21-110: Problem Solving in Recreational Mathematics

Algebra puzzles

Wednesday, February 3, 2010

(Problems from *The Moscow Puzzles* by Boris A. Kordemsky, edited by Martin Gardner.)

Problem 37. *The Price of a Book.* A book costs \$1 plus half its price. How much does it cost?

Problem 61. *For the Tsimlyansk Power Installation.* A factory making measuring equipment urgently needed by the famous Tsimlyansk power installation has a brigade of ten excellent workers: the chief (an older, experienced man) and 9 recent graduates of a manual training school.

Each of the nine young workers produces 15 sets of equipment per day, and their chief turns out 9 more sets than the average of all ten workers.

How many sets does the brigade produce in a day?

Problem 62. *Delivering Grain on Time.* A collective farm was due to deliver its quota of grain to the state authorities. The management of the kolkhoz decided the trucks should arrive in the city at exactly 11:00 a.m. If the trucks traveled at 30 miles per hour they would reach the city at ten, an hour early; at 20 miles an hour they would arrive at noon, an hour late.

How far is the kolkhoz from the city, and how fast should the trucks travel to arrive at 11:00 a.m.?

Problem 70. *What Is It?* A half is a third of it. What is it?

Problem 73. *Would He Have Saved Time?* Our man Ostap was going home from Kiev. He rode halfway—fifteen times as fast as he goes on foot. The second half he went by ox team. He can walk twice as fast as that.

Would he have saved time if he had gone all the way on foot? How much?

Problem 76. *A Cake of Soap.* If you place 1 cake of soap on a pan of a scale and 3/4 cake of soap and a 3/4-pound weight on the other, the pans balance.

How much does a cake of soap weigh?

Problem 79. *Misha's Kittens.* Every time young Misha sees a stray kitten he picks up the animal and brings it home. He is always raising several kittens, but he won't tell you how many because he is afraid you may laugh at him.

Someone will ask: "How many kittens do you have now?"

"Not many," he answers. "Three-quarters of their number plus three-quarters of a kitten."

His pals think he is joking. But he is really posing a problem—an easy one.

Problem 80. *Average Speed.* A horse travels half his route, with no load, at 12 miles per hour. The rest of the way a load slows him to 4 miles per hour.

What is his average speed?

Problem 81. *The Sleeping Passenger.* A passenger fell asleep on a train halfway to his destination. He slept till he had half as far to go as he went while he slept. How much of the whole trip was he sleeping?

Problem 83. *A Cyclist.* After a cyclist has gone two-thirds of his route, he gets a puncture. Finishing on foot, he spends twice as long walking as he did riding.

How many times as fast does he ride as walk?

Problem 85. *Who Is Right?* Masha had to find the product of three numbers in order to calculate the volume of some soil.

She multiplied the first number by the second correctly and was about to multiply the result by the third number when she noticed that the second number had been written incorrectly. It was one-third larger than it should be.

To avoid recalculating, Masha decided it would be safe to merely lower the third number by one-third of itself—particularly since it equaled the second number.

"But you shouldn't do that," a girl friend said to Masha. "If you do, you will be wrong by 20 cubic yards."

"Why?" said Masha.

Why indeed? And what is the correct soil volume?

Problem 217. *Mutual Aid.* During the rebuilding after World War II, we were short of tractors. The machine and tractor stations would lend each other equipment as needed.

Three machine and tractor stations were neighbors. The first lent the second and third as many tractors as they each already had. A few months later, the second lent the first and third as many as they each had. Still later, the third lent the first and second as many as they each already had. Each station now had 24 tractors.

How many tractors did each station originally have?

Problem 218. *The Idler and the Devil.* An idler sighed: "Everyone says, 'We don't need idlers. You are always in the way. Go to the devil!' But will the devil tell me to get rich?"

No sooner did the idler say this than the devil himself stood in front of him.

"Well," said the devil, "the work I have for you is light, and you will get rich. Do you see the bridge? Just walk across and I will double the money you have now. In fact, each time you cross I will double your money."

"You don't say!"

"But there is one small thing. Since I am so generous you must give me $24 after each crossing."

The idler agreed. He crossed the bridge, stopped to count his money ... a miracle! It had doubled.

He threw $24 to the devil and crossed again. His money doubled, he paid another $24, crossed a third time. Again his money doubled. But now he had only $24, and he had to give it all to the devil. The devil laughed and vanished.

The moral: When anyone gives you advice you should think before you act.

How much money did the idler start with?

Problem 222. *Vera Types a Manuscript.* Mother asked Vera to type a manuscript. Vera decided: "I will type an average of 20 pages a day."

She typed the first half of the manuscript rather lazily, at 10 pages a day. To make up for it, she typed the second half at 30 pages a day.

"See, I did average 20 pages a day," Vera concluded. "Half of $10 + 30$ is 20."

"No, you didn't," her mother said.

Who was right?

Problem 228. *Young Pioneers.* Vitya pledges that his brigade of Young Pioneers will plant half the number of fruit trees the rest of the Pioneers plant. Kiryusha pledges his brigade, the largest in the detachment, will plant as many trees as the rest of the Pioneers (including Vitya's brigade).

Their brigades work the last shift simultaneously. The preceding brigades of the detachment plant 40 trees. Assuming that both pledges are fulfilled exactly, how many trees does the whole detachment plant?

Problem 233. *Jack London's Journey.* Jack London tells how he raced from Skagway in a sled pulled by 5 huskies to reach the camp where a comrade was dying.

For 24 hours the huskies pulled the sled at full speed. Then 2 dogs ran off with a pack of wolves. London, left with 3 dogs, was slowed down proportionally. He reached camp 48 hours later than he had planned. If the runaway huskies had stayed in harness for 50 more miles, London writes, he would have been only 24 hours late.

How far is the camp from Skagway?