MC	A	28%	A.REI.4.B
7	MC	D	22%	A.CED.2
8	MC	D	47%	F.IF.8.A
9	MC	A	39%	F.BF.3
10	MC	D	35%	F.BF.1.B
11	MC	C	18%	F.IF.5
12	MC	D	17%	F.BF.1.B
13	MC	C	31%	G.CO.3
14	MC	C	28%	G.GMD.4
15	MC	D	26%	G.SRT.1.A
16	MC	D	23%	G.CO.5

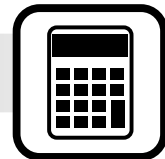


Item Number	Type ²	Key	Percent Correct ³	Standard
17	MC	D	20%	S.CP.6
18	MC	B	20%	S.CP.7
19	MC	B	66%	A.REI.2
20	MC	B	56%	G.GPE.6
21	MC	B	33%	A.SSE.2
22	MC	C	39%	F.IF.2
23	MC	A	55%	F.BF.3

¹These released items were administered to students during a previous test administration. This sample set of released items may not reflect the breadth of the standards assessed and/or the range of item difficulty found on the NC Final Exam. Additional information about the NC Final Exam is available in the *Assessment Specification* for each exam located at <http://www.ncpublicschools.org/accountability/common-exams/specifications/>.

²This NC Final Exam contains only multiple-choice (MC) items.

³Percent correct is the percentage of students who answered the item correctly during a previous administration.



Standard Descriptions

Only standard descriptions addressed by the released items in this booklet are listed below. A complete list of standards for English Language Arts and Mathematics may be reviewed at <http://www.ncpublicschools.org/curriculum/mathematics/scos/>.

N.RN.2 (High School: Number and Quantity)

The Real Number System: Extend the properties of exponents to rational exponents. Rewrite expressions involving radicals and rational exponents using the properties of exponents.

A.SSE.2 (High School: Expressions)

Seeing Structure in Expressions: Interpret the structure of expressions. Use the structure of an expression to identify ways to rewrite it. For example, see $x^4 - y^4$ as $(x^2)^2 - (y^2)^2$, thus recognizing it as a difference of squares that can be factored as $(x^2 - y^2)(x^2 + y^2)$.

A.CED.2 (High School: Algebra)

Creating Equations: Create equations that describe numbers or relationships. Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.

A.REI.2 (High School: Algebra)

Reasoning with Equations and Inequalities: Understand solving equations as a process of reasoning and explain the reasoning. Solve simple rational and radical equations in one variable, and give examples showing how extraneous solutions may arise.

A.REI.7 (High School: Algebra)

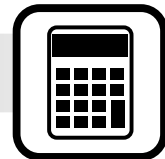
Reasoning with Equations and Inequalities: Solve systems of equations. Solve a simple system consisting of a linear equation and a quadratic equation in two variables algebraically and graphically. For example, find the points of intersection between the line $y = -3x$ and the circle $x^2 + y^2 = 3$.

A.REI.4.B (High School: Algebra)

Reasoning with Equations and Inequalities: Solve equations and inequalities in one variable. Solve quadratic equations by inspection (e.g., for $x^2 = 49$), taking square roots, completing the square, the quadratic formula and factoring, as appropriate to the initial form of the equation. Recognize when the quadratic formula gives complex solutions and write them as $a \pm bi$ for real numbers a and b .

F.IF.2 (High School: Functions)

Interpreting Functions: Understand the concept of a function and use function notation. Use function notation, evaluate functions for inputs in their domains, and interpret statements that use function notation in terms of a context.

**F.IF.5 (High School: Functions)**

Interpreting Functions: Interpret functions that arise in applications in terms of the context. Relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes. For example, if the function $h(n)$ gives the number of person-hours it takes to assemble n engines in a factory, then the positive integers would be an appropriate domain for the function.

F.IF.8.A (High School: Functions)

Interpreting Functions: Analyze functions using different representations. Write a function defined by an expression in different but equivalent forms to reveal and explain different properties of the function: Use the process of factoring and completing the square in a quadratic function to show zeros, extreme values, and symmetry of the graph, and interpret these in terms of a context.

F.BF.3 (High School: Functions)

Interpreting Functions: Build new functions from existing functions. Identify the effect on the graph of replacing $f(x)$ by $f(x) + k$, $k f(x)$, $f(kx)$, and $f(x + k)$ for specific values of k (both positive and negative); find the value of k given the graphs. Experiment with cases and illustrate an explanation of the effects on the graph using technology. Include recognizing even and odd functions from their graphs and algebraic expressions for them

F.BF.1.B (High School: Functions)

Building Functions: Build a function that models a relationship between two quantities. Write a function that describes a relationship between two quantities: Combine standard function types using arithmetic operations. For example, build a function that models the temperature of a cooling body by adding a constant function to a decaying exponential, and relate these functions to the model.

G.GPE.6 (High School: Geometry)

Expressing Geometric Properties with Equations: Translate between the geometric description and the equation for a conic section. Find the point on a directed line segment between two given points that partitions the segment in a given ratio.

G.CO.3 (High School: Geometry)

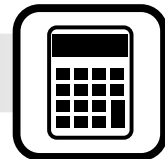
Congruence: Experiment with transformations in the plane. Given a rectangle, parallelogram, trapezoid, or regular polygon, describe the rotations and reflections that carry it onto itself.

G.CO.5 (High School: Geometry)

Congruence: Experiment with transformations in the plane: Given a geometric figure and a rotation, reflection, or translation, draw the transformed figure using, e.g., graph paper, tracing paper, or geometry software. Specify a sequence of transformations that will carry a given figure onto another.

G.SRT.1.A (High School: Geometry)

Similarity, Right Triangles, and Trigonometry: Understand similarity in terms of similarity transformations. Verify experimentally the properties of dilations given by a center and a scale factor. A dilation takes a line not passing through the center of the dilation to a parallel line, and leaves a line passing through the center unchanged.

**G.GMD.4 (High School: Geometry)**

Geometric Measurement and Dimension: Visualize relationships between two-dimensional and three-dimensional objects. Identify the shapes of two-dimensional cross-sections of three-dimensional objects, and identify three-dimensional objects generated by rotations of two-dimensional objects.

S.CP.6 (High School: Statistics and Probability)

Conditional Probability and the Rules of Probability: Use the rules of probability to compute probabilities of compound events. Find the conditional probability of A given B as the fraction of B 's outcomes that also belong to A , and interpret the answer in terms of the model.

S.CP.7 (Statistics and Probability)

Conditional Probability and the Rules of Probability: Use the rules of probability to compute probabilities of compound events. Apply the Addition Rule, $P(A \text{ or } B) = P(A) + P(B) - P(A \text{ and } B)$, and interpret the answer in terms of the model.

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