Francis

Released Items

Student Name: Key - Worked out

NC Math 3

3

2017–2018

NC Final Exam

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

1 Let $f(x) = 14x^3 + 28x^2 - 46x$ and $g(x) = 2x + 7$. Which is the solution set to the equation $\frac{1}{12}f(x) = g(x)$?

graph → $y_1 = \left(\frac{1}{12}\right)(14x^3 + 28x^2 - 46x$
$y_2 = 2x + 7$

* Look for points of intersections

Trace Answer Choices

$X = -3$
$X = -1$
$X = 2$
} Are points on both graphs

A {-3, 0, 1}

B {-3, -1, 2}

C {-2, 1, 3}

D {1, 5, 11}

2 A function is shown below.

$$f(x) = \begin{cases} -x^2 + 2x & \text{for } x \le -3 \\ 2\left(\frac{1}{3}\right)^{2x} & \text{for } -3 < x < 4 \\ \frac{2x-5}{x-7} & \text{for } x \ge 4 \end{cases}$$

What is the value of the expression $f(-3) + 2f(-1) - f(4)$?

$\left[-(-3)^2 + 2(-3) + 2\left(2\left(\frac{1}{3}\right)^{2(-1)}\right)\right] - \left(\frac{2(4)-5}{4-7}\right)$

$-9 - 6 + 36 - \frac{3}{-3}$

$-9 - 6 + 36 + 1$

$= 22$

A $\frac{101}{36}$

B $\frac{32}{9}$

C 4

D 22

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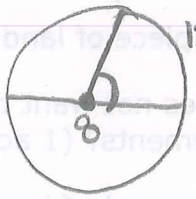
3 The diameter of a circle is 8 centimeters. A central angle of the circle intercepts an arc of 12 centimeters. What is the radian measure of the angle?

$s = r\theta$



$\frac{12}{4} = \frac{4\theta}{4}$

$3 = \theta$

A $\frac{3}{2}$

B 3 ✓

C 4

D 8π

4 To completely cover a spherical ball, a ball company uses a total area of 36 square inches of material. What is the maximum volume the ball can have?

(Note: Surface area of a sphere = $4\pi r^2$. Volume of a sphere = $\frac{4}{3}\pi r^3$.)

Solve for r.

$36 = 4\pi r^2$

$\frac{36}{4\pi} = \frac{4\pi r^2}{4\pi}$

$\frac{9}{\pi} = r^2$

$\frac{3}{\sqrt{\pi}} = r$ → plug r into volume formula

A 27π cubic inches $= 84.82$

B $36\sqrt{\pi}$ cubic inches $= 63.8$

C $\frac{36}{\sqrt{\pi}}$ cubic inches $= 20.31$

D $\frac{27}{\pi}$ cubic inches $= 8.59$

$V = \frac{4}{3}\pi r^3 \rightarrow (4/3)\pi\left(\frac{3}{\sqrt{\pi}}\right)^3$

$\left(\frac{4\pi}{3}\right)\left(\frac{3}{\sqrt{\pi}}\right)^3 = 20.3108$

↑ Check to see which answer choice matches this decimal

5 A farmer wants to buy between 90 and 100 acres of land.

- He is interested in a rectangular piece of land that is 1,500 yards long and 300 yards wide.
- The piece of land is being sold as one complete unit for $87,000.

If the farmer does not want to spend more than $900 an acre, does the land meet all of his requirements? (1 acre ≈ 43,560 ft^2)

A Yes, the amount of land satisfies his needs, and the price is low enough.

B No, the price is low enough, but there is too much land.

C No, the price is low enough, but there is not enough land.

D No, the amount of land satisfies what he needs, but the price is too high.

6 A reporter wants to know the percentage of voters in the state who support building a new highway. What is the reporter's population?

A the number of people who live in the state

B the people who were interviewed in the state

C all voters over 25 years old in the state

D all eligible voters in the state

(5) Calculate the area of land to acres

① $A = l \cdot w$

$A = (900)(4500)$

$A = 4{,}050{,}000\ ft.$

(*) Feet to acres

② $\frac{4{,}050{,}000}{43{,}560} = 92.975$ acres

This is between 90 & 100 ✓ amount of land is satisfied

(*) Price per acre

② $\frac{87000}{92.975} = \$935.73$ per Acre ← Too much

D

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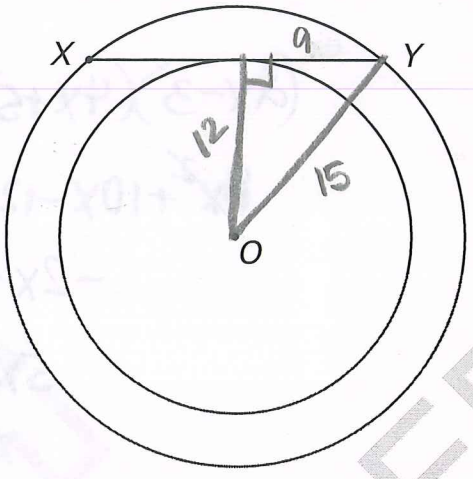
7 The figure below shows concentric circles, both centered at *O*.



$15^2 = 12^2 + x^2$

$9 = x$

$9 + 9 = 18$

- Chord *XY* is tangent to the smaller circle.
- The radius of the larger circle is 15 cm.
- The radius of the smaller circle is 12 cm.

What is the length of chord *XY*?

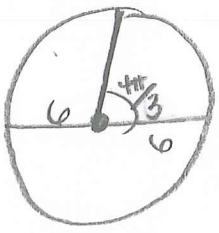
A 27 cm

B 24 cm

C 18 cm

D 10 cm

8 What is the ***approximate*** length of the arc subtended by an angle of $\frac{4\pi}{3}$ radians on a circle with a radius of 6.00 meters?



$S = r\theta$

$S = 6\left(\frac{4\pi}{3}\right)$

$S = 25.13$

A 12.57 meters

B 14.14 meters

C 25.13 meters

D 28.27 meters

Go to the next page.

* Plug in answer choices

9 What is the solution to the equation $\frac{2x-3}{x-1} = \frac{8x+1}{4x+5}$?

A $-\frac{14}{5}$

B $-\frac{14}{9}$

C $\frac{14}{9}$

D $\frac{14}{5}$

$(2x-3)(4x+5) = (x-1)(8x+1)$

$8x^2+10x-12x-15 = 8x^2+x-8x-1$

$-2x-15 = -7x-1$

$5x = 14$

$x = 14/5$

10 Which expression is equivalent to $\frac{x+7}{x^2+4x-21} \div \frac{x+5}{x^2+8x+15}$ when x is restricted so that the expressions are defined?

A $\frac{x+3}{x-3}$

B $\frac{x-3}{x+3}$

C 1

D -1

copy change flip

$\frac{x+7}{x^2+4x-21} \cdot \frac{x^2+8x+15}{x+5}$

$\frac{(x+7)}{(x+7)(x-3)} \cdot \frac{(x+5)(x+3)}{(x+5)}$

$\frac{x+3}{x-3}$

11 Which function has a point of discontinuity at $x = 3$ when graphed?

A $f(x) = \begin{cases} 3x + 1 & \text{for } x < 3 \\ x^2 + 1 & \text{for } x \geq 3 \end{cases}$ → closed circle → continuous

B $f(x) = |x - 3| + 2$ → continuous graph

C $f(x) = \frac{x - 3}{x^2}$ → has a value @ $x=3$

D $f(x) = \frac{x + 2}{x^2 - 9}$ → $\frac{x+2}{(x-3)(x+3)}$ → Error when graphed @ $x=3$

12 Joshua is constructing a triangle with a circle inscribed in it. Each vertex of the triangle will have a line passing through it bisecting the angle. No matter where he places the third vertex, the following conditions will be true:

- Each line will always bisect its corresponding vertex angle.
- The three lines will always intersect at the center of the circle.
- The circle will always be inscribed in the triangle. ↳ inside

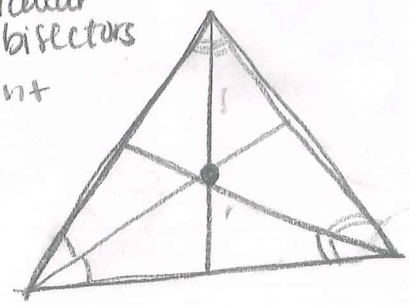
Which type of center exists where the three lines intersect?

A centroid — medians meet

B circumcenter — perpendicular bisectors

C midpoint — middle point of line

D incenter — angle bisectors



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13 The function $y = a(1.20)^t$ models the value of an investment after t years. Based on the function, what is the ***approximate*** monthly interest rate?

A 8.9%

B 8.3%

C 1.5%

D 1.0%

$y = a(1+r)^t$

$y = a(1+0.20)^t$

$\frac{0.20}{12} = 0.016$

1.6%

divide by 12 because of monthly there are 12 months per yr.

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NC Math 3
RELEASED Items[1]
2017–2018
Answer Key

Item Number	Type[2]	Key	Standard
1	MC	B	A-REI.11
2	MC	D	F-IF.2
3	MC	B	F-TF.1
4	MC	C	G-MD.3
5	MC	D	G-MG.1
6	MC	D	S-IC.1
7	MC	C	G-C.2
8	MC	C	F-TF.1
9	MC	D	A-REI.2
10	MC	A	A-APR.7b
11	MC	D	F-IF.7
12	MC	D	G-CO.10
13	MC	C	A-SSE.3

This is the end of the NC Math 3 Released Items.

Directions:

1. **Look back over your answers for the test questions.**
2. **Make sure all your answers are entered on the answer sheet. Only what is entered on your answer sheet will be scored.**
3. **Put all of your papers inside your test book and close the test book.**
4. **Place your calculator on top of the test book.**
5. **Stay quietly in your seat until your teacher tells you that testing is finished.**
6. **Remember, teachers are not allowed to discuss items from the test with you, and you are not allowed to discuss with others any of the test questions or information contained within the test.**