Mathematics Test Two—Scoring Key

		Subscore Area		
	Key	EA	AG	GT
1.	D	___		
2.	J			___
3.	C	___		
4.	F	___		
5.	E	___		
6.	K	___		
7.	A			___
8.	G	___		
9.	A	___		
10.	H	___		
11.	B	___		
12.	K		___	
13.	E			___
14.	G		___	
15.	B	___		
16.	H	___		
17.	E	___		
18.	J	___		
19.	D	___		
20.	H		___	
21.	E	___		
22.	F			___
23.	E	___		
24.	J	___		
25.	B	___		
26.	H		___	
27.	A		___	
28.	H		___	
29.	A		___	
30.	H			___

		Subscore Area		
	Key	EA	AG	GT
31.	A		___	
32.	J			___
33.	B			___
34.	G		___	
35.	D			___
36.	F		___	
37.	A	___		
38.	G		___	
39.	B		___	
40.	H			___
41.	E	___		
42.	H	___		
43.	E			___
44.	F			___
45.	D			___
46.	H		___	
47.	B		___	
48.	F			___
49.	C			___
50.	J			___
51.	A			___
52.	J		___	
53.	E		___	
54.	H		___	
55.	B			___
56.	G	___		
57.	E	___		
58.	H			___
59.	A		___	
60.	K	___		

Number Correct (Raw Score) for:

Pre-Algebra/Elementary Algebra (EA) Subscore ______ (24)

Intermediate Algebra/Coordinate Geometry (AG) Subscore ______ (18)

Plane Geometry/Trigonometry (GT) Subscore ______ (18)

Total Number Correct for Math Test (EA + AG + GT) ______ (60)

Use the conversion chart on page 142 to convert the total number correct to the ACT Scoring Scale of 1 to 36.

Mathematics Test Two—Answer Explanations

1. Begin by setting up an equation with the given information: $(0.30)z = 18$. Then solve by dividing each side of the equation by 0.30: $z = 18/0.30 = 60$. The answer is D.

2. The measure of angle x is equal to $180° - 85° - 50° = 45°$. The answer is J.

3. Because rate is equal to distance divided by time, divide 1050 by 18.5. The answer is C.

4. $2 \times 3^2 \times 5 \times 7$ is the prime factorization of 630, as 2, 3, 5, and 7 are all prime numbers, raised to the appropriate powers such that when multiplied together, the answer is 630. The answer is F.

5. The number of different outfits that Lily can put together equals the total number of blouses (4) multiplied by the total number of skirts (3) multiplied by the number of jackets (2) multiplied by the number of pairs of shoes (2): $4 \times 3 \times 2 \times 2 = 48$. The answer is E.

6. Substitute x and n with the given values: $x = -3$ and $n = -1$. Then, solve the equation: $3 - (2x^3 + 4n^2) = 3 - ([2(-3)^3 + 4(-1)^2] = 3 - (-54 + 4) = 3 - (-50) = 3 + 50 = 53$. The answer is K.

7. Because the triangle is a right triangle, use the Pythagorean Theorem to find the length of segment QR: $10^2 + 5^2 = (QR)^2$; $125 = (QR)^2$; $QR = 5\sqrt{5}$. The answer is A.

8. $10^8 / 10^2 = 10^6 = (10)(10)(10)(10)(10)(10) = 1{,}000{,}000$. The answer is G.

9. The given equation, $6x^2 + x - 15 = 0$, can be factored into $(2x - 3)(3x + 5) = 0$. In order to find the possible values of x, set each quantity equal to zero and solve for x: $(2x - 3) = 0$ and $(3x + 5) = 0$. Thus, the possible values of x are 3/2 and -5/2. The answer is A.

10. Expand the factors: $(4m + 3n)(4m + 3n) = 16m^2 + 12mn + 12mn + 9n^2 = 16m^2 + 24mn + 9n^2$. The answer is H.

11. Begin by expanding the given formula: $2a + 3b - 4(a + 7c) + 6c = 2a + 3b - 4a - 28c + 6c$. Then, combine like terms: $(2a - 4a) + 3b - 28c + 6c = -2a + 3b - 22c$. The answer is B.

12. In order to find the smallest possible integer value for x, remove the absolute value signs and make the left side of the inequality negative: $-(3-x) \geq 6$. Next, expand the left side of the inequality: $-3 + x \geq 6$. Then, add 3 to both sides: $-3 + x + 3 \geq 6 + 3$. Thus, $x \geq 9$. The answer is K.

13. The third side of the triangle must be greater than the difference between the first 2 sides ($7 - 5 = 2$, in this case) and less than the sum of the first 2 sides ($7 + 5 = 12$, in this case). Because the length of this triangle's third side must be between 2 and 12, the length of 1 can be eliminated. The answer is E.

14. Recall that slope intercept form is $y = mx + b$, where m is the slope of the line, and b is the y-intercept. Rewrite the given equation of the line in slope-intercept form by dividing each side of the equation by 3: $3y/3 = (8/3)x + (6/3)$; $y = (8/3)x + 2$. Thus, it can be seen that the slope of the line is 8/3. The answer is G.

15. Divide the number of tulips in the greenhouse (45) by the total number of flowers in the greenhouse $(120 + 45 + 135)$: $45 / 300 = 0.15 = 15\%$. The answer is B.

16. Find the total number of buildings that Steven is designing: $7 + 8 = 15$. Next, find the number of designs that Steven has completed: $3 + 7 = 10$. Next, set up the fraction by placing the number of designs completed in the numerator and the total number of designs in the denominator: 10/15. Finally, reduce the fraction: $10/15 = 2/3$. The answer is H.

17. Set up an equation with the given information, placing the sum of the five counting trials in the numerator and the total number of trials in the denominator: $(39 + 42 + 47 + 43 + 49) / 5 = 44$. The answer is E.

18. $\sqrt{5}$ is an irrational number because it cannot be written as a fraction, where both the numerator and denominator are integers. Hence, the answer is J.

19. Solve the given equation: $(3\sqrt{3})^2 = (3\sqrt{3})(3\sqrt{3}) = 9\sqrt{9} = (9)(3) = 27$. The answer is D.

20. Simplify the given equation: $(2a^{(-2)}b^3c^4) / (3b^{(-2)}c^2) = 2b^5c^2 / 3a^5$. The answer is H.

21. In order to find the number of miles that Jack runs each morning, multiply the number of miles that Tom runs each morning by p: 2p. Then, add one mile: 2p + 1. The answer is E.

22. The cosine of θ is equal to the length of the side adjacent to θ divided by the length of the hypotenuse: s/r. The answer is F.

23. Add the five point values in order to find the total number of points that Jim scored in all five games: (p + p + (p - 2) + (p - 2) + (2p + 1) = 6p - 3. The answer is E.

24. First, find the total number of blue, red, and silver cars: 9 + 6 + 12 = 27. Next, find the number of blue, red, and silver cars that Chris washed: 7 + 3 + 11 = 21. Set up the fraction by placing the number of washed cars in the numerator and the total number of cars in the lot in the denominator: 21/27. Then, reduce the fraction: 21/27 = 7/9. The answer is J.

25. By definition, the denominator of a fraction cannot be equal to zero. Thus, in the given equation, $cd \neq 0$. Additionally, in order for the fraction to equal zero, the numerator must be equal to zero: c - d = 0. The answer is B.

26. In order to find the real values of x that are solutions for the inequality, begin by adding three to each side of the inequality: $-5 + 3 < 4x - 3 + 3$ which equals $-2 < 4x$. Next, divide both sides by 4: $-(1/2) < x$ or $x > -(1/2)$. The answer is H.

27. Substitute the given information into the equation of a circle: $(x - h)^2 + (y - k)^2 = r^2$, where (h, k) is the center of the circle and r is the radius: : $(x - 3)^2 + (y - 4)^2 = 2^2$. Thus, the answer is A.

28. The slope-intercept form for the equation of a line is y = mx + b, where m is the slope of the line, and b is the y-intercept. By placing the given equation in slope intercept form: y = (1/4)x - 2, it can be seen that the slope of the given line is 1/4 and the y-intercept is -2. The equation 2x - 8y = 16 also has a slope of 1/4 and a y-intercept of -2, as can be seen by converting the equation into slope intercept form: y = (1/4)x - 2. Thus, their graphs are the same. The answer is H.

29. Begin by factoring: $x^2 - x - 6 = (x - 3)(x + 2)$. In order to find the values of x that would make the equation equal to zero, set each of the quantities equal to zero and then solve for a value of x in each of the two equations: x - 3 = 0 and x + 2 = 0. From this, it can be seen that x must have a value of 3 or -2 in order for the given equation to be equal to zero. The answer is A.

30. Find the area of the square by multiplying 4 x 4 = 16. Then, find the area of the semi-circle by using the equation $(1/2)\pi r^2$, where r is the length of the radius: $(1/2)\pi(2)^2 = 2\pi$. Add these two areas: $16 + 2\pi$. The answer is H.

31. $(-4)^{-1} = -(1/4)$ and $(-1)^{-3} = -1$. $-(1/4) + (-1) = -(5/4)$. The answer is A.

32. The measure of angle x equals 180° - 120° = 60°. The answer is J.

33. By definition, the circumference of a circle is equal to $2\pi r$, where r is the length of the radius. In this case, the circumference is equal to 12, or $12 = 2\pi r$. In order to solve the equation for r, divide both sides by 2π and simplify: $r = 12/2\pi = 6/\pi$. The answer is B.

34. In order to find the distance between two points in the standard (x, y) coordinate plane, the distance formula is used: $\sqrt{(x_1 - x_2)^2 + (y_1 - y_2)^2}$, where the two points are (x_1, y_1) and (x_2, y_2). Substitute the given points into the distance formula: $\sqrt{(3-9)^2 + (2-(-4))^2} = \sqrt{36 + 36} = \sqrt{72} = 6\sqrt{2}$. The answer is G.

35. Note that the two triangles are similar triangles, having the same angles and proportional sides. In order to find the value of n on the larger triangle that Karen created, set up an equation with the given information that relates the sides of the triangles: 4/5 = n/14. Then, solve for n by multiplying both sides of the equation by 14: n = (4/5)(14) = 11 1/5. The answer is D.

36. Begin by setting up the professor-student ratio. Place the number of professors (120) in the numerator and the number of students (1440) in the denominator. Then, simplify: 120/1440 = 1/12. Thus, the professor-student ratio is 1 to 12. In order to find the number of students admitted with 140 professors at the school, multiply 140 by 12: (140)(12) = 1680. The answer is F.

37. The class average is found by adding each of the scores together in the numerator and dividing by the total number of scores in the denominator. Thus, the new class average will increase by the number of points the student's score increased (h) divided by the total number of students in the class (q): h/q. The answer is A.

38. Begin by dividing both sides by -2 in order to isolate the variable, remembering to change the direction of the inequality sign as a result of dividing by a negative number: $-2 < x$ or $x > -2$. The answer is G.

39. Use the answer options to determine which combination of tickets and prices equals \$92,400. Thus, 3480(\$20) + (5000 - 3480)(\$15) = \$92,400. The answer is B.

40. Use the equation for area of a triangle: (1/2)bh, where b is the length of the base and h is the height of the triangle, perpendicular to the base. In this case, the base and the height of the triangle are both equal to 5. Thus, the area of the unshaded triangle equals: (1/2)(5)(5) = 12 1/2. The area of the square is 5 x 5 = 25. Subtract these two areas to find the areas of the shaded triangles: 25 - 12.5 = 12.5. The answer is H.

41. Rearrange the given equation such that the equation is set equal to zero: $3x^2 = 2 - 5x$ becomes $3x^2 + 5x - 2 = 0$. Then, factor: $3x^2 + 5x - 2 = (3x - 1)(x + 2)$. To find the possible values for x, set each of the quantities equal to zero and solve: $(3x - 1) = 0$ and $(x + 2) = 0$. Thus, in accordance with the given equations, x can be equal to 1/3 and -2. The answer is E.

42. Begin by substituting values for u into the answer options. Notice that for any integer value of u, $6u^2$ will produce an even integer. Hence, the answer is H.

43. The four angles of a quadrilateral sum to 360°. The measure of angle x is equal to 360° - 55°- 100° - 120° = 85°. The answer is E.

44. Recall that the equation used to find the area of a triangle is (1/2)bh, where b is the length of the triangle's base and h is the height of the triangle perpendicular to the base. Remember that, for an isosceles triangle, the height bisects the base. In order to find the area of the given triangle, first find the height; this can be done using the Pythagorean Theorem because the height is perpendicular to the base, creating a right triangle. The Pythagorean Theorem is: $a^2 + b^2 = c^2$ where c is the right triangle's hypotenuse and both a and b are sides of the right triangle.
In this case: $8^2 + b^2 = 10^2$: $64 + b^2 = 100$: $b^2 = 36$:b = 6. Thus, the area of the original triangle is (1/2)(16)(6) = 48.
The answer is F.

45. Because the two triangles have the same angle measures and thus proportional sides, set up an equation relating the sides of the triangles. Let the variable x stand for the length of side ON: 10/5 = 16/x. Therefore, x = 8. The answer is D.

46. The greatest y-coordinate along a circle will always be r points above the circle's center, where r is the length of the radius. From the given equation, it is known that the center of the circle is (3,-2). The greatest y-coordinate must be r points (6 points) above the center. Thus, the greatest y-coordinate is -2 + 6 = 4. The answer is H.

47. First, rearrange the equations into slope-intercept form: y = mx + b, where m is the slope of the line and b is the y-intercept. In slope-intercept form, the equations are: y = 4x + 2 and y = 4x + 3. Thus, it can be seen that the slope of each of the given lines is 4. To find the slope of the perpendicular line, take the inverse of the original slope (1/4) and then make it negative -(1/4). The answer is B.

48. Imagine that a line has been drawn, connecting points w and z. This line is assumed to be the hypotenuse of a right triangle. The base of this triangle equals 2 + 1 = 3. The height of the triangle is 4. Use the Pythagorean Theorem to solve for the length of the hypotenuse, c: $a^2 + b^2 = c^2$: $3^2 + 4^2 = c^2$: $9 + 16 = c^2$: c = 5. The answer is F.

49. The tangent of an angle is equal to the length of the opposite side divided by the length of the adjacent side. Hence, the tangent of Y equals y/x. The answer is C.

50. Because tangent equals sine/cosine, this value be substituted into the original equation: (sin a) / [(cos a)(tan a)] = [(sin a)(cos a)] / [(cos a)(sin a)] = 1. The answer is J.

51. Because T is a point tangent to the circle, it is known that triangle TAD is a right triangle. The length of the circle's radius, segment AT, is given as 3 inches long. The Pythagorean Theorem can be used to determine the length of line segment TD: $32 + (TD)^2 = 82$: $9 + (TD)^2 = 64$: $TD = \sqrt{55}$. The answer is A.

52. Begin by substituting 2 for x in the given equation: $x^{(3x+2)} = 2^8 = 256$. 4^4 is also equal to 256. Thus, it can we seen that 4 must be raised to the power of 4. In order find the value of b, set (b - 3) equal to 4. b - 3 = 4: b = 7. The answer is J.

53. By looking at the graph, it can be seen that the y-intercept is -3. The slope of the line is equal to rise divided by run: [0 - (-3)] / (1 - 0) = 3. Thus, the equation of the line is y = 3x - 3 in slope-intercept form: y = mx + b, where m is the slope of the line and b is the y-intercept. The answer is E.

54. Divide 168, the total number of flower in the garden shop, by (5 + 3) or 8: 168/8 = 21. Then, multiply this number (21) by 3, in order to calculate the total number of roses: (21)(3) = 63. The answer is H.

55. In order to find the number of panels that Ted needs in order to panel his ceiling, divide 7 (the length of the ceiling) by 1 (the length of a tile): 7/1 = 7; and then divide 12 (the width of the ceiling) by 2 (the width of a tile): 12/2 = 6. Thus, 7 tiles are required lengthwise and 6 are required across the width of the ceiling. Finally, in order to find the total number of tiles needed to cover the surface area of the ceiling, multiply 7 by 6: 7 x 6 = 42. The answer is B.

56. Expand the equation: $(c - d)^2 = 36$ becomes $c^2 - 2cd + d^2 = 36$. Substitute cd = 7: $c^2 - 14 + d^2 = 36$. Then $c^2 + d^2 = 50$. The answer is G.

57. Begin by substituting the answer options into the given equation: $12x^2 + 2x - 2 = (4x + a)(3x - 1)$. It can be seen that the solution a = 2 is the only possible solution: $12x^2 + 2x - 2 = (4x + 2)(3x - 1)$. Thus, the answer is E.

58. Because of the angle measures given, it can be found that WZJ measures 27°, and ZJW measures 65°. Thus, ZWJ measures 180° - (27° + 65°) = 88°. Finally, JWS measures 180° - 88° = 92°. The answer is H.

59. Expand the factors and combine similar terms: $(8 - \sqrt{5})(5 - \sqrt{5}) = 40 - 5\sqrt{5} - 8\sqrt{5} + \sqrt{25} = 45 - 13\sqrt{5}$. The answer is A.

60. Five million multiplied by 6 billion = 5,000,000 x 6,000,000,000 = 30,000,000,000,000,000. The answer is K.