Released Items

Student Name: _____

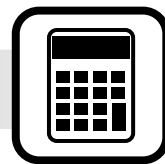## NC Math 3

3

2017–2018

NC Final Exam

1   Let $f(x) = 14x^3 + 28x^2 - 46x$ and $g(x) = 2x + 7$. Which is the solution set to the equation $\frac{1}{12}f(x) = g(x)$?
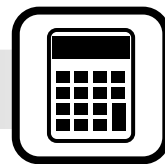
A $\{^-3, 0, 1\}$

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

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

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

2   A function is shown below.

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

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

A $\frac{101}{36}$
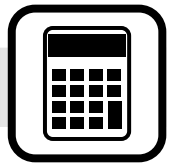
B $\frac{32}{9}$

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 $\dfrac{3}{2}$

     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 $\dfrac{36}{\sqrt{\pi}}$ cubic inches
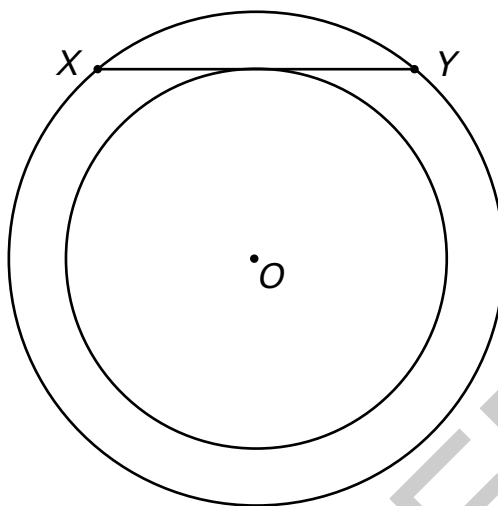
     D $\dfrac{27}{\pi}$ cubic inches

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 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

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

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.

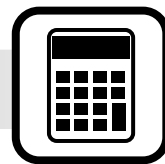- The circle will always be inscribed in the triangle.

Which type of center exists where the three lines intersect?

A   centroid

B   circumcenter

C   midpoint

D   incenter

Go to the next page.

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%

RELEASED

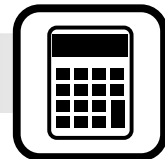**This is the end of the NC Math 3 Released Items.**

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.**

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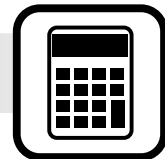## RELEASED Items[1]
2017–2018
Answer Key

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

Standard Descriptions

Only standard descriptions addressed by the released items in this booklet are listed below. A complete list of standards for Mathematics may be reviewed at http://www.ncpublicschools.org/curriculum/mathematics/scos/.

A-SSE.3 (Algebra)
Seeing Structure in Expressions: Write expressions in equivalent forms to solve problems. Write an equivalent form of an exponential expression by using the properties of exponents to transform expressions to reveal rates based on different intervals of the domain.

A-APR.7b (Algebra)
Arithmetic with Polynomial and Rational Expressions: Rewrite rational expressions. Understand the similarities between arithmetic with rational expressions and arithmetic with rational numbers.
b. Multiply and divide two rational expressions.

A-REI.2 (Algebra)
Reasoning with Equations and Inequalities:
Understand solving equations as a process of reasoning and explain the reasoning.
Solve and interpret one variable rational equations arising from a context, and explain how extraneous solutions may be produced.
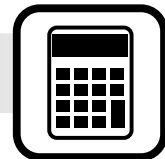
A-REI.11 (Algebra)
Reasoning with Equations and Inequalities: Represent and solve equations and inequalitities graphically.
Extend an understanding that the x-coordinates of the points where the graphs of two equations $y = f(x)$ and $y = g(x)$ intersect are the solutions of the equation $f(x) = g(x)$ and approximate solutions using a graphing technology or successive approximations with a table of values.

F-IF.2 (Algebra)
Interpreting Functions: Understand the concept of a function and use function notation.
Use function notation to evaluate piecewise defined functions for inputs in their domains, and interpret statements that use function notation in terms of a context.

F-IF.7 (Functions)
Interpreting Functions: Analyze functions using different representations.
Analyze piecewise, absolute value, polynomials, exponential, rational, and trigonometric functions (sine and cosine) using different representations to show key features of the graph, by hand in simple cases and using technology for more complicated cases, including: domain and range; intercepts; intervals where the function is increasing, decreasing, positive, or negative; rate of change; relative maximums and minimums; symmetries; end behavior; period; and discontinuities.

F-TF.1 (Functions)
Trigonometric Functions: Extend the domain of trigonometric functions using the unit circle.
Understand radian measure of an angle as:
  •The ratio of the length of an arc on a circle subtended by the angle to its radius.
  •A dimensionless measure of length defined by the quotient of arc length and radius that is a real number.
•The domain for trigonometric functions.

G-CO.10 (Geometry)
Congruence: Prove geometric theorems.
Verify experimentally properties of the centers of triangles (centroid, incenter, and circumcenter).

G-C.2 (Geometry)
Circles: Understand and apply theorems about circles.
Understand and apply theorems about circles.
  •Understand and apply theorems about relationships with angles and circles, including central, inscribed and circumscribed angles.
  •Understand and apply theorems about relationships with line segments and circles including, radii, diameter, secants, tangents and chords.

G-MD.3 (Geometry)
Geometric Measurement & Dimension: Explain volume formulas and use them to solve problems.
Use the volume formulas for prisms, cylinders, pyramids, cones, and spheres to solve problems.

G-MG.1 (Modeling)
Modeling with Geometry: Apply geometric concepts in modeling situations.
Apply geometric concepts in modeling situations.
  •Use geometric and algebraic concepts to solve problems in modeling situations:
  •Use geometric shapes, their measures, and their properties, to model real-life objects.
  •Use geometric formulas and algebraic functions to model relationships.
  •Apply concepts of density based on area and volume.
  •Apply geometric concepts to solve design and optimization problems.

S-IC1 (Statistics and Probability)
Making Inferences and Justifying Conclusions: Understand and evaluate random processes underlying statistical experiments.
Understand the process of making inferences about a population based on a random sample from that population.