| Released Items |

Student Name: _____

NC Math 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 $\frac{1}{12}f(x) = g(x)$?

    A $\{^-3, 0, 1\}$

    B $\{^-3, ^-1, 2\}$

    C $\{^-2, 1, 3\}$

    D $\{1, 5, 11\}$

2. A function is shown below.

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

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

    A $\frac{101}{36}$

    B $\frac{32}{9}$

    C   4

    D   22

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?

   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 $= \frac{4}{3}\pi r^3$.)

   A 27π cubic inches

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

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

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

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 ft²)

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

7   The figure below shows concentric circles, both centered at *O.*
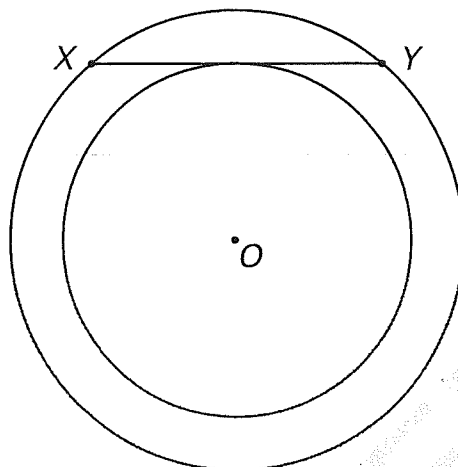
- Chord *XY* is tangent to the smaller circle.
- The radius of the larger circle is 15 cm.
- The radius of the smaller circle is 12 cm.

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?

A   12.57 meters

B   14.14 meters

C   25.13 meters

D   28.27 meters

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

A $\dfrac{^{-}14}{5}$

B $\dfrac{^{-}14}{9}$

C $\dfrac{14}{9}$

D $\dfrac{14}{5}$

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

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

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

C   1

D $^{-}1$

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

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

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

C $f(x) = \dfrac{x - 3}{x^2}$

D $f(x) = \dfrac{x + 2}{x^2 - 9}$

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.

Which type of center exists where the three lines intersect?

A   centroid

B   circumcenter

C   midpoint

D   incenter

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%