

Below is the explanation of the final Math Meet question in Beast Academy Guide 2D.

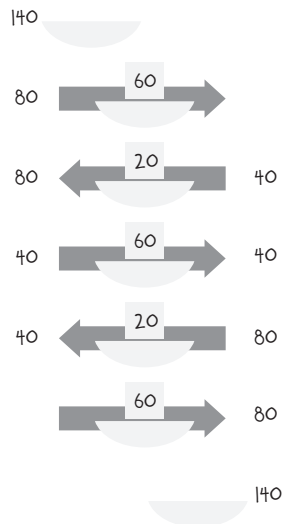
Four monsters, weighing 20, 30, 40, and 50 pounds, want to cross a river using a small canoe that can carry up to 60 pounds. How many times will the canoe need to be paddled across the river to deliver all four monsters safely to the other side?

To end on the opposite shore, the canoe must make an odd number of trips across the river. (If the canoe makes an even number of trips, it will end up on the same shore where it started.)

The solution the little monsters came up with in the Math Meet required 7 trips. To show that 7 is the smallest possible number, we must show that it cannot be done in 5 or fewer trips.

Each trip across the river can carry up to 60 pounds. The return trip must have at least one monster in the canoe, so each return trip must carry at least 20 pounds (the smallest monster).

So, the most we can transport in 5 trips is
 $60 - 20 + 60 - 20 + 60 = 140$ pounds as shown below.



The total weight of the four monsters is exactly
 $20 + 30 + 40 + 50 = 140$ pounds!

Unfortunately, since there is no monster that can ride with the 50-pound monster to fill the canoe to 60 pounds, the monsters cannot cross the river in just 5 trips. So, the canoe must cross the river at least 7 times.

There are a total of 24 different ways for the monsters to cross the river in 7 trips, including the one described by the little monsters on page 106 of Guide 2D.