Chapter 6

Even Transportation

While the titles for other chapters are more or less understandable, the title for this chapter is quite confusing and misleading. Ancient commentators explained that 'transportation' here means transportation of tax in the form of grain, such as millet. 'Even' here means that one needs to consider the distance one has to cover when transporting the tax to a tax collection center. However, this chapter discusses only very few problems remotely related to tax collection. Most problems are applications of fractions. These problems often appear in today's mathematics textbooks. We here select 15 out of 28 problems in this chapter. As we did in previous chapters, units of measurements are changed so readers can understand these problems better. But, since the numbers are kept the same, sometimes, such changes make these figures less realistic.

Problem 1 We are given that the task of collecting tax millet is distributed among 4 counties.

County A, 8 days away from the tax collection center, has 10,000 households;

County B, 10 days away from the center, has 9,500 households;

County C, 13 days away from the center, has 12,350 households;

County D, 20 days away from the center, has 10,000 households.

The total tax millet to be collected is 250,000 bushels. Assume that the tax collected should be *proportional* to the number of households in each county and *inversely proportional* to the distance from the tax center. How much each county should pay? If 10,000 carts are used to transport the tax millet and each cart can load 25 bushels. How many carts should be sent to each county to collect them? Find solutions in integers only.

Ans: County A, 83 100 bushels, 3324 carts; County B, 63 175 bushels, 2527 carts; County C, 63,175 bushels, 2527 carts; County D, 40 550 bushels, 1622 carts;

The next problem explains why households far away from the tax collecting center should pay less: the tax millet is, perhaps, transported to the center by farmers themselves. This was the case in the countryside where I was living in China during the 1970s. The tax rice or wheat were shipped to the tax collecting center by farmers using boats.

Problem 2. The tax collecting center is in County A, which has 20,520 households and where millet costs 20 dollars a bushel. Transportation cost is negligible.

County B, 200 miles away from the center, has 12,312 households and millet costs 10 dollars a bushel;

County C, 150 miles away from the center, has 7,182 households and millet costs 12 dollars a bushel;

County D, 250 miles away from the center, has 13,338 households and millet costs 17 dollars a bushel;

County E, 150 miles away from the center, has 5,130 households and millet costs 13 dollars a bushel.

The total tax to be collected is 10,000 bushels. A cart with capacity of 25 bushels costs 1 dollar per mile in transportation. Assume the payment by each household is the same in cash and labor. Find how much millet should each county pay.

Ans: $A : 3571\frac{517}{2873}; B : 2380\frac{2260}{2873}; C : 1388\frac{2276}{2873}; D : 1719\frac{1313}{2873}; E : 939\frac{2253}{2873}.$

Problem 3. Someone transports agricultural supplies from one place to another. An unloaded cart travels 70 miles a day and a loaded one travels 50 miles a day. This person makes 3 round trips in 5 days, how far is the distance between the two locations. (One needs to assume that one way is loaded and the other unloaded.)

Problem 4. A fast walker covers 100 yards, while a slow walker covers 60 yards. Assume that the latter goes 100 yards ahead of the former, who catches up with him. In how many yards will the two come abreast?

Problem 5. A slow walker goes ahead 10 miles. A fast walker, after pursuing 100 miles, is now ahead of the slow walker by 20 miles. In how many miles, does the fast walker catch up with the slow walker?

Problem 6. A hare runs 100 meters ahead. A hound, after pursuing 250 meters, is still 30 meters behind the hare. If the hound keeps pursuing, in how many more meters, will it catch up with the hare?

Problem 7. A person, carrying 12 pounds of gold through a pass, pays a tax of 10%. The pass takes away 2 pounds and gives back 5000 coins in return. Find, what is the price (in coins) of gold per pound?

Problem 8. A guest on horseback rides 300 miles a day. The guest left at day break and forgot his clothes. When the host discovered it, 1/3 day had just passed. The host started to chase the guest. As soon as he caught up with the guest, he gave back the clothes and turned back home. When he arrived home, 3/4 day had just passed. Assume neither the guest nor the host had stopped on the way. Find how far the host can go in a day.

Problem 9. Assume a cone-shaped lighthouse has 5 stories. The heights of 5 stories are in arithmetic progression. The bottom story is 40 feet and the top story is 20 feet. Find the heights of other stories.

Problem 10. 5 persons are to share 5 coins. The sum of the two greater shares is equal to that of the three smaller shares. Assume the shares are in arithmetic progression. How much does each get?

Problem 11. A wild duck flies from the south sea to the north sea in 7 days. A wild goose flies from the north sea to the south see in 9 days. Assume the two birds start at the same moment. When will they meet?

Problem 12. Peter starts from City A to City B, taking 5 days. Paul starts from City B to City A, taking 7 days. Assume Paul starts his journey 2 days earlier than Peter. When will they meet?

Problem 13. One person makes 38 prostrate tiles or 76 supine tiles a day. Assume he makes an equal number of both kinds of tiles in a day. How many tiles of each kind can he make?

Problem 14. A person can straighten 50 arrow shaft in one day, or pack feathers for 30 arrows, or install 15 arrow heads. Assume the he does all 3 jobs by himself. How many arrows can he prepare in a day?

Problem 15. A cistern is filled through 5 canals. Open the first canal and the cistern fills in $1/3$ day. With the second canal open, it fills in one day. With the third, in 2 and a half days. With the fourth, in 3 days, and with the fifth, in 5 days. Assume all of the canals are opened. How many days are required to fill the cistern?

A cistern is a receptacle for holding water or other liquid, especially a tank for catching and storing rainwater.

Other Similar Problems

There are many similar problems in AMC8, AMC10, and AMC12. The next problem is sent by a friend of Sharon from Pennsylvania.

One day, Pauline was walking through a train tunnel on her way to town. Suddenly, she heard the whistle of a train approaching from behind her! Pauline knew that the train always traveled at an even 60 mile per hour. She also knew that she was exactly three-eighths of the way through the tunnel, and she could tell from the train whistle how far the train was from the tunnel. Pauline wasn't sure if she should run forward as fast as she could, or run back to the near end of the tunnel. Well, she did some lightening-fast calculations, based on how fast she could run and the length of the tunnel. She figured out that whichever way she ran, she would just barely make it out of the tunnel before the train reached her. How fast could she run? (Carefully explain how you found the answer.)