

Mathematics Test

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

Mathematics Test Explanations

1. **The correct answer is D.** According to information in the problem, a vehicle must be *at most* 1,500 pounds to cross the bridge. This means that a vehicle can weigh 1,500 pounds, but it cannot weigh more than 1,500 pounds. Express this mathematically as follows: weight (w) \leq 1,500.

2. **The correct answer is H.** This problem requires you to find the smallest number into which 2, 6, and 9 all go. Eliminate answer choice G, because 17 is an odd number and cannot be a multiple of 2. Next, because you are asked to find the smallest multiple, try the remaining answer choices in order from smallest to largest:

9 does not go into 12, so eliminate answer choice F.

$2 \times 9 = 18$, and $6 \times 3 = 18$, so 18 is the smallest positive integer that is a multiple of 2, 6, and 9.

3. **The correct answer is E.** Anytime that you have zero in the denominator, the expression is undefined. Therefore, one number that CANNOT be zero is u , which is in the denominator. Likewise, when you multiply any number by 0, the result is 0, so z CANNOT be zero.

4. **The correct answer is H.** The first step in solving this problem is to calculate the percentage of residents who DO have a white house. Set up a proportion:

648 is to 2,160 as $x\%$ is to 100%

$$\frac{648}{2,160} = \frac{x}{100}$$

Cross-multiply and solve for x :

$$2,160x = 64,800$$

$$x = 30$$

30% of the residents have a white house. Therefore, $100\% - 30\%$, or 70% of the residents DO NOT have a white house.

5. **The correct answer is D.** To solve this problem, substitute -1 for q and 3 for s wherever those variables appear in the expression:

$$\begin{aligned} & \frac{(q-s)}{3q} \\ &= \frac{(-1-3)}{3(-1)} \\ &= \frac{-4}{-3} = \frac{4}{3} \end{aligned}$$

6. **The correct answer is F.** You can factor 6 out of $(6p+60)$ so that it is equal to $6(p+10)$. Dividing $6(p+10)$ by 6 results in $p+10$.

7. **The correct answer is B.** Line s is a transversal that cuts the parallel lines, p and q . When a transversal cuts 2 parallel lines, all corresponding angles created have the same measurement. $\angle m$ corresponds with $\angle n$, because they are alternate interior angles, they have the same measurement. Since you are given that $m+n=230^\circ$, both $\angle m$ and $\angle n$ must equal $230^\circ \div 2$, or 115° . There are 180° in a straight line. Therefore, if $\angle m$ is 115° , then $\angle o$ must be $180^\circ - 115^\circ$, or 65° .

8. **The correct answer is J.** You are given the equation for the volume of a cylinder, and you are given the lengths of the 2 variables. Simply plug these values into the equation and solve:

$$\text{Volume} = \pi r^2 h$$

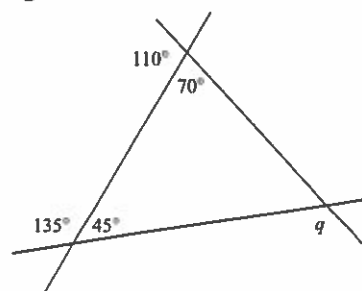
$$\text{Volume} = \pi(4)^2(5)$$

$$\text{Volume} = \pi(16)(5)$$

$$\text{Volume} = \pi 80, \text{ or } 80\pi.$$

9. **The correct answer is C.** The absolute value of a number is the numerical value of a real number without regard to its sign. In order to solve this problem, you must first substitute the number 7 for the x in $|4-x|$, so that you get $|4-7|$. Then, perform the operation within the vertical lines, so that you get $|-3|$. Since you must disregard the negative sign in order to determine absolute value, you know that the absolute value of $|-3|$ is 3.

10. **The correct answer is K.** The first step in solving this problem is to recognize that the angles adjacent to the 110° and 135° angles are complementary to 110° and 135° . This means that, when added together, 110° and the angle adjacent to it must equal 180° , and 135° and the angle adjacent to it must equal 180° . So, the angle adjacent to 110° must equal 70° , and the angle adjacent to 135° must equal 45° . Fill in the measurements on the diagram as shown:



The sum of the interior angles of any triangle is 180° . So, $70^\circ + 45^\circ +$ the measure of the third angle $x = 180^\circ$. Solve for the measure of the third angle:

$$70 + 45 + x = 180$$

$$115 + x = 180$$

$$x = 65$$

The angle adjacent to angle q is 65° , which means that angle q must be $180^\circ - 65^\circ$, or 115° .

11. The correct answer is D. Use the FOIL method to solve this equation. Multiply the First terms, then the Outside terms, then the Inside terms, then the Last terms, as follows:

$$(\sqrt{2} - 6)(\sqrt{2} - 4) =$$

$$\text{First terms: } (\sqrt{2})(\sqrt{2}) = 2$$

$$\text{Outside terms: } (\sqrt{2})(-4) = -4\sqrt{2}$$

$$\text{Inside terms: } (-6)(\sqrt{2}) = -6\sqrt{2}$$

$$\text{Last terms: } (-6)(-4) = 24$$

Now, add like terms together:

$$2 + 24 + (-4\sqrt{2}) + (-6\sqrt{2})$$

$$26 - 10\sqrt{2}$$

12. The correct answer is G. Use the FOIL method to solve this equation. Multiply the First terms, then the Outside terms, then the Inside terms, then the Last terms, as follows:

$$(x - 3y)^2 = (x - 3y)(x - 3y)$$

$$\text{First terms: } (x)(x) = x^2$$

$$\text{Outside terms: } (x)(-3y) = -3xy$$

$$\text{Inside terms: } (-3y)(x) = -3xy$$

$$\text{Last terms: } (-3y)(-3y) = 9y^2$$

Now, add like terms together:

$$x^2 + (-3xy) + (-3xy) + 9y^2$$

$$x^2 - 6xy + 9y^2$$

13. The correct answer is A. Because you are looking for an odd integer, a good way to solve this problem is to pick a value for x , and try the answer choices to see which one yields an odd integer. You are given that x is an odd integer greater than 5, pick 7 as your substitute:

Answer choice A: $x + 2 = 7 + 2 = 9$; $x + 2$ yields an odd integer, so answer choice A could be correct.

Answer choice B: $x + 3 = 7 + 3 = 10$; eliminate answer choice B.

Answer choice C: $x + 5 = 7 + 5 = 12$; eliminate answer choice C.

Answer choice D: $3x = 3(7) = 21$; while this is an odd integer, 21 is greater than 9, so answer choice D is not correct (remember, you're looking for the *next* greater odd integer).

Answer choice E: $x^2 = 7^2 = 49$; again, while this is an odd integer, it is greater than 9, which means that answer choice A must be correct.

If you remembered that the sum of an even and an odd number is always odd, you could have quickly recognized that answer choice A is correct.

14. The correct answer is J. In order to solve this problem, you must put the equations into the standard form, $y = mx + b$. The equation in the problem is equivalent to $y = \frac{-x}{8} + \frac{3}{8}$. Convert the answer choices into the standard form:

$$\text{F. } 3x + 11y = 6; 11y = -3x + 6; y = \frac{-3}{11}x + \frac{6}{11}$$

$$\text{G. } 2x + 10y = 5; 10y = -2x + 5;$$

$$y = \frac{-2}{10}x + \frac{5}{10}; y = \frac{-1}{5}x + \frac{1}{2}$$

$$\text{H. } 3x + y = 8; y = -3x + 8$$

$$\text{J. } 3x + 24y = 9; 24y = -3x + 9; y = \frac{-3x}{24} + \frac{9}{24}; y = \frac{-1}{8}x + \frac{3}{8}$$

Answer choice J, when simplified, is the same equation as the one given in the problem, so this choice is correct.

15. The correct answer is B. To solve this problem, set up an equation. The combined age is 24, which means that Anne's age plus Kyle's age equals 24. Solve for Anne's age:

$$\text{Anne} + \text{Kyle} = 24$$

$$\text{Anne} = 3(\text{Kyle})$$

$$3(\text{Kyle}) + \text{Kyle} = 24$$

$$4(\text{Kyle}) = 24$$

$$\text{Kyle} = \frac{24}{4} = 6$$

Anne is 6×3 , or 18 years old.

16. The correct answer is H. Lines \overline{PQ} and \overline{ST} are 2 parallel lines cut by transversals. This means that the angles created have special relationships. For example, opposite interior angles are congruent,

that is, they have the same measurement. So, angle P is congruent to angle T , which means that the measure of angle T must also be 65° , answer choice H.

17. The correct answer is D. If Carrie has seven dollars less than her brother, who has d dollars, then Carrie has $d - 7$ dollars. If she does not spend any money and earns three dollars, Carrie then has $d - 7 + 3$ dollars, or $d - 4$ dollars.

18. The correct answer is G. Solve for a by isolating a on the left side of the equation. Be careful to line up the decimal points:

$$0.2a + 1.8 = a - 2.2$$

$$0.2a - a = -2.2 - 1.8$$

a is equivalent to $1.0a$; $1.0 - 0.2 = .8$

$$-0.8a = -4.0$$

$$a = \frac{-4.0}{-0.8} = 5$$

19. The correct answer is A. The best way to solve this problem is to substitute the answer choices for x and solve until you get a negative number. Since the question asks you for the smallest integer, start with the smallest answer choice:

$$-\sqrt{8} + 2 = -\sqrt{4} \times \sqrt{2} + 2 = -2\sqrt{2} + 2$$

$$-2(1.41) + 2 = -2.82 + 2 = -0.82$$

The smallest integer, x , that will result in a negative value is 2, answer choice A. Test this by trying the remaining choices.

20. The correct answer is K. To solve this problem, you could recognize that, if the ratio of the pieces is 2:3, then the larger piece will be equal to $\frac{3}{5}$ of the total length. This is true because the part to part ratio is 2:3, so the part to whole ratios must be equal to 2:5 and 3:5. Solve for $\frac{3}{5}$ of 30:

$$30 \times \frac{3}{5} = x$$

$$30 \times 3 = 5x$$

$$90 = 5x$$

$$18 = x$$

21. The correct answer is B. The formula for the area of a circle is πr^2 . Since the area is given as 49π , r^2 must equal 49, and r must equal 7. The diameter is equal to twice the radius, so the diameter equals $2(7)$, or 14.

22. The correct answer is H. The first step in solving this problem is to recognize that the figure

is made up of a right triangle and a rectangle. Calculate the area of each separate figure, then add the results to get the area of the entire figure:

$$\text{Area of a triangle} = \frac{1}{2}(bh)$$

$$\text{Area} = \frac{1}{2}(3 \times 4)$$

$$\text{Area} = \frac{1}{2}(12) = 6$$

The area of the triangle is 6.

$$\text{Area of a rectangle} = l \times w$$

$$\text{Area} = 7 \times 4 = 28$$

The area of the rectangle is 28. Therefore, the area of the figure shown is $6 + 28$, or 34.

23. The correct answer is D. The question asks you to reduce the equation into simpler terms. Since there are 3 variables, a , b , and c , begin simplifying the a s first, then the b s, and finally the c s. When multiplying like coefficients with exponents, add the exponents. When dividing like coefficients with exponents, subtract the exponents. Consider the following:

$$\frac{3a^2b^{-4}c^2}{2^{-2}ac^{-2}} = \frac{3ab^{-4}c^2}{2^{-2}c^{-2}} = \frac{3ab^{-4}c^2}{(\frac{1}{2^2})(\frac{1}{c^2})}$$

$$\frac{3ab^{-4}c^4}{\frac{1}{4}} = 4(3ab^{-4}c^4)$$

$$4\left(\frac{3ac^4}{b^4}\right) = \frac{12ac^4}{b^4}$$

24. The correct answer is J. To solve this problem, cross multiply and solve for x , as follows:

$$\left(\frac{3\sqrt{7}}{7}\right) = \left(\frac{3\sqrt{7}}{x\sqrt{7}}\right)$$

$$21\sqrt{7} = 3x(7)$$

$$21\sqrt{7} = 21x$$

$$\sqrt{7} = x$$

25. The correct answer is D. The first step in solving this problem is to rearrange the terms and set the equation equal to 0:

$$3x^2 - 4x = 0$$

The next step is to factor the common value, x , from each of the terms:

$$x(3x - 4) = 0$$

$$x = 0, \text{ and } 3x - 4 = 0; \text{ solve for } x.$$

$$3x = 4$$

$$x = \frac{4}{3}$$

Therefore, the solutions for x are 0 or $\frac{4}{3}$.

26. The correct answer is K. The slope of a line measures the steepness of a line, and can be calculated by using the following formula: $\frac{y_1 - y_2}{x_1 - x_2}$. Two points on the line are given: (3, -8) and (4, 7). The y values are -8 and 7, so the change in y is $-8 - 7$, or -15. The x values are 3 and 4, so the change in x is $3 - 4$, or -1. The slope is -15 over -1, or 15.

27. The correct answer is B. A circle centered at (a, b) with a radius r has the equation $(x - a)^2 + (y - b)^2 = r^2$. Plug the information given in the question into the equation:

$$(x - 2)^2 + (y - (-7))^2 = 5^2$$

$$(x - 2)^2 + (y + 7)^2 = 25$$

28. The correct answer is H. The key to solving this problem is to recognize that $8x^2 - 8x - 6$ can be factored, as follows:

$$8x^2 - 8x - 6$$

$$= (2x - 3)(4x + 2)$$

So, $(2x - 3)(4x + 2) = (ax - 3)(4x + a)$. Therefore, a must equal 2.

29. The correct answer is A. The slope-intercept form of a line is $y = mx + b$, where m is the slope and b is the y -intercept. By definition, a line perpendicular to any given line will have a slope equal to the negative reciprocal of the given line. Since the slope of the given line is $-\left(\frac{1}{4}\right)$, a line perpendicular to the given line will have a slope of 4. Eliminate answer choices B, D, and E, because they do not have a slope of 4. You are given that another point on the line is (0, -5). This means, that when $x = 0$, $y = -5$; by definition, therefore, -5 is the y -intercept. So the slope-intercept form of the line in the question is $y = 4x - 5$.

30. The correct answer is K. To solve this problem, set up a proportion showing the relationship between the quantity of flour and the number of cookies.

24 cookies is to 60 cookies as 2 cups of flour is to x cups of flour.

$$\frac{24}{60} = \frac{2}{x}; \text{ solve for } x$$

$$24x = 120$$

$$x = 5$$

31. The correct answer is D. One way to solve this problem is to substitute in the answer choices for

the first p -value and solve the equation. Start with the answer choice in the middle, answer choice C. Since you are multiplying by a decimal, if substituting answer choice C into the equation yields a result that is too small, you can eliminate any answer choices that are greater than answer choice C:

$$0.1(800 + 1,800) =$$

$$0.1(2,600) = 260; 260 \text{ is smaller than } 800.$$

Now you can eliminate answer choices A, B, and C. Try answer choice D:

$$0.1(200 + 1,800) = 200; 200 = 200, \text{ so answer choice D is correct.}$$

32. The correct answer is F. The formula of a circle is $(x - a)^2 + (y - b)^2 = r^2$, where (a, b) is the center of the circle, and r is the radius. The diagram shows one edge of the circle at (6, 0), and the other at (0, 0). The midpoint between 0 and 6 is 3, so the radius is 3 and the center of the circle is at point (3, 0). Plug these values into the formula for a and b and the radius, 3, for r :

$$(x - 3)^2 + (y - 0)^2 = 3^2$$

$$(x - 3)^2 + y^2 = 9$$

33. The correct answer is B. To find the solution for the given inequality, isolate x on the left side of the inequality:

$$x + 2(5 - x) \leq 2x + 3$$

$$x + 10 - 2x \leq 2x + 3$$

$$-x + 10 \leq 2x + 3$$

$$-3x \leq -7$$

Now, you need to divide both sides of the inequality by -3; remember to reverse the inequality sign:

$$x \geq \frac{7}{3}$$

34. The correct answer is K. Remember that when you raise an exponent to another exponent, you must multiply the exponents. Therefore, the correct answer will include a^{16} . Only answer choice K includes the correct exponent value, so it must be correct. The complete mathematical solution is shown next:

$$(4a^4)^4 = 4^4 a^{4 \times 4} = 256a^{16}$$

35. The correct answer is B. The formula for the area of a parallelogram is base \times height. You will need to calculate the height by applying the

Pythagorean Theorem: $a^2 + b^2 = c^2$. The unshaded region is a right triangle, so plug the given values into the Pythagorean Theorem:

$$3^2 + b^2 = 5^2$$

$$9 + b^2 = 25$$

$$b^2 = 16$$

$$b = 4$$

The height of the parallelogram is 4. The base is given as 8, so the area of the parallelogram is 4×8 , or 32. Now, calculate the area of the unshaded triangle and subtract it from the total area of the parallelogram. The area of a triangle is $\frac{1}{2}(bh)$, where b is the base, and h is the height:

$$\frac{1}{2}(3 \times 4) =$$

$$\frac{1}{2}(12) = 6$$

$$32 - 6 = 26$$

36. The correct answer is K. This problem requires you to solve for x . Isolate x on the left side of the equation:

$$\frac{3}{4}x - \frac{3}{8} = \frac{1}{4} + \frac{5}{8}x$$

$$\frac{3}{4}x - \frac{5}{8}x = \frac{1}{4} + \frac{3}{8}$$

Now, find the lowest common denominator so that you can add and subtract the fractions. Since both 4 and 8 go into 8, 8 is the lowest common denominator:

$$\frac{3}{4}x = \frac{6}{8}x; \frac{1}{4} = \frac{2}{8}$$

$$\frac{6}{8}x - \frac{5}{8}x = \frac{2}{8} + \frac{3}{8}$$

$$\frac{1}{8}x = \frac{5}{8}$$

$$x = 8 \left(\frac{5}{8} \right)$$

$$x = 5$$

37. The correct answer is D. By definition, a right isosceles triangle has 2 sides of equal length and the hypotenuse is equal to $\sqrt{2}$ times the length of either of the sides. Therefore, the smaller isosceles triangle with a hypotenuse of $2\sqrt{2}$ cm has 2 sides with lengths both equal to 2 cm. To answer this question, you must recognize that similar triangles have the same shape and the same proportions. You are given that the larger, similar triangle has a perimeter 2 times the perimeter of the smaller triangle. Therefore, each side in the larger triangle must

be 2 times the length of the corresponding side in the smaller triangle. Since the 2 equal sides of the smaller triangle are each 2 cm, the 2 equal sides of the larger triangle are each 4 cm.

38. The correct answer is G. To solve this problem, you should calculate the area of the parallelogram and the area of the triangle, then add the results. The area of a parallelogram is equivalent to the base times the height. The area of a triangle is equivalent to $\frac{1}{2}(bh)$, where b is the base and h is the height. You will need to use the Pythagorean Theorem to calculate the height, which will be the same for both the parallelogram and the triangle.

$$a^2 + b^2 = c^2$$

$$6^2 + b^2 = 10^2$$

$$36 + b^2 = 100$$

$$b^2 = 64$$

$$b = 8$$

Now, plug the appropriate values into the equations:

$$\text{Parallelogram} = (b)(h) = (13)(8) = 104.$$

$$\text{Triangle} = \frac{1}{2}(b)(h) = \frac{1}{2}(6)(8) = \frac{1}{2}(48) = 24.$$

$$104 + 24 = 128$$

39. The correct answer is A. By definition, the sine of any acute angle is calculated by dividing the length of the side opposite the acute angle by the hypotenuse ($\sin = \frac{\text{opp}}{\text{hyp}}$). The length of the side opposite angle a is 3, and the length of the hypotenuse is 5. Therefore, $\sin a = \frac{3}{5}$.
40. The correct answer is H. The first step in solving this problem is to solve each element of the equation for x .

$$(x + m) = 0$$

$$x = -m$$

$$(x + n) = 0$$

$$x = -n$$

Now, substitute the value of the solutions given in the equation for x in order to get the values for m and n :

$$x = -m; -3 = -m, \text{ so } m = 3$$

$$x = -n; 5 = -n, \text{ so } n = -5$$

Now add $m(3)$ to $n(-5)$:

$$3 + -5 = -2$$

41. The correct answer is D. The slope-intercept form of the equation for a line is $y = mx + b$, where m is the slope and b is the y -intercept. You can determine the slope of the line with the 2 points given in the question: $(-2, -1)$ and $(2, 2)$. By definition, the slope is equal to $\frac{y_1 - y_2}{x_1 - x_2}$:

$$\frac{-1 - 2}{-2 - 2} = \frac{-3}{-4} = \frac{3}{4}$$

The slope of the line is $\frac{3}{4}$. Use this value as m and 1 of the 2 points given in the question as x and y in the equation for a line. Solve for b :

$$2 = \frac{3}{4}(2) + b$$

$$2 = \frac{3}{2} + b$$

$$b = \frac{1}{2}$$

The equation of this line is $y = \frac{3}{4}x + \frac{1}{2}$. The question asks you to determine what the value of x is when $y = 5$, so substitute 5 for y in the equation of the line and solve for x :

$$5 = \frac{3}{4}x + \frac{1}{2}$$

$$4\frac{1}{2} = \frac{3}{4}x$$

$$x = 6$$

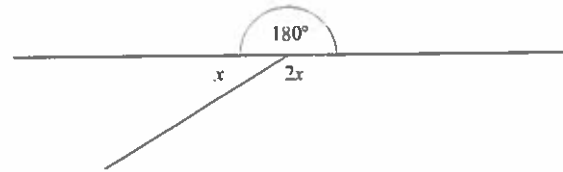
When $y = 5$, $x = 6$.

42. The correct answer is F. By definition, the tangent of any acute angle is $\frac{\sin}{\cos}$. $\sin B$ is given as $\frac{8}{17}$ and $\cos B$ is given as $\frac{15}{17}$. Therefore, $\tan B = \frac{8}{17} \div \frac{15}{17}$. To divide fractions, multiply the numerator by the reciprocal of the denominator: $\frac{8}{17} \cdot \frac{17}{15}$; the 17s will cancel each other out, so $\tan B = \frac{8}{15}$.
43. The correct answer is A. The first step in solving this problem is to recognize that you are looking for the equation of a line in the slope-intercept form, $y = mx + b$, where m is the slope and b is the y -intercept. Since the line shown intersects the y -axis at 5, the y -intercept must be 5. Eliminate answer choices C, D, and E. Since the line shown has a positive slope, answer choice A must be correct. You can calculate the

slope as the change in y -values over the change in x -values:

$$\frac{5 - 0}{0 - (-3)} = \frac{5}{3}$$

44. The correct answer is H. Two adjacent angles have one common ray. As in the picture below, the noncommon rays form a straight angle (a line) which has a measure of 180° .



Given that the measure of one angle is twice ($2x$) that of the other angle (x), the total degree measure of the angles can be found by setting 180° equal to $3x$ ($180 = 3x$). Solve for x (the measure of the smaller angle) to get 60° .

45. The correct answer is D. One way to solve this problem is to recognize that each of the 6 letters can be involved in 20 different 3-letter combinations. For example, when P is in the first position, and O is in the second position, there are 4 possible 3-letter combinations (PON, POI, POE, and POS). Likewise, when P is in the first position, and N is in the second position, there are an additional 4 possible 3-letter combinations (PNO, PNI, PNE, and PNS). Therefore, because you cannot repeat a letter, each letter can be included in $5 \times 4 = 20$ different combinations; a total of 120 (6×20) 3-letter orderings can be made.
46. The correct answer is H. The volume of a cube is calculated by multiplying the length by the width by the height ($l(w)(h)$). You are given that each side has a length of 5 centimeters, so the volume would be equivalent to $5 \cdot 5 \cdot 5$, or 5^3 .
47. The correct answer is E. This problem requires you to find the values of x that make $3x^2 + 4x - 15$ positive. Set up the inequality $3x^2 + 4x - 15 > 0$. One approach is to solve this as if there was an equal sign:

$$3x^2 + 4x - 15 = 0$$

$$(3x - 5)(x + 3) = 0$$

$$x = \frac{5}{3} \text{ and } -3$$

These numbers tell you when $3x^2 + 4x - 15$ is equal to 0. Since answer choices A, B, C, and D

do not reference both of these numbers, they can be eliminated. To make sure that answer choice E is correct, pick a number that is greater than $\frac{5}{3}$, like 2. Plug 2 into the expressions and see if it yields a positive result. Pick another number that is less than -3 , like -4 . Plug -4 into the expression and see if it yields a positive result. Since both do, answer choice E is correct.

48. The correct answer is F. By definition, in a perfect square trinomial the first and last terms are perfect squares, and the middle term is twice the product of the square roots of the first and last terms. Eliminate answer choices G and J because the last terms are not perfect squares. Eliminate choice H because the first term is not a perfect square. Look at the middle term in answer choices F and K; $12 = 2(2 \cdot 3)$, so answer choice F is a perfect square trinomial:

$$4x^2 + 12x + 9 = (2x + 3)(2x + 3)$$

49. The correct answer is E. By definition, a rational number can be expressed as a ratio of 2 integers. Whole numbers are rational numbers, as are fractions and most decimal numbers. Since you are given that both p and q are negative integers, all of the operations represented by the roman numerals will result in rational numbers. Negative numbers can be rational; pick numbers that solve the equation given, to check this theory:

$$p = 2q$$

$$-6 = 2(-3); p = -6 \text{ and } q = -3$$

Now try the given operations using these values:

$$p + q = -6 + -3 = -9; \text{ this is a rational number.}$$

$$\frac{p}{q} = \frac{-6}{-3} = 2; \text{ this is a rational number.}$$

$$\frac{q}{p} = \frac{-3}{-6} = \frac{1}{2}; \text{ this is a rational number.}$$

50. The correct answer is J. To solve this problem, make x minutes the time that it took Marcia to get to Alan's house. On the way home, Marcia went 2 times as fast as she did going to Alan's house, which means that it took her $\frac{1}{2}$ the time, or $\frac{1}{2}x$ minutes. The total number of minutes that Marcia biked is equal to x minutes + $\left(\frac{1}{2}\right)x$ minutes:

$$x + \frac{1}{2}x$$

To add the fractions together, you must convert x into like terms:

$$\frac{2}{2}x + \frac{1}{2}x = \frac{3}{2}x$$

51. The correct answer is E. For this problem, the best approach is to use the given equation and test the answer choices to see which yields the greatest value. Replace r with each of the values in the answer choices and solve the equations:

$$\text{A: } s = 19 - (5 + 19)^3$$

$$s = 19 - (24)^3$$

$$s = 19 - 13,824$$

$$s = -13,805$$

$$\text{B: } s = 19 - (5 + 5)^3$$

$$s = 19 - (10)^3$$

$$s = 19 - 1,000$$

$$s = -981$$

$$\text{C: } s = 19 - (5 + 1)^3$$

$$s = 19 - (6)^3$$

$$s = 19 - 216$$

$$s = -197$$

$$\text{D: } s = 19 - (5 + -5)^3$$

$$s = 19 - (0)^3$$

$$s = 19 - 0$$

$$s = 19$$

$$\text{E: } s = 19 - (5 + -19)^3$$

$$s = 19 - (-14)^3$$

$$s = 19 - (-2,774)$$

$$s = 2,793$$

Answer choice E yields the greatest, or maximum value.

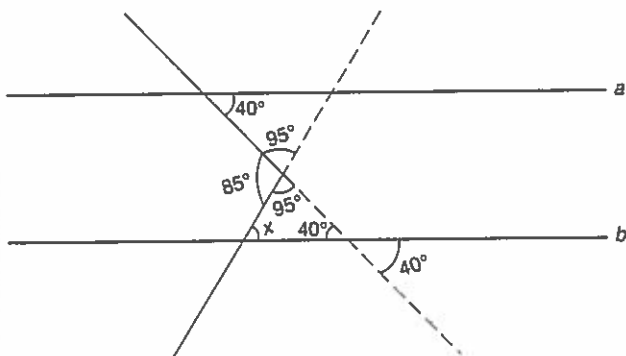
52. The correct answer is K. The sum of the interior angles of a regular octagon is $6(180^\circ)$, or $1,080^\circ$. Since all of the angles are the same, each interior angle is $\frac{1,080^\circ}{8} = 135^\circ$.

53. The correct answer is D. The best way to solve this problem is to set up a table indicating the time period in years, and the number of both CDs and videogames purchased during the years given. The consumption rate is the same, so, based on information in the problem, you can fill in the table as follows:

Time period	CDs	Videogames
1995	5	2
1996	6	4
1997	7	6
1998	8	8
1999	9	10

Teenagers bought the same average number of CDs and videogames in 1998.

54. The correct answer is G. To solve this problem, extend the transversals so that they cross the parallel lines again, as shown below:



Apply the rules regarding parallel lines cut by a transversal to fill in the angle measures. Because the total measure of the other 2 angles of the triangle created by extending the transversals is 135, the measure of angle x must be 45.

55. The correct answer is E. This question tests your ability to recognize and apply the distributive property. According to the distributive property, for any numbers a , b , and c , $c(a + b) = ca + cb$. According to the distributive property, $a(b + c) =$

$ab + ac$ is equivalent to $ca + ba$, so roman numeral I is correct; eliminate answer choices B and C.

$ab + ac$, so roman numeral II is correct; eliminate answer choice A.

$(b + c)a$, so roman numeral III is also correct, eliminate answer choice D.

Since all of the operations are equivalent to $a(b + c)$, answer choice E is correct.

56. The correct answer is F. By definition, the tangent of any angle is $\frac{\sin}{\cos}$. Therefore,

$$\frac{(\tan x)}{(\sin x \cos x)}, \text{ simplified as } (\tan x) \cdot \left(\frac{1}{\sin x \cos x}\right)$$

is equal to $\frac{\sin}{\cos} \cdot \left(\frac{1}{\sin x \cos x}\right)$. Multiply the fractions, first canceling the $\sin x$ from the numerator and denominator to get:

$$\frac{1}{\cos^2 x}$$

57. The correct answer is C. The absolute value is always positive, so in order for the absolute value of x^3 to equal $-x^3$, x must be either a negative number or 0, answer choice C. If you cube a negative number, the result is always negative. So, if x were equal to -1 , for example, the absolute value of x^3 would be $(-1)(-1)(-1)$, or 1. The value of $-x^3$ would also be 1, because $-(-1)^3$ is equivalent to 1^3 . Zero is an option as well, since 0 is neither negative nor positive, and 0 raised to any power is still 0.

58. The correct answer is F. The best way to solve this problem is to substitute in the answer choices for c and factor the equation:

$$3x^2 + 2x - 1 = 0$$

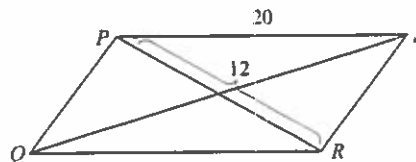
$$(3x - 1)(x + 1) = 0$$

$$3x - 1 = 0; 3x = 1; x = \frac{1}{3}$$

$$x + 1 = 0; x = -1$$

Answer choice F gives you 2 real solutions for x . Testing the other answer choices will yield 2 distinct complex roots, not real roots.

59. The correct answer is B. You are given that angle QPR and angle PRS are right angles; you are also given the lengths of diagonal PR (12), and side PS (20). Draw a diagram to help visualize the problem:



You should now see that you have the length of 1 side of the right triangle PRS (12), and the length of the hypotenuse (20). Use the Pythagorean Theorem to calculate the length of the remaining side:

$$a^2 + b^2 = c^2$$

$$12^2 + b^2 = 20^2$$

$$144 + b^2 = 400$$

$$b^2 = 256$$

$$b = 16$$

The length of RS is 16.

60. The correct answer is K. Before you answer the question, notice that the ramp forms a triangle with sides s and x , and a hypotenuse of an unknown length that represents the length of the ramp. The slope of the ramp can be defined in the same way the slope of a line is defined: $\frac{\text{change in } y}{\text{change in } x}$. In this instance, the change in y is

the vertical length, or height of the triangle, and the change in x is the horizontal length, or base of the triangle. If the slope of the ramp is t , then:

$$t = \frac{\text{change in } y}{\text{change in } x} = \frac{s}{x}$$

$$x = \frac{s}{t}$$

Now that you have a value for x , you can use the Pythagorean Theorem: $a^2 + b^2 = c^2$. Solve for the length of the ramp (or the hypotenuse), c :

$$(\text{length of the ramp})^2 = s^2 + \left(\frac{s}{t}\right)^2$$

$$\text{length of the ramp} = \sqrt{s^2 + \left(\frac{s}{t}\right)^2}$$