

**Mathematics Test**

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

## Mathematics Test Explanations

1. The correct answer is B. This is a basic Algebra problem that requires you to solve for  $x$ . Isolate the variable,  $x$ , on one side of the equation, as follows:

$$2x + 5 = 17$$

$$2x = 12$$

$$x = \frac{12}{2} = 6$$

2. The correct answer is G. The best way to answer this question is to look at the answer choices given and decide whether each choice is true, based on the 3 statements, or false because it contradicts 1 or more of the 3 statements.

Answer choice G states that Horse B is brown. Since you know that Horse B also runs fast, and that all horses that run fast are brown, answer choice G must be true, and, therefore is the correct answer.

3. The correct answer is A. To solve this problem, find the difference between  $x - 2$  and  $x + 5$ , as follows:

$$(x + 5) - (x - 2)$$

$$= x - x + 5 - (-2)$$

$$= 7$$

4. The correct answer is K. To solve this problem, substitute 15 for  $b$  in the equation:

$$4(15) - 30$$

$$= 60 - 30$$

$$= 30$$

5. The correct answer is C. The price of the carton of soda is currently \$6.60, but will be reduced by 20% when it goes on sale. The decimal form of 20% is .20. In order to find the sale price, perform the following operations:

$$\begin{array}{r} \$6.60 \text{ (original price)} \\ \times .20 \text{ (discount percent)} \\ \hline \end{array}$$

$$\begin{array}{r} \$1.32 \text{ (discount amount)} \\ \hline \end{array}$$

$$\begin{array}{r} \$6.60 \text{ (original price)} \\ - \$1.32 \text{ (discount amount)} \\ \hline \end{array}$$

$$\begin{array}{r} \$5.28 \text{ (sale price)} \\ \hline \end{array}$$

6. The correct answer is K. To find the value of  $a$  and  $b$ , first find the square root of 64 and 81. Since a negative number squared results in a positive number, consider both the negative and positive values:

$$\sqrt{64} = 8 \text{ or } -8 \text{ and } \sqrt{81} = 9 \text{ or } -9$$

Find all of the possibilities for  $a + b$ :  $-8 + -9 = -17$ ,  $8 + -9 = -1$ ,  $-8 + 9 = 1$ , and  $8 + 9 = 17$ . This means that 145 is NOT a value of  $a + b$ , so answer choice K is correct.

7. The correct answer is D. Triangle  $BEF$  is an isosceles triangle with 2 congruent sides,  $\overline{BE}$  and  $\overline{BF}$ , and 2 angles with equal measure,  $\angle BFE$  and  $\angle BEF$ .  $\overline{BF}$  is also the transversal between 2 parallel lines,  $\overline{AC}$  and  $\overline{DG}$ , making angles  $\angle CBF$  and  $\angle BFE$  alternate interior angles, which are congruent. By definition, if angle  $\angle CBF$  is  $40^\circ$ , angle  $\angle BFE$  is also  $40^\circ$ . Since there are  $180^\circ$  in a line, angle  $\angle BFG$  must equal  $180^\circ - 40^\circ$ , or  $140^\circ$ .

8. The correct answer is F. Simply substitute  $-3$  for  $x$  wherever  $x$  appears in the equation and solve the equation. Don't forget to keep track of the negative signs!

$$(-3)^2 - 6(-3) - 18$$

$$= (9) - (-18) - 18$$

$$= 9 + 18 - 18$$

$$= 9 + 0$$

$$= 9$$

9. The correct answer is C. In order to solve this problem, you must first substitute the number 12 for the  $a$  in  $|1 - a|$ , so that you get  $|1 - 12|$ . Then, perform the operation within the vertical lines to get  $|-11|$ . Since you must disregard the negative sign in order to determine absolute value, the absolute value of  $-11$  is 11.

10. The correct answer is J. To solve this problem, substitute  $kb$  for  $c$  in the first equation and solve for  $k$ :

$$ab = kb$$

$$\frac{ab}{b} = k$$

$$a = k$$

11. The correct answer is A. According to the law of exponents,  $(x^a)^b = x^{(a \times b)}$ . So,  $(x^3)^{13}$  is equal to  $x^{(3 \times 13)}$ , or  $x^{39}$ .

12. The correct answer is H. The easiest way to solve this problem is to plug the answer choices into the inequality and solve. Because the question asks you for the largest possible value of  $x$ , start with the largest answer choice (note that the answer choices are in ascending order):

$$\frac{2}{28} \geq \frac{1}{7}; \frac{2}{28} = \frac{1}{14}, \text{ which is less than } \frac{1}{7}, \text{ so eliminate answer choice K.}$$

Try the next largest number:

$\frac{2}{15} \geq \frac{1}{7}$ ;  $\frac{2}{15} = \frac{1}{7.5}$ , which is less than  $\frac{1}{7}$ , so eliminate answer choice J.

Try the next largest number:

$\frac{2}{14} \geq \frac{1}{7}$ ;  $\frac{2}{14} = \frac{1}{7}$

This satisfies the inequality and is the largest remaining answer choice, so answer choice H must be correct.

13. **The correct answer is D.** There are 360 degrees in a circle. To calculate the number of degrees in 5 of the 12 sectors, perform the following operations:

$360^\circ \div 12 = 30^\circ$ . Each sector is equivalent to  $30^\circ$ .

$30^\circ \times 5$  (the number of sectors) =  $150^\circ$

14. **The correct answer is G.** To solve this problem, calculate the average by first finding the total number of students who entered through the main entrance that week:

$$(450 + 427 + 462 + 433 + 398) = 2,170$$

Next, divide by the number of school days:

$$2,170 \div 5 = 434$$

15. **The correct answer is A.** To solve this problem, set each element of the equations in the answer choices equal to 0 and solve for  $x$ , starting with answer choice A:

$$(x - 6) = 0; x = 6$$

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

Since this equation has solutions of 6 and  $-3$ , answer choice A is correct.

16. **The correct answer is H.** This problem requires you to solve for  $x$ . Perform the operations and simplify as much as possible:

First, distribute the  $-2$  to get  $-2(x - 10) = -2x - (-20)$ ; this simplifies to  $-2x + 20$ .

Then, add the 7 back in to get  $7 + (-2x) + 20$ , or  $-2x + 27$ .

17. **The correct answer is D.** The first step in selecting the correct answer to this problem is to recognize that  $x$  cannot be less than 90. This means that answer choices A, B, and C can be eliminated. Set up a proportion to calculate the correct answer:

90 is to  $x$  as 60% is to 100%.

$\frac{90}{x} = \frac{60}{100}$ ; cross-multiply and solve for  $x$ .

$$60x = 9,000$$

$$x = 150$$

18. **The correct answer is G.** To solve this problem, calculate the price of 1 box of popcorn and subtract it from the price of 1 box of popcorn and 1 drink.

$\$8.35$  (2 boxes and 1 drink)  $-$   $\$5.10$  (1 box and 1 drink) =  $\$3.25$  (1 box of popcorn)

$\$5.10$  (1 box and 1 drink)  $-$   $\$3.25$  (1 box of popcorn) =  $\$1.85$

The price of 1 drink is  $\$1.85$ .

19. **The correct answer is A.** In order to solve this problem you must first calculate the total cost of the lamps, including tax. Since the sales tax is 7%, multiply the price of the 2 lamps ( $\$8.99 \times 2$ ) by 0.07, the decimal equivalent of 7%:

$$\$8.99 \times 2 = \$17.98$$

$$\$17.98 \times 0.07 = 1.2586$$

$\$1.2586$  rounded to the nearest cent is  $\$1.26$ .

Now, add the sales tax to the price of the lamps:

$$\$17.98 + \$1.26 = \$19.24$$

Based on these calculations, you will need  $\$0.24$  in exact change.

20. **The correct answer is G.** To solve this problem, find the cube root of 343, then multiply it by 3:

$$r^3 = 343$$

$$r = 7$$

$$3r = 21$$

You could have quickly eliminated answer choice J because it is too large. Cubing a number typically results in a value greater than the value obtained when multiplying the number by 3. Likewise, you could have eliminated answer choices F and H, because neither 7 nor 49 is divisible by 3.

21. **The correct answer is B.** In order to solve this problem you must know that  $\pi$  is approximately equal to 3.14. The next step is to find the value

of the fractions  $\frac{7}{3}$  and  $\frac{9}{2}$ . To do this, divide the numerators by the denominators:  $7 \div 3 = 2.33$  and  $9 \div 2 = 4.5$ . Now, put the values in order from least to greatest:  $2.33 < 3.14 < 4.5$ , or  $\frac{7}{3} < \pi < \frac{9}{2}$ .

22. The correct answer is J. The question can be solved using the following equation:  $\frac{9+x}{13+x} = \frac{3}{4}$ . Cross-multiply to get  $4(9+x) = 3(13+x)$ . Solve for  $x$ :

$$4(9+x) = 3(13+x)$$

$$36 + 4x = 39 + 3x$$

$$4x - 3x = 39 - 36$$

$$x = 3$$

23. The correct answer is B. The slope of a line is the rise of the line over the run of the line (rise/run). Rise represents the change in  $y$ , and run represents the change in  $x$ . Two points on the line are given:  $(5,4)$  and  $(2,-7)$ . The  $y$  values are 4 and  $-7$ , so the change in  $y$  is  $4 - (-7)$ , or  $4 + 7$ , which is 11. The  $x$  values are 5 and 2, so the change in  $x$  is  $5 - 2$ , or 3. The slope is  $\frac{11}{3}$ .

24. The correct answer is H. To solve this problem, list the prime factors for both 38 and 100:

Prime factors of 38: 1, 2, 19

The largest prime factor of 38 ( $p$ ) is 19, so the correct answer must be greater than 19; eliminate answer choices F and G.

Prime factors of 100: 1, 2, 5

The largest prime factor of 100 ( $f$ ) is 5, so  $p+f = 19+5 = 24$ .

25. The correct answer is E. The key to solving this problem is to recognize that, if  $(t+v)^2 = 289$ , then  $t+v$  must equal 17, because  $17^2$  equals 289. Now, since you are given that  $tv = 30$ , you need to find 2 numbers that, when added together give you 17, and when multiplied together give you 30. The only 2 numbers that will satisfy both operations are 15 and 2. Substitute 15 for  $t$  and 2 for  $v$  in the final equation:

$$15^2 + 2^2$$

$$225 + 4 = 229$$

26. The correct answer is G. When exponents are raised to an exponential power, the rules state that you must multiply the exponents by the power to which they are raised. In this problem,  $x$  is raised to the  $(3a+5)$  power. This exponent is then raised to the fourth power, so you should multiply  $3a+5$  by 4:  $4(3a+5) = 12a+20$ . You now have the equation  $x^{12a+20} = x^{44}$ .

Since the bases are equal ( $x$ ), the exponents must also be equal, so  $12a+20 = 44$ . Solve for  $a$ :

$$12a + 20 = 44$$

$$12a = 24$$

$$a = \frac{24}{12} = 2$$

27. The correct answer is B. Logarithms are used to indicate exponents of certain numbers called bases. This problem tells you that log to the base  $x$  of 16 equals 2. By definition,  $\log_a b = c$ , if  $a^c = b$ . So  $\log_x 16 = 2$  when  $x^2 = 16$ . Since the square root of 16 is 4, answer choice B is correct.

28. The correct answer is J. To solve this problem you can use the Midpoint Formula. The midpoint of a line,  $M$ , is equal to the average of the  $x$ -coordinates and the average of the  $y$ -coordinates. The formula looks like this:

$$M = \left( \frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2} \right)$$

You are given 1 point on the line,  $(-2, 9)$  and the midpoint of the line  $(4,4)$ . Since the midpoint is  $(4,4)$  the average of the  $x$ -coordinates is 4, and the average of the  $y$ -coordinates is 4. Set up equations to solve for the other endpoint:

$$4 = \frac{-2 + x_2}{2}$$

$$8 = -2 + x_2$$

$$10 = x_2$$

The  $x$ -coordinate of the other endpoint is 10. Since only answer choice J includes an  $x$ -coordinate of 10, it must be the correct answer. If you solve for the  $y$ -coordinate in the same way that you solved for the  $x$ -coordinate, you will get  $y = -1$ .

29. The correct answer is D. A circle centered at  $(a,b)$  with a radius  $r$ , has the equation  $(x-a)^2 + (y-b)^2 = r^2$ . Based on this definition, a circle with the equation  $(x-4)^2 + (y+1)^2 = 14$  would have a radius of  $\sqrt{14}$ . If  $r^2 = 14$ , then  $r = \sqrt{14}$ .
30. The correct answer is H. The cosine of any angle is calculated by dividing the length of the side adjacent to the acute angle by the hypotenuse ( $\cos = \frac{\text{adj}}{\text{hyp}}$ ), so the  $\cos \angle A = \frac{12}{x}$ . To find the

length of the hypotenuse, use the Pythagorean Theorem,  $a^2 + b^2 = c^2$ :

$$12^2 + 5^2 = c^2$$

$$144 + 25 = 169 = c^2$$

$$\sqrt{169} = \sqrt{c^2}, \text{ so } c = 13$$

$$\text{The cos of } \angle A = \frac{12}{13}$$

31. The correct answer is B. You should think of this problem as a basic fraction, where  $(13a^2b^4)(-8a^3b^5)$  is the numerator and  $(4a^2b^6)$  is the denominator. The first step is to multiply together the 2 elements in the numerator, as follows:

When multiplying exponents, the rules state that you should add exponents with like bases, so  $(13a^2b^4)(-8a^3b^5) = -104a^5b^9$ .

To solve a fraction, you simply divide the numerator by the denominator.

When dividing exponents, the rules state that you should subtract exponents of the same bases in the denominator from the exponents of the same bases in the numerator, so  $-104a^5b^9 \div (4a^2b^6) = -26a^3b^3$ .

32. The correct answer is K. 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 (only for a right isosceles triangle). Therefore, a right isosceles triangle could have side lengths equal to 2, 2, and  $2\sqrt{2}$ , answer choice K.

33. The correct answer is C. In the point-slope form of a line,  $y = mx + b$ ,  $b$  is the  $y$ -intercept. The first step in solving this problem is to put the equation in the point-slope form, as follows:

$$3x + 7y - 2 = 0$$

$$7y = -3x + 2$$

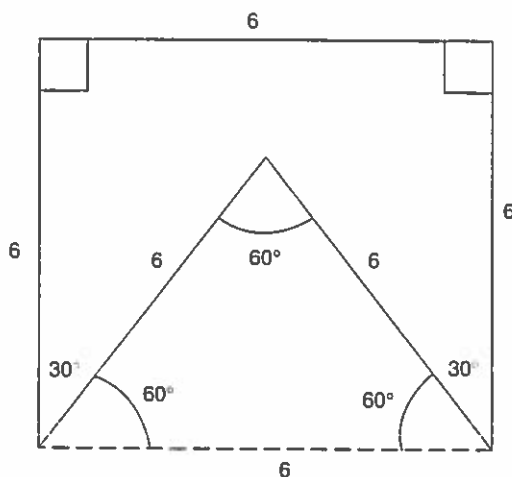
$$y = -\frac{3x}{7} + \frac{2}{7}$$

As you can see, the  $y$ -intercept is  $\frac{2}{7}$ .

34. The correct answer is F. According to the graph shown, the number  $-4$  is included, but the number 6 is not included. This means that  $x$  must be greater than or equal to  $-4$  ( $x \geq -4$ ) and/or  $x$  must be less than 6 ( $x < 6$ ). Since the sets overlap on the graph, the correct answer is  $x \geq -4$  and  $x < 6$ .

35. The correct answer is B. You are given that the figure is drawn to scale, so you know that if the

square shown had a bottom, it would also be 6 units (see figure below):



You also know that the angles created by drawing the bottom of the square must be  $60^\circ$  because they are complementary to the  $30^\circ$  shown. Because there are  $180^\circ$  in a triangle, the top angle must also be  $60^\circ$ , thereby creating an equilateral triangle. An equilateral triangle has congruent sides, which means that each side measures 6 units, and the perimeter of the original figure is  $6 \times 5 = 30$ .

36. The correct answer is H. Because a negative number cannot have a square root, the value under a square root sign *must* be positive. In this problem, the value under the square root sign is  $3\left(\frac{x^3}{2y}\right)$ , or  $\frac{3x^3}{2y}$ . Choose values for the answer choices and eliminate those choices that could give you a negative value under the square root sign:

If  $x$  is negative, then  $x^3$  will be negative. If  $y$  is also negative, then  $2y$  will also be negative, so the value under the square root sign will be positive. Answer choice F will work.

If  $x$  is positive, then  $x^3$  will be positive. If  $y$  is also positive, then  $2y$  will also be positive, so the value under the square root sign will be positive. Answer choice G will also work.

Answer choices J and K are not true, because you have just determined that both  $x$  and  $y$  must both be either positive or negative.

Since answer choices F and G cannot both be correct, you are left with answer choice H.

37. The correct answer is D. The question asks you to solve for  $S$ , so perform the following operations:

$$A = 2S + 9$$

$$A - 9 = 2S$$

$$\frac{A - 9}{2} = S$$

38. The correct answer is G. Calculate the slope by using the following formula:  $\frac{(y_1 - y_2)}{(x_1 - x_2)}$ . Any line perpendicular to the  $y$ -axis is a horizontal line. Because there is no change in  $y$ , the numerator  $(y_1 - y_2)$ , is 0. This means that the slope of a horizontal line is 0, answer choice G.

39. The correct answer is D. To solve this problem, recall that wherever a line crosses the  $x$ -axis, the  $y$ -coordinate is 0. Substitute 0 for  $y$  in the equation and solve for  $x$ :

$$5 \times 0 = 25x - 50$$

$$0 = 25x - 50$$

$$50 = 25x$$

$$x = 2$$

40. The correct answer is K. To solve this problem, you must calculate the  $\tan \alpha$  and the  $\cos \beta$ . The tangent of any acute angle is calculated by dividing the length of the side opposite the acute angle by the length of the side adjacent to the acute angle ( $\tan = \frac{\text{opp}}{\text{adj}}$ ). The cosine of any acute angle is calculated by dividing the length of the side adjacent to the acute angle by the hypotenuse ( $\cos = \frac{\text{adj}}{\text{hyp}}$ ). The  $\tan$  of angle  $\alpha$  is  $\frac{4}{3}$ , and the  $\cos$  of angle  $\beta$  is  $\frac{4}{5}$ . Now you can substitute these values into the equation given in the problem and solve:

$$(\tan \alpha)(\cos \beta) = \left(\frac{4}{3}\right)\left(\frac{4}{5}\right) = \frac{16}{15}$$

41. The correct answer is E. According to information in the problem, Amy can run 3 miles in  $s$  minutes, or  $\frac{3}{s}$ . The question asks you to calculate the distance she can run in 50 minutes. Set up a proportion and solve for  $x$ :

$$\frac{3}{s} = \frac{x}{50}$$

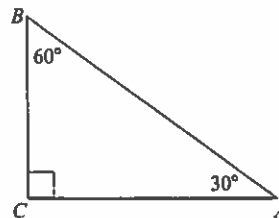
$$sx = 150$$

$$x = \frac{150}{s}$$

42. The correct answer is J. The problem states that each gallon of oil weighs 6 pounds. Multiply the number of pounds per gallon (6) by the number of gallons that the tank contains (4,800):

$$6 \times 4,800 = 28,800$$

43. The correct answer is C. The area of a triangle is calculated using the formula  $A = \frac{1}{2}(bh)$ , where  $b$  is the length of the base, and  $h$  is the height. Based on the measures of the angles given, you can draw triangle  $ABC$  as shown below:



You are given that  $\overline{AB}$ , the hypotenuse, is 16 units long. Because this is a  $30^\circ$ - $60^\circ$ - $90^\circ$  triangle, you can calculate the lengths of the height ( $\overline{BC}$ ) and the base ( $\overline{AC}$ ). The relationship between the sides of a  $30^\circ$ - $60^\circ$ - $90^\circ$  triangle is as follows: The side opposite the  $30^\circ$  is equal to  $\frac{1}{2}$  of the length of the hypotenuse, and the side opposite the  $60^\circ$  is equal to  $\frac{\sqrt{3}}{2}$  of the length of the hypotenuse times  $\sqrt{3}$ . Calculate the lengths of the sides:

$$\text{Side } \overline{AC} \text{ (the base)} = \frac{1}{2}(16\sqrt{3}) = 8\sqrt{3}$$

$$\text{Side } \overline{BC} \text{ (the height)} = \frac{1}{2}(16) = 8$$

Now you can substitute these values into the formula for the area of a triangle:

$$A = \frac{1}{2}(8)(8\sqrt{3}) = 4(8\sqrt{3}) = 32\sqrt{3}$$

44. The correct answer is F. Perpendicular lines have negative reciprocal slopes. The equation of the line given is  $y = 2x + 1$ , so the slope is 2. The slope of a line perpendicular to this line will have a slope equal to  $-1/2$ . Only answer choice F has a slope equal to  $-1/2$ , so it must be the correct choice.

45. The correct answer is C. The area of a rectangle is calculated by multiplying the width by the length ( $A = w \times l$ ). Calculate the area of the first rectangle as follows:

Set the width equal to  $x$ , and the length equal to  $2x$ .

$$A = x(2x) = 2x^2$$

Now calculate the area of the second rectangle:

The length is tripled and the width is doubled, so the length is  $3(2x)$  and the width is  $2x$ .

$$A = 3(2x)(2x) = 6x(2x) = 12x^2$$

The area of the second triangle is  $12x^2$ , which is 6 times greater than the area of the first triangle ( $2x^2$ ).

46. The correct answer is J. Systems of equations will have an infinite number of solutions when the equations are equal to each other. The first step in solving this problem is to recognize that the second equation is exactly 3 times the value of the first equation:  $72x = 3(24x)$ ,  $45y = 3(15y)$ , so  $9z$  must equal  $3(108)$ . Solve for  $z$ :

$$9z = 3(108)$$

$$9z = 324$$

$$z = 36$$

47. The correct answer is B. A prime number is a number that is only divisible by 1 and itself. If you list all of the numbers between 36 and 54, not including 36 and 54, you will find the prime numbers 37, 41, 43, 47, and 53. There are 5 prime numbers between 36 and 54.

48. The correct answer is H. The tangent of any acute angle is calculated by dividing the length of the side opposite the acute angle by the length of the side adjacent to the acute angle ( $\tan = \frac{\text{opp}}{\text{adj}}$ ). The sine of any acute angle is calculated by dividing the length of the side opposite to the acute angle by the hypotenuse ( $\sin = \frac{\text{opp}}{\text{hyp}}$ ). If  $\tan A = \frac{x}{y}$ , then  $\sin A = \frac{x}{\text{hypotenuse}}$ . To determine the length of the hypotenuse, use the Pythagorean Theorem,  $a^2 + b^2 = c^2$ . According to this equation,  $a^2 + b^2 = x^2 + y^2$ , so  $c^2 = x^2 + y^2$ , and  $c = \sqrt{x^2 + y^2}$ . Now that you know the value of the hypotenuse, you can solve for  $\sin A$ .  $\sin A$  is  $\frac{x}{\sqrt{x^2 + y^2}}$ .

49. The correct answer is B. To solve this problem, you must first recognize that there are 360 degrees in a circle. Next, set up a ratio to calculate the number of degrees represented by Aishah's time playing the piano:

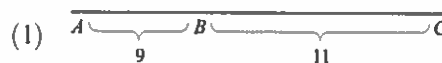
1.5 is to 24 as  $x$  is to 360.

$$\frac{1.5}{24} = \frac{x}{360}$$

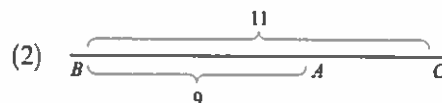
$$24x = 540$$

$$x = 22.5$$

50. The correct answer is H. The easiest way to solve this problem is to draw a line and place the given points on the line, as follows:



Based on the line above, 1 possible length of  $AC$  is 20. Eliminate answer choices G, J, and K. Since you are left with answer choices F and H, you need to determine if  $AC$  could also be 2 meters long. Draw another line, and change the order of the points:



Based on this line, another possible length of  $AC$  is 2, so answer choice H must be correct.

51. The correct answer is E. To solve this problem, first recall that there are 360 degrees in a circle. The sector shown is equal to  $30^\circ$ , so it is  $1/12$  of the total circle. Likewise, the arc represents  $1/12$  of the total circumference of the circle. The formula for the circumference of a circle is  $C = 2\pi r$ , so the circumference of the circle is  $12(6\pi) = 2\pi r$ . Solve for  $r$  as shown next:

$$12(6\pi) = 2\pi r$$

$$72\pi = 2\pi r$$

$$36 = r$$

You now know that the radius of the circle is 36. The formula for area of a circle is  $A = \pi r^2$ . Calculate the area of the circle as shown next:

$$A = \pi (36)^2$$

$$A = 1,296\pi$$

Because sector  $LMN$  is  $1/12$  of the total area of the circle, the area of sector  $LMN$  is  $1,296 \div 12 = 108$ .

52. The correct answer is G. In this problem, the quantity  $6a^5b^7$  is less than 0, which means it must be negative. 6 is positive and  $a^5$  and  $b^7$  can be positive or negative. Since a negative number times a negative number yields a positive number, either  $a^5$  or  $b^7$  must be negative, but not both. Eliminate answer choice F. By definition, if you raise a negative number to an odd numbered power, the result will be negative. Since the problem asks which must be true, answer choice G is correct because it makes either  $a$  or  $b$  negative, but not both.

53. The correct answer is C. The easiest way to solve this problem is to determine the number of patients Mandy visited each day and calculate the total number of visits on all 5 days:

Day 1: 7 visits

Day 2:  $7 + 3 = 10$  visits

Day 3:  $10 + 3 = 13$  visits

Day 4:  $13 + 3 = 16$  visits

Day 5:  $16 + 3 = 19$  visits

$7 + 10 + 13 + 16 + 19 = 65$  visits.

54. The correct answer is K. If 2 numbers,  $x$  and  $y$ , differ by 8, that means that  $x - y = 8$ . Multiplying the 2 numbers,  $(x)(y)$ , will yield the product. Solve the first equation for  $x$ :

$$x - y = 8$$

$$x = y + 8$$

Substitute the result for  $x$  in the second equation, as follows:

$$(y + 8)y$$

Since one of the answer choices must be the solution to that equation, plug in the answer choices, starting with the smallest value (note that the answer choices are in descending order):

$$(y + 8)y = -16$$

$$y^2 + 8y = -16$$

$$y^2 + 8y + 16 = 0$$

$$(y + 4)^2 = 0$$

$$y = -4$$

Now, substitute  $-4$  for  $y$  in the first equation and solve for  $x$ :

$$x - (-4) = 8$$

$$x = 4$$

Since  $(4)(-4) = -16$ , answer choice K is correct.

55. The correct answer is A. Because angle  $x$  is less than  $90^\circ$ , it is an acute angle. The cosine of any acute angle is calculated by dividing the length of the side adjacent to the acute angle by the hypotenuse ( $\cos = \frac{\text{adj}}{\text{hyp}}$ ). This means that the length of the side adjacent to angle  $x$  is 4, and the length of the hypotenuse is 5. The sine of any acute angle is calculated by dividing the length of the side opposite to the acute angle by the hypotenuse ( $\sin = \frac{\text{opp}}{\text{hyp}}$ ). Since you know the measure of the side adjacent to angle  $x$  and the length of the hypotenuse, you can use the Pythagorean Theorem to calculate the length of the side opposite angle  $x$ .

Pythagorean Theorem:  $a^2 + b^2 = c^2$ , where  $c$  is the hypotenuse.

$$4^2 + b^2 = 5^2$$

$$16 + b^2 = 25$$

$$b^2 = 9$$

$$b = 3$$

The side opposite angle  $x$  is 3, so the sine of angle  $x$  is  $\frac{3}{5}$ .

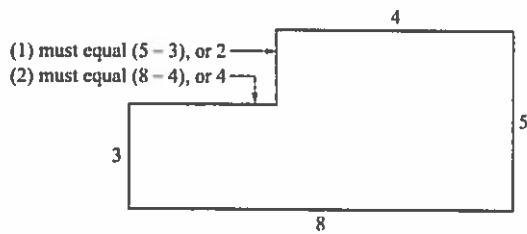
56. The correct answer is F. The problem asks for an expression that represents the *number* of sets of books sold, not the *price* of the sets of books sold. One way to understand the problem is to make a table and notice the pattern:

Change in \$ per set of books	Number of books sold
Original price of \$9.50	1,750 books sold (given in problem)
Decrease by \$1.00 = \$8.50	1,750 + 1,200(1) books sold
Decrease by \$2.00 = \$7.50	1,750 + 1,200(2) = 1,750 + 2,400 books sold
Decrease by \$3.00 = \$6.50	1,750 + 1,200(3) = 1,750 + 3,600 books sold
Decrease by \$ $x$ = $(9.50 - x)$	1,750 + 1,200 $x$ books sold

57. The correct answer is A. The rules of the game state that a player is a winner if 2 marbles drawn have a sum greater than 45. Martin has already drawn the marble numbered 17. In order to win, Martin must draw another marble with a number greater than 28 ( $17 + 28 = 45$ ). The possible winning marbles are 29, 30, 31 ... 44. Therefore, Martin has 16 chances to draw a winning marble. Since he has already drawn one of the 45 marbles and did not put it back, he has 16 chances out of 44 to draw a winning marble.  $\frac{16}{44}$  can be reduced to  $\frac{4}{11}$ .

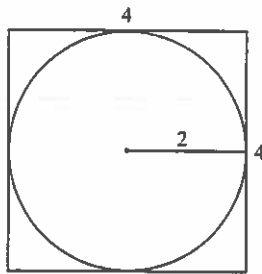


58. The correct answer is F. The perimeter is the distance around an object. Calculate the perimeter by adding the lengths of the sides. First, find the missing lengths:



The perimeter is  $3 + 4 + 5 + 8 + 2 + 4$ , which is 26.

59. The correct answer is C. A circle that is inscribed in the square will be contained completely inside the square, and will touch all 4 sides of the square. Draw a picture to help you visualize the problem:



If the vertices, or corners of the square, are at the coordinates given, the length of each of the sides of the square must be 4. This means that the

diameter of the circle is 4, and the radius is 2. The equation of a circle centered at  $(a,b)$  with a radius  $r$ , is  $(x - a)^2 + (y - b)^2 = r^2$ . Substitute 2 for  $r$  and get a value of 4 for  $r^2$ . You can eliminate answer choices A, B, and E, which indicate that  $r^2$  is equal to either 2 or 8. Answer choice C matches the standard form of the equation of a circle, so it is the correct choice.

60. The correct answer is K. According to the question, on Wednesday, the original price (\$60) was reduced by 15%. This means that the price on Wednesday was  $100\% - 15\%$ , or 85% of \$60. Multiply \$60 by 0.85, the decimal equivalent of 85%, to get \$51. Two weeks later, this price (\$51) is further reduced by 20%. Calculate this reduced price:

$$100\% - 20\% = 80\%$$

$$(\$51) 0.80 = \$40.80$$

Set up a proportion to calculate the percent this price is of the original price:

$$\$40.80 \text{ is to } \$60 \text{ as } x\% \text{ is to } 100\%$$

$$\frac{40.80}{60.00} = \frac{x}{100}; \text{ cross-multiply and solve for } x.$$

$$60x = 4,080$$

$$x = 68$$