

Math Applied Test 4 – Answer Key

1. If $s = t^2 - 16$, then what is the value of s when $t = 5$?

Substitute the value 5 for t in the equation.

$$s = (5)^2 - 16$$

Following the order of operations, evaluate exponents before subtracting.

$$s = 25 - 16$$

$$s = 9$$

The correct answer is choice E, 9.

2. If the tenths and hundredths digits are interchanged in the number 248.395, the resulting number is

The digit 3 is in the tenths place and the digit 9 is in the hundredths place. Switching these changes the number to 248.935.

The correct answer is choice B, 248.935.

3. If $n - 2 = 0$, then $1 \div n =$

First solve for n .

$$n - 2 = 0$$

$$n = 2$$

Now, substitute $n = 2$ into $1 \div n$.

$$1 \div n$$

$$1 \div 2$$

The expression $1 \div 2$ can also be written as $\frac{1}{2}$.

The correct answer is choice D, $\frac{1}{2}$.

4. If $89 \times 89 = 9 \times 9 \times k$, then the closest approximation to k is

First estimate 89×89 as 90×90 . Then factor 90×90 as $9 \times 10 \times 9 \times 10$.

$$89 \times 89 = 9 \times 9 \times k$$

$$90 \times 90 = 9 \times 9 \times 10 \times 10$$

The closest approximation to k is 10×10 , or 100.

The correct answer is choice C, 100.

5. If $x = \sqrt{2}$ and $xy = 4$, then $y =$

Substitute $\sqrt{2}$ for x .

$$xy = 4$$

$$(\sqrt{2})y = 4$$

Now solve for y .

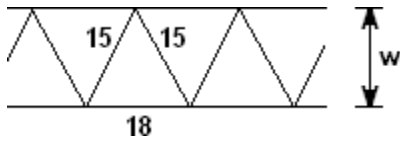
$$y = \frac{4}{\sqrt{2}}$$

Since the denominator contains a radical, the denominator must be rationalized. Multiply by the form of one, $\frac{\sqrt{2}}{\sqrt{2}}$

$$\frac{4}{\sqrt{2}} \left(\frac{\sqrt{2}}{\sqrt{2}} \right) = \frac{4\sqrt{2}}{2} = 2\sqrt{2}$$

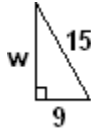
The correct answer is choice D, $2\sqrt{2}$.

6. The figure shows a row of triangular tiles each with two sides 15 centimeters long and one side 18 centimeters long. What is w , the width of the row, in centimeters?



Note: Figure Not Drawn To Scale

The variable w represents the height of the triangle. The height of the triangle is not 15. The height must form a 90° angle with the base of the triangle. Focus on half of the triangle so that a right triangle is formed, and the Pythagorean Theorem may be used.



The quick student will recognize this right triangle as a 3-4-5 triangle, a very common Pythagorean triple. According to the 3-4-5 pattern, the missing side is 12. If the 3-4-5 pattern is not recognized, simply use the Pythagorean Theorem to solve for the missing side.

$$\text{Pythagorean Theorem } a^2 + b^2 = c^2$$

$$9^2 + w^2 = 15^2$$

$$81 + w^2 = 225$$

$$w^2 = 225 - 81$$

$$w^2 = 144$$

$$w = 12$$

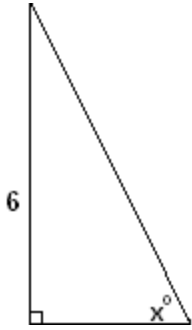
The correct answer is choice B, 12 centimeters.

7. If x is any integer divisible by 21, then $\frac{x}{7}$ will always be

If x is divisible by 21, it is divisible by both 7 and 3. After it has been divided by 7, it can still be divided by 3.

The correct answer is choice A, divisible by 3.

8. If the area of the right triangle is 18, what is the value of x ?



Note: Figure Not Drawn to Scale

To find the area of a triangle, use $A = \frac{1}{2}bh$. We know that area = 18.

Substitute the known values into the area formula.

$$A = \frac{1}{2}bh$$

$$18 = \frac{1}{2}(b)(6)$$

$$18 = 3(b)$$

$$b = 6$$

Since both the base and height are the same length, the triangle is an isosceles right triangle. The angles of an isosceles right triangle are always 45-45-90.

The correct answer is choice C, 45.

9. If $x + y = 12$ and $x^2 + xy = 84$, then $y =$

To solve for y , first factor $x^2 + xy = 84$.

$$x^2 + xy = 84$$

$$x(x + y) = 84$$

Now substitute $x + y = 12$

$$x(12) = 84$$

$$x = 7$$

Since $x = 7$ and $x + y = 12$, y must equal 5.

The correct answer is choice A, 5.

Questions 10 & 11 refer to the following definition:

For each integer n that is greater than 1, let $[n] = n + (n - 1) + (n - 2) + \dots + 1$.

For example: $[5] = 5 + 4 + 3 + 2 + 1 = 15$

10. $[7] =$

Following the example, $[7] = 7 + 6 + 5 + 4 + 3 + 2 + 1 = 28$

The correct answer is choice E, 28.

Questions 10 & 11 refer to the following definition:

For each integer n that is greater than 1, let $[n] = n + (n - 1) + (n - 2) + \dots + 1$.

For example: $[5] = 5 + 4 + 3 + 2 + 1 = 15$

11. If a and n are integers greater than 1 and $[n + 2] = [n] + a$, what is n in terms of a ?

Using the example given and our answer from question 10, we know that

$$[5] = 5 + 4 + 3 + 2 + 1 = 15 \quad \text{and} \quad [7] = 7 + 6 + 5 + 4 + 3 + 2 + 1 = 28$$

These values can be substituted into $[n + 2] = [n] + a$.

$$[n + 2] = [n] + a$$

$$[7] = [5] + a$$

$$28 = 15 + a$$

$$a = 13$$

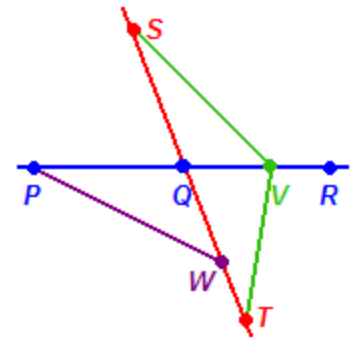
To find n in terms of a , use $a = 13$ and $n = 5$. When substituting $a = 13$ into $\frac{a - 3}{2}$, we arrive at the correct value for n , 5.

The correct answer is choice E, $\frac{a - 3}{2}$

12. Points P, Q, R, S, T, V, and W are distinct points arranged in a plane as follows:

Points P, Q, and R lie on one line and points S, Q, and T lie on another line. If STV and PQW are triangles, what is the greatest possible number of these seven points that can lie on one line?

Draw the scenario described. Shown is one possibility where we see that the greatest possible number of points that can lie on one line is four.



The correct answer is choice B, four.

13. The average (arithmetic mean) of 3 numbers is 10. If the average of x and these 3 numbers is 11, what is the value of x ?

The sum of the four numbers must be 44 since after dividing by 4 the average is 11. The sum of the three numbers before adding x was 30, since the average of these 3 numbers is 10. The value of x must be 14, the difference between 44 and 30.

The correct answer is choice A, 14.

14. If 1 quart of punch contains $\frac{1}{2}$ pint of syrup, then $\frac{1}{2}$ pint of the same punch contains how much syrup? (1 quart = 2 pints)

A quart contains 32 ounces and a pint contains 16 ounces. Since a quart (32 ounces) contains $\frac{1}{2}$ pint (8 ounces) of syrup, the punch is 25% syrup. If there is only $\frac{1}{2}$ pint of punch (8 ounces), 25% of this volume is 2 ounces. Two ounces is equal to $\frac{1}{8}$ pint.

The correct answer is choice C, $\frac{1}{8}$ pint.

15. A cube with volume 27 is cut into 8 smaller cubes having equal volumes. What is the difference between the surface area of the original cube and the surface area of one of the smaller cubes?

The formula for the volume of a cube is s^3 , where s is the length of the edge of the cube. Since the volume of the large cube is 27 cubic units, the length of each edge must be 3 units.

Each smaller cube has volume $\frac{27}{8}$ cubic units (since the original cube was divided into 8 equal cubes). The length of each edge is the cube root of $\frac{27}{8}$ or $\frac{3}{2}$ units.

The formula for the surface area of a cube is $6(s)^2$. The surface area of the original cube is $6(3)^2 = 54$ square units.

The surface area of each smaller cube is $6\left(\frac{3}{2}\right)^2 = 13.5$ square units.

The difference between 54 and 13.5 is 40.5.

The correct answer is choice B, 40.5.

16. If a and b are different positive integers, then which of the following statements must be false?

Since a and b are positive, there is no way that the operation can equal 0. The box represents any operation – add, subtract, multiply, or divide.

The correct answer is choice D, $a - b$ can equal 0.

17. A pool is filled to $\frac{3}{4}$ of its capacity. $\frac{1}{9}$ of the water in the pool evaporates.

If the pool can hold 24,000 gallons when it is full, how many gallons of water will have to be added in order to fill the pool?

If $\frac{1}{9}$ evaporates, then $\frac{8}{9}$ remains. Since the pool is only $\frac{3}{4}$ full, then $\frac{8}{9} \times \frac{3}{4} = \frac{2}{3}$.

Therefore, the pool is $\frac{1}{3}$ empty. To fill the pool, it is necessary to add $\frac{1}{3}$ of 24,000 gallons or 8000 gallons.

The correct answer is choice B, 8000 gallons.

18. If $\frac{12m}{7}$ is an integer, m could be any of the following *except*

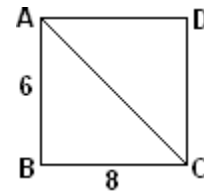
The question is made simpler if you realize that since $\frac{12m}{7}$ has to be an integer, m must be evenly divisible by 7. The number 7 does not divide evenly into 15.

The correct answer is choice D, 15.

19. If $AD = DC$, what is side $AD +$ side DC ?

Use the Pythagorean Theorem to solve for side AC .

$$\begin{aligned}6^2 + 8^2 &= (AC)^2 \\36 + 64 &= (AC)^2 \\100 &= (AC)^2 \\10 &= AC\end{aligned}$$



Note: Figure not drawn to scale

Since side AD equals side DC , triangle ADC is a $45^\circ-45^\circ-90^\circ$ triangle.

$$\text{Therefore, side } AD \text{ equals } AC \div \sqrt{2} = 10 \div \sqrt{2} = \frac{10}{\sqrt{2}} \left(\frac{\sqrt{2}}{\sqrt{2}} \right) = \frac{10\sqrt{2}}{2} = 5\sqrt{2}.$$

Since $AD = DC$, $DC = 5\sqrt{2}$. Then $AD + DC = 10\sqrt{2}$.

The correct answer is choice C, $10\sqrt{2}$.

20. 4 “ABCD” equals 3 “EFGH.” 4 “EFGH” equals 5 “IJKL.” How many “ABCD” are equal to 15 “IJKL”?

Two ratios are given, and “EFGH” is the common link between them.

$$\begin{aligned}4 \text{ “ABCD”} &= 3 \text{ “EFGH”} \\4 \text{ “EFGH”} &= 5 \text{ “IJKL”}\end{aligned}$$

Multiply the top equation by 4 and the second equation by 3 in order to make “EFGH” the same.

$$16 \text{ “ABCD”} = 12 \text{ “EFGH”} = 15 \text{ “IJKL”}$$

Then $16 \text{ “ABCD”} = 15 \text{ “IJKL”}$

The correct answer is choice D, 16.

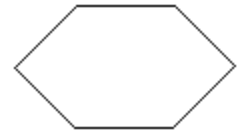
21. According to the chart, $k =$

From the chart, we see that $\frac{2}{3}$ of j consistently gives k as its answer.

The correct answer is choice A, $\frac{2}{3}j$.

22. In the figure, what is the sum of the six angles divided by the average of the six angles?

When calculating the average angle measure, the sum of the measures of the angles is divided by the number of angles. So, if we instead divide by the average, the answer will simply be the number of angles.



The correct answer is choice D, 6.

23. A man bought 1200 shares of stock at $\$22\frac{5}{8}$ and sold the same 1200 shares at $\$23\frac{1}{2}$. What is the profit not counting commissions or taxes?

Estimation works well in this problem. We know that the stock went up by almost 1 dollar. Therefore, the profit must be almost 1200 dollars.

The correct answer is choice D, \$1050.

24. A certain neon sign flashes every 2 seconds, another sign flashes every 3 seconds, and a third flashes every 5 seconds. If they all flash together, how many seconds will pass before they all flash simultaneously again?

The question might be phrased, “what is the least common multiple for 2, 3, and 5?”
Multiply $2 \times 3 \times 5 = 30$.

The correct answer is choice B, 30 seconds.

25. Marianne can read at a rate of 300 words per minute. While taking a speed reading course, Marianne increases her speed by $\frac{1}{3}$. After finishing the course, Marianne's speed drops by 100 words per minute. What percent of her original speed is her current speed?

$300 \times \frac{1}{3} = 100$. Marianne increased her speed by 100 words. When her speed drops by 100 words, she will be back at 300, which is 100% of her original speed.

The correct answer is choice B, 100.

26. A student scored 70, 75, and 80 on three tests. If the student scored y on the fourth test, what is the average (arithmetic mean) of the four tests?

We compute average by adding up the items to be averaged and then dividing that sum by the number of items.

$$\frac{70 + 75 + 80 + y}{4} = \frac{225 + y}{4}$$

The correct answer is choice A, $\frac{225 + y}{4}$.

27. Two snails are three feet apart and directly facing each other. If one snail moves forward continuously at 0.04 inches per second and the other moves forward continuously at 0.05 inches per second, how many minutes will it take for the snails to touch?

In order to use consistent measurement throughout the problem, we will convert 3 feet into 36 inches. We can think of this as the two snails having to move a total of 36 inches. Use the formula: rate \times time = distance

$$\begin{aligned} 0.04(t) + 0.05(t) &= 36 \\ 0.09(t) &= 36 \\ t &= 400 \end{aligned}$$

It will take 400 seconds which is equal to $6\frac{2}{3}$ minutes.

The correct answer is choice B, $6\frac{2}{3}$ minutes.

28. The water level of a swimming pool, 75 feet by 42 feet, is to be raised four inches. The number of gallons of water needed for this is:

(7.48 gal. = 1 cubic ft)

4 inches is $\frac{1}{3}$ foot. The volume of the added level is $75 \times 42 \times \frac{1}{3} = 1050$ cubic feet.

There are 7.48 gallons in 1 cubic foot, so $1050 \text{ cubic feet} \times 7.48 \text{ gal / cubic foot} = 7854$ gallons.

The correct answer is choice B, 7854.

29. The part of the total quantity represented by a 24-degree sector of a circle graph is:

There are 360 degrees in a circle. A 24-degree sector is $\frac{24}{360} = 0.067$, or about $6\frac{2}{3}\%$ of a circle.

The correct answer is choice A, $6\frac{2}{3}\%$.

30. The square of a fraction between 0 and 1 is

Fractions between 0 and 1 are proper fractions, and the numerator n is always less than the denominator d .

When squaring a proper fraction such as $\frac{1}{3}$, the new fraction $\left(\frac{1}{3}\right)^2 = \frac{1}{9}$ is less than the original fraction since the denominator is getting larger much faster than the numerator.

The correct answer is choice A, less than the original fraction.

31. A store marks dolls to give a 50% profit on cost. As part of a store-wide sale the price of the dolls is reduced by 20%. If the store still made a \$30 profit on each doll, how much did the store pay for a doll?

Word problems should be solved one step at a time. The first important piece of information is that the store marks the items for a 50% profit; so we get our first equation

$$\text{Selling Price} = 150\% \times \text{Cost} = 1.5C$$

The next thing that we are told is that the selling price is reduced by 20%, which means that the buyer now pays 80% of the selling price.

$$\text{Selling Price} = (0.80)(1.5C)$$

Thus we have a new equation

$$\text{Selling Price} = 1.2C$$

Finally we are told that the store made a profit of \$30. This is \$30 more than the store's original cost.

$$\text{Selling Price} - 30 = \text{Cost}$$

$$1.2C - 30 = C$$

$$0.2C = 30$$

$$C = 150$$

The correct answer is choice C, \$150.

32. 285 is 5% of

$$5\% \text{ is } 0.05$$

$$0.05(x) = 285$$

$$x = 5700$$

The correct answer is choice D, 5700.

33. What is the value of rs in the equation $43rs + 17 = 77rs$?

$$43rs + 17 = 77rs$$

Subtract $43rs$ from both sides

$$17 = 34rs$$

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

The correct answer is choice C, $\frac{1}{2}$.

34. Find the value of x in the equation $2x - 0.2x = 9$

$$2x - 0.2x = 9$$

$$1.8x = 9$$

$$x = 5$$

The correct answer is choice D, 5.

35. An automobile traveled 6 hours at an average speed of 40 miles per hour. It averaged only 30 miles per hour on the return trip. What was the approximate average speed in miles per hour for the round trip?

The distance, one way, is $40 \text{ mph} \times 6 \text{ hours} = 240 \text{ miles}$. The time to return was $240 \text{ miles} \div 30 \text{ mph} = 8 \text{ hours}$. The total distance is 480 miles and the total time is 14 hours, therefore the average speed was $480 \text{ miles} \div 14 \text{ hours} = 34 \text{ mph}$.

The correct answer is choice B, 34.
