

Released Items

Student Name: \_\_\_\_\_

KEY  
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Fall 2014  
NC Final Exam  
**Math II**



# Student Booklet



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

$8^{-2/3} w^{-14/3} x^{10/3} z^6 y^{-2}$

$8^{2/3} w^{14/3} x^{10/3} z^6 y^2$

$\sqrt[3]{8^2} = 4$

$$\begin{array}{r} 1 \\ 2 \overline{) 32} \\ \underline{2} \phantom{0} \\ 10 \\ 2 \overline{) 10} \\ \underline{4} \phantom{0} \\ 6 \\ 2 \overline{) 6} \\ \underline{4} \\ 2 \\ 2 \overline{) 2} \\ \underline{2} \\ 0 \end{array}$$

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A

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

$t = \frac{d}{m/hr.}$

18



- 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

$t = \frac{kN}{x}$   
 $3 = \frac{k \cdot 12}{6}$   
 $18 = 12k$   
 $k = \frac{18}{12} = \frac{3}{2} = 1.5$

$t = \frac{1.5n}{x}$   
 $5.25 = \frac{1.5(28)}{x}$   
 $5.25x = 42$   
 $x = 8$

5 hrs. +  $\frac{15}{60}$  (1/4) (1.25)

C

- 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

$F = \frac{k}{d^2}$   
 $8.2 = \frac{k}{(0.64)^2}$   
 $k = 3.35878$

$F = \frac{3.35878}{d^2}$   
 $F = \frac{3.35878}{(0.77)^2}$   
 $F = 5.664$

B

- 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?

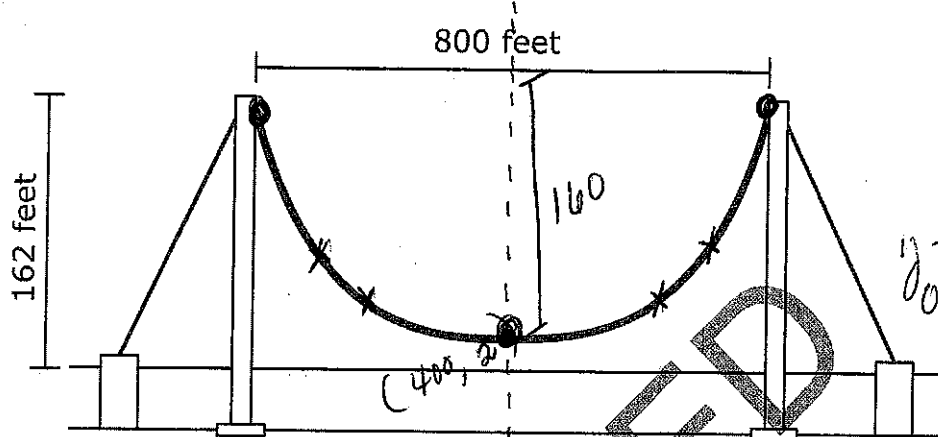
- A -4
- B -2
- C 8
- D 16

$x^2 + 2x + 8 = -4x$   
 $x^2 + 6x + 8 = 0$   
 $(x + 4)(x + 2) = 0$   
 $x = -4 \text{ or } -2$   
 therefore  
 $y = 16 \text{ or } 8$

C



- 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.



x	y
0	162
400	2
800	162

stats

$$y = 0.001x^2 - 0.8x + 162$$

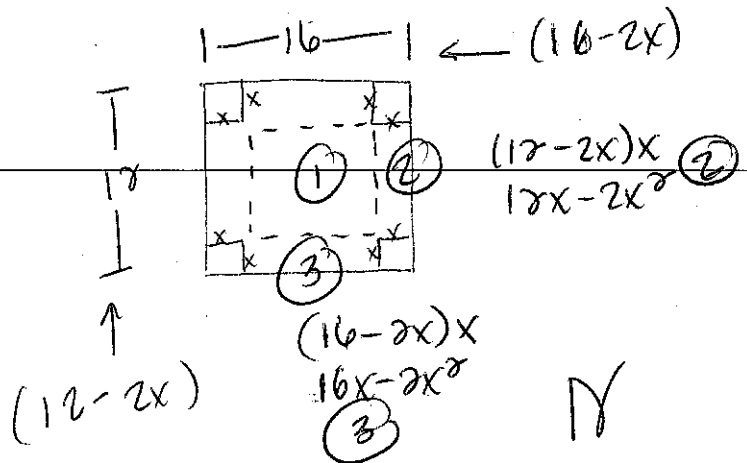
$$0.001(120)^2 - 0.8(120) + 162 = 80.4$$

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  $y = 192 - 4x^2$



$A = lw$   
 $(16 - 2x)(12 - 2x)$   
 $192 - 32x - 24x + 4x^2$   
 $192 - 56x + 4x^2$

$(192 - 56x + 4x^2) + 2(16x - 2x^2) + 2(12x - 2x^2)$   
 $192 - 4x^2$



- 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.  $h = 2w$
  - The newspaper charges a flat rate of \$50 plus an additional \$10 per square inch.  $50 + 10 \text{ in.}$
  - The company can spend no more than \$2,050 on the advertisement.  $\leq 2,050$

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

- A 5 inches  $5 \sqrt{5 \times 2.5} \neq 200$
- B 10 inches
- C 15 inches
- D 20 inches  $20 \sqrt{20 \times 10} = 200$

$$50 + 10x \geq 2050$$

$$\underline{-50}$$

$$10x \geq 2000$$

$$\boxed{x \geq 200}$$

↳ how many sq in for ad.

18.

9 Which function is even?

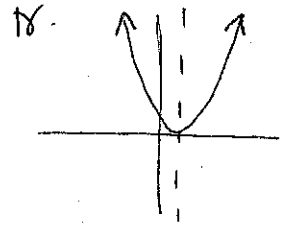
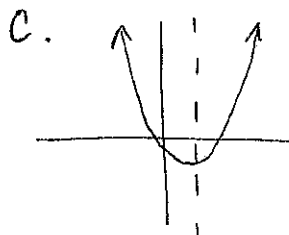
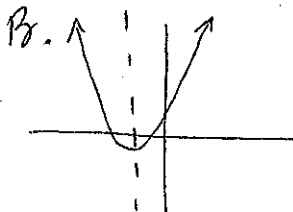
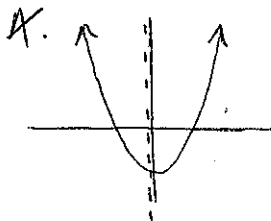
- A  $f(x) = (x + 2)(x - 2)$
- B  $f(x) = x(x + 2)$
- C  $f(x) = (x + 1)(x - 2)$
- D  $f(x) = (x - 1)(x - 1)$

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even functions  
↳ symmetric about y-axis

odd functions  
↳ symmetry about the origin

Graphs →



A.



- 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.

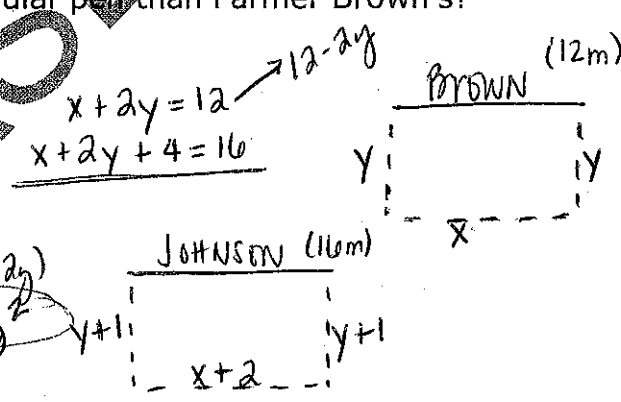
Farmer Johnson built a rectangular pen for her chickens using 16 meters of fence.

- 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

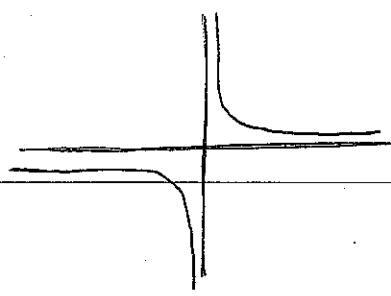
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Handwritten area calculations:  
 $A = y(12 - 2y)$   
 $A = 12y - 2y^2$

- 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	y
-1	-85
0	ERROR
1	85
2	42.5

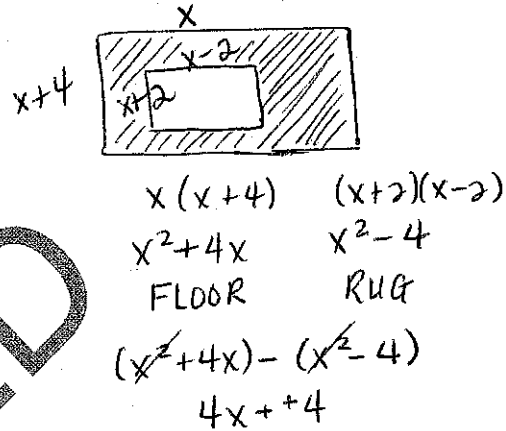
Handwritten note:  $\rightarrow$  can't have a negative unit of pressure.

C.



- 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? 18.

- 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? (6 sides)

- A a  $30^\circ$  counterclockwise rotation
- B a  $90^\circ$  counterclockwise rotation
- C a  $120^\circ$  counterclockwise rotation
- D a  $270^\circ$  counterclockwise rotation

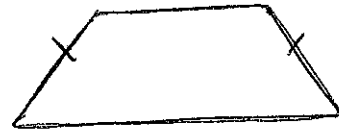
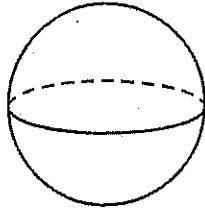
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$\frac{360}{6} = 60^\circ$  (1 rotation)  
 $120^\circ$  (2 rotations)  
 $180^\circ$  (3 rotations) C.  
 $240^\circ$  (4 rotations)  
 $300^\circ$  (5 rotations)

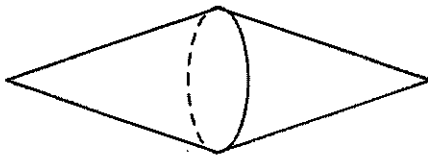


14 Kathleen rotated an isosceles trapezoid  $360^\circ$  around its longest base. Which choice could be the resulting solid?

A



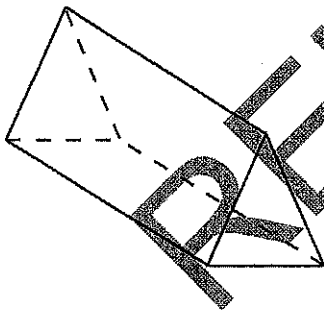
B



C

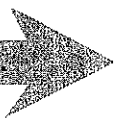


D



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C.







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  $(\frac{-3}{4})k$ .

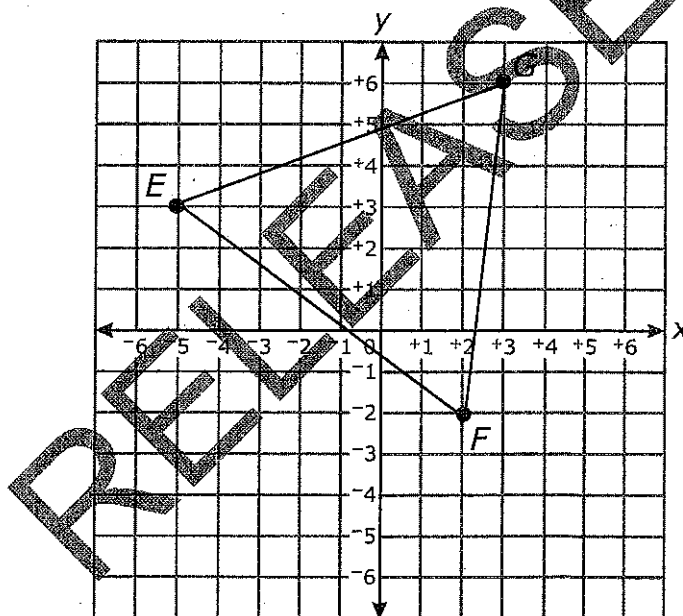
D The line that passes through  $F'$  and  $G'$  has a slope of  $\frac{-3}{4}$ .

If  $k=2$  then  
 $(4, 8)(12, 2)$   

x	y
4	8
12	2

 $y = -\frac{3}{4}x + 11$   
*N.*

16 Triangle  $EGF$  is graphed below.



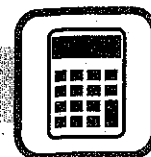
original-  
 $E(-5, 3) F(2, -2) G(3, 6)$   
 $90^\circ (-y, x)$   
 $E(-3, -5) F(2, 2) G(-6, 3)$   
 $y\text{-axis } (-x, y)$   
 $E(3, -5) F(-2, 2) G(6, 3)$

Triangle  $EGF$  will be rotated  $90^\circ$  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  $270^\circ$  counterclockwise around the origin
- B rotation  $180^\circ$  counterclockwise around the origin
- C reflection across the line  $y = -x$

D reflection across the line  $y = x$

*N.*



- 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

- 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.
- 232 vanilla  
 • 277 males

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  $\frac{38}{135}$

$$\frac{277}{540} + \frac{232}{540} - \frac{152}{540} = \frac{357}{540}$$

↳  $\frac{119}{180}$  Reducers

18