

Mathematics Test One—Scoring Key

		Subscore Area					Subscore Area		
	Key	EA	AG	GT		Key	EA	AG	GT
1.	D	—			31.	B		—	
2.	F			—	32.	H			—
3.	D	—			33.	B			—
4.	F	—			34.	K		—	
5.	A	—			35.	C			—
6.	J	—			36.	G		—	
7.	A			—	37.	B	—		
8.	K	—			38.	J		—	
9.	C	—			39.	B		—	
10.	G	—			40.	F			—
11.	D	—			41.	B	—		
12.	G		—		42.	H	—		
13.	C			—	43.	A			—
14.	J		—		44.	K			—
15.	D	—			45.	A			—
16.	K	—			46.	J		—	
17.	C	—			47.	E		—	
18.	J	—			48.	H			—
19.	C	—			49.	E			—
20.	K		—		50.	G			—
21.	D	—			51.	C			—
22.	H			—	52.	J		—	
23.	A	—			53.	E		—	
24.	K	—			54.	H		—	
25.	A	—			55.	E			—
26.	F		—		56.	K	—		
27.	B		—		57.	D	—		
28.	F		—		58.	J			—
29.	C		—		59.	E		—	
30.	F			—	60.	G	—		

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) _____

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

Mathematics Test One—Answer Explanations

- In order to find the value of x , begin by adding 4 to each side of the equation: $3x - 4 + 4 = 14 + 4$; $3x = 18$. Next, divide each side of the equation by 3, in order to isolate x : $3x/3 = 18/3$; $x = 6$. The answer is D.
- The measure of angle a is equal to $180^\circ - 140^\circ = 40^\circ$. The answer is F.
- To find the baseball team's average score, set up a fraction with the given information. The sum of the point totals should be in the numerator and the total number of games should be in the denominator: $(2 + 3 + 7 + 4 + 4) / 5 = 20/5 = 4$. The answer is D.
- Substitute values for a , b , and c into the given equation and solve: $ab^2 + (3c)/a - b^3 = 2(3)^2 + [(3)(8)/2] - 3^3 = 18 + 12 - 27 = 3$. The answer is F.
- Because distance equals rate multiplied by time, multiply 6.5 (the time during which Ann drove) hours by 60 mph (Ann's speed of driving): $(6.5)(60) = 390$. The answer is A.
- First, expand $-2(m - 3n)$: $-2m + 6n$. Then, solve by combining terms with common variables: $3m - 6n - 2m + 6n = 1m + 0n = m$. The answer is J.
- Begin by finding the areas of the two rooms to be carpeted by multiplying the length of the room by the width of the room. For the first room, the area would be equal to 10×12 and for the second room: 15×13 . Thus, the two areas are $10 \times 12 = 120$ and $15 \times 13 = 195$. Finally, add the two values in order to find the total area of both rooms: $120 + 195 = 315$. The answer is A.
- Substitute the given value of $x = 3$ into the equation and solve for c : $2(3) + c - 6 = 4(3) - c$. Then $6 + c - 6 = 12 - c$. Then $0 + c = 12 - c$. Finally, $c = 6$. The answer is K.
- Expand the factors: $(4x + 7)(3x - 2)$: $4x(3x) + 7(3x) + 4x(-2) + 7(-2) = 12x^2 + 13x - 14$. The answer is C.
- To find the fraction of the 40 roses that the gardener picked, reduce the fraction, $16/40$ by dividing both the numerator and the denominator by their greatest common factor of 8: $(16/8)/(40/8) = 2/5$. The answer is G.
- To obtain the increased price of the red sweater, first multiply \$55 by 0.05 (i.e., 5%) in order to find the actual dollar amount of the price increase: $(\$55)(0.05) = 2.75$. Then, add this amount to the original price to obtain the new price: $\$55 + \$2.75 = \$57.75$. Next, to obtain the decreased price of the blue sweater, multiply \$80 by 0.10 (i.e., 10%) in order to calculate the dollar amount of the price decrease: $(\$80)(0.10) = \8.00 . Then, subtract this amount from the original price: $\$80 - \$8 = \$72$. Finally, add the new price of the red sweater ($\$57.75$) to the new price of the blue sweater ($\$72.00$): $\$57.75 + \$72.00 = \$129.75$. The answer is D.
- 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. In this case, the center is $(4, 4)$ and the radius is equal to 4. Thus, the equation of the given circle is $(x - 4)^2 + (y - 4)^2 = 16$. The answer is G.
- It is known that the diameter of the circle is equal to 8 units. The radius is half the length of the diameter: $8/2 = 4$ units. By definition, the area of a circle can be found using the equation πr^2 , where r is the length of the radius. In this case, the area of the circle would be $\pi 4^2 = 16\pi$. The answer is C.
- Recall that slope-intercept form of a line is $y = mx + b$, where m is the slope of the line and b is the y -intercept. Rewrite the equation of the given line in slope-intercept form by subtracting $3x$ from each side and then dividing each side by 4: $y = -3/4(x) + 3$. Thus, it can be seen that the y -intercept is 3. The answer is J.
- In order to find the smallest positive integer that is divisible by 3, 4, and 5 with no remainders, examine each of the answer option. It can be seen that 60 is the only option that is divisible by 3 ($60/3 = 20$), 4 ($60/4 = 15$), and 5 ($60/5 = 12$) with no remainders. Thus, the answer is D.
- $10^6(10^2) = 10^8$ and $10^{-3} = 1/10^3$. Thus, dividing 10^8 by $1/10^3$ is the same as multiplying 10^8 by 10^3 : $10^8 \times 10^3 = 10^{11}$. The answer is K.

17. Rearrange the given equation in order to combine similar terms: $0.05y + 4.5 = y - 3.1$. Then $7.6 = 0.95y$. Then, solve for y by dividing each side of the equation by 0.95: $y = 8$. The answer is C.
18. In order to find the total cost of 300 gallons of water used, begin by calculating the cost of the first 100 gallons. This can be done by multiplying the number of gallons (100) by the cost per gallon ($\$0.22$): $100(\$0.22) = \22.00 . Next, calculate the cost for the remaining 200 gallons: $200(\$0.20) = \40.00 . Finally, add the two dollar amounts: $\$22.00 + \$40.00 = \$62.00$. The answer is J.
19. First, find the cost of the CD with tax. This can be accomplished by multiplying the price of the CD ($\$14.99$) by 108 % or 1.08: $\$14.99 \times 1.08 = \16.19 , rounded to the nearest cent. Thus, in order to have exact change, you will need 19 cents in addition to 16 dollars in bills. The answer is C.
20. Begin by expanding the left side of the inequality: $6 - 3(x - 2) = 6 - 3x + 6 = 12 - 3x$. Then combine similar terms and solve for x : $12 - 3x \geq 2x + 2$. Then $10 \geq 5x$. Then $x \leq 2$. Thus, the answer is K.
21. $\sqrt{3}$ is an irrational number because it cannot be written as a fraction, where both the numerator and denominator are integers. The answer is D.
22. Because the circumference of a circle is equal to πd , where d is the circle's diameter, the circumference of a circle with a diameter of 10 units equals 10π . The answer is H.
23. In order to find the percentage of the students who are not members of sports teams, divide the number of students not on teams (390) by the total number of students at the school ($210 + 390 = 600$). $390/600 = 0.65$. The answer is A.
24. Expand the factors: $(6 - 3\sqrt{2})(2 + 2\sqrt{2}) = 12 - 6\sqrt{2} + 12\sqrt{2} - 6\sqrt{4} = 12 + 6\sqrt{2} - 12 = 6\sqrt{2}$. The answer is K.
25. The number of different combinations that Deena can put together consisting of a coat, scarf, and hat equals the total number of coats (3) multiplied by the number of scarves (3) multiplied by the number of hats (4): $3 \times 3 \times 4 = 36$. The answer is A.
26. In order to find the first of two possible values of x , remove the absolute value signs and make the left side of the inequality negative: $-(6 - 2x) \leq 3$. Then, expand the left side of the inequality: $-6 + 2x \leq 3$. Add 6 to both sides: $2x \leq 9$. Then, divide both sides by 2: $x \leq 9/2$. In order to find the second possible value for x , remove the absolute value signs and solve: $6 - 2x \leq 3$: $-2x \leq -3$: $x \geq 3/2$. Because, $3/2$ is less than $9/2$, the answer is F.
27. $x^3 = (x)(x)(x) = (3)(3)(3) = 27$. $x^0 = 3^0 = 1$ because any number raised to the "0" power is always equal to 1. Therefore, $x^3 + x^0 = 27 + 1 = 28$. The answer is B.
28. Rearrange the given equation into slope-intercept form, which is $y = mx + b$, where m is the slope of the line and b is the y -intercept. This can be done by first subtracting 6 from both sides and then dividing each side of the equation by -3: $y = 2x - 3$. The answer is F.
29. In order to find the value of x , begin by cross-multiplying within the given equation: $3/8 = x/56$: $3(56) = 8x$. Then, solve for x by dividing each side of the equation by 8: $168 = 8x$: $168/8 = x$: $x = 21$. The answer is C.
30. The measure of angle a is equal to $180^\circ - 70^\circ - 45^\circ = 65^\circ$. The answer is F.
31. Remove the absolute value signs and make the left side of the inequality negative: $-(5 - 3x) \geq 4$. Then, expand the left side of the inequality: $-5 + 3x \geq 4$. Add 5 to both sides: $3x \geq 9$. Then, divide both sides by 3: $x \geq 9/3 \geq 3$. The answer is B.
32. It is known that in a 30° - 60° - 90° triangle the shortest side is always half of the length of the hypotenuse. In this case, the shortest side of the 30° - 60° - 90° triangle is 3 units long. Thus, the hypotenuse is 6 units long. Use the Pythagorean theorem to find the length of DE : $3^2 + (DE)^2 = 6^2$: $9 + (DE)^2 = 36$: $(DE)^2 = 27$: $DE = \sqrt{27} = 3\sqrt{3}$ units in length. The answer is H.
33. Because M is a point tangent to the circle, it is known that the triangle QOM is a right triangle. Thus, the Pythagorean theorem can be used to determine the length of OM , the circle's radius: $7^2 + (OM)^2 = 9^2$: $49 + (OM)^2 = 81$: $(OM)^2 = 32$: $OM = 4\sqrt{2}$. The answer is B.

34. The graph shows an open circle over the -5 with a line extending to a closed circle over 2. This means that x is greater than -5 and less than or equal to 2. The answer is K.
35. We know that the length of the hypotenuse is equal to 5 because of the Pythagorean theorem: $3^2 + 4^2 = 5^2$. Next, use the equation for area of a triangle in order to solve for segment DE. The equation for area of a triangle is $(1/2)bh$, where b is the length of the triangle's base and h is the triangle's height, perpendicular to the chosen base. Recall that any side may be chosen as the base as long as the height is a perpendicular measure from this side. In this case, the area of the triangle = $(1/2)(3)(4) = (1/2)(5)(DE)$. Solve for DE: $6 = (5/2)(DE)$: $DE = 12/5$. The answer is C.
36. The distance formula provides a measure of distance between two points in the (x, y) coordinate plane. Because the coordinates of the circle's center as well as a point along the circle are given, use the distance formula to find the radius of the circle: $r = \sqrt{(4 - 1)^2 + (6 - 2)^2} = \sqrt{9 + 16} = \sqrt{25} = 5$. Then, substitute the radius along with the given center of the circle into the equation of a circle which is $(x - h)^2 + (y - k)^2 = r^2$ where (h, k) is the center of the circle and r is the radius. In this case: $(x - 1)^2 + (y - 2)^2 = 25$. The answer is G.
37. Set up a fraction with the given information, where the sum of the test scores is in the numerator and the total number of tests is in the denominator. Be sure to include all six tests, leaving the score on the sixth test designated as x . Set this fraction equal to 93, which is the average score needed in order for Fred to earn an "A" in math. Then, solve for x : $(91 + 84 + 93 + 99 + 97 + x)/6 = 93$: $(464 + x)/6 = 93$: $(464 + x) = 93(6)$: $464 + x = 558$: $x = 558 - 464 = 94$. The answer is B.
38. Slope is defined as rise divided by run. Any line parallel to the y -axis has a run of zero. Thus, the rise divided by zero is undefined since division by zero is undefined. The answer is J.
39. Divide 250 by 200 in order to find the ratio. Thus, the length to height ratio is 1.25 to 1. In order to find the ski length for someone 150 centimeters tall multiply 150 by 1.25. The answer is B.
40. The four angles of any quadrilateral sum to 360° . The measure of angle x equals $360^\circ - 100^\circ - 135^\circ - 45^\circ = 80^\circ$. The answer is F.
41. After substituting values of x into the equation from the answer options, it can be concluded that the value 9 must be added, as $4x^2 - 12x + 9$ is a perfect square trinomial: $(2x - 3)(2x - 3) = 4x^2 - 12x + 9$. The answer is B.
42. One red ball, one green ball, and one orange ball have already been drawn from the container. Thus, there are only 17 balls left in the container, 10 of which are red. Hence, the probability of Mary drawing a red ball on her 4th draw is $10/17$. The answer is H.
43. Because the square's perimeter equals 36 feet, the length of each side can be found by dividing 36 by 4: $36/4 = 9$. Thus, the area of the square equals $9^2 = 81$. The area of the triangle equals $(1/2)(b)(h)$, where b is the length of the triangle's base and h is the height of the triangle. In this case, the area of the triangle equals $(1/2)(3)(4) = 6$. The sum of the areas of these two figures equals $81 + 6 = 87$. The answer is A.
44. The sine of angle θ is equal to the length of the side opposite the angle (3) divided by the length of the hypotenuse (5): $\sin \theta = 3/5$. The answer is K.
45. The measure of angle TLW equals $180^\circ - 82^\circ - 37^\circ = 61^\circ$. The answer is A.
46. The slope of the line is 1. The y -intercept is -1. The next step is to write the equation for the line in slope-intercept form, $y = mx + b$, where m is the slope of the line and b is the y -intercept. In this case, however, because the area below the line is shaded, the equal sign is replaced with a "less than or equal to" sign. Thus, the equation of the line and shaded region is $y \leq x - 1$. The answer is J.
47. First, remember that slope equals rise divided by run (i.e., the change in y divided by the change in x). Set up an equation with the given information: slope = 3 = $(7 - y_2)/(2 - 4)$. Then solve for y_2 : $3 = (7 - y_2)/-2$: $-6 = 7 - y_2$: $y_2 = 13$. The answer is E.
48. The value of k is equal to $\sqrt{60.2}$, which is between $7, \sqrt{49}$, and $8, \sqrt{64}$. The answer is H.

49. Because triangle JKL is a $45^\circ - 45^\circ - 90^\circ$ triangle, it is known that the length of JK equals the length of JL. In this type of triangle, the hypotenuse is $\sqrt{2}x$ where x is a side. The length of JL equals the length of JK = 3, which is the length of the circle's radius. The area of the circle can then be found using the equation πr^2 , where r is the length of the radius, which is 3, in this case: $\pi 3^2 = 9\pi$. The answer is E.
50. Because a circle's circumference is equal to $2\pi r$, where r is the length of the circle's radius, substitute the given value of $C = 36\pi$ into the equation for a circumference and solve for the length of the radius: $36\pi = 2\pi r$: $r = 18$. The answer is G.
51. First, find the area of the square: $(9)(9) = 81$. Then find the area of the circle using the equation πr^2 , where r is the length of the radius, or half of one side of the square: $\pi 4.5^2 = 20.25\pi$. Thus, the area of the shaded region = $81 - 20.25\pi$. The answer is C.
52. When x is a negative number, $|-2x| = -2x$, and when x is equal to zero, $|-2x| = -2x$. Thus, the solution set for the given equation includes all values of x less than or equal to 0. The answer is J.
53. Begin by solving for variable b in terms of a : $b = (7.5a)/10$. Then, substitute this value into the first equation and solve for a : $10a + 5[(7.5a)/10] = 22$: $a = 1.6$. Next, using 1.6 as the value of a , solve for b : $10(1.6) + 5(b) = 22$: $b = 1.2$. Finally, add a and b : $1.6 + 1.2 = 2.8$. The answer is E.
54. Recall that the distance between two points (x_1, y_1) and (x_2, y_2) is equal to $\sqrt{(x_1 - x_2)^2 + (y_1 - y_2)^2}$. Substitute the given information into the distance formula to find the distance between the points with the given coordinates: $\sqrt{(4 - 3)^2 + (5 - (-2))^2} = \sqrt{1 + 49} = \sqrt{50} = 5\sqrt{2}$. The answer is H.
55. By definition, the graph of $\sin \theta$ has amplitude of 1 with a period of 2π . The graph of $2 \sin 3\theta$ has amplitude of 2 and a period of $2\pi/3$. Thus, the amplitude increases by a factor of 2 and the period is $1/3$ the original. The answer is E.
56. The time it would take both typists, working together to type 1,000,000 words, is equal to the total number of words (1,000,000) divided by the sum of both typists' abilities $(k + 4k) = 5k$. Thus, the answer is K.
57. Given that the absolute values of c and d are equal to one another, we know that the paradigm is if $c = x$, then $d = -x$ or x . Thus, c/d is always equal to positive or negative 1. The answer is D.
58. First, find the area of the rectangle by multiplying the length of the rectangle, 10, by the width of the rectangle, 2, or area = 20. Then, find the area of the semicircle, using the equation $1/2\pi r^2$, where r is the radius of the circle: $1/2\pi 2^2 = 2\pi$. Finally, add the two areas: $20 + 2\pi$. The answer is J.
59. $(2 + \sqrt{5})(2 - \sqrt{5}) = -1$, which is a rational number. $(2 + \sqrt{5}) + (2 - \sqrt{5}) = 4$, which is also a rational number. However, $(2 + \sqrt{5}) / (2 - \sqrt{5})$ cannot be reduced to a rational number. The answer is E.
60. The smallest possible value for the product of 2 real numbers that differ by 8 can be found by multiplying 4 by -4, producing a value of -16. The answer is G.