

Office of Catholic Schools

Algebra I

**Section 2 – No Calculator**

**Teacher Key**

**45 Minutes**

OCS Algebra 1  
Teacher Key

Teacher Key			
Item	Unit	Benchmark	Correct Answer
28.	Relations & Functions	Evaluate linear, exponential, and quadratic functions, expressed in function notation	C
29.	Relations & Functions	Evaluate linear, exponential, and quadratic functions, expressed in function notation	A
30.	Relations & Functions	Make connections between different representations (graphs, equations, tables, list of ordered pairs) of relationships between two variables	D
31.	Relations & Functions	Determine key parts of a function given a graph (intercepts, maximum and minimum)	C
32.	Relations & Functions	Determine key parts of a function given a graph (intercepts, maximum and minimum)	A
33.	Relations & Functions	Determine domain and range of different function representations (graphs, list of ordered pairs)	D
34.	Relations & Functions	Determine domain and range of different function representations (graphs, list of ordered pairs)	A
35.	Relations & Functions	Given an equation or function, find an equation or function whose graph is a translation by a specified amount	B
36.	Exponents, Radicals, and Polynomials	Apply properties of integer exponents with variables and constant bases to simplify expressions	D
37.	Exponents, Radicals, and Polynomials	Apply properties of integer exponents with variables and constant bases to simplify expressions	C
38.	Exponents, Radicals, and Polynomials	Apply properties of rational exponents to simplify expressions	A
39.	Exponents, Radicals, and Polynomials	Apply properties of rational exponents to simplify expressions	B
40.	Exponents, Radicals, and Polynomials	Convert between radical and exponential forms of expressions	A
41.	Exponents, Radicals, and Polynomials	Convert between radical and exponential forms of expressions	D
42.	Exponents, Radicals, and Polynomials	Simplify radical single terms	B
43.	Exponents, Radicals, and Polynomials	Simplify radical expressions	C
44.	Exponents, Radicals, and Polynomials	Simplify radical expressions	B
45.	Exponents, Radicals, and Polynomials	Add, subtract, multiply, and divide polynomials	D
46.	Exponents, Radicals, and Polynomials	Write and simplify expressions to represent the area or perimeter of rectangles with binomials and variables	B
47.	Exponents, Radicals, and Polynomials	Factor a monomial from a polynomial expression	C
48.	Exponents, Radicals, and Polynomials	Factor a quadratic trinomial into two binomials	B
49.	Exponents, Radicals, and Polynomials	Factor a quadratic trinomial into two binomials	A
50.	Exponents, Radicals, and Polynomials	Factor a trinomial into the product of a monomial and two binomials	C
51.	Exponents, Radicals, and Polynomials	Manipulate and simplify rational expressions	C
52.	Exponents, Radicals, and Polynomials	Manipulate and simplify rational expressions	B
53.	Exponents, Radicals, and Polynomials	Manipulate and simplify rational expressions	A

## MATH TEST – MULTIPLE CHOICE

26 Questions

**DIRECTIONS:** Solve each problem, choose the correct answer, and then fill in the corresponding oval on your answer document.

You are NOT allowed to use a calculator for this section of the test.

28. If  $f(x) = 4x^2 - 15$ , then  $f(3) = ?$

- A. -51
- B. -3
- C. 21
- D. 27

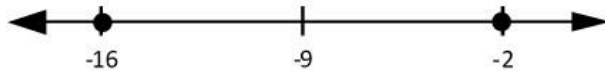
A.	$4(-9) - 15$
B.	$4(3) - 15$
C.	$4(9) - 15$ Correct
D.	$4(3) + 15$

29. If  $f(x) = x^2 - 2x + 4$  for all values of  $x$ , what is the value of  $f(x-3)$  ?

- A.  $x^2 - 8x + 19$
- B.  $x^2 - 8x + 13$
- C.  $x^2 - 8x + 7$
- D.  $x^2 - 2x + 4$

A.	$(x-3)^2 - 2(x-3) + 4 = x^2 - 6x + 9 - 2x + 6 + 4$ Correct
B.	Used middle term of $2x$ instead of $2(x-3)$
C.	Subtracted 6 instead of added
D.	Original function

30.

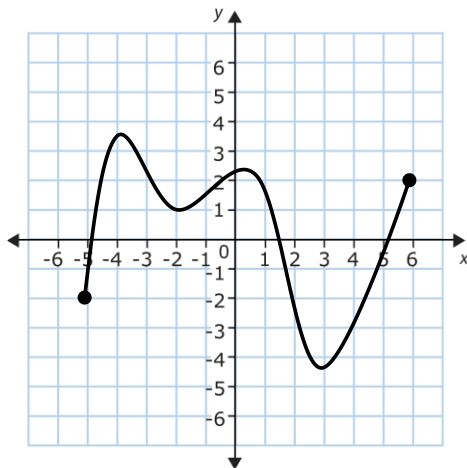


Which of the following equations describes the number line above?

- A.  $|x - 7| = 9$
- B.  $|x + 7| = 9$
- C.  $|x - 9| = 7$
- D.  $|x + 9| = 7$

A.	Numbers are reversed, operation is incorrect
B.	Numbers are reversed
C.	Operation is incorrect for a negative point value
D.	Correct

31. The complete graph of function  $g$  is shown in the standard  $(x, y)$  coordinate plane below. What is the  $x$  value of the minimum of  $g(x)$ ?



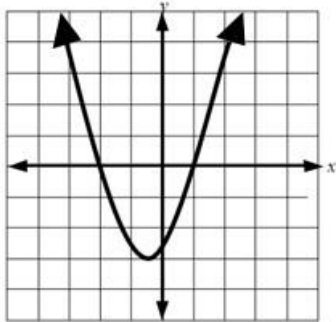
A.	Minimum $x$ value
B.	Rounded value of minimum $g(x)$
C.	Correct
D.	Rounded value of maximum $g(x)$

- A. -5  
B. -4  
C. 3  
D. 4

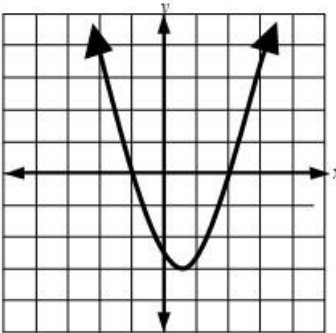
32. The range of the polynomial function  $f$  is the set of real numbers greater than or equal to  $-3$ . If the zeros of  $f$  are  $-2$  and  $1$ , which of the following could be the graph of  $y = f(x)$  in the  $xy$ -plane?

A.	Correct
B.	$x$ -intercepts have signs wrong
C.	Range is less than or equal to
D.	Range is less than or equal to and $x$ -intercepts have signs wrong

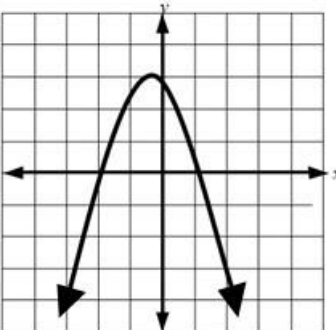
A.



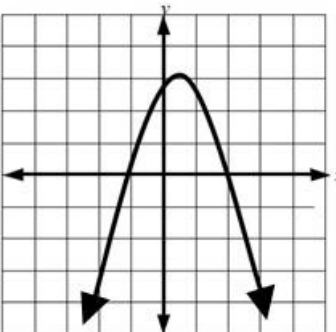
B.



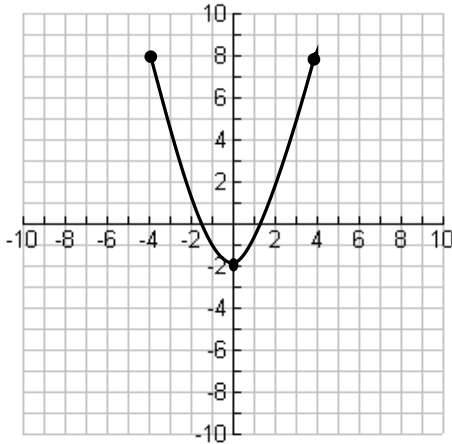
C.



D.



33. What is the range of the following function?



- A.  $\{x: 0 \leq x \leq -2\}$
- B.  $\{x: -4 \leq x \leq 4\}$
- C.  $\{y: -4 \leq y \leq 4\}$
- D.  $\{y: -2 \leq y \leq 8\}$

A.	Vertex
B.	Domain endpoints
C.	Domain with $y$ as variable
D.	Correct

34. Given the following points on the function  $h(x)$ , which value(s) should be in the domain?

$\{(-2, 8), (0, 8), (2, 8), (4, 8), (6, 8), (8, 8)\}$

- A.  $\{x: -2 \leq x \leq 8\}$
- B.  $\{y: -2 \leq y \leq 8\}$
- C.  $\{x: x = 8\}$
- D.  $\{y: y = 8\}$

A.	Correct
B.	Domain with $y$ as variable
C.	Range with $x$ as variable
D.	Range is value of $y$

35. The equation  $f(x) = x^2$  is graphed in the standard  $(x, y)$  coordinate plane. What is the proper translation to  $f(x) = (x - 3)^2 + 2$  ?

- A. Right 2 units, up 3 units
- B. Right 3 units, up 2 units
- C. Left 2 units, down 3 units
- D. Left 3 units, down 2 units

A.	Reversed values
B.	Correct
C.	Reversed values and opposite directions
D.	Opposite directions

36. For all nonzero values of  $x$ ,  $\frac{15x^6+35x^9}{5x^3} = ?$

- A.  $3x^2 + 7x^3$
- B.  $3x^2 + 7x^6$
- C.  $3x^3 + 7x^3$
- D.  $3x^3 + 7x^6$

A.	Divided exponents
B.	Divided exponents on first term
C.	Divided exponents on second term
D.	Correct

37.  $\sqrt{3a^2 + 6} - x = 0$

If  $a > 0$  and  $x = 9$  in the equation above, what is the value of  $a$ ?

- A. 3
- B. 4
- C. 5
- D. 9

A.	Coefficient
B.	$(6 \div 3)^2$
C.	$\sqrt{3a^2 + 6} = 9; 3a^2 + 6 = 81; 3a^2 = 75; a^2 = 25; a = -5, 5$ since $a > 0$ , $a = 5$ Correct
D.	$3^2$

38. If  $\frac{a^x}{a^y} = a^{\frac{3}{4}}$  for which all  $a \neq 0$ , which of the following must be true?

- A.  $x - y = \frac{3}{4}$
- B.  $x + y = \frac{3}{4}$
- C.  $x \div y = \frac{3}{4}$
- D.  $x \times y = \frac{3}{4}$

A.	Correct
B.	$a^2 \times a^2$
C.	Rule improperly used
D.	$(a^x)^y$

39. Which expression is another way to write  $x^{5/2}$  ?

- A.  $5x + 2$
- B.  $\sqrt{x^5}$
- C.  $\sqrt[5]{x^2}$
- D.  $2x - 5$

A.	Incorrect operation
B.	Correct
C.	Switched exponents
D.	Incorrect operation

40. Which expression is equivalent to  $\sqrt[3]{a^6b^{12}}$  ?

- A.  $a^2b^4$
- B.  $a^3b^6$
- C.  $a^3b^9$
- D.  $a^9b^{15}$

A.	Correct
B.	Square root
C.	Subtracted exponents
D.	Added exponents

41. Which expression is equivalent to  $(9x)^{3/2}$  ?

- A.  $3x\sqrt{x}$
- B.  $6\sqrt[3]{x^2}$
- C.  $9\sqrt[3]{x^2}$
- D.  $27x\sqrt{x}$

A.	Did not cube 3
B.	$(9 \div 3) \times 2$ , reciprocal exponent
C.	Exponent not applied to 9, reciprocal exponent on $x$
D.	Correct

42. Simplify the following expression.

$$\sqrt[3]{16r^5s^6}$$

- A.  $2rs^2\sqrt[3]{r^2}$
- B.  $2rs^2\sqrt[3]{2r^2}$
- C.  $2r^2s\sqrt[3]{2r^2s^2}$
- D.  $8r^2s^3$

A.	2 missing from cube root
B.	Correct
C.	Exponents incorrect on $r$ and $s$
D.	Half of 16, Subtracted exponents



43. What is the value of the following expression?

$$\sqrt{45} + \sqrt{125}$$

- A.  $4\sqrt{5}$   
 B.  $8\sqrt{3}$   
 C.  $8\sqrt{5}$   
 D.  $\sqrt{170}$

A.	$\sqrt{125} - 45$
B.	Incorrect square root value
C.	$3\sqrt{5} + 5\sqrt{5}$ Correct
D.	$\sqrt{45} + 125$

44. Simplify the following expression?

$$(\sqrt[3]{x^2})(\sqrt[3]{x^4})$$

- A.  $x$   
 B.  $x^2$   
 C.  $2x^2$   
 D.  $3x^6$

A.	Forgot exponent
B.	Correct
C.	Added $x$
D.	Used cube root as coefficient, added exponents

45.  $(-8x^2y + 4xy^2 - 6y^2) + (x^2y - 4y^2 + 9xy^2)$

Which of the following is equivalent to the expression above?

- A.  $-9x^2y + 8xy^2 - 15y^2$   
 B.  $-9x^2y - 5xy^2 - 2y^2$   
 C.  $-7x^2y + 8xy^2 - 15y^2$   
 D.  $-7x^2y + 13xy^2 - 10y^2$

A.	Added coefficients on terms without regard to variables or operations, ignored first negative
B.	Subtracted all terms
C.	Added coefficients on terms without regard to variables or operations
D.	Correct

46. The width of a rectangle is 5 inches longer than the length. What expression gives the perimeter in inches?

- A.  $2w - 5$   
 B.  $4w - 10$   
 C.  $4w + 20$   
 D.  $4w - 20$

A.	Half perimeter
B.	$w + w + (w - 5) + (w - 5)$ Correct
C.	Incorrect operation, added 5 to each side
D.	Subtracted 5 from each side

47. Which of the following is an equivalent form of the expression  $12x + 15xy$  ?

- A.  $27x^2y$   
 B.  $27(2x + y)$   
 C.  $3x(4 + 5y)$   
 D.  $12x(15xy)$

A.	Added coefficients, multiplied variables
B.	Added coefficients, grouped variables
C.	Correct
D.	Changed addition sign to parenthesis

48. Which of the following is an equivalent form of the expression below?

$$36x^4 - 121y^2$$

- A.  $(6x + 11y)(6x - 11y)$   
 B.  $(6x^2 + 11y)(6x^2 - 11y)$   
 C.  $(6x + 11y^2)(6x - 11y^2)$   
 D.  $(6x^2 - 11y)^2$

A.	Exponents are missing
B.	Correct
C.	Exponents are incorrect
D.	1 factor is incorrect

49. Which of the following is an equivalent form of the expression below?

$$25z^2 - 64t^2$$

- A.  $(5z + 8t)(5z - 8t)$   
 B.  $(5z^2 + 8t^2)(5z^2 - 8t^2)$   
 C.  $(5z + 8t)^2$   
 D.  $(5z^2 - 8t)^2$

A.	Correct
B.	Exponents are incorrect
C.	1 factor is incorrect
D.	1 factor is incorrect

50. Factor the following trinomial completely.

$$15x^2 - 39x + 18$$

- A.  $(3x - 3)(5x - 6)$   
 B.  $(5x - 9)(3x - 2)$   
 C.  $3(5x - 3)(x - 2)$   
 D.  $3(5x - 2)(x - 3)$

A.	Does not result in correct middle term
B.	Does not result in correct middle term
C.	Correct
D.	Does not result in correct middle term

51. If  $R = \frac{1}{6}s(2t - u)$ , solve for  $u$  in terms of  $R$ ,  $s$ , and  $t$ ?

A.  $u = 2t - R - s$

B.  $u = 2t - \frac{R}{s}$

C.  $u = 2t - 6\frac{R}{s}$

D.  $u = 2t - 6R - s$

A.	Missing coefficient on last term, incorrect operation
B.	Missing coefficient on last term
C.	Correct
D.	Incorrect operation

52. Which of the following is an equivalent

expression of  $\frac{6x^3y^{-2}z^{-1}}{16x^7y^{-5}z^4}$ ?

A.  $\frac{3y^7}{8x^{10}z^5}$

B.  $\frac{3y^3}{8x^4z^5}$

C.  $\frac{3y^3}{8x^{10}z^5}$

D.  $\frac{3y^7}{8x^{10}z^3}$

A.	Exponent on $x$ is incorrect
B.	Correct
C.	Exponent on $y$ is incorrect
D.	Exponent on $z$ is incorrect

53. If  $g$  is any even integer, for  $g \neq 7, -7$ , simplify the following.

$$\frac{g-7}{g^2-49} \div \frac{1}{g+7}$$

A. 1

B. 2

C.  $\frac{1}{g^2 - 49}$

D.  $\frac{2}{(g + 7)^2}$

A.	$\frac{g-7}{g^2-49} \times \frac{g+7}{1} = \frac{g^2-49}{g^2-49}$ Correct
B.	Added and ignored denominator
C.	Cancelled $g - 7$ and $g + 7$
D.	Added

## MATH TEST – SHORT RESPONSE

2 Questions

**DIRECTIONS:** Solve each problem. Clearly show all steps, including appropriate formulas, substitutions, diagrams, graphs, charts, etc. For all questions in this part, a correct numerical answer but with no work shown will receive only partial credit.

You are NOT allowed to use a calculator for this section of the test.

1. Relations & Functions, Make connections between different representations (graphs, equations, tables, list of ordered pairs) of relationships between two variables  
 Relations & Functions, Given an equation or function, find an equation or function whose graph is a translation by a specified amount  
 Linear Concepts, Determine the slope of a line from an equation, two points, a graph, or a table  
 Linear Concepts, Interpret and apply linear concepts written using two variables other than  $x$  and  $y$

**PROMPT:**

Given the following ordered pairs  $(-4, -1)$ , and  $(4, 5)$

- Using slope formula, find the slope of the given line. Show all work.
- Write the equation of the line, in point-slope form, that is perpendicular to the given line and passes through the point  $(-4, -1)$ .
- Find the  $x$ -intercept,  $(a, 0)$ , of the line found in part (b). Show all work.

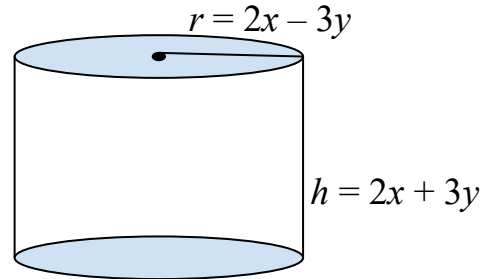
Prompt	Response	Points
a. Using slope formula, find the slope of the given line. Show all work.	$m = \frac{5 - (-1)}{4 - (-4)} = \frac{6}{8} = \frac{3}{4}$ OR $m = \frac{-1 - 5}{-4 - 4} = \frac{-6}{-8} = \frac{3}{4}$	1: puts values in proper positions 1: calculates values properly
b. Write the equation of the line, in point-slope form, that is perpendicular to the given line and passes through the point $(-4, -1)$ .	Perpendicular slope is opposite reciprocal so $m = -\frac{4}{3}$  $y + 1 = -\frac{4}{3}(x + 4)$	1: uses opposite reciprocal of previous slope 1: uses point-slope form and perpendicular $m$
c. Find the $x$ -intercept, $(a, 0)$ , of the line found in part (b). Show all work.	$0 + 1 = -\frac{4}{3}(x + 4)$ $x = -\frac{19}{4}$ OR $x = -4\frac{3}{4}$ OR $x = -4.75$	1: inputs $y = 0$ into equation from part (b) 1: find the correct value for $x$ of the $x$ -intercept

2. Exponents, Radicals, and Polynomials, Apply properties of rational exponents to simplify expressions  
Exponents, Radicals, and Polynomials, Write and simplify expressions to represent the area or perimeter of rectangles with binomials and variables

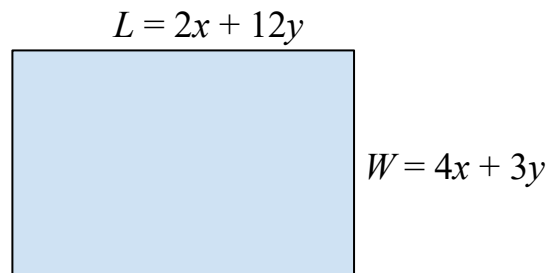
**PROMPT:**

Simplify all algebraic expressions

- a. Determine the algebraic expression for volume in simplest form, using the formula for volume of a cylinder,  $V = \pi r^2 h$  (leave answer in terms of the symbol  $\pi$  rather than the numeric value).



- b. Find the algebraic expression for the perimeter of the rectangle. Simplify the answer.  
c. If the value of perimeter is 216, and  $y$  is two times the value of  $x$ , what is the value of  $x$ ,  $y$ , and the area?



Prompt	Response	Points
a. Determine the algebraic expression for volume in simplest form, using the formula for volume of a cylinder, $V = \pi r^2 h$ (leave answer in terms of the symbol $\pi$ rather than the numeric value).	$V = \pi (2x - 3y)^2(2x + 3y)$ $V = (4x^2 - 9y)(2x - 3y) \pi$ OR $V = (4x^2 - 12xy + 9y^2)(2x + 3y) \pi$ $V = (8x^3 - 12x^2y - 18xy^2 + 27y^3) \pi$	1: Correctly substitutes into expression 1: Correctly multiplies two expressions 1: Answer or equivalent
b. Find the algebraic expression for the perimeter of the rectangle. Simplify the answer.	$2(2x + 12y) + 2(4x + 3y)$ $4x + 24y + 8x + 6y$ $12x + 30y$	1: Correctly substitutes expression  1: Final expression
c. If the value of perimeter is 216, and $y$ is two times the value of $x$ , what is the value of $x$ , $y$ , and the area?	$12x + 30(2x)$ $72x = 216;$ $x = 3$ $y = 6$  $L = 2(3) + 12(6) = 78$ $W = 4(3) + 3(6) = 30$ $\text{Area} = 2,340$	1: Value of $x$ 1: Value of $y$  1: Value of Area