Released Items

Student Name: *Key*

NC Math 2

2

2017–2018

NC Final Exam

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

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

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

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

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

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

Handwritten work:

$$= 8^{-\frac{2}{3}} w^{-\frac{14}{3}} x^{\frac{10}{3}} y^{-2} z^6$$

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

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

$$8^{\frac{2}{3}} = \left(\sqrt[3]{8}\right)^2$$
$$= 2^2$$
$$= 4$$

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?
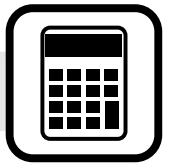
A $t = 26.2 - 26.2s$

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

C $t = 26.2s$

(D) $t = \dfrac{26.2}{s}$

Handwritten work:

$$d = r\,t$$
$$\frac{26.2}{s} = \frac{s\,t}{s}$$
$$t = \frac{26.2}{s}$$

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

$$F = \frac{k}{r^2} \qquad F = \frac{3.35872}{r^2}$$

$$8.2 = \frac{k}{.64^2} \qquad F = \frac{3.35872}{.77^2}$$

$$k = 3.35872 \qquad F \approx 5.7$$

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

* you can graph in demos and find where the graphs intersect.

or
use algebra (substitution)

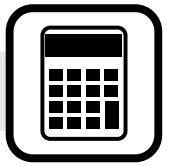$$x^2 + 2x + 8 = -4x$$
$$x^2 + 6x + 8 = 0$$
$$(x+2)(x+4) = 0$$
$$x+2=0 \qquad x+4=0$$
$$x = -2 \qquad\quad x = -4$$
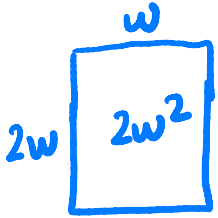$$y = -4x \qquad\quad y = -4x$$
$$y = -4(-2) = 8 \qquad y = -4(-4)$$
$$y = 8$$

2   Go to the next page.

5   The cost of a newspaper advertisement is a function of its size.

w

$2w$ $2w^2$

$h = 2w$

- 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. $C = 10(A) + 50$

    area

- 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 $A = 2w^2$ $10(2w^2) + 50 = C$

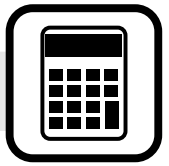B   10 inches $20w^2 + 50 \leq 2050$

C   15 inches $20w^2 \leq 2000$

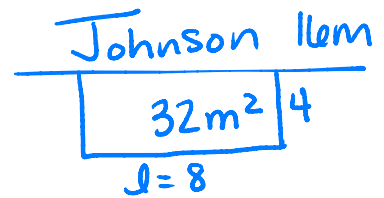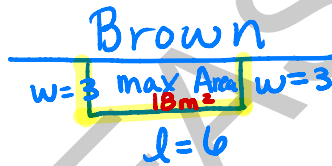D   20 inches $w^2 \leq 100$

$w \leq 10$ w can not be negative

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

Handwritten work:

Brown
w=3 max Area w=3
18m²
l=6

Johnson 16m
32m² | 4
l=8

$2w + l = 12$
$l = -2w + 12$

max Area $A = l\,w$

$A = (-2w+12)w$
$A = -2w^2 + 12w$

max
$\left(\dfrac{-b}{2a}\right)$
$\left(\dfrac{-12}{-4}\right)$
(3)
$w=3$

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. $P(7|T) = .08$
- When he chooses to get home by bus, he arrives home after 7 p.m. 15 percent of the time. $P(7|B) = .15$
- Because the bus is cheaper, he uses the bus 60 percent of the time. $P(B) = .60 \quad P(T) = .40$

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

$$P(B|7) = \frac{.09}{.122} = \boxed{.74}$$

A   0.09

B   0.14

C   0.60

(D)   0.74

	7	Not	Total
Taxi	.032		.40
Bus	.09		.60
Total	.122		1

$.60$ Bus $.15$ → $7|B$ $(.60)(.15) = .09$
Not$|B$
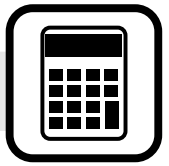$.40$ Taxi $.08$ → $7|T$ $(.40)(.08) = .032$
Not$|T$
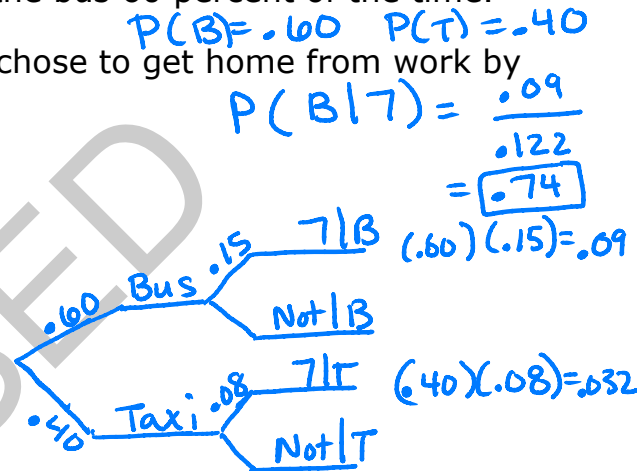
8   The graph of $f(x) = 2x^2 - 3x + 5$ will be translated 8 units down, producing the graph of $q(x)$. Which equation represents the new function, $q(x)$?

(A) $q(x) = 2x^2 - 3x - 3$

B $q(x) = 2x^2 - 11x + 5$

C $q(x) = 2x^2 - 3x + 13$

D $q(x) = 2x^2 + 5x + 5$
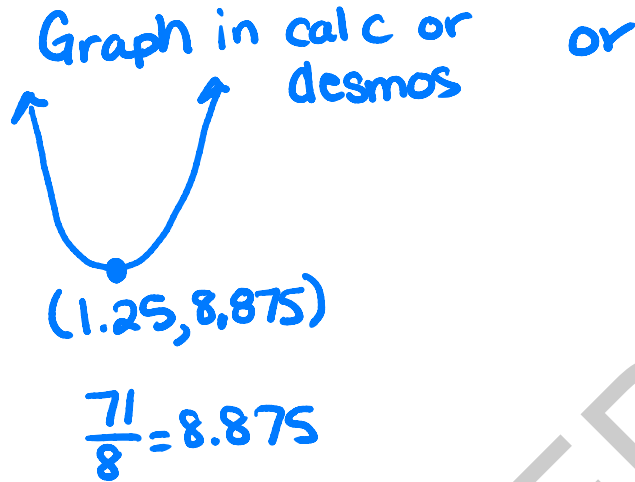
$q(x) = 2x^2 - 3x + 5 - 8$

$q(x) = 2x^2 - 3x - 3$

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?
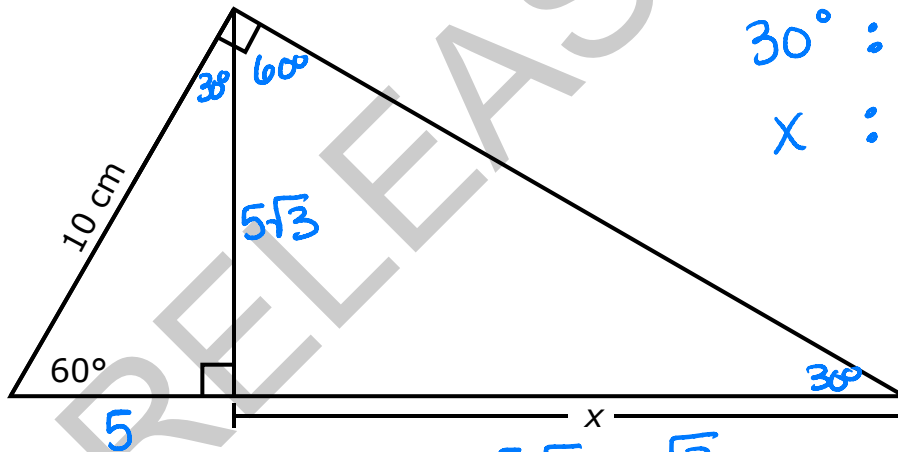
Graph in calc or desmos   *or*

A $\dfrac{167}{16}$

B $\dfrac{71}{8}$

C $\dfrac{25}{8}$

D $\dfrac{25}{16}$

(1.25, 8.875)

$\dfrac{71}{8} = 8.875$

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

$30° : 60° : 90°$
$x : x\sqrt{3} : 2x$

$5\sqrt{3} \cdot \sqrt{3}$
$5 \cdot 3$
$\boxed{15}$

A $\dfrac{5\sqrt{3}}{2}$ cm

B $5\sqrt{3}$ cm

C   10 cm

D   15 cm
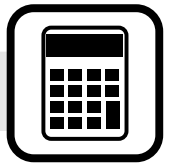
11 The length of a rectangular prism is $4\sqrt{3}$ units. The height is $3\sqrt{6}$ units. If the volume is <u>irrational</u>, which could be the measure of the width of the rectangular prism?

A $2\sqrt{50}$ $5\sqrt{2}$

B $4\sqrt{12}$ $2\sqrt{3}$

C $5\sqrt{8}$ $2\sqrt{2}$

D $7\sqrt{18}$ $3\sqrt{2}$

Handwritten work:

$V = l \cdot w \cdot h$

$V = (4\sqrt{3}) \cdot w \cdot (3\sqrt{6})$

$V = 12\sqrt{3 \cdot 3 \cdot 2}\; w$

$V = 12 \cdot 3\sqrt{2}\; w$

$V = 36\sqrt{2}\; w$

$V = (36\sqrt{2})(4\sqrt{12})$

$V = 104\sqrt{24}$

$V = 104 \cdot 2\sqrt{6}$

$V = 208\sqrt{6}$

↑ irrational

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 $y = (x - 6)^2 + 10$

Handwritten work:

$y = (x^2 - 6x + 9) + 10\; -9$

$y = (x - 3)^2 + 1$

Go to the next page.
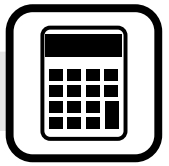
13   Triangle *EGF* is graphed below.
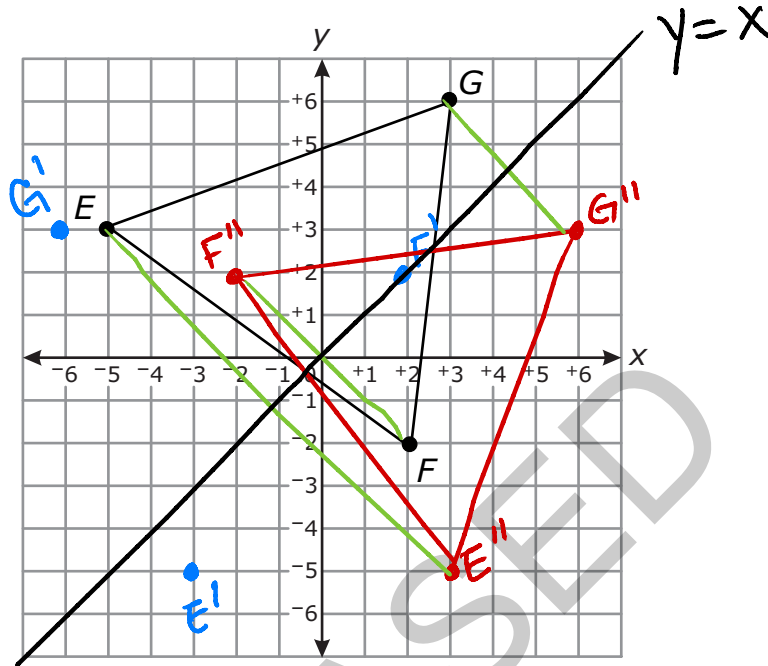
Triangle *EGF* will be rotated 90° counterclockwise around the origin and will then be reflected across the *y*-axis, producing an image triangle. Which additional transformation will map the image triangle back onto the original triangle?

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 $y = x$