Released Items

Published October 2018

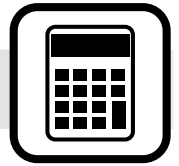# NC Math 3

North Carolina End-of-Course Assessment

Questions 1 and 2 are gridded response items that require you to write your answers in the boxes provided on your answer sheet. Write only one number or symbol in each box and fill in the circle in each column that matches what you have printed. Fill in only one circle in each column.
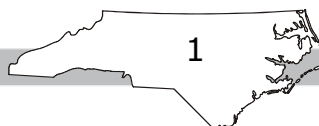
1 What is the remainder when $x^3 - 1$ is divided by $(x + 2)$?

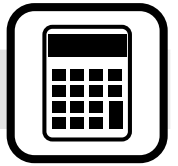2 The function below, $f(x)$, has $(x - 7)$ and $(x + 4i)$ as factors.

$$f(x) = 2x^5 - 13x^4 + 22x^3 - 187x^2 - 160x + 336$$

What is the total number of real zeros of $f(x)$?

Go to the next page.

3 The graph of the function $m(x) = x^3 + 3x^2 - 2x - 4$ has a zero at $^-1$. What are the other zeros of the function?

A $^-2$ and 2

B $^-1$ and 4

C $^-1 \pm \sqrt{5}$

D $1 \pm 2\sqrt{3}$

4 Which expression is equivalent to $(x^2 - 2x - 37) \div (x^2 - 3x - 40)$?
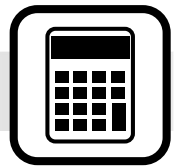
A $1 + \dfrac{x + 3}{x^2 - 3x - 40}$

B $1 - \dfrac{x + 3}{x^2 - 3x - 40}$

C $1 + \dfrac{2x - 37}{x^2 - 3x - 40}$

D $1 - \dfrac{2x - 37}{x^2 - 3x - 40}$

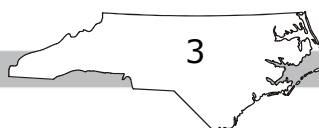5   This is a paper/pencil copy of an online technology enhanced item.

Place (click and drag) into the appropriate boxes the values of A, B, and C that will make the equation shown below true.

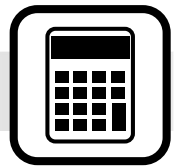$$\frac{3x - 5}{4x + 3} + \frac{^-2x + 1}{7x - 2} = \frac{Ax^2 + Bx + C}{(4x + 3)(7x - 2)}$$

    1   *2*   *3*

A = ☐   B = ☐   C = ☐

1	*2*	*3*
12	⁻31	⁻7
13	⁻33	⁻3
16	⁻43	13
29	⁻51	16

6   Which expression is equivalent to $\dfrac{\left(x^2 - 5x + 6\right)^{-1}}{(x - 2)^{-2}} \div \dfrac{(x - 3)^{-1}}{(x - 2)^{-2}}$?

A $\dfrac{(x - 2)^3}{(x - 3)^2}$

B $\dfrac{(x + 2)^3}{(x + 3)^2}$

C $\dfrac{1}{x - 3}$

D $\dfrac{1}{x - 2}$

7   A company makes and boxes spaghetti.

- One machine fills each box with approximately 32 ounces of spaghetti.
- After the boxes are filled, another machine weighs each box.
- A box is discarded if the weight of the box differs by more than 0.25 ounce from the target weight of 32 ounces.

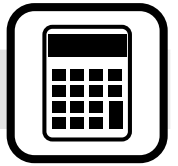Which inequality can be used to find the range of acceptable weights, x, of the spaghetti?
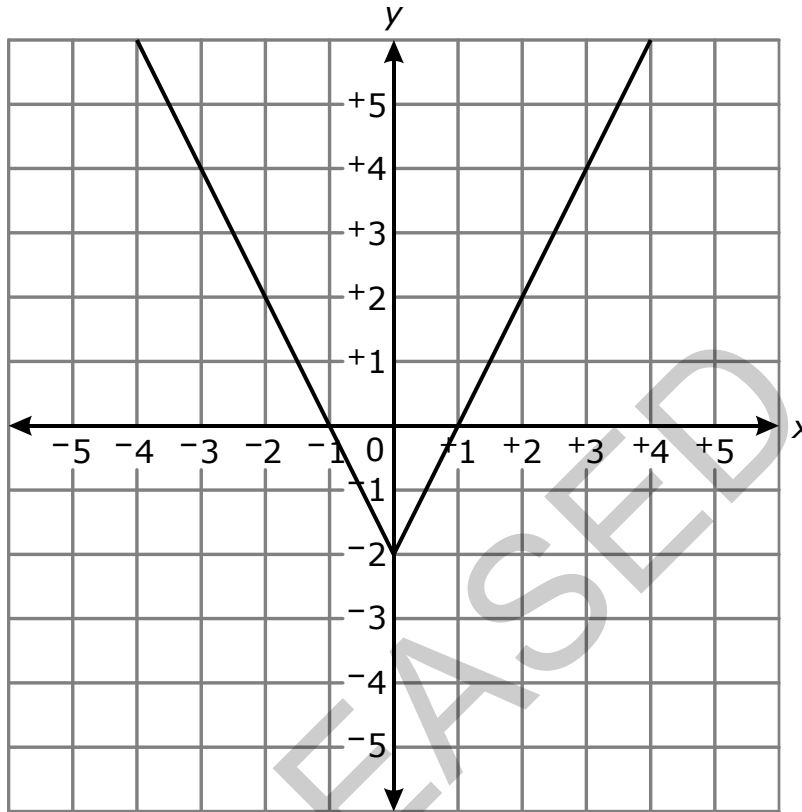
A $|x - 0.25| \le 32$

B $|x + 0.25| \le 32$
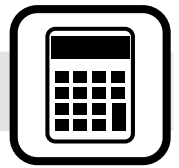
C $|x - 32| \le 0.25$

D $|x + 32| \le 0.25$

8   The graph of an equation is shown below.

Which equation represents the graph?

A $y = |x| - 2$

B $y = |2x| - 2$

C $y = |x - 2|$

D $y = |2x - 2|$

Questions 9 through 10 are gridded response items that require you to write your answers in the boxes provided on your answer sheet. Write only one number or symbol in each box and fill in the circle in each column that matches what you have printed. Fill in only one circle in each column.
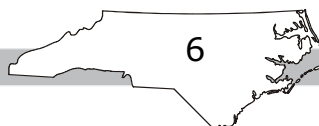
9 Martha can paint a room in 2 hours. Jamie can paint the same room in 6 hours. How long, to the nearest tenth of an hour, will it take them to paint the room together?
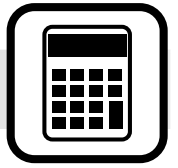
10 Two functions are shown below.

$$f(x) = 2x^3 + 2x - 3$$

$$g(x) = {}^-0.5|x - 4|$$

What is the *y*-value when $f(x) = g(x)$?

11 Which choice is equivalent to the expression shown below?

$$48x^3 - 243xy^2$$
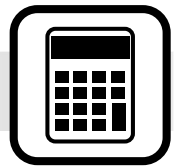
A $\quad 3(4x^2 - 9y)(4x^2 - 9y)$

B $\quad 3(4x^2 - 9y)(4x^2 + 9y)$

C $\quad 3x(4x - 9y)(4x - 9y)$

D $\quad 3x(4x - 9y)(4x + 9y)$

12 A polynomial, $p(x)$, has a lead coefficient of 1 and exactly three distinct zeros.

- $x = {}^-1$ is a zero of multiplicity two
- $x = 2$ is a zero of multiplicity one
- $x = 4$ is a zero of multiplicity one

What choice shows $p(x)$?

A $\quad p(x) = x^3 - 5x^2 + 2x + 8$

B $\quad p(x) = x^3 + 5x^2 + 2x - 8$

C $\quad p(x) = x^4 - 4x^3 - 3x^2 + 10x + 8$

D $\quad p(x) = x^4 + 4x^3 - 3x^2 - 10x + 8$

13 If $f(x) = k(x - 2)^4$, where k is positive, what is the effect on the graph of $f(x)$ as k increases?

   A   The graph of $f(x)$ is shifted up.

   B   The graph of $f(x)$ is shifted down.

   C   The graph of $f(x)$ is stretched vertically.

   D   The graph of $f(x)$ is stretched horizontally.
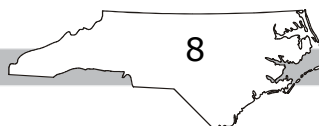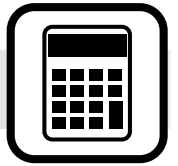
14 Two piecewise functions are shown below.

$$h(x) = \begin{cases} {}^{-}3x & \text{for } x < 2 \\ 4x + 1 & \text{for } x \geq 2 \end{cases}$$

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

What is the value of $3h(2) + 4g(1)$?

   A   39
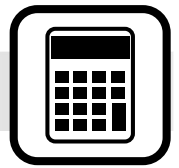
   B   28

   C   10

   D   ⁻6

Question 15 is a gridded response item that requires you to write your answer in the boxes provided on your answer sheet. Write only one number or symbol in each box and fill in the circle in each column that matches what you have printed. Fill in only one circle in each column.

15   A function is shown below.

$$h(x) = \begin{cases} \dfrac{-1}{2}x - 15 & \text{for } x \le {}^{-}4 \\ 20 - 3x^2 & \text{for } x > {}^{-}4 \end{cases}$$
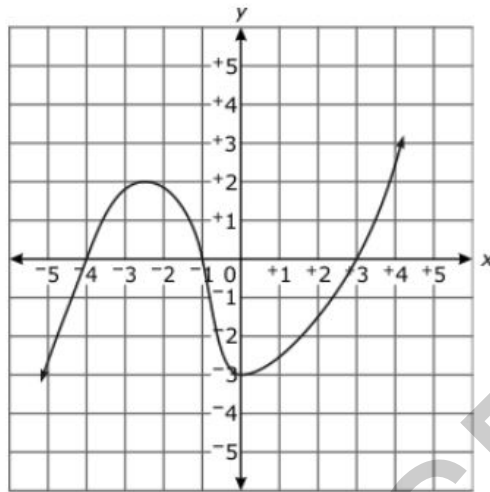
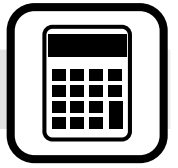What is the value of $h({}^{-}4) + 3h({}^{-}2)$?

16   This is a paper/pencil copy of an online technology enhanced item.

The graph of a function is shown below.

Place (click and drag) each interval into the column that describes the function on that interval.

Decreasing	Increasing	Positive	Negative

| (⁻4, ⁻1)	[⁻2, 0)	(0, 2]	(0, 4]

Question 17 is a gridded response item that requires you to write your answer in the boxes provided on your answer sheet. Write only one number or symbol in each box and fill in the circle in each column that matches what you have printed. Fill in only one circle in each column.

17   A function is shown below.

$$H(x) = 4x^3 - 5x^2 - 23x + 6$$

What is the distance, to the nearest hundredth of a unit, between the two zeros that are closest to each other?

Go to the next page.
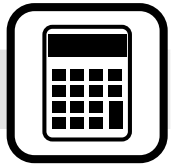
18   Which function does **not** have the set of all real numbers as its domain?

A $f(x) = 5^x - 3$

B $f(x) = \dfrac{x + 1}{x + 3}$

C $f(x) = |2x - 1|$

D $f(x) = \cos(x) + 1$

19   An equation is shown below.

$$9^{-3x + 2} = 48$$

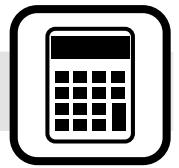What is the value of x to the nearest ten-thousandth?
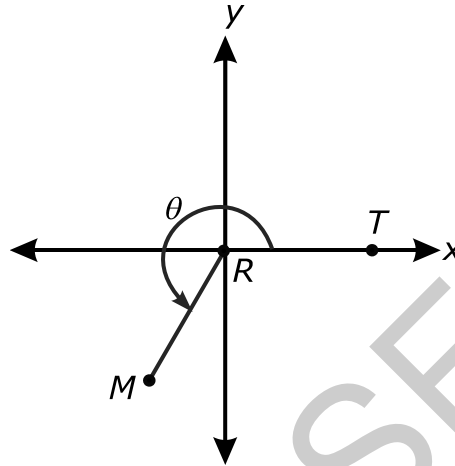
A   0.0794

B   0.0995

C   0.4243
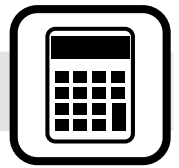
D   0.4774

20   The diagram below shows an angle, θ, graphed in the *xy*-coordinate plane.
     Segment *RT* is the initial side of the angle, and segment *RM* is the terminal side.
     Segments *RT* and *RM* are radii of the unit circle centered at the origin *R*(0, 0).

The *x*-coordinate of point *M* is $\frac{-1}{2}$. What is the measure of θ to the nearest thousandth of a radian?

A   4.712

B   4.189

C   3.927

D   3.665

21　This is a paper/pencil copy of an online technology enhanced item.

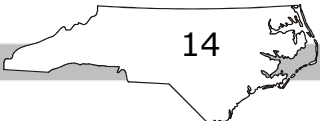A function, $f(x) = A\sin(Bx) + H$, has the following properties:

- a period of 6,
- a minimum value of 2,
- $f(2.5) = 5$, and
- A, B, and H are all positive constants.

Place (click and drag) values into the appropriate cells below that will create this function.
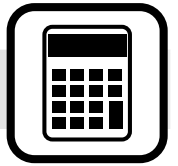
	1		2		3
A =	☐	B =	☐	H =	☐

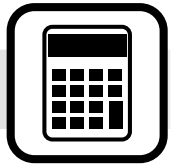| 1	2	3
2	$\frac{\pi}{2}$	2
3	$\frac{\pi}{3}$	4
4	$\frac{\pi}{4}$	6
5	$\frac{\pi}{6}$	8

Go to the next page.

22 The vertices of a triangle are at (0, 0), (6, 6), and (9, 3). What is the volume, in cubic units, of the figure created by rotating the triangle about $y = x$?

A $\quad 54\sqrt{2}$

B $\quad 324\sqrt{2}$

C $\quad 36\pi\sqrt{2}$

D $\quad 108\pi\sqrt{2}$

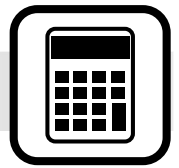**Question 23 is a gridded response item that requires you to write your answer in the boxes provided on your answer sheet. Write only one number or symbol in each box and fill in the circle in each column that matches what you have printed. Fill in only one circle in each column.**

23   In parallelogram *MNPT*, $m\angle M = (6x + 10)°$ and $m\angle N = (5x + 10.5)°$. How many degrees is $\angle T$?

Go to the next page.

24 In rectangle *FGHI*, diagonals $\overline{FH}$ and $\overline{GI}$ intersect at *E*.
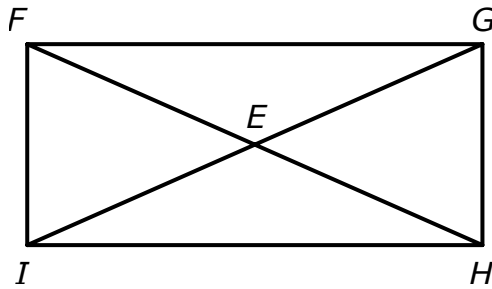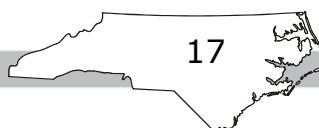

- *IE* = 3*x* + 4

- *EG* = 5*x* – 6

What is the length of $\overline{FH}$?
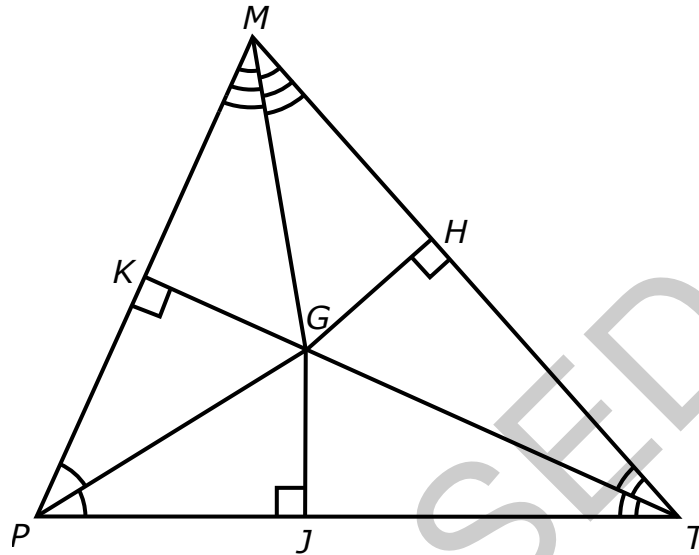
A   5 units

B   10 units

C   19 units

D   38 units
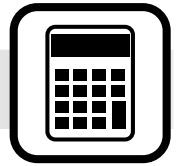
Go to the next page.

25   Triangle *PMT* is shown below.

- $m\overline{GH} = x + 3$
- $m\overline{PG} = 4x + 1$
- $m\overline{GJ} = 2x - 1$

What is the measure of segment *PG*?

A   4 units

B   7 units

C   14 units

D   17 units

26 What is the length of a radius of the circle represented by the equation
$x^2 + y^2 - 4x - 4y + 4 = 0$?

A   2 units

B   4 units

C   8 units

D   16 units

27 David plans to cover the floor of his room with new material.

- The floor is an isosceles trapezoid whose bases are 16 feet and 26 feet and sides are 13 feet in length.
- Each piece of new material has an area of 2.5 square feet.

Assuming the pieces of new material can be cut as needed, how many pieces does David need?

A   101

B   126

C   202

D   252

28 Which method is **most likely** to produce a random sample of 5 students from a school club?

A   selecting 5 club members who have brown hair

B   selecting the 5 club members who have raised the most funds for the club

C   selecting 5 club members from a hat containing the names of all members

D   selecting the 5 club members who arrive last to a club meeting
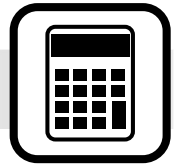
29   This is a paper/pencil copy of an online technology enhanced item.

A high school randomly selected 75 of the 200 seniors at the school to take a sample college entrance exam. The mean grade point average (GPA) of the seniors selected was 2.85, and the standard deviation was 0.4. Select (click) all of the statements that are true.

(Note: Margin of error $\approx 2\frac{s}{\sqrt{n}}$, where s is the standard deviation and n is the sample size.)

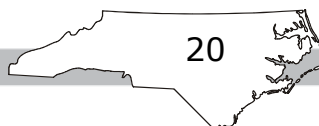The margin of error for the mean grade point average is about 0.057.

The margin of error for the mean grade point average is about 0.092.

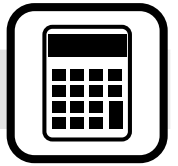The margin of error would decrease if the sample size were changed to 125 seniors.

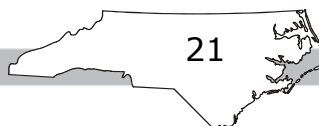The margin of error would increase if the sample size were changed to 125 seniors.

Selected:

30   The police chief of a town is trying to determine the average speed of drivers on a specific road.

- The police chief took a random sample of the speeds of 100 drivers on the road.

- The mean was 48.5 miles per hour, with a standard deviation of 2.5 miles per hour.

- The police chief wanted to decrease the margin of error of his next sample.

Which choice would decrease the margin of error?

(Note: margin of error $\approx 2\dfrac{s}{\sqrt{n}}$ where s is the sample standard deviation and n is the sample size.)

A   decreasing the sample size

B   increasing the sample size

C   changing the time that the data is collected

D   changing the road on which the data is collected

This is the end of the NC Math 3 released items.

NC Math 3 Released Items
2018–2019
Answer Key

Calculator Active

Question Number	Question Type[1]	Correct Answer	Standard	DOK[2]
1	GR	–9	NC.M3.A-APR.2	2
2	GR	3	NC.M3.A-APR.3	2
3	MC	C	NC.M3.A-APR.3	2
4	MC	A	NC.M3.A-APR.6	1
5	TD	Online only	NC.M3.A-APR.7.a	1
6	MC	D	NC.M3.A-APR.7.b	1
7	MC	C	NC.M3.A-CED.1	2
8	MC	B	NC.M3.A-CED.2	2
9	GR	1.5	NC.M3.A-REI.2	2
10	GR	$\frac{-7}{4}$	NC.M3.A-REI.11	1
11	MC	D	NC.M3.A-SSE.2	1
12	MC	C	NC.M3.F-BF.1.a	1
13	MC	C	NC.M3.F-BF.3	1

Go to the next page.

Question Number	Question Type[1]	Correct Answer	Standard	DOK[2]
14	MC	A	NC.M3.F-IF.2	2
15	GR	11	NC.M3.F-IF.2	1
16	DD	Online only	NC.M3.F-IF.4	2
17	GR	2.25	NC.M3.F-IF.7	2
18	MC	B	NC.M3.F-IF.7	2
19	MC	A	NC.M3.F-LE.4	2
20	MC	B	NC.M3.F-TF.2.b	2
21	TD	Online only	NC.M3.F-TF.5	3
22	MC	C	NC.M3.G-GMD.4	3
23	GR	83	NC.M3.G-CO.14	2
24	MC	D	NC.M3.G-CO.14	2
25	MC	D	NC.M3.G-CO.14	2
26	MC	A	NC.M3.G-GPE.1	2
27	MC	A	NC.M3.G-MG.1	2
28	MC	C	NC.M3.S-IC.1	1

Question Number	Question Type[1]	Correct Answer	Standard	DOK[2]
29	TI	Online only	NC.M3. S-IC.4	2
30	MC	B	NC.M3. S-IC.4	2

Question	Technology Enhanced Item Solution
5	A = 13, B = $^-$43, C = 13
16	$\left[^-2, 0\right), \left(0, 4\right], \left(^-4, ^-1\right), \left(0, 2\right]$
21	A = 2, B = $\frac{\pi}{3}$, H = 4
29	Sentence 2, 3

[1]Question Type:
  MC = multiple choice
  GR = gridded response (requiring numerical response)
  DD = drag and drop
  TD = targeted drop
  TI = text identify

[2]DOK:
  1 = Recall
  2 = Skill/Concept
  3 = Strategic Thinking

Note for Gridded Response Items: Only 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, . , -, and / are allowed in your answer. Answers that are mixed numbers must be entered as an improper fraction or decimal.

STOP