SAT Math Abilities YY – Answer Key

1. $\frac{1}{10}$ is what part of $\frac{3}{4}$?

Divide $\frac{1}{10}$ by $\frac{3}{4}$. Remember that when dividing fractions, rewrite as multiplying by the reciprocal.

$$\frac{1}{10} \div \frac{3}{4} \quad \rightarrow \quad \frac{1}{10} \times \frac{4}{3} \quad \rightarrow \quad \frac{4}{30} = \frac{2}{15}$$

The answer is C. $\frac{2}{15}$

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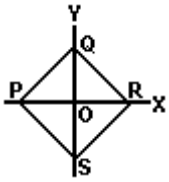
2. The area of square PQRS is 49. What are the coordinates of Q ?



Since PQRS is a square, each quarter of the square is a 45-45-90 triangle. Use that fact to recall that the length of the hypotenuse equals the leg length times $\sqrt{2}$. We know that the hypotenuse has length 7 (since the area of the triangle is 49). Divide 7 by $\sqrt{2}$ to find the length of each leg and then rationalize the denominator.

$\frac{7}{\sqrt{2}}\left(\frac{\sqrt{2}}{\sqrt{2}}\right) = \frac{7\sqrt{2}}{2}$. Since each leg has length $\frac{7\sqrt{2}}{2}$, the segment OQ measures $\frac{7\sqrt{2}}{2}$ units and the coordinates for point Q are $\left(0, \frac{7\sqrt{2}}{2}\right)$.

The answer is B. $\left(0, \frac{7\sqrt{2}}{2}\right)$

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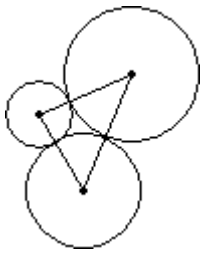
3. Three circles are tangent externally to each other and have radii of 2, 3, and 4 inches, respectively. How many inches are in the perimeter of the triangle formed by joining the centers of the 3 circles ?



From the diagram, we see that the radii of each circle is included twice to complete the perimeter of the triangle.

Add 2 + 2 + 3 + 3 + 4 + 4 = 18

The answer is D. 18

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4. If a circle of radius 10 inches has its radius decreased 3 inches, by what percent is its area decreased ?

A circle with radius 10 has an area of 100π. A circle with radius 7 has an area of 49π.

The difference is 51π and the percent of decrease is $\frac{51\pi}{100\pi} = 51$

The answer is C. 51

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5. If a purse costs $4.20 after a 40% discount, what was its original price ?

Set the original price as *x*. Then recall that a 40% discount means that 60% of the original price was paid.

Multiply the original price *x* by 0.60 to equal the sale price of $4.20 → $0.60(x) = 4.20$

To solve for *x*, divide both sides by 0.60 and then *x* = 7.00, the original cost of the purse.

The answer is D. $7.00

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6. How many inches of wire would be required to form the edges of a cube whose volume is 64 cubic inches ?

Since the volume of a cube is s^3, each edge must measure 4 inches ($\sqrt[3]{64} = 4$).

There are 12 edges of a cube. If each edge is 4 inches long, the total will be 48 inches.

The answer is B. 48

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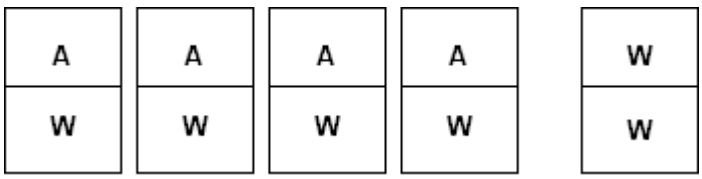
7. A four-quart mixture of alcohol and water is 50% alcohol. If a quart of water is added, what percent of the mixture is alcohol ?

Draw a diagram representing the given information. From the diagram, we see that $\frac{4}{10} = \frac{2}{5}$ of the mixture is alcohol. Converting to a percent, $\frac{2}{5} = 40\%$



The answer is D. 40%

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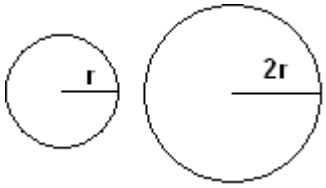
8. If the radius of a circle is increased by 100%, by what percent is the area increased ?

If the radius increases by 100%, it doubles in length. The area of a circle with radius r is πr^2. If the radius is $2r$, the area becomes $\pi(2r)^2 = 4\pi r^2$. Therefore, the new area is four times as large, so it increases by 300%. (The increase is the *difference* between the new area and the original area.)



The answer is C. 300%

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9. The distance from City A to City B is 150 miles. It is 90 miles from City A to City C. therefore, it is also must be true that:

After reading each answer choice, only B can be true. We do not have enough information to assume that any of the other choices are true.

For choice B, if we multiply the distance from A to B by 6, the total is 900 miles. Also, the distance from A to C multiplied by 10 equals 900 miles.

The answer is B. Six times the distance from A to B is 10 times the distance from A to C.

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10. Abe is 15 years old. Beth is one-third older. How many years ago was Beth twice as old as Abe ?

Since Beth is one-third older than Abe, she is currently 20. So she is 5 years older than Abe.

Working backward, check choice C first. Since Abe is 15 now, 7.5 years ago, he would be 7.5 and Beth would be 12.5. This is not twice Abe's age. Try a larger number so the difference is greater.

Checking choice D, 8 years ago, Abe would be 7, and Beth would be 12. This is not twice Abe's age.

Since we know we needed a larger number, the answer must be E. Choice E works because 10 years ago Abe was 5 and Beth was 10. This was twice Abe's age.

The answer is E. 10

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11. A report from a large city states that if one were to eat 3 meals a day, each in a different restaurant, it would take more than 19 years to have eaten at all the restaurants in the city. Based on this information, which of the following must be true of the city's restaurants ?

Multiplying 19 years $\times$ 365 days $\times$ 3 meals per day equals 20,805 total meals.

The answer is A. The total exceeds 20,500.

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12. The distance *S*, in feet, that an object falls *t* seconds after being dropped from a high cliff is represented by the formula $S = 16t^2$. What distance will the object fall in 8 seconds ?

Substitute $t = 8$ into the given formula.

$S = 16(8)^2$

$S = 1024$

The answer is B. 1024 feet

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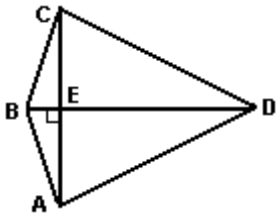
13. In the figure shown, *AB* = *BC* and $\angle BEA$ is a right angle. If the length of *DE* is four times the length of *BE*, what is the ratio of the area of ΔACD to the area of ΔABC ?

Both ΔACD and ΔABC have a common base, segment AC.

Since $A = \frac{1}{2}bh$, only the height will be different when calculating the areas for the two triangles. Since length *DE* is four times the length *BE*, the area of ΔACD will be four times the area of ΔABC .



The answer is D. 4:1

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14. A pound of pure water is evaporated from 6 pounds of sea-water containing 4% salt. What is the percentage of salt left in the remaining solution ?

The original 6 pounds of sea-water contained 4% salt which is (0.04)(6) = 0.24 pounds of salt.

Now, since 1 pound of pure water evaporated, there is 0.24 pounds of salt in 5 pounds of water. This percent is $\frac{0.24}{5} = 0.048 = 4.8\% = 4\frac{4}{5}\%$

The answer is C. $4\frac{4}{5}$

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15. Find the product of 75^3 and 75^7.

Recall that exponents are added when like-bases are multiplied.

The answer is B. 75^{10}

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16. The scale of a map is $\frac{3}{4}$ inch = 10 miles. If the distance on the map between two towns is 6 inches, the actual distance in miles is

Set up a proportion $\frac{3/4}{10} = \frac{6}{x}$. Using cross multiplication, $\frac{3}{4}x = 60$. Divide both sides by $\frac{3}{4}$ to find $x = 80$ miles.

The answer is D. 80

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17. If $d = m - \frac{50}{m}$ and m is a positive number that increases in value, then d

As the denominator m gets larger, the fraction $\frac{50}{m}$ gets smaller. Therefore the value of d will increase as m increases.

The answer is A. increases

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18. A cubic inch of metal weighs 2 lbs. How much does a cubic foot weigh?

There are $12 \times 12 \times 12 = 1728$ cubic inches in one cubic foot.

If one cubic inch of metal weighs 2 lbs, multiply by 1728 to find that a cubic foot of metal weighs 3456 lbs.

The answer is E. 3456

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19. If the number of square inches in the area of a circle is equal to the number of inches in its circumference, the diameter of the circle in inches is

The area formula for a circle is πr^2 and the circumference is $2\pi r$. For the area and circumference to be the same, the radius must be 2 and the diameter would be 4.

The answer is A. 4

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20. John is now three times Pat's age. Four years from now John will be *x* years old. In terms of *x*, how old will Pat be?

Let John's age now be represented by J and Pat's age now be represented by P → J = 3P

If we let *x* equal John's new age, then 4 years earlier his age was three times Pat's age.

$$x - 4 = 3P \text{ and solve for } P = \frac{x - 4}{3}$$

Since P represents Pat's original age, we must add 4 years

$$P + 4 = \frac{x - 4}{3} + 4 \quad \rightarrow \quad P + 4 = \frac{x - 4}{3} + \frac{12}{3}$$

$$P + 4 = \frac{x + 8}{3}$$

The answer is E. $(x + 8) \div 3$

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21. Six quarts of a 20% solution of alcohol in water are mixed with 4 quarts of a 60% solution of alcohol in water. The alcoholic strength of the mixture is

Write an equation to find the amount of alcohol present in the mixture: $6(0.20) + 4(0.60) = 3.6$

Therefore, there is 3.6 quarts of alcohol in 10 quarts of water (6 quarts + 4 quarts) and the strength of the mixture is $\frac{3.6}{10} = 0.36 = 36\%$

The answer is A. 36%

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22. Eight test scores average 84%. The best and worst scores are dropped resulting in an average of 86% on the remaining six. What is the average of the best and worst test scores?

If eight test scores average to 84%, assume each original test score was 84. Then the sum of these test scores equals 672. If the remaining six tests average 86%, assume each of these test scores were 86 for a sum of 516.

The difference of the sums is 672 – 516 = 156.

To find the average of the two dropped tests, divide 156 by 2.

The answer is C. 78

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23. If $9x + 5 = 23$, the numerical value of $18x + 5$ is

Solve the first equation for x to find that $x = 2$. Now substitute that x-value into the second equation: $18(2) + 5 = 41$.

The answer is B. 41

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24. Which of the following groups is arranged in ascending order of size?

Convert each fraction to a decimal to determine that choice D is correct.

$\frac{2}{3} \approx 0.667$ $\frac{9}{13} \approx 0.692$ $\frac{5}{7} \approx 0.714$ $\frac{8}{11} \approx 0.727$

The answer is D. $\frac{2}{3}, \frac{9}{13}, \frac{5}{7}, \frac{8}{11}$

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25. If $\frac{1}{2}$ of the girls in college eat in the cafeteria a $\frac{1}{3}$ of the boys eat there, what fractional part of the student body eats in the cafeteria?

Since we do not know the total number of girls or total number of boys, we cannot make any determination about a fractional part for the students combined.

The answer is E. cannot be determined
