

Released Items

Student Name: _____ *Key*

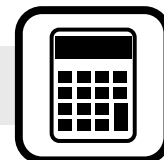
Fall 2014
NC Final Exam
Math II



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

Handwritten notes for Question 1:
 - Red arrows point from the original expression to the variables in the options.
 - "negative exponents move to bottom" with arrows pointing to the negative exponents in the original expression.
 - "put in calc" with an arrow pointing to the calculation below.
 - Calculated exponents: $8^{-2/3}$, $w^{10/3}$, $x^{-14/3}$, y^2 , z^6 .

Handwritten calculation:

$$\frac{1 \cdot x^{\frac{10}{3}} \cdot z^6}{4w^{\frac{14}{3}} y^2}$$

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 $t = 26.2s$

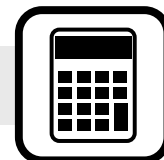
D $t = \frac{26.2}{s}$

Handwritten notes for Question 2:
 - " $= d$ " above the underlined 26.2.
 - $t(s) = \left(\frac{d}{s}\right)^t$ solve for t

Handwritten equation: $\frac{t}{s} = \frac{d}{s}$

Handwritten equations: $t = \frac{d}{s}$ and $t = \frac{26.2}{s}$

MATH II — RELEASED ITEMS



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 $5\frac{1}{4}$ hours?

$5\frac{1}{4}$ hrs
 $\frac{21}{4}$ hrs

- A 6
- B 7
- C 8
- D 9

$$t = \frac{kn}{x} \qquad t = \frac{1.5n}{x}$$

$$3 = \frac{k(12)}{6} \qquad \frac{21}{4} = \frac{1.5(28)}{x}$$

$$\frac{3}{2} = \frac{2k}{2} \qquad \frac{21x}{21} = \frac{168}{21}$$

$k = 1.5$ $x = 8$ $y = k/x$

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

$$F = \frac{k}{r^2} \qquad F = \frac{3.36}{r^2}$$

$$(.64)^2(8.2) = \left(\frac{k}{(.64)^2}\right)(.64)^2$$

$$k \approx 3.36$$

$$F = \frac{3.36}{(.77)^2}$$

$$F \approx 5.66$$

5 A system of equations is shown below.

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

plug x 's into $y = -4x$ set equal to each other

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

- A -4
- B -2
- C 8
- D 16

$$x^2 + 2x + 8 = -4x$$

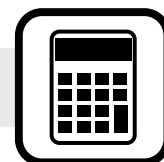
$$\frac{\quad +4x \quad +4x}{x^2 + 6x + 8 = 0}$$

$$4 \times 2 \rightarrow \text{change signs}$$

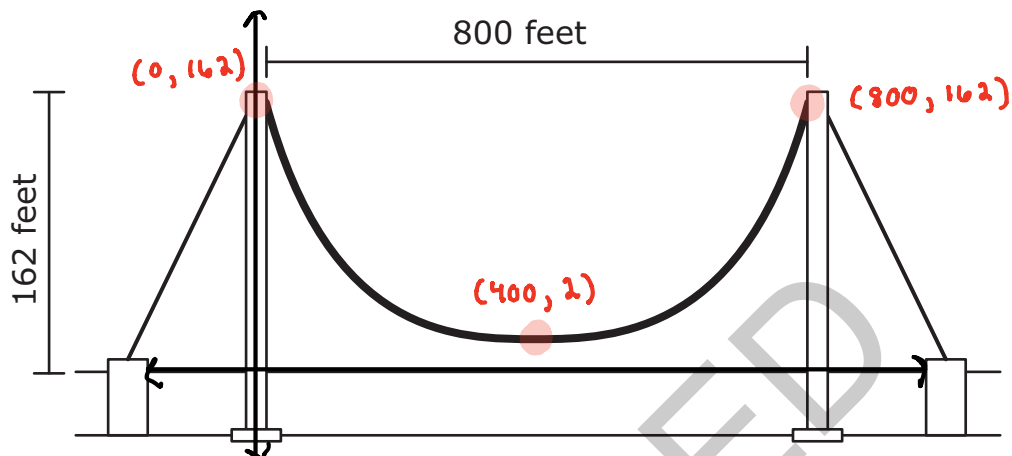
$$x = -4 \qquad y = -4(-4) = 16$$

$$x = -2 \qquad y = -4(-2) = 8$$

Go to the next page.



- 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

Calc. steps:

Stat Enter

$L_1 \rightarrow$ x-values of ordered pairs

$L_2 \rightarrow$ y-values of ordered pairs

Stat over to Calc

Opt. 5 (Quad Reg)

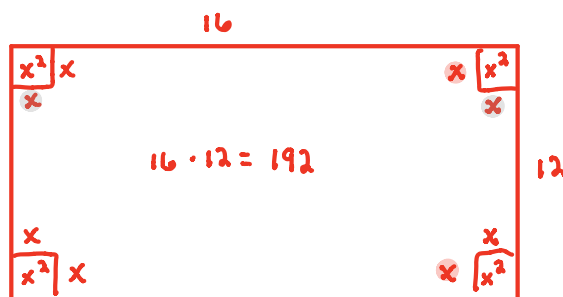
$$y = .001x^2 - .8x + 162$$

$$y = .001(120)^2 - .8(120) + 162$$

$$y = 80.4 \text{ ft}$$

- 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 $y = 192 - 4x^2$



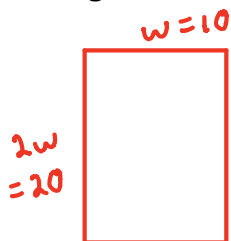
$$192 - 4x^2$$



- 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. $10x + 50$
 - 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



$$\begin{aligned} 10x + 50 &= 2050 \\ -50 &\quad -50 \\ \hline 10x &= 2000 \\ \frac{10x}{10} &= \frac{2000}{10} \\ x &= 200 \end{aligned}$$

$$\begin{aligned} 2w(w) &= 200 \\ \frac{2w^2}{2} &= \frac{200}{2} \\ \sqrt{w^2} &= \sqrt{100} \\ w &= 10 \end{aligned}$$

- 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

Brown: $8 \times 2 = 16 \text{ sq m}$
 Johnson: $10 \times 3 = 30 \text{ sq m}$
 $30 - 16 = 14 \text{ sq meters more}$

- 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 $0 < x \leq 85$ • can't divide by zero
 B $0 \leq x \leq 85$ • $x >$ than 85
 C $x > 0$
 D $x \geq 0$



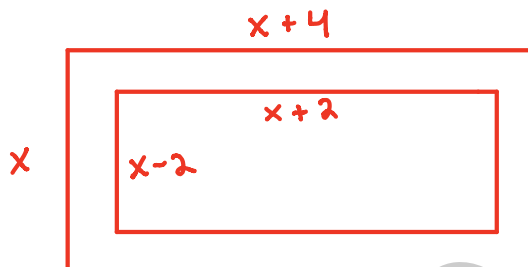
- 12 A rectangular rug is placed on a rectangular floor. The width of the floor is 4 feet greater than the length, x , of the floor. The width of the rug is 2 feet less than the width of the floor. The length of the rug is 4 feet less than the width of the rug. Which function, $R(x)$, represents the 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 $R(x) = 4x + 4$



$x(x+4) - (x-2)(x+2)$

$x^2 + 4x - x^2 + 4$

$4x + 4$

- 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

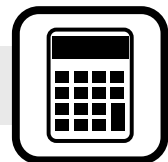
D a 270° counterclockwise rotation

6 sides

$\frac{360}{6} = 60^\circ$

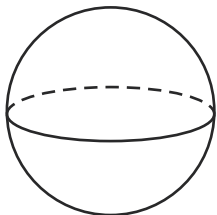
→ only answer divisible by 60

RELEASED

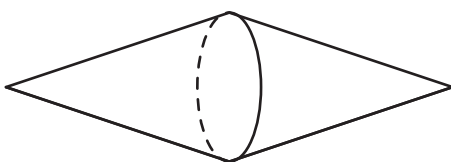


14 Kathleen rotated an isosceles trapezoid 360° around its longest base. Which choice could be the resulting solid?

~~A~~



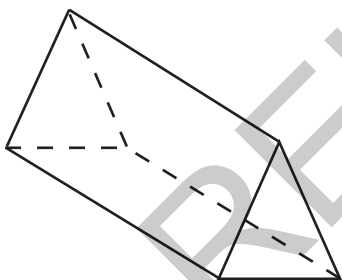
~~B~~



C



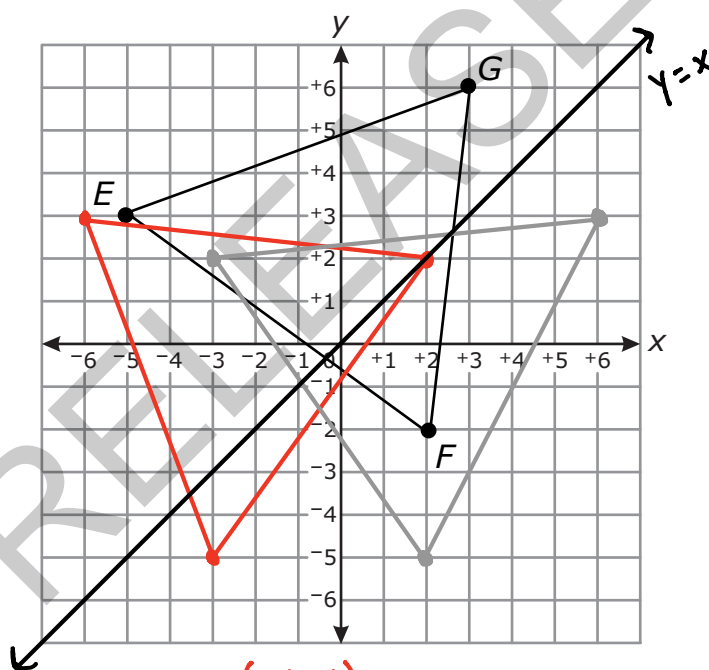
~~D~~





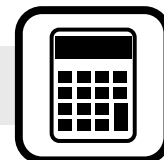
- 15 \overline{FG} has points $F(2, 4)$ and $G(6, 1)$. If \overline{FG} is dilated with respect to the origin by a factor of k , to produce $\overline{F'G'}$, which statement must be true?
- A The line that passes through F' and G' intersects the y -axis at $(0, 5.5 + k)$.
 - B The line that passes through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

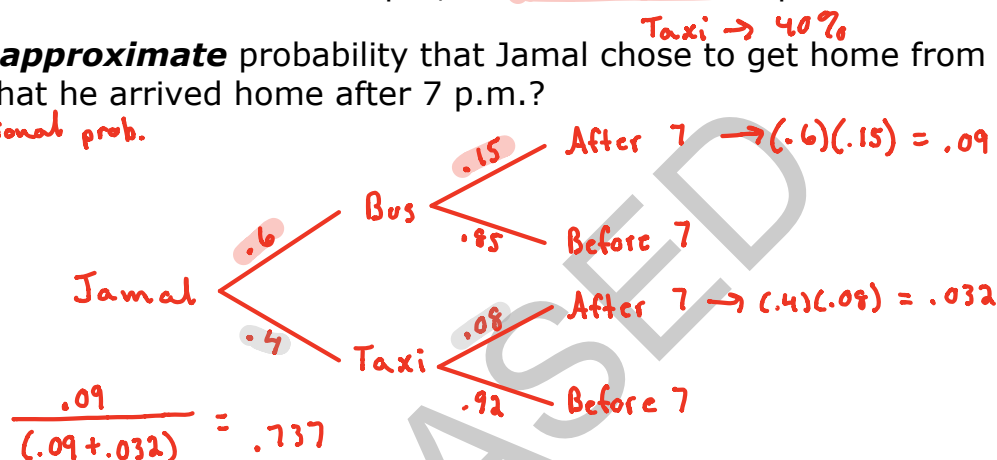


17 Suppose that Jamal can choose to get home from work by taxi or bus.

- When he chooses to get home by taxi, he arrives home after 7 p.m. 8 percent of the time. *Before 7pm → 92%*
- When he chooses to get home by bus, he arrives home after 7 p.m. 15 percent of the time. *Before 7pm → 85%*
- Because the bus is cheaper, he uses the bus 60 percent of the time. *Taxi → 40%*

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

- conditional prob.*
- ~~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~~ $\frac{38}{135}$

Handwritten calculations:
 $540 - 308 = 232$ preferred vanilla
 $540 - 263 = 277$ male customers

Handwritten notes:
 → Add
 mutually inclusive
 $P(A) + P(B) - P(A+B)$

Handwritten calculation:
 $\frac{277}{540} + \frac{232}{540} - \frac{152}{540} = \frac{357}{540} = \frac{119}{180}$



**Math II
RELEASED Items¹
Fall 2014
Answer Key**

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

MATH II — RELEASED ITEMS



Item Number	Type ²	Key	Percent Correct ³	Standard
17	MC	D	20%	CCSS.Math.Content.HSS.CP.B.6
18	MC	B	20%	CCSS.Math.Content.HSS.CP.B.7

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 items may be reviewed at <http://www.ncpublicschools.org/accountability/common-exams/released-forms/>. 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 the Spring 2014 administration.