

MATH II — RELEASED ITEMS



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 work for Question 1:
 $8^{-\frac{2}{3}} w^{(7 \cdot \frac{-2}{3})} x^{(-5 \cdot \frac{-2}{3})} y^{(3 \cdot \frac{-2}{3})} z^{(9 \cdot \frac{-2}{3})}$
 $\frac{1}{4} w^{-\frac{14}{3}} x^{\frac{10}{3}} y^{-2} z^6$
 $\frac{x^{\frac{10}{3}} z^6}{4w^{\frac{14}{3}} y^2}$

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 work for Question 2:
 distance = rate \cdot time
 $26.2 = s \cdot t$
 $t = \frac{26.2}{s}$

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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

Handwritten work for Question 3:
 $t = \frac{k \cdot n}{x}$ 15 minutes = 0.25 hours
 $3 = \frac{k \cdot 12}{6}$ $5 \cdot 0.25 = 1.5 \cdot 28$
 $k = 18/12 = 3/2 = 1.5$ $x = 8$

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

Handwritten work for Question 4:
 $F = \frac{k}{r^2}$ $8.2 = \frac{k}{(0.64)^2}$ $k = 3.359$
 Force = $\frac{3.359}{(0.77)^2} = 5.66$

5 A system of equations is shown below.

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

Handwritten work for Question 5:
 $-4x = x^2 + 2x + 8$
 $+4x$ $+4x$

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

A -4

B -2

C 8

D 16

Intersections

$(-4, 16)$

$(-2, 8)$

$x^2 + 6x + 8 = 0$

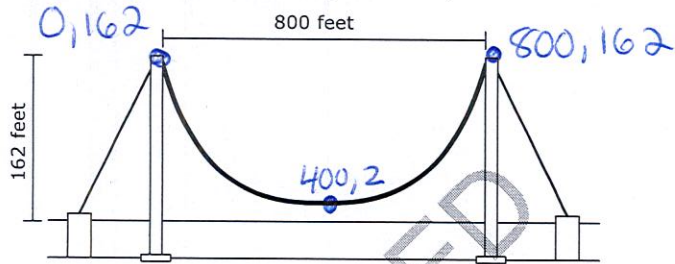
$(x+4)(x+2) = 0$

$x = -4$ $x = -2$

* Note - Smallest y , not Smallest x !



- 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?

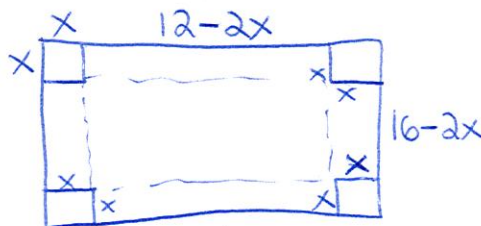
- A 80 feet
 B 74 feet
 C 22 feet
 D 16 feet

Quad Reg

$y =$
 plugin 120 for x

- 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 $y = 192 - 4x^2$



2 Flaps $x(12-2x) \cdot 2$

2 Flaps $x(16-2x) \cdot 2$

Bottom $(12-2x)(16-2x)$

Go to the next page.

$$[24x - 4x^2] + [32x - 4x^2] + [192 - 56x + 4x^2]$$

$$192 - 4x^2$$



- 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.
 - 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?

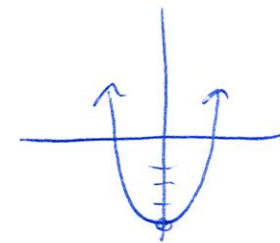
- A 5 inches
 B 10 inches
 C 15 inches
 D 20 inches

If height = 20 width = 10
 Area = 200
 $x \$10$
 $\frac{2000}{\$10} + 50 = \$2050 \checkmark$

- 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 $f(x) = (x - 1)(x - 1)$

Graph it!

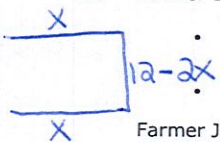


Even / Symmetric with y-axis

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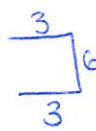


10 Farmer Brown built a rectangular pen for his chickens using 12 meters of fence.



- 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.

Area = $x(12-2x)$
 max(3, 18)

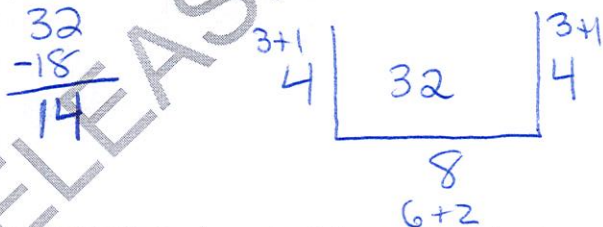


Farmer Johnson built a rectangular pen for her chickens using 16 meters of fence.

- 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 $f(x)$?

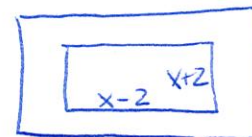
- A $0 < x \leq 85$
- B $0 \leq x \leq 85$
- C $x > 0$
- D $x \geq 0$

$x \neq 0$ (cannot divide by 0)
 pressure/volume are positive



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 $R(x) = 4x + 4$

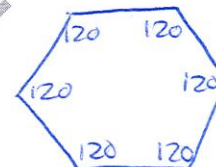


$x+4 = \text{width}$

Floor $x(x+4) - \text{Rug } (x-2)(x+2) = x^2+4x - (x^2-4) = 4x+4$

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



$(n-2)180 = \text{Angle Sum}$

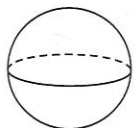
$(6-2)180 = 720$

$\frac{720}{6} = 120^\circ$

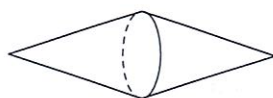


- 14 Kathleen rotated an isosceles trapezoid 360° around its longest base. Which choice could be the resulting solid?

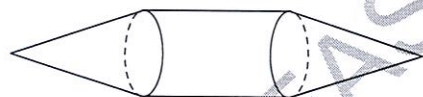
A



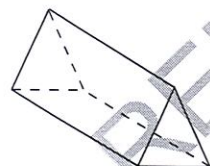
B



C



D



RELEASED

(dilated)
making a segment bigger does not change slope

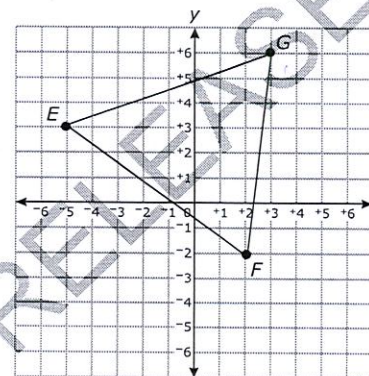


- 15 \overline{FG} has points $F(2, 4)$ and $G(6, 1)$. If \overline{FG} is dilated with respect to the origin by a factor of k , to produce $\overline{F'G'}$, which statement must be true?

- 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 $(-\frac{3}{4})k$.
- D The line that passes through F' and G' has a slope of $-\frac{3}{4}$.

- 16 Triangle EGF is graphed below.

$90^\circ (-y, x)$
y-axis $(-x, y)$
 $G(3, 6)$
 $90^\circ (-6, 3)$
y-axis $(6, 3)$



Now
 $(6, 3) \rightarrow (3, 6)$
 $(x, y) \rightarrow (y, x)$

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 $\frac{38}{135}$

$$P(\text{male}) + P(\text{Vanilla}) - P(\text{both})$$

$$\frac{277}{540} + \frac{232}{540} - \frac{152}{540}$$

$$\frac{357}{540} = 0.6611$$

| | Vanilla | Choc | |
|--------|---------|------|-----|
| male | 152 | 125 | 277 |
| Female | 80 | 183 | 263 |
| | 232 | 308 | 540 |

$$540 - 308 = 232$$

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

| Item Number | Type ² | Key | Percent Correct ³ | 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 |

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| 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.