

Released Form

Student Name: \_\_\_\_\_

Spring 2013  
North Carolina  
Measures of Student Learning:  
NC's Common Exams  
**Common Core Math II**



# Student Booklet



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



- 1 The equation  $s = 2\sqrt{5x}$  can be used to estimate the speed,  $s$ , of a car in miles per hour, given the length in feet,  $x$ , of the tire marks it leaves on the ground. A car traveling 90 miles per hour came to a sudden stop. According to the equation, how long would the tire marks be for this car?
- A 355 feet  
B 380 feet  
C 405 feet  
D 430 feet
- 2 The heights of two different projectiles after they are launched are modeled by  $f(x)$  and  $g(x)$ . The function  $f(x)$  is defined as  $f(x) = -16x^2 + 42x + 12$ . The table contains the values for the quadratic function  $g$ .

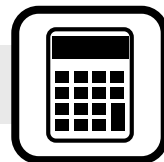
$x$	$g(x)$
0	9
1	33
2	25

What is the **approximate** difference in the maximum heights achieved by the two projectiles?

- A 0.2 feet  
B 3.0 feet  
C 5.4 feet  
D 5.6 feet



- 3 A city map is placed on a coordinate grid. The post office is located at the point  $P(5, 35)$ , the library is located at the point  $L(15, 10)$ , and the fire station is located at the point  $F(9, 25)$ . What is the ratio of the length of  $\overline{PF}$  to the length of  $\overline{LF}$ ?
- A 2 : 3  
B 3 : 2  
C 2 : 5  
D 3 : 5
- 4 Twenty-one students at a school have an allergy to peanuts, shellfish, or both.
- Fourteen students at the school are allergic to peanuts.
  - Twelve students at the school are allergic to shellfish.
- How many of the students are allergic to both peanuts and shellfish?
- A 12  
B 7  
C 5  
D 2
- 5 Events  $M$  and  $N$  have probabilities such that  $P(M) = 0.4$ ,  $P(N) = 0.28$ ,  $P(M \cup N) = 0.56$ , and  $P(M \cap N) = 0.12$ . Are event  $M$  and event  $N$  independent?
- A no, because  $P(M) - P(N) = P(M \cap N)$   
B no, because  $P(M) \cdot P(N) \neq P(M \cap N)$   
C yes, because  $P(M) + P(N) = P(M \cup N)$   
D yes, because  $P(M) \cdot P(N) \neq P(M \cup N)$



6 Which expression is equivalent to  $(3x^5 + 17x^3 - 1) + (-2x^5 - 6)$ ?

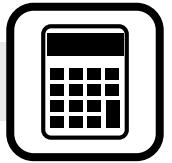
A  $x^5 + 17x^3 - 7$

B  $x^5 - 11x^3 - 1$

C  $5x^5 + 17x^3 + 7$

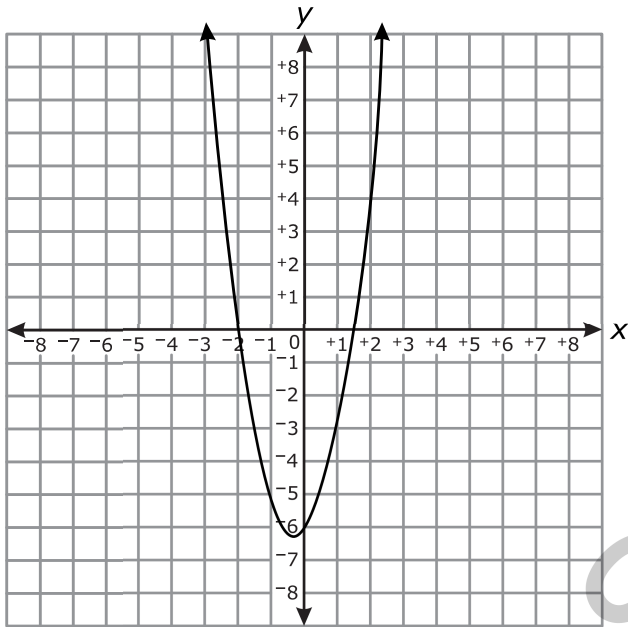
D  $-6x^5 + 17x^3 + 6$

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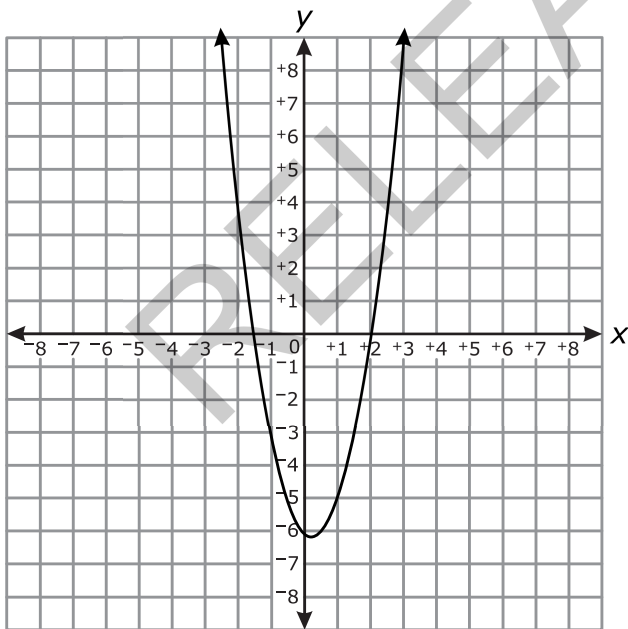


7 Which graph displays the function  $f(x) = (2x + 3)(x - 2)$ ?

A



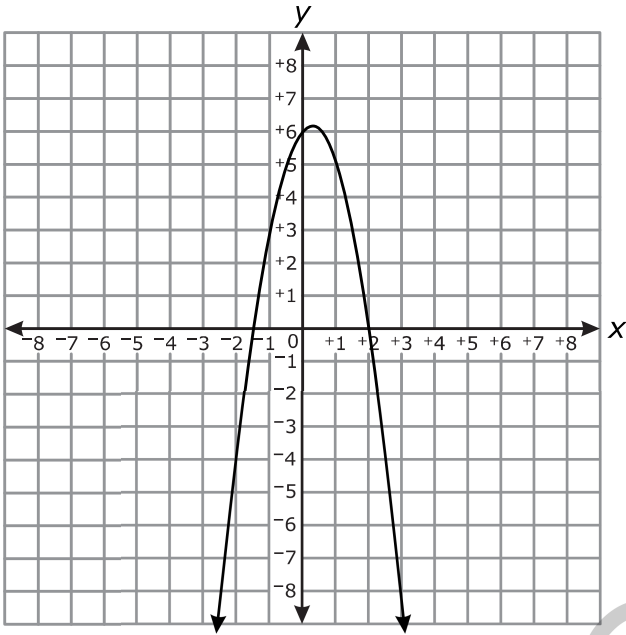
B



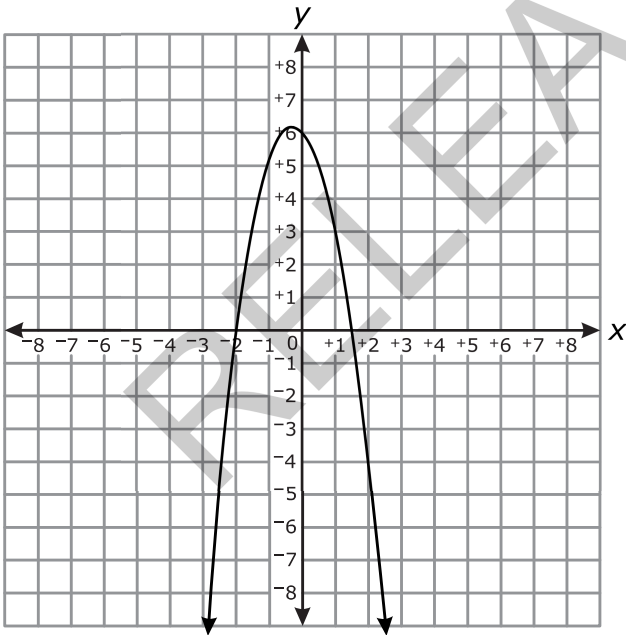
Answer choices C and D are on the following page.



C

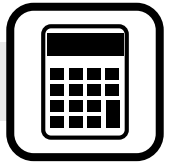


D





- 8 The sum of two numbers is 24. The sum of the squares of the two numbers is 306. What is the product of the two numbers?
- A 119  
B 128  
C 135  
D 144
- 9 Which equation has exactly one real solution?
- A  $4x^2 - 12x - 9 = 0$   
B  $4x^2 + 12x + 9 = 0$   
C  $4x^2 - 6x - 9 = 0$   
D  $4x^2 + 6x + 9 = 0$
- 10 A circular pond is modeled by the equation  $x^2 + y^2 = 225$ . A bridge over the pond is modeled by a segment of the equation  $x - 7y = -75$ . What are the coordinates of the points where the bridge meets the edge of the pond?
- A (9, 12) and (-12, 9)  
B (9, 12) and (12, 9)  
C (9, -12) and (-12, -9)  
D (-9, 12) and (12, -9)

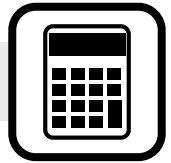


- 11 The volume,  $V$ , of a certain gas varies inversely with the amount of pressure,  $P$ , placed on it. The volume of this gas is  $175 \text{ cm}^3$  when  $3.2 \text{ kg/cm}^2$  of pressure is placed on it. What amount of pressure must be placed on  $400 \text{ cm}^3$  of this gas?
- A  $1.31 \text{ kg/cm}^2$
- B  $1.40 \text{ kg/cm}^2$
- C  $2.86 \text{ kg/cm}^2$
- D  $7.31 \text{ kg/cm}^2$
- 12 A company manufactures DVDs.
- The company spent \$247,000 to develop its process for manufacturing the DVDs.
  - The company spends an additional \$1.25 to manufacture each DVD.

Which function represents the average total cost per DVD,  $y$ , for the company to manufacture  $x$  total DVDs?

- A  $y = \frac{x}{1.25x}$
- B  $y = \frac{1.25x}{x}$
- C  $y = \frac{x}{1.25x + 247,000}$
- D  $y = \frac{1.25x + 247,000}{x}$





- 13 For a carnival game, a jar contains 20 blue marbles and 80 red marbles.
- Children take turns randomly selecting a marble from the jar.
  - If a blue marble is chosen, the child wins a prize.
  - After each turn, the marble is replaced.
  - Casey has drawn six red marbles in a row.

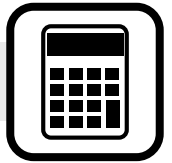
Which statement is true?

- A If Casey selects another red marble, then 2 of her next 3 picks will be blue marbles because 2 blue marbles are selected for every 8 red marbles selected.
- B The probability that Casey selects a blue marble on the next turn is higher than it was on her last turn because she has chosen so many red marbles in a row.
- C The probability that Casey selects a blue marble on her next turn is the same as it was on the last turn because selections are independent of each other.
- D If Casey draws 4 more times, she will select 2 blue marbles because the probability that a blue marble will be selected is 2 out of every 10 turns.
- 14 A plane intersects a regular triangular pyramid. The plane is parallel to one of the faces of the pyramid. What type of polygon is formed at the intersection?
- A square
- B right triangle
- C isosceles trapezoid
- D isosceles triangle

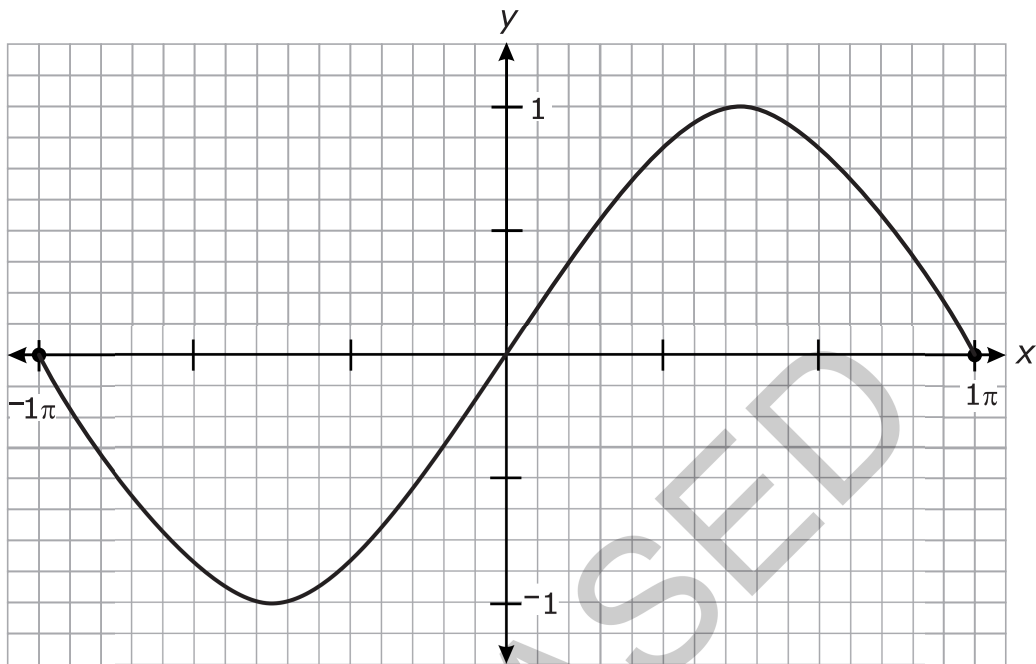


- 15 The number of bacteria in a culture can be modeled by the function  $N(t) = 28t^2 - 30t + 160$ , where  $t$  is the temperature, in degrees Celsius, the culture is being kept. A scientist wants to have fewer than 200 bacteria in a culture in order to test a medicine effectively. What is the **approximate** domain of temperatures that will keep the number of bacteria under 200?
- A  $-1.01^\circ\text{C} < t < 2.03^\circ\text{C}$
- B  $-0.90^\circ\text{C} < t < 1.97^\circ\text{C}$
- C  $-0.86^\circ\text{C} < t < 1.93^\circ\text{C}$
- D  $-0.77^\circ\text{C} < t < 1.85^\circ\text{C}$

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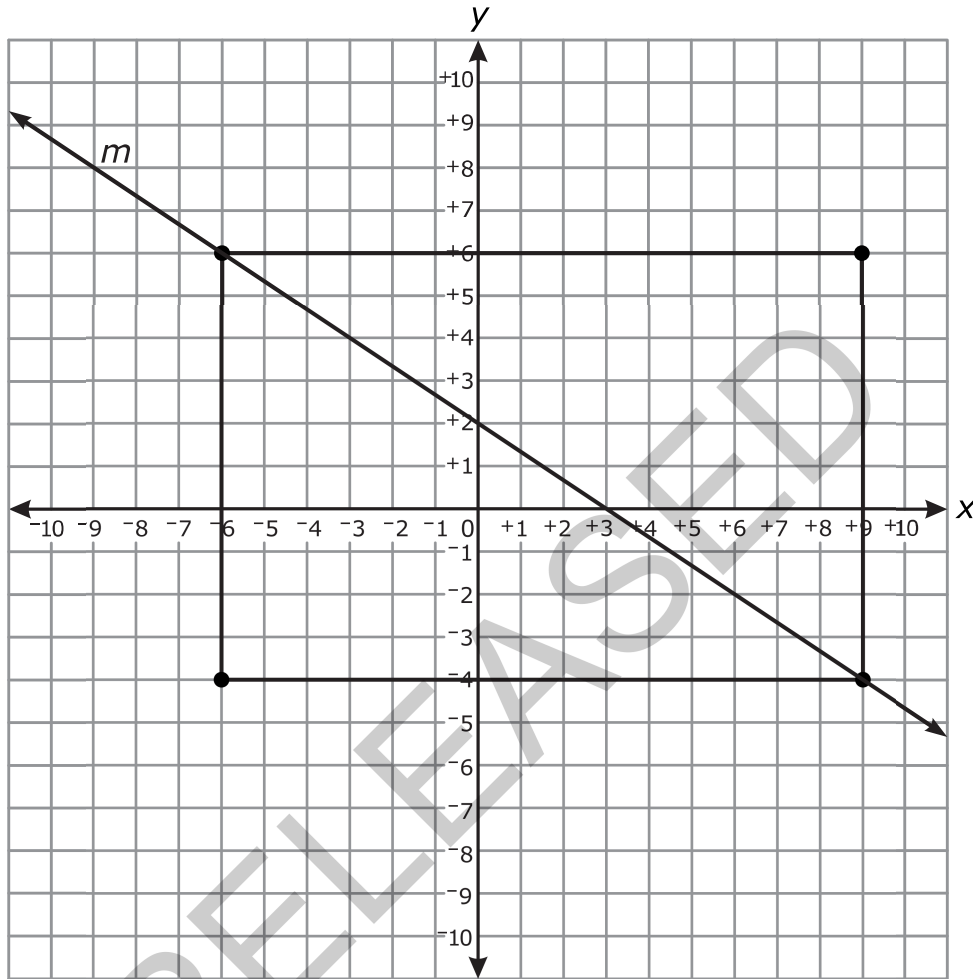
16 Which function is graphed below?



- A  $y = \sin x$
- B  $y = \cos x$
- C  $y = \tan x$
- D  $y = \cot x$



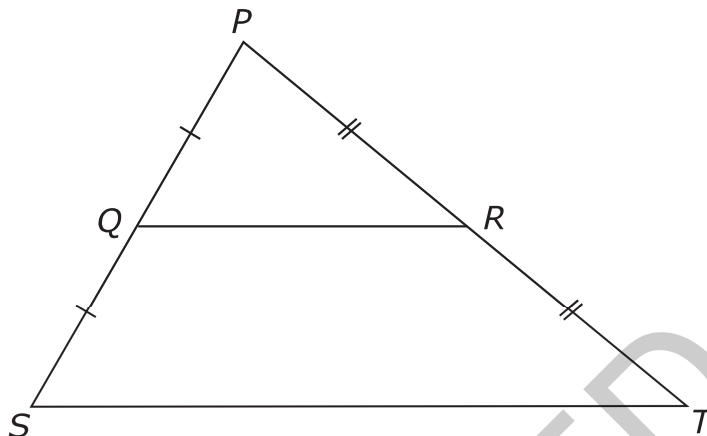
17 Which transformation will carry the rectangle shown below onto itself?



- A a reflection over line  $m$
- B a reflection over the line  $y = 1$
- C a rotation  $90^\circ$  counterclockwise about the origin
- D a rotation  $270^\circ$  counterclockwise about the origin



- 18 Which statement must be true about the triangle below?



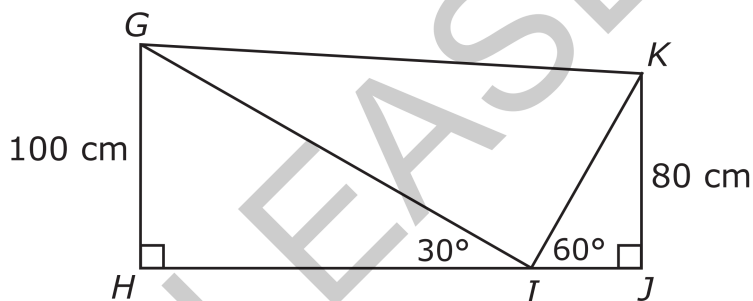
- A  $PQ + QS = PR + RT$
- B  $\triangle PQR \cong \triangle PST$
- C  $ST = 2 \cdot QR$
- D  $\angle S \cong \angle T$
- 19 The graph of  $f(x) = x^2$  will be translated 5 units up and 2 units to the right. Which function describes the graph produced by the translation?
- A  $g(x) = x^2 - 4x + 9$
- B  $g(x) = x^2 + 4x - 1$
- C  $g(x) = x^2 - 10x + 27$
- D  $g(x) = x^2 + 10x + 23$



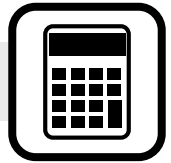
- 20 An investment has a balance of \$2,000 and earns 3.2% interest each year. If \$150 is added at the end of each year by the account holder and no money is withdrawn from the investment, which represents a function that can be used to calculate the investment balance for successive years?

- A  $B_n = 0.032B_{n-1} + 2,000, B_0 = 150$   
B  $B_n = 0.032B_{n-1} + 150, B_0 = 2,000$   
C  $B_n = 1.032B_{n-1} + 2,000, B_0 = 150$   
D  $B_n = 1.032B_{n-1} + 150, B_0 = 2,000$

- 21 What is the **approximate** length of  $\overline{HJ}$  in the diagram below?



- A 292 cm  
B 265 cm  
C 219 cm  
D 196 cm



- 22 Angles  $F$  and  $G$  are complementary angles.
- As the measure of angle  $F$  varies from a value of  $x$  to a value of  $y$ ,  $\sin(F)$  increases by 0.2.

How does  $\cos(G)$  change as  $F$  varies from  $x$  to  $y$ ?

- A It increases by a greater amount.
- B It increases by the same amount.
- C It increases by a lesser amount.
- D It does not change.
- 23 If  $t$  is an unknown constant, which binomial must be a factor of  $7m^2 + 14m - tm - 2t$ ?
- A  $7m + t$
- B  $m - t$
- C  $m + 2$
- D  $m - 2$
- 24 The value,  $V$ , of a car can be modeled by the function  $V(t) = 13,000(0.82)^t$ , where  $t$  is the number of years since the car was purchased. To the nearest tenth of a percent, what is the monthly rate of depreciation?
- A 1.5%
- B 1.6%
- C 9.2%
- D 18.0%



25 Which expression is equivalent to  $\left(\frac{16x^{\frac{1}{6}}y^{-2}}{x^{-\frac{1}{6}}y^6}\right)^{\frac{3}{2}}$ ?

A  $24x^{\frac{9}{2}}y^{\frac{9}{2}}$

B  $\frac{24x^{\frac{3}{4}}}{y^9}$

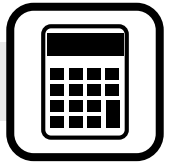
C  $\frac{64}{x^{\frac{1}{2}}y^8}$

D  $\frac{64x^{\frac{1}{2}}}{y^{12}}$

**This is the end of the multiple-choice portion of the test.**

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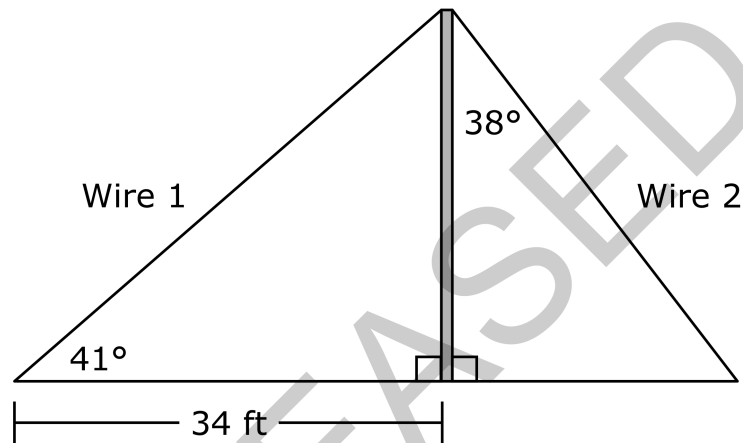




The questions you read next will require you to answer in writing.

1. Write your answers on separate paper.
2. Be sure to write your name on each page.

- 1 In the figure below, a pole has two wires attached to it, one on each side, forming two right triangles.



Based on the given information, answer the questions below.

- How tall is the pole?
  - How far from the base of the pole does Wire 2 attach to the ground?
  - How long is Wire 1?
- 2 The amount of time it takes to build a road varies inversely with the number of workers building the road. Suppose it takes 50 workers 8 months to build the road.
- What is the constant of variation?
  - Write an equation that could be used to determine how long it would take  $n$  workers to build the road. (Be sure to define the variables.)
  - How much faster would 60 workers build the road than 50 workers?



- 3 The function  $f(x)$  is defined as  $f(x) = x^2 + 2x - 4$ . The function  $g(x)$  is defined as  $g(x) = -3f(x) + 2$ .
- Graph  $g(x)$  for  $-2 \leq x \leq 2$ .
  - Describe the transformations that take the function  $f(x)$  onto  $g(x)$ .
  - Write a new function,  $h(x)$ , that transforms  $g(x)$  back onto  $f(x)$ .

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**This is the end of the Common Core Math II test.**

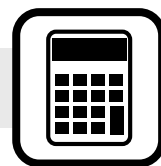
- 1. Look back over your answers.**
- 2. Put all of your papers inside your test book and close the test book.**
- 3. Place your calculator on top of the test book.**
- 4. Stay quietly in your seat until your teacher tells you that testing is finished.**

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**Common Core Math II**  
**RELEASED Form**  
**Spring 2013**  
**Answer Key**

Item number	Type	Key	Conceptual Category
1	MC	C	F — Function
2	MC	D	F — Function
3	MC	A	G — Geometry
4	MC	C	S — Statistics and Probability
5	MC	B	S — Statistics and Probability
6	MC	A	A — Algebra
7	MC	B	A — Algebra
8	MC	C	A — Algebra
9	MC	B	A — Algebra
10	MC	A	A — Algebra
11	MC	B	A — Algebra
12	MC	D	A — Algebra
13	MC	C	S — Statistics and Probability
14	MC	D	G — Geometry
15	MC	D	F — Function
16	MC	A	F — Function
17	MC	B	G — Geometry
18	MC	C	G — Geometry
19	MC	A	F — Function
20	MC	D	F — Function
21	MC	C	G — Geometry
22	MC	B	G — Geometry
23	MC	C	A — Algebra



Item number	Type	Key	Conceptual Category
24	MC	B	A — Algebra
25	MC	D	N — Number and Quantity
26	CR	Rubric	G — Geometry
27	CR	Rubric	A — Algebra
28	CR	Rubric	F — Function

**Item Types:**

MC = multiple choice

CR = constructed response

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