

- 1) The two angles indicated, which were formed by the two intersecting lines, are vertical angles. As such, they are congruent. Set them equal to each other and solve for x:

$$\begin{aligned} 2x - 5 &= x + 5 && \text{Subtract } x \text{ from both sides.} \\ x - 5 &= 5 && \text{Add 5 to both sides.} \\ \mathbf{x} &= \mathbf{10} \end{aligned}$$

ANSWER: (3)

- 2) You are asked to solve the following equation:

$$\begin{aligned} 13x - 2(x+4) &= 8x + 1 && \text{Use the distributive property on } -2(x+4) \\ 13x - 2x - 8 &= 8x + 1 && \text{Combine like terms.} \\ 11x - 8 &= 8x + 1 && \text{Subtract } 8x \text{ from both sides.} \\ 3x - 8 &= 1 && \text{Add 8 to both sides.} \\ 3x &= 9 && \text{Divide both sides by 3.} \\ \mathbf{x} &= \mathbf{3} \end{aligned}$$

ANSWER: (3)

- 3) A dilation is the transformation that does not preserve distance. What this means is that under a dilation, an object and its image will not be the same size. The image will either be enlarged or decreased in size following a specific ratio.

ANSWER: (4)

- 4) You are asked for the product of $\frac{1}{3}x^2y$ and $\frac{1}{6}xy^3$. The "product" is the answer to a multiplication problem. First multiply $\frac{1}{3} \cdot \frac{1}{6} = \frac{1}{18}$. Next $x^2 \cdot x = x^3$. Then $y \cdot y^3 = y^4$.

The final answer will therefore be $\frac{1}{18}x^3y^4$

ANSWER: (4)

- 5) Simply use your calculator for this one and you will see that the answer is **1680**.

Or $8! = 8 \cdot 7 \cdot 6 \cdot 5 \cdot 4 \cdot 3 \cdot 2 \cdot 1$ $4! = 4 \cdot 3 \cdot 2 \cdot 1$

$$\frac{8!}{4!} = \frac{(8)(7)(6)(5)(4)(3)(2)(1)}{(4)(3)(2)(1)} = (8)(7)(6)(5) = \mathbf{1680}$$

ANSWER: (1)

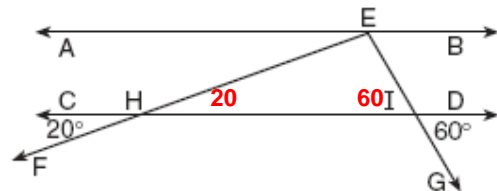
- 6) You are presented with the diagram at the right:

You are asked for the measure of angle HEI.

The angles I've inserted in red are vertical to the angles in black, and therefore congruent to them

The sum of the measures of the angle of a triangle equals 180 degrees. You have just accounted for

80 degrees for triangle HEI, and are therefore left with 100 degrees to complete the triangle. The measure of angle HEI is therefore **100 degrees**.



ANSWER: (3)

- 7) This is simply an example requiring you to use the counting principle. If one thing can be done m number of ways, and the other can be done in n number of ways, then both can be done in mn number of ways. For this problem multiply **5 • 3 • 4**.

ANSWER: (1)

- 8) To find the area of a square, you square the measure of its side. To find the perimeter of a square, you multiply the measure of its side by 4. **One of the lengths given as a choice is 4.** That would be your answer, as 4 squared would get you the area of 16, while 4 times 4 would also get you the perimeter of 16. Algebraically, we are looking for a value of x such that:

$$x^2 = 4x \quad \text{Subtract } 4x \text{ from both sides.}$$

$$x^2 - 4x = 0 \quad \text{Factor out an } x.$$

$$x(x - 4) = 0 \quad \text{Set both factors equal to 0}$$

$$x = 0 \quad x-4=0 \quad \text{When } x-4=0, \mathbf{x = 4}$$

ANSWER: (4)

- 9) Use your calculator to convert the given values into decimal form: (use 3 places)

$$\sqrt{10} = 3.162 \quad \frac{22}{7} = 3.142 \quad \pi = 3.141 \quad 3.1 = 3.100$$

In order from smallest to largest these decimals would be ordered as follows:

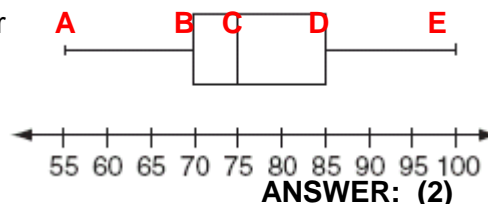
$$3.100 \quad 3.141 \quad 3.142 \quad 3.162$$

Using the original values the answer would be:

$$3.1, \pi, \frac{22}{7}, \sqrt{10}$$

ANSWER: (4)

- 10) Here is some information regarding the box-and-whisker plot pictured at the right. Point A represents the lowest data item. Point B would represent the first quartile. C represents the second quartile, which is really the same as the median. D represents the third quartile, while E would represent the greatest data item.

**ANSWER: (2)**

- 11) Based on the given information, define your variables.

Let x = the measure of the first side of the triangle.

$x+2$ = the measure of the second side.

$x-3$ = the measure of the third side.

The perimeter of a triangle is found by adding up its three sides.

In this triangle, therefore, the perimeter would be represented by:

$$x + x+2 + x-3 \quad \text{Combine like terms.}$$

$$\mathbf{3x - 1}$$

ANSWER: (3)

- 12) Given the equation below, what is the value of x ?

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

Cross multiply (product of means=product of extremes)

$$4(2x+1)=3x$$

Distribute the 4.

$$8x + 4 = 3x$$

Subtract $3x$ from both sides.

$$5x + 4 = 0$$

Subtract 4 from both sides.

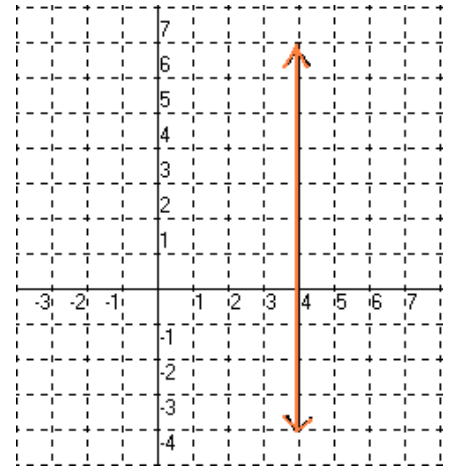
$$5x = -4$$

Divide both sides by 5.

$$\mathbf{x = -\frac{4}{5}}$$

ANSWER: (2)

- 13) To the right is the graph represented by the equation $x=4$. You can clearly see that it is a line that runs through the point $(4,0)$, and is parallel to the y -axis. The x -coordinate of every point on the line is 4. Any equation where x equals a constant, will always be parallel to the y -axis.



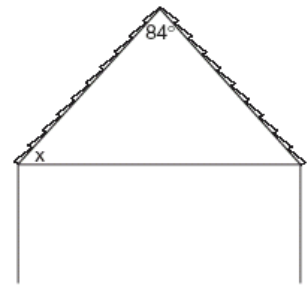
When you have an equation where y equals a constant, for example $y=4$, then the resulting graph would be a line parallel to the x -axis and going through the point $(0,4)$.

ANSWER: (3)

- 14) You are presented with a conditional statement (If....then), and asked to determine when it is false. A conditional statement is false in only one case: where the first part (hypothesis) is true, and its second part (conclusion) is false. In our example therefore, for the hypothesis to be true, x would have to be a rational number. All the examples given happen to be rational numbers. So now all you have to do is determine for which x will the square root of x be rational. This would make the conclusion false. The answer is 4. 4 is a rational number and the $\sqrt{4}$ is not irrational -- it is rational.

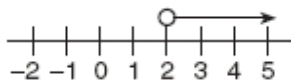
ANSWER: (4)

- 15) You are told that the roof of the house pictured at the right is an isosceles triangle and that its vertex is 84 degrees. This means that the angle indicated by x is one of the congruent base angles. You know that the sum of the measure of a triangle is 180. Once you know that the vertex angle is 84, you subtract it from 180 and are left with 96. This 96 has to be divided equally among the two base angles. 96 divided by 2 is **48**. Each base angle will therefore equal 48 degrees. In other words, **$x = 48$** .

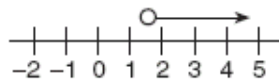


ANSWER: (4)

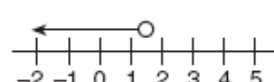
- 16) You are presented with the four graphs below and asked to determine which one best represents the solution set for the inequality $x > \sqrt{2}$. First use your calculator to determine the square root of two. You will see it is 1.4142, a number between 1 and 2.



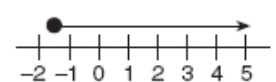
(1) $x > 2$



(2) $x > \sqrt{2}$



(3) $x < \sqrt{2}$



(4) $x \geq \sqrt{2}$

ANSWER: (2)

17) Given the formula $v = \pi r^2 h$, solve for h.

$v = \pi r^2 h$ Divide both sides by $\pi r^2 h$

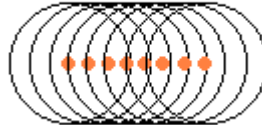
$$\frac{V}{\pi r^2} = h$$

ANSWER: (2)

18) The slope of a horizontal line is 0. The slope of a vertical line is undefined. If the line is slanted towards the right, its slope is positive. If it is slanted towards the left, its slope is negative.

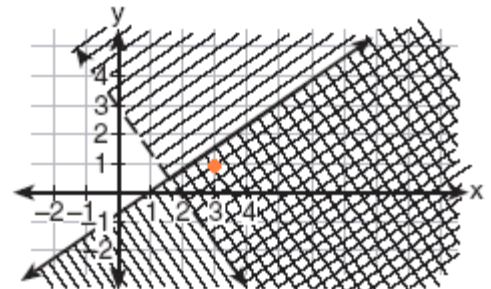
ANSWER: (2)

19) The wheel of a wagon is in the shape of a circle. The center of this wheel would be the center of the circle. Imagine the diagram to the right as being the wheel, with the red dot being its center. As the wheel continues to roll towards the right, you can see that the red center remains on the same level and forms a straight line parallel to road on which it is moving.



ANSWER: (3)

20) You are presented with the graphs for a system of inequalities as shown at the right. Any point within the area that is crisscrossed is included in the solution set. The point (3,1), which I high lighted in red, is within the crisscrossed area and therefore would be within the solution set. Choices 2 and 3 would each satisfy one of the inequalities shown, while choice 4 would be outside the solution set of any of the inequalities shown.



ANSWER: (1)

21) The sum of the measures of complementary angles is 90 degrees. Set up your equation and solve for x.

$$\begin{aligned} (3x+15) + (2x - 10) &= 90 \\ 3x + 15 + 2x - 10 &= 90 \\ 5x + 5 &= 90 \\ 5x &= 85 \\ x &= 17 \end{aligned}$$

Drop the parenthesis.
Combine like terms.
Subtract 5 from both sides.
Divide both sides by 5.

ANSWER: (1)

22) A prime number is a number greater than 1, that has only itself and 1 as factors. The number 3 satisfies this condition and is therefore a prime number. It is also an odd number. You are presented with four choices. Choices 1,3, and 4 are conjunctions, while choice 2 is a disjunction. (Answer continues on the next page)

A conjunction will be true only when both of its statements are true. A disjunction will be false only if both of its parts are false.

Choice 1 is true as both of its parts are true--3 is prime and odd.

Choice 2 (the disjunction) is true. At least one of its statements is true--3 is odd.

Choice 3 is false because its first statement that 3 is not prime is false.

Choice 4 is true because both of its parts are true.

ANSWER: (3)

23) Factor completely:

$$2y^2 + 12y - 54$$

$$2(y^2 + 6y - 27)$$

$$2(y+9)(y-3)$$

First factor out a 2.

Continue factoring. You are looking for two numbers whose product will be -27, and whose sum will be +6. You can use +9 and -3.

ANSWER: (1)

24) Choice 1 is an example of the commutative property for addition.

Choice 2 is an example of the commutative property for multiplication.

Choice 3 is an example of the inverse property for addition.

Choice 4 is an example of the additive identity property (0 is the additive identity for addition as 0 and any other element will equal that other element).

ANSWER: (4)

25) You are presented with $\frac{5x}{6} + \frac{x}{4}$ and asked for its equivalent.

$$\frac{5x}{6} + \frac{x}{4}$$

Multiply 1st term by $\frac{2}{2}$, and second term by $\frac{3}{3}$

$$\frac{2}{2} \cdot \frac{5x}{6} + \frac{3}{3} \cdot \frac{x}{4}$$

Complete the multiplication to obtain common denominator.

$$\frac{10x}{12} + \frac{3x}{12}$$

Combine

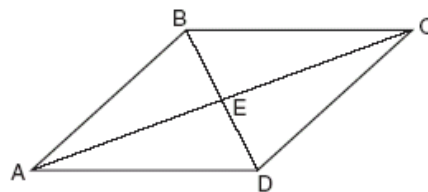
$$\frac{13x}{12}$$

ANSWER: (3)

26) You are presented with the parallelogram at the right.

In addition, you are told the length of BE and of ED.

You should know that the diagonals of a parallelogram bisect each other. What this tells you in this problem is that the length of BE will equal the length of DE. So all you have to now do is set up your equation using the givens.



$$\frac{2}{3}x = x - 10$$

Multiply each term by 3. (The 3 in the denominator will be canceled.)

$$2x = 3x - 30$$

Subtract 3x from both sides.

$$-1x = -30$$

Divide both sides by -1.

$$x = 30$$

ANSWER: (2)

27) Express in simplest radical form the product of $\sqrt{6} \cdot \sqrt{15}$

Here's one way to do this. First simplify by multiplying $\sqrt{6} \cdot \sqrt{15} = \sqrt{90}$

Factor the 90 by using at least 1 perfect square (9X10)

$$\sqrt{90} = \sqrt{9} \cdot \sqrt{10} = 3\sqrt{10} \quad (\text{Remember } \sqrt{9} = 3)$$

ANSWER: (2)

28) You can use a calculator on this one and then convert it to scientific notation, or you can do it this way. 6×10^3 equals 6,000, and 3×10^2 equals 300. Added together this is 6300. 6300 in scientific notation is 6.3×10^3 .

ANSWER: (1)

29) You are presented with the diagram at the right.

Points A, B, and C form the vertices of a triangle.

$\angle ACB = 70^\circ$, and $\angle ABC = 65^\circ$. Let us now figure out

the measure of $\angle A$. The sum of the 3 angles of a triangle

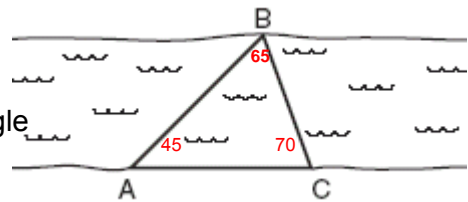
add up to 180 degrees. The two given angles already

add up to 135° . Angle A will equal $180 - 135$ or 45° .

Now for the question. You are asked to determine the relationship between the lengths of the sides of the triangle. The answer is based on the following concept. The side opposite the greatest angle will be the longest side. In our triangle, therefore, AB which is opposite the 70° angle, will be longer than AC which is opposite a 65° angle. BC, which is opposite the 45° angle will be the shortest side of this triangle. Given the 4 choices, number 3 has them in the correct order. BC (opp. 45) < AC (opp. 65) < AB (opp. 70)

BC < AC < AB

ANSWER: (3)

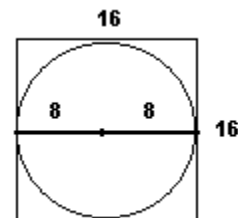


30) The probability of an impossible event is 0. The probability of a sure event is 1. Therefore, the probability of any event will be somewhere between 0 and 1, inclusive. Choice 4 can be read as x is greater than or equal to 0, and less than or equal 1.

ANSWER: (4)

31) Check out the diagram at the right. You see a circle with a radius of 8, resulting in a diameter of 16. As seen in the diagram, the square circumscribed about this circle will have a side of 16. You are asked to determine the area of this square. The area of a square is found by squaring its side. For this square, 16 squared equals $16(16)$ or **256 square feet**.

Answer: 256 square feet



32) Imagine that the 5 friends in question are named A, B, C, D, and E. Each one will shake each others right hand only once. Keep in mind that when A shakes the hand of B, it also counts as B shaking the hand of A. In other words, once you have listed A,B you would not list B,A because those two have already shaken hands.

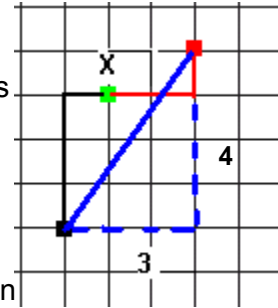
Here is what the sample space would look like for the handshakes:

- A,B B,C C,D D,E
- A,C B,D C,E
- A,D B,E
- A,E

Counting the above, you see that **there would be a total of 10 handshakes**.

This answer can also be obtained by figuring out the answer to ${}_5C_2$. Using your calculator you will see that a ${}_5C_2$ will equals 10. **ANSWER: 10 handshakes**

- 33) Consider the grid at the right a map of the hikes in question. The green point marked X is where both hikers begin. One hiker travels 2 miles east (to the right) and then 1 mile north (up) and ends up at the point marked in red. The other hiker travels 1 mile to west (to the left) followed by 3 miles to the south (down). This hiker ends up at the point marked in black. You are now asked to find the distance between the 2 hikers. In the diagram at the right, this distance would be represented by the solid blue diagonal line. Now, imagine forming a triangle, as shown by the dotted blue line. You can see that the base of the triangle is 3 miles, while its altitude is 4 miles. The diagonal blue line which is now the hypotenuse of the triangle would be **5 miles**. Remember your 3, 4, 5 triangle. If you don't remember that triangle you can always calculate the third side of a right triangle by using the Pythagorean Theorem.



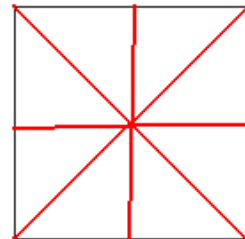
ANSWER: 5 miles

- 34) Solve the following equation for x:

$$\begin{array}{ll}
 3.3 - x = 3(x-1.7) & \text{Use the distributive law.} \\
 3.3 - x = 3x - 5.1 & \text{Add } x \text{ to both sides.} \\
 3.3 = 4x - 5.1 & \text{Add } 5.1 \text{ to both sides.} \\
 8.4 = 4x & \text{Divide both sides by } 4. \\
 \mathbf{2.1 = x} &
 \end{array}$$

ANSWER: $x = 2.1$

- 35) You are presented with the square at the right and asked to draw all its lines of symmetry. A line of symmetry is a line that can be drawn through a figure so that the sides of the figure are mirror images of each other. I have drawn those lines in red. You can see there are four lines of symmetry.



- 36) Tamara has two sisters. Based on the given information you can solve this problem algebraically as follows. First set up and define your variables.

$$\begin{array}{l}
 \text{Let } x = \text{ Tamara's age} \\
 x+7 = \text{ Older sister's age} \\
 x-3 = \text{ Younger sister's age}
 \end{array}$$

You are told that the product of her sisters' ages is 24. The "product" is the answer to a multiplication problem. You can now set up your equation which will end up being a quadratic

(Problem continues on the next page)

$$(x+7)(x-3) = 24$$

$$x^2 + 7x - 3x - 21 = 24$$

$$x^2 + 4x - 21 = 24$$

$$x^2 + 4x - 45 = 0$$

$$(x + 9)(x - 5) = 0$$

$$x+9= 0 \quad x-5= 0$$

$$x= -9 \text{ rej.} \quad x = 5$$

Multiply using FOIL or any other method.

Combine like terms.

Subtract 24 from both sides.

Factor (you are looking for two factors whose sum is 4, and whose product is -45) You can use +9 and -5.

Set each factor equal to 0 and solve.

Reject the negative value as the age will not be negative

Since x represented Tamara's age, **we now know that her age is 5.** **ANSWER: 5**

- 37) Before determining the median of a set of scores, these scores have to be ordered. The scores for this problem in order are: 60, 64, 72, 76, 78, 78, 80, 84, 86, 88, 90, 92. You are asked to determine the mean, median, and mode for the above scores. The mean is determined by finding the sum of the scores and then dividing by how many scores there are--in this case, 12. The sum of the scores is 948. Divide 948 by 12 and your quotient is 79. **Your mean is therefore 79.**

You median will be the middle score. You have an even number of scores. Divide this number by 2. Your number of scores, 12, divided by 2 is 6. You median will therefore be between the 6th and 7th score. What this really boils down to is your finding the mean of the 6th and 7th score. The sixth score is 78, and the seventh is 80. Their mean is $(78+80)/2$ or 79. **The median for the above scores is therefore 79.**

The mode is the score that appears most often. In this case it is the number 78.

The mode is 78.

- 38) Sharu has 32 coins consisting of nickels and dimes. Once you know how many of one kind Sharu has, all you have to do to figure out how many there are of the other kind is to subtract from 32. In other words, if x were to equal the number of nickels then 32-x would equal the number of dimes. So we now have:

Let X= number of nickels
32- X= number of dimes
The coins total \$2.35 (which is 235 cents).

If you have 3 nickels then you have 5(3) or 15 cents.

If you have 3 dimes, you have 10(3) or 30 cents. In other words, once you know how many nickels you have, you multiply by 5 to determine their value in cents. And in order to determine the value of a bunch of dimes, you multiply their number by 10.

Now you are ready to set up your equation:

$$5X + 10(32-X) = 235$$

$$5X + 320 - 10X = 235$$

$$-5X + 320 = 235$$

$$-5X = -85$$

$$X = 17$$

Use the distributive law.

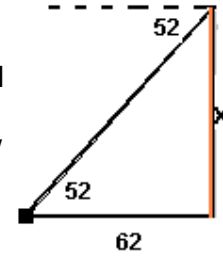
Combine like terms.

Subtract 320 from both sides.

Divide both sides by -5.

Once you know that X=17, you know you have X nickels or **17 nickels.** You also have 32-X or 32-17 dimes. This means you have **15 dimes.**

- 39) The information given in the problem is depicted by the diagram at the right. The red vertical line is the wall. From the top of the wall to a point 62 feet away from the base of the wall, the angle of depression is 52° . Once you complete the right triangle you know that the angle at the bottom will also equal 52° because the angle of depression and the angle of elevation are alternate interior angles and therefore congruent. You are asked to determine the height of the wall, indicated in the diagram at the right by x .



In relation to the angle of 52° , the height and base that are shown are opposite and adjacent. The trigonometric ratio that uses opposite and adjacent is tangent.

$$\tan 52^\circ = \frac{\text{opposite}}{\text{adjacent}} = \frac{x}{62} \quad \text{This will be your equation.}$$

$$\tan 52^\circ = \frac{x}{62} \quad \text{Multiply both sides by 62.}$$

$$62 (\tan 52^\circ) = x \quad \text{Use your calculator to multiply } \tan 52^\circ \text{ by 62.}$$

$$79.3563 = x \quad \text{Round to the nearest tenth.}$$

$$\mathbf{x = 79.4} \quad \text{The height of the wall to the nearest tenth is 79.4 feet.}$$