

2020 Castro Valley Junior Math Tournament
Algebra & Probability Solutions – 3rd-5th Grades

1. **What number is 62 more than the product of 7 and 48?**

$$7 \cdot 48 + 62 = 336 + 62 = 398$$

2. **What is the remainder when 31 is divided by 5?**

$$31 = 5 \cdot 6 + 1, \text{ for an answer of } 1.$$

3. **When the secret number is increased by 73 and this result is divided by 8, the final result is 53. What is the secret number?**

The intermediate result must have been $8 \cdot 53 = 424$, so that the secret number must have been $424 - 73 = 351$.

4. **Evaluate:** $\frac{6!}{4!}$

$$\frac{6!}{4!} = \frac{6 \cdot 5 \cdot 4 \cdot 3 \cdot 2}{4 \cdot 3 \cdot 2} = 6 \cdot 5 = 30$$

5. **Evaluate:** $8 - 6 \div 2$

Order of operations (PEMDAS) says we need to divide before subtraction, so $8 - 6 \div 2 = 8 - 3 = 5$.

6. **Mariana can ride her bike at a speed of 2 miles per hour. How many miles will she ride in 2 hours?**

She goes 2 miles in each of the 2 hours, for an answer of $2 \cdot 2 = 4$.

7. **A bag contains 7 purple marbles and 9 black marbles. When one marble is drawn at random, what is the probability that it is purple?**

There are $7 + 9 = 16$ total marbles, for a probability of $\frac{7}{16}$.

8. **If $x@y = 2x + 9y$, evaluate $19@9$.**

$$19@9 = 2 \cdot 19 + 9 \cdot 9 = 38 + 81 = 119$$

9. **When one card is drawn from a standard 52-card deck, what is the probability that it ranks higher than a 9? Assume the Ace is the highest rank.**

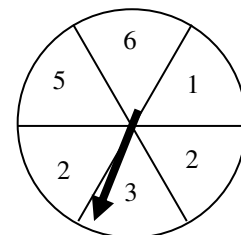
We want a 10, J, Q, K, or A, so there are five ranks in each of the four suits, for a total of 20 “good” cards out of 52, for a probability of $\frac{20}{52} = \frac{5}{13}$.

10. **Evaluate:** $-4 - -5(-7 + -3)$

$$-4 - -5(-7 + -3) = -4 + 5(-10) = -4 - 50 = -54$$

11. **When the spinner to the right is spun, what is the probability that it lands on 2? Assume all of the sectors are the same shape.**

There are six equivalent sectors, two of which are 2's, for a probability of $\frac{2}{6} = \frac{1}{3}$.



12. **When a single fair coin is flipped twice, what is the probability that the second flip shows heads?**

The first flip is irrelevant. The second flip has a $\frac{1}{2}$ probability of being heads no matter what the first flip did.

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13. **How many days are in 2 non-leap years?**

$$2 \cdot 365 = 730$$

14. **What value of b satisfies $5b - 96 = 14$?**

$$5b = 14 + 96 = 110, \text{ so } b = 110 \div 5 = 22.$$

15. **Express 0.05076 in scientific notation.**

$$0.05076 = 5.076 \cdot .01 = 5.076 \cdot 10^{-2}$$

16. **If 4 Aardvarks are equivalent to 3 Basketballs, how many Aardvarks are equivalent to 72 Basketballs?**

72 basketballs is $72 \div 3 = 24$ sets of 3, and is thus equivalent to $24 \cdot 4 = 96$ Aardvarks.

17. **Arrange the letters below in order of descending value (e.g. BCDA):**

$$A = \frac{2}{6}, B = 1.1, C = \frac{1}{8}, D = 0.75$$

$A = \frac{1}{3} \cong .333$, $B = 1.1$, $C = .125$, and $D = .75$, for an answer of BDAC.

18. **A bag contains 6 yellow marbles and 4 green marbles. When two marbles are drawn, what is the probability that exactly 2 of them are green?**

There are $10c2 = \frac{10!}{2! \cdot 8!} = \frac{10 \cdot 9}{2} = 5 \cdot 9 = 45$ ways to grab two of ten marbles, and there are

$$4c2 = \frac{4!}{2! \cdot 2!} = \frac{4 \cdot 3}{2} = 2 \cdot 3 = 6 \text{ ways to pick two of six marbles, for a probability of } \frac{6}{45} = \frac{2}{15}.$$

19. **What is the median of the data set {4, 0, 9, 3, 8}?**

In order, the elements are 0, 3, 4, 8, 9, so the median (middle) is 4.

20. **Evaluate as a mixed number: $2\frac{1}{6} \div 1\frac{1}{3}$**

$$2\frac{1}{6} \div 1\frac{1}{3} = \frac{13}{6} \div \frac{4}{3} = \frac{13}{6} \cdot \frac{3}{4} = \frac{13}{2} \cdot \frac{1}{4} = \frac{13}{8} = 1\frac{5}{8}$$