STATISTICS
Average

EXAMPLE | The average of the five numbers below is 80. Find the missing value in the list.

$$74 \quad 75 \quad 78 \quad 81 \quad \underline{}$$

Five numbers with an average of 80 have a sum of $5 \cdot 80 = 400$.
The sum of the four numbers we know is $74+75+78+81 = 308$.
So, the missing number is $400-308 = \textbf{92}$.

— *or* —

We consider how the numbers "balance" around the average.

74, 75, and 78 are below the average by a total of 13, and 81 is above the average by 1. So, the four given numbers are a total of 12 below the average.

$$\overset{\displaystyle -12}{\overbrace{\underset{74\ \ 75\ \ 78\ \ 81}{-6 \quad -5 \quad -2 \quad +1}}}$$

To balance all of the below-average numbers, we need a number that is above the average by 12. So, the missing number is $80+12 = \textbf{92}$.

$$\begin{array}{ccccc} -6 & -5 & -2 & +1 & +12 \\ 74 & 75 & 78 & 81 & \underline{\textbf{92}} \end{array}$$

PRACTICE | Fill in each missing number so that every list has the average given.

30. Average: 40

39 35 44 _____

31. Average: 20

19 14 25 18 _____

32. Average: 54

55 50 56 60 _____

33. Average: 105

111 101 103 110 _____

34. Average: 91

95 88 86 97 89 _____

35. Average: 176

174 176 180 175 170 _____

PRACTICE | Answer each question below.

36. In the first five basketball games of the season, Orange Academy scored 33, 38, 32, 30, and 40 points. Their sixth game brought their average score down to 34 points. How many points did Orange Academy score in their sixth game?

36. _____

37. Below are Teddy's scores on his math tests so far this year. What score does Teddy need on his next test so that his test average is 90?

81, 96, 100, 88, 91, 78

37. _____

38. ★ Which *two* numbers can be removed from the list below so that the average of the four remaining numbers is 78?

71, 73, 74, 78, 81, 84

38. _____ and _____

39. ★ Find the average of the four numbers below *without* computing their sum.

8,953   8,952   8,950   8,957

39. _____

40. ★ During the last Beastball season, Kat scored 5 points below the team average, Matt scored 8 points above the team average, and Pat scored 82 points. The average of Kat's, Matt's, and Pat's scores is the same as the team average. What is the team average?

40. _____

Averatile

STATISTICS

In an **Averatile** puzzle, every shape must be filled with a *positive digit* according to two rules:

1. The number in each square is the average of all the numbers in the triangles that the square shares a side with.

2. No two shapes that share a side may contain the same digit.
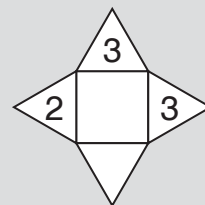
EXAMPLE | Solve the Averatile puzzle to the right.

Since each shape must be filled with a positive digit, we know that the sum of the four numbers around the square is divisible by 4. The sum of the known digits is $2+3+3=8$. The only digits that could be added to 8 to get a multiple of 4 are 4 and 8.

However, if we fill the triangle with a 4, the average of the four triangles around the square is $\frac{2+3+3+4}{4}=\frac{12}{4}=3$. Adjacent shapes may not contain the same digit, so we cannot place a 3 in the square.
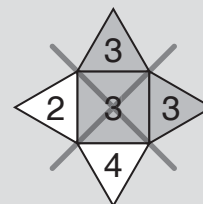
If we place an 8 in the empty triangle, the average of the four triangles is $\frac{2+3+3+8}{4}=\frac{16}{4}=4$. This is the only solution.
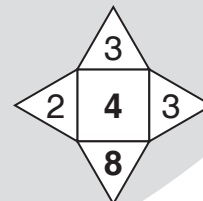
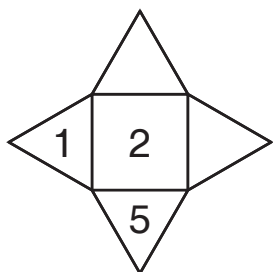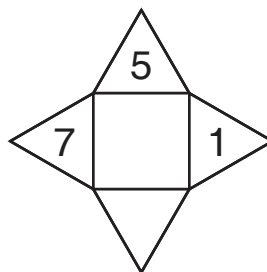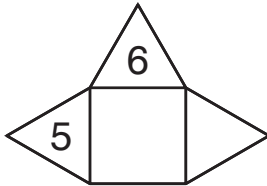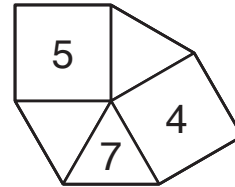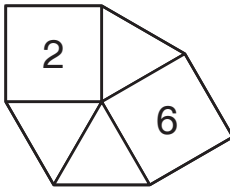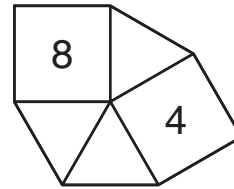**PRACTICE** | Solve each Averatile puzzle below.

41.
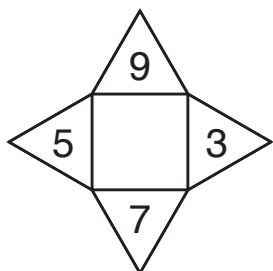
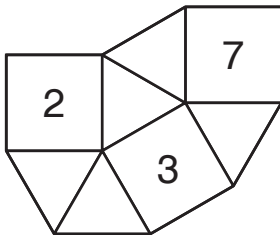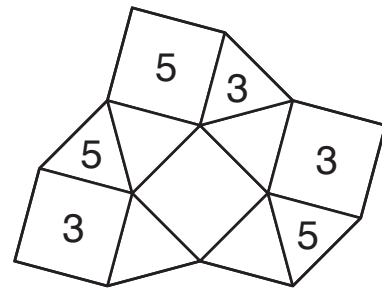**42.**
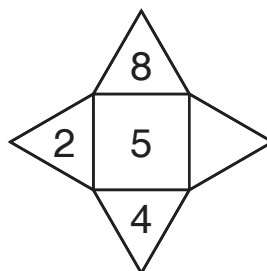
43.

44.

PRACTICE | Solve each Averatile puzzle below.

45.

46.

47.

48.

49.

50.

51.

52.