Sprint 1 At a certain middle school, there are 16 seventh graders and 24 eighth graders enrolled in algebra this term. What percent of the students enrolled in algebra are eighth graders?

Sprint 2 The following equation was written on the chalkboard: ♣ + ♣ + ◊ + ∅ – ♣ = ♥. If ♣ = 4, ∅ = 3 and ♥ = 12, what is the value of ◊?

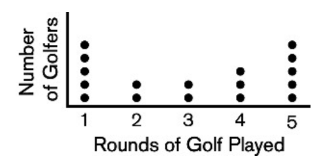
Sprint 3 Mady evenly distributed x candies among nine Halloween bags so that every bag received the greatest possible number of candies, but some candies were left over. What is the greatest possible number of candies that could have been left over?

Sprint 4 The median of a set of consecutive odd integers is 138. If the greatest integer in the set is 145, what is the least integer in the set?

Sprint 5 If $m \nabla n = (m^2 - n) \div n$ for all real numbers m and n, where $n \neq 0$, what is the value of $6 \nabla 3$?

Sprint 6 What is the absolute difference between $\frac{1}{6}$ of 3 and $\frac{2}{7}$ of $2\frac{1}{3}$? Express your answer as a common fraction.

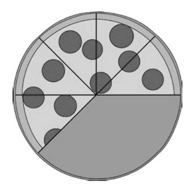
Sprint 7 The number of rounds of golf played by each golfer of an amateur golf association is shown in the chart. What is the average number of rounds played by each golfer? Express your answer to the nearest whole number.



Sprint 8 What is the probability that a randomly chosen positive integer less than or equal to 24 is a factor of 24? Express your answer as a common fraction.

Sprint 9 New York and Denver are in different time zones. When it is noon in New York, it is 10:00 a.m. in Denver. At 2:00 p.m. in New York, a train departs, and it arrives in Denver 45 hours later. What time is it in Denver when the train arrives?

Sprint 10 Three slices have been removed from the circular pizza shown here. If the pizza originally contained eight congruent slices, what is the degree measure of the central angle of the missing sector?

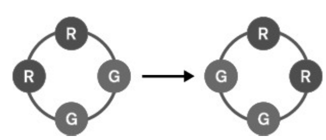


Sprint 11 A group of scientists catch, tag and release 121 catfish into a lake. The next day they catch 48 catfish, of which 22 have been tagged. Using this ratio, how many catfish would be estimated to be in the lake?

Sprint 12 A sequence is formed by multiplying each term by 3 and then adding 3 to get the next term. If the third term is 39, what is the value of the first term?

Sprint 13 A bag contains 8 white marbles, 6 red marbles and 4 blue marbles. How many blue marbles must be added to the bag so that the probability of choosing a blue marble is 1/2?

Sprint 14 A bracelet is made by stringing together four beads. Each bead is either red or green. How many different color patterns are possible for the bracelet, where patterns are considered the same if rotating one will produce the other, as shown here?



Sprint 15 Richmond Middle School has 12 doors to enter or leave the building. In how many ways is it possible to enter the building by one door and leave the building by a different door?

Sprint 16 By hitting a target, Gina can score 16, 17, 23, 26, 29 or 40 points with each arrow she shoots. What is the fewest arrows she can shoot to score exactly 100 points?

Sprint 1

There are 16 seventh graders and 24 eighth graders in the class for a total of 16 + 24 = 40 students enrolled in algebra. So, 24/40 = 6/10 = **60%** of the students are eighth graders.

Sprint 2

When the values are substituted into the equation, we have 4 + 4 + ◊ + 3 – 4 = 12. This simplifies to 7 + ◊ = 12, so ◊ = **5**.

Sprint 3

The greatest possible remainder when dividing by nine is 8. There could be **8** candies left over. If there were nine or more candies left over, another candy would have been put into each bag.

Sprint 4

This is a set of consecutive odd integers that has a median of 138, which is not odd. The median, 138, must be the mean of the two middle integers of the set, and the two middle numbers must be 137 and 139. Since 145 is the greatest integer, the set contains four integers greater than the median, namely 139, 141, 143 and 145. There must also be four integers in the set that are less than the median, namely 137, 135, 133 and 131. The least integer in the set is **131**.

Sprint 5

Using the given rule for the operation ∇, we can calculate 6 ∇ 3 as $(6^2 - 3) \div 3 = (36 - 3) \div 3 = 33 \div 3 =$ **11**.

Sprint 6

One-sixth of 3 is 1/6 × 3/1 = 3/6 = 1/2. Two-sevenths of $2\frac{1}{3}$ is 2/7 × 7/3 = 2/3. The absolute difference is |1/2 – 2/3| = |3/6 – 4/6| = **1/6**.

Sprint 7

We need to find the average number of rounds of golf per golfer, so using the chart, we find this to be [(5 × 1) + (2 × 2) + (2 × 3) + (3 × 4) + (5 × 5)]/(5 + 2 + 2 + 3 + 5) = (5 + 4 + 6 + 12 + 25)/17 = 52/17 ≈ **3** rounds played by each golfer.

Sprint 8

First, we need to know the factors of 24. They are 1, 2, 3, 4, 6, 8, 12 and 24. There are a total of 24 positive integers less than or equal to 24, and 8 of those positive integers are factors of 24. So, the probability that a randomly chosen positive integer less than or equal to 24 is a factor of 24 is 8/24 = **1/3**.

Sprint 9

If the train departs at 2:00 p.m. in New York and arrives in Denver 45 hours later, this is equivalent to saying that the train leaves New York at noon, Denver time, and arrives in Denver 45 hours later. If it were to arrive in Denver 48 hours later (instead of 45) it would be exactly two days later or noon in Denver time. But since it takes only 45 hours instead of 48, it must arrive three hours earlier, at **9:00** a.m.

Sprint 10

A complete circle contains 360 degrees in its central angle. If the pizza had 8 congruent slices, the central angle of each slice was 360/8 = 45 degrees. The three slices that were removed, and therefore the missing sector of the pizza, would make up 45 × 3 = **135** degrees.

Sprint 11

The idea is that the ratio of the 121 catfish that were tagged and released on the first day compared to the unknown number of catfish in the lake c is proportional to the ratio of the tagged fish caught to the total fish caught on the second day, which is 22/48 = 11/24. We set up the proportion $121/c = 11/24$, and solve for c. The cross product is $11c = 121 \times 24$, so $c = (121 \times 24)/11 = 11 \times 24 = 264$. We would estimate that there are **264** catfish in the lake.

Sprint 12

Working backward, we subtract 3 and then divide by 3 to find each previous term. The third term is 39. So, the second term is $(39 - 3)/3 = 12$, and the first term is $(12 - 3)/3 =$ **3**.

Sprint 13

If the probability of choosing a blue marble from the bag is to be 1/2, then we must add enough blue marbles to make up half of the total number of marbles. Since there are 8 white and 6 red to start, we will need a total of 8 + 6 = 14 blue. There are 4 blue marbles to start with, so 14 – 4 = **10** blue marbles must be added to the bag.

Sprint 14

There is only 1 way to make a four-bead bracelet with just red beads. Likewise, there is only 1 way to make a bracelet with all green beads. There is only 1 way to make a bracelet with three red beads and one green. Similarly, there is 1 way to make a bracelet with three green beads and one red. When we consider using two red beads and two green beads, however, we find that there are 2 possible bracelets (R-R-G-G or R-G-R-G). Thus, there are 1 + 1 + 1 + 1 + 2 = **6** different color patterns.

Sprint 15

There are 12 possible doors to enter, and since we must leave by a different door, only 11 possible doors to exit by. Order counts, i.e. entering by door 1 and leaving by door 2 is different from entering by door 2 and leaving by door 1. So, there are 12 × 11 = **132** ways to do this.

Sprint 16

The only sums of 3 of these scores that total as much as 100 are 40 + 40 + 40 = 120, 40 + 40 + 29 = 109, 40 + 40 + 26 = 106 and 40 + 40 + 23 = 103, so Gina needs to shoot at least 4 arrows. Trial and error shows that Gina can get a total of 100 points with 4 arrows, such as 17 + 17 + 26 + 40 or 16 + 26 + 29 + 29. In fact, these are the only possibilities with 4 arrows. So, the fewest arrows Gina can shoot to score exactly 100 points is **4** arrows.