2020 Castro Valley Junior Math Tournament
Mental Math Solutions – 6th-8th Grades

1. **What number is 64 more than half of 42?**

$64 + \frac{42}{2} = 64 + 21 = 85$

2. **How many faces does a cube have?**

A cube has six square faces.

3. **Round 5071.4285 to the nearest whole number.**

We're rounding to the 1s digit, and the next digit is a 4 (less than 5), so we'll round "down", which means truncate, for an answer of 5071.

4. **When my favorite number is increased by 71 and this result is multiplied by 3, the final result is 465. What is my favorite number?**

The intermediate result must be $465 \div 3 = 155$, so that the favorite number must be $155 - 71 = 84$.

5. **Your closet contains 5 pairs of pants and 4 shirts. How many different outfits (pairings of shirts & pants) could you wear?**

The counting principle says that when you have multiple choices that don't influence each other, the total number of choices is simply the product of the number of individual choices, for an answer of $5 \cdot 4 = 20$.

6. **Evaluate: 9 + 8 x 8**

Order of Operations (PEMDAS) says that multiplication comes before addition, for an answer of $9 + 8 \cdot 8 = 9 + 64 = 73$.

7. **What is the perimeter, in feet, of a regular octagon with sides measuring 4 ft?**

For a regular polygon, $P = ns = 8 \cdot 4 = 32$.

8. **Evaluate:** $\frac{1}{3} + \frac{2}{7}$

$\frac{1}{3} + \frac{2}{7} = \frac{7}{21} + \frac{6}{21} = \frac{13}{21}$

9. **What is the measure, in degrees, of an angle that is supplementary to a 75 degree angle?**

Supplementary angles add up to $180°$, for an answer of $180 - 75 = 105$.

10. **If 3 Zithers are equivalent to 4 Yoyos, how many Zithers are equivalent to 24 Yoyos?**

24 Yoyos is $24 \div 4 = 6$ sets of four, for an answer of $6 \cdot 3 = 18$.

11. **What is the median of the data set {5, 1, 9, 8, 5}?**

In order, the set is 1, 5, 5, 8, 9, and the median (middle) is 5.

12. **Express 2704 in scientific notation.**

$2704 = 2.704 \cdot 1000 = 2.704 \cdot 10^3$

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13. **What is the slope of a line perpendicular to the line 4x + 3y = -4 ?**

The slope of this line is $m = -\frac{A}{B} = -\frac{4}{3}$. The slope of a perpendicular line is $-\frac{1}{m} = -\frac{1}{-\frac{4}{3}} = \frac{3}{4}$.

14. **A triangle has sides measuring 24 m, 44 m, and x m. What is the smallest possible integer value of x?**

If the angle between the two given sides were zero, their ends would be $44 - 24 = 20$ apart, but it wouldn't be a triangle because it would be flat. If the angle is barely larger than zero, the third side will get a little longer, so 20 is no longer possible, making the answer 21.

15. **What is the diameter, in meters, of a circle with a circumference of 16π m?**

For a circle, $C = \pi d = 2\pi r$, so $d = 16$.

16. **What is the 7th term of the arithmetic (adding or subtracting) sequence whose first three terms are 7, 16, and 25?**

The common difference is $16 - 7 = 9 = 25 - 16$, for an answer of $7 + 6 \cdot 9 = 7 + 54 = 61$.

17. **Express $\sqrt{108}$ in simplest radical form.**

$\sqrt{108} = \sqrt{4 \cdot 27} = 2\sqrt{9 \cdot 3} = 2 \cdot 3\sqrt{3} = 6\sqrt{3}$

18. **What is the area, in meters, of a circle with a circumference of 8π m^2?**

For a circle, $C = \pi d = 2\pi r$, so that $d = 8$ and $r = 4$. $A = \pi r^2 = \pi \cdot 4^2 = 16\pi$.

19. **Alejandro and Noah see one another when they are 171 feet apart, and immediately begin running towards one another. If Alejandro can run at a speed of 6 feet per second, and Noah can run at a speed of 3 feet per second, how many seconds will it take them to reach each other?**

The two approach one another at a rate of $6 + 3 = 9$ feet per second, for an answer of $\frac{171}{9} = \frac{57}{3} = 19$.

20. **What is the prime factorization, in exponential form, of 768?**

$768 = 2^2 \cdot 3 \cdot 64 = 2^8 \cdot 3^1$