

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:

$$8^{-2/3} w^{7(-2/3)} x^{-5(-2/3)} y^{3(-2/3)} z^{-9(-2/3)}$$

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

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

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:

$$t = \frac{\text{distance}}{\text{speed}} \quad t = \frac{26.2}{s}$$



3 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

inverse variation:  $y = \frac{k}{x^2}$

$$F = \frac{k}{r^2} \quad 8.2 = \frac{k}{(0.64)^2}$$

$$8.2 = \frac{k}{.4096} \quad .4096(8.2) = k$$

$$k = 3.35872$$

$$F = \frac{3.35872}{(0.77)^2} \approx 5.7$$

4 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

the solution(s) are the intersection

type in  $y =$ , calculate intersection

intersects twice, smallest  $y$  means use

$(-2, 8)$  the one closest to the  $x$ -axis



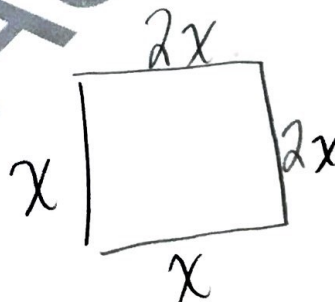
- 5 The cost of a newspaper advertisement is a function of its size.
- A company wants its advertisement to have a height that is twice its width.  $h = 2w$
  - The newspaper charges a flat rate of \$50 plus an additional \$10 per square inch.  $C = 10 \text{sq. i.} + 50$
  - The company can spend no more than \$2,050 on the advertisement.  $2050 = 10 \text{sq. i.} + 50$

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

- A 5 inches  $2050 = 10 \text{sq. i.} + 50$   
 B 10 inches  $-50$   
 C 15 inches  $2000 = 10 \text{sq. in}$   
 (D) 20 inches  $\frac{10}{10} \quad \frac{10}{10}$

of work  
 it backwards...  
 only  $20 \cdot \frac{1}{2}(20) = 200$

Area = 200 sq. inches



$2x \cdot x = 200$

$2x^2 = 200$

$\sqrt{x^2} = \sqrt{100}$

$x = \pm 10$

~~-10~~ 10 ✓

$10 = w$

$2w = h \quad 2(10) = 20 = h$





- 6 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.

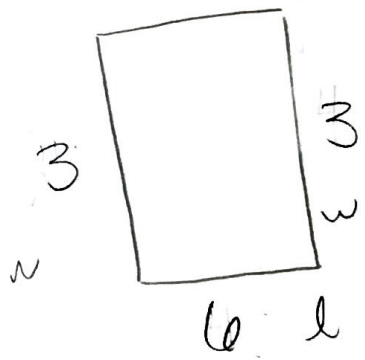
- She used part of one side of her barn as one length of the rectangular pen.
- The length of her pen was 2 meters more than the length of Farmer Brown's pen.
- The width of her pen was 1 meter more than the width of Farmer Brown's pen.

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

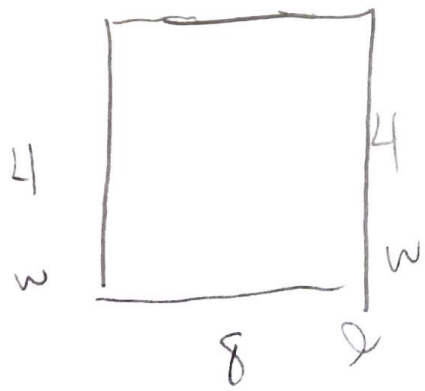
- A 24 square meters
- B 18 square meters
- C 16 square meters
- D 14 square meters

RELEASED

Barn Brown

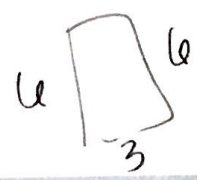
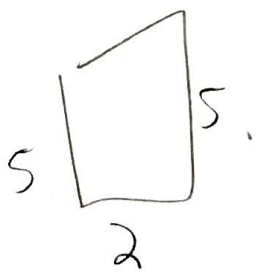


Barn Johnson



$$(4 \times 8) - (3 \times 6) = 32 - 18$$

14

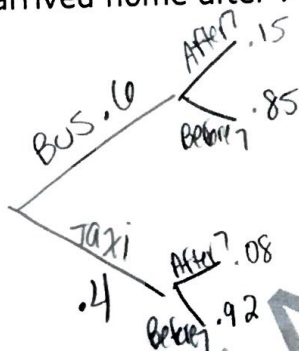




- 7 Suppose that Jamal can choose to get home from work by taxi or bus.
- When he chooses to get home by taxi, he arrives home after 7 p.m. 8 percent of the time.
  - When he chooses to get home by bus, he arrives home after 7 p.m. 15 percent of the time.
  - Because the bus is cheaper, he uses the bus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



$P(\text{BUS}) + P(\text{After 7}) - P(\text{BUS and after 7})$

$.6 + .23 - (.6 \times .15)$

$\frac{\text{BUS and after 7}}{\text{BUS and 7 or taxi and 7}}$   
 $\frac{.6(.15)}{.6(.15) + .4}$

- 8 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  $q(x) = 2x^2 + 5x + 5$

$2x^2 - 3x + 5 - 8$   
 $2x^2 - 3x - 3$   
 8 units down



- 9 The equation  $2x^2 - 5x = -12$  is rewritten in the form of  $2(x - p)^2 + q = 0$ . What is the value of  $q$ ?

- A  $\frac{167}{16}$
- B  $\frac{71}{8}$
- C  $\frac{25}{8}$
- D  $\frac{25}{16}$

Handwritten work for Question 9:

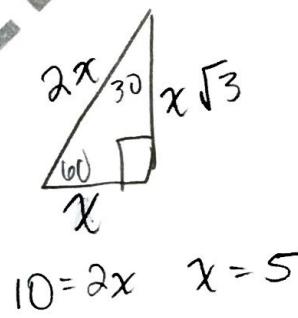
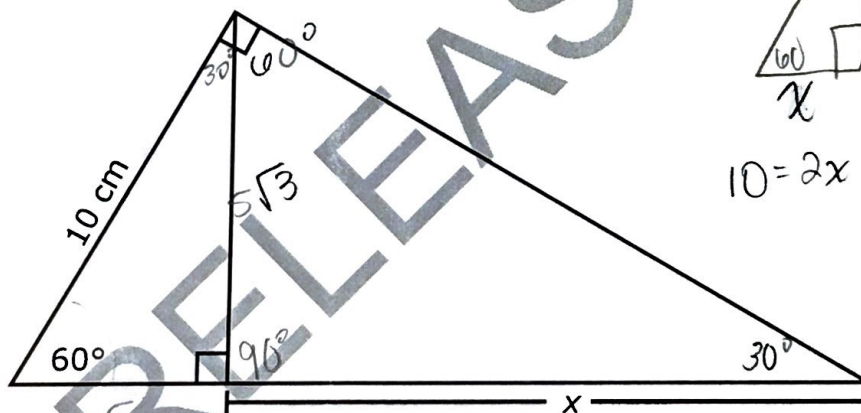
$$2(x^2 - \frac{5}{2}x + \underline{\quad}) = -12 + \underline{\quad}$$

$$2(x^2 - \frac{5}{2}x + \frac{25}{16}) = -12 + 2(\frac{25}{16})$$

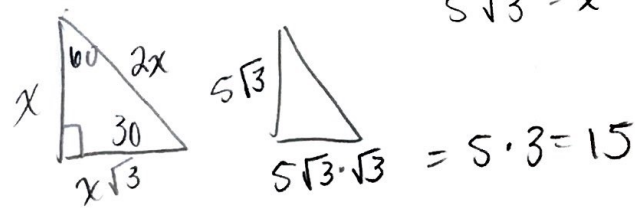
$$2(x - \frac{5}{4})^2 = -\frac{71}{8}$$

$$2(x - \frac{5}{4})^2 + (\frac{71}{8}) = 0$$

- 10 What is the value of  $x$  in the triangle below?



- A  $\frac{5\sqrt{3}}{2}$  cm
- B  $5\sqrt{3}$  cm
- C 10 cm
- D 15 cm







11 The length of a rectangular prism is  $4\sqrt{3}$  units. The height is  $3\sqrt{6}$  units. If the volume is irrational, which could be the measure of the width of the rectangular prism?

- A  $2\sqrt{50}$
- B  $4\sqrt{12}$
- C  $5\sqrt{8}$
- D  $7\sqrt{18}$

find the one that multiplies with  $\sqrt{3}$  and  $\sqrt{6}$  to still be irrational

$\sqrt{3} \cdot \sqrt{6} = \sqrt{18}$

$\sqrt{18} \cdot \sqrt{50} = \sqrt{900} \neq \text{irrational}$

$\sqrt{18} \cdot \sqrt{12} = \sqrt{216} = \text{irrational}$

$\sqrt{18} \cdot \sqrt{8} = \sqrt{144} \neq \text{irrational}$

$\sqrt{18} \cdot \sqrt{18} = 18$

RELEASED

12 Which function is equivalent to  $y = x^2 - 6x + 10$ ?

- A  $y = (x + 3)^2 - 1$
- B  $y = (x - 3)^2 + 1$
- C  $y = (x + 6)^2 - 10$
- D  $y = (x - 6)^2 + 10$

to do it quick, type in  $y =$ , find vertex + use that for  $h + k$

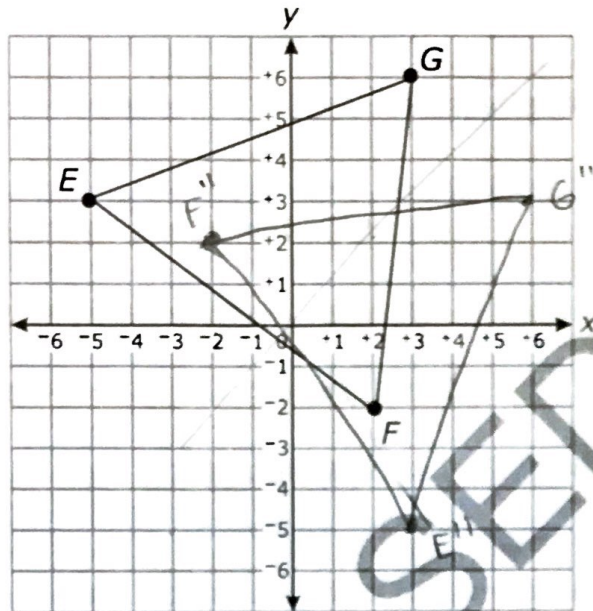
min, (vertex) at  $(3, 1)$

$(x-h)^2 + k$

$(x-3)^2 + 1$



13 Triangle  $EGF$  is graphed below.



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  $y = x$

*90° CCW*  
*double prime*  
 $90^\circ \text{ CCW} \Rightarrow (x, y) \Rightarrow (-y, x)$   
 $F(2, -2) \rightarrow F'(2, 2) \rightarrow F''(-2, 2)$   
 $G(3, 6) \rightarrow G'(-6, 3) \rightarrow G''(6, 3)$   
 $E(-5, 3) \rightarrow E'(-3, -5) \rightarrow E''(3, -5)$   
 Reflect  $y$ -axis, flip sign of  $x$   
 $(x, y) \Rightarrow (-y, x) \Rightarrow (y, x)$   
 $= y = x$   
 reflection rule





NC Math 2  
RELEASED Items<sup>1</sup>  
2017–2018  
Answer Key

| Item Number | Type <sup>2</sup> | Key | Percent Correct <sup>3</sup> | Standard |
|-------------|-------------------|-----|------------------------------|----------|
| 1           | MC                | A   | 37%                          | N-RN.2   |
| 2           | MC                | D   | 67%                          | A-CED.2  |
| 3           | MC                | B   | 40%                          | A-REI.2  |
| 4           | MC                | C   | 33%                          | A-REI.7  |
| 5           | MC                | D   | 47%                          | F-IF.8   |
| 6           | MC                | D   | 35%                          | F-BF.1   |
| 7           | MC                | D   | 20%                          | S-CP.6   |
| 8           | MC                | A   | 61%                          | F-BF.3   |
| 9           | MC                | B   | 30%                          | A-REI.4a |
| 10          | MC                | D   | 61%                          | G-SRT.8  |
| 11          | MC                | B   | 46%                          | N-RN.3   |
| 12          | MC                | B   | 67%                          | A-SSE.3  |
| 13          | MC                | D   | 23%                          | G-CO.5   |