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PROBLEM

Lewis Carroll's Five-Bag Puzzle

"A knot!" said Alice. "Oh, do let me help to undo it!" (Lewis Carroll)

Mansur Gilmullin · 03.01.2025 · EN

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Lewis Carroll (1832–1898), English mathematician and science popularizer · [Source](#)



A page from a modern reprint of Lewis Carroll's A Tangled Tale · [Source](#)

“A knot!” said Alice. “Oh, do let me help to undo it!”

— Lewis Carroll

The English writer and mathematician Lewis Carroll, whose real name was Charles Lutwidge Dodgson (1832–1898), is best known as the author of *Alice’s Adventures in Wonderland* and *Through the Looking-Glass*. Yet he also wrote many scholarly works on mathematics and mathematical logic.

Carroll devoted considerable attention to recreational mathematics: riddles and puzzles. He invented many new games and problems. He published *A Tangled Tale*, a collection of puzzles and games for children. Each “knot” in the book is a new, engaging story with fantastical characters who invite young readers to solve intriguing puzzles and mathematical problems.



Cover of a modern reprint of Lewis Carroll's *A Tangled Tale* · [Source](#)

Here is one of these “knots.”

A Tangled Tale

“There are five sacks. The first and second together weigh 12 pounds; the second and third, 13.5 pounds; the third and fourth, 11.5 pounds; the fourth and fifth, 8 pounds; and the first, third and fifth, 16 pounds. Find the weight of each sack.”

In the English version: *A Tangled Tale. Problem.* — “There are 5 sacks, of which Nos. 1, 2, weigh 12 lbs.; Nos. 2, 3, 13½ lbs.; Nos. 3, 4, 11½ lbs.; Nos. 4, 5, 8 lbs.; Nos. 1, 3, 5, 16 lbs. Required the weight of each sack”.

Try solving it yourself before looking at the answer below.

Carroll wrote: *“As any algebraist sees at a glance, the problem of finding the weights of the sacks reduces to solving a system of linear equations. But it is easily solved by arithmetic alone, and I therefore consider it bad form to use more elaborate methods.”*



There are five sacks. Sacks 1 and 2 together weigh 12 pounds; 2 and 3, 13.5 pounds; 3 and 4, 11.5 pounds; 4 and 5, 8 pounds; and 1, 3 and 5, 16 pounds. Find the weight of each sack · [Source](#)

Solution

The five weighing results add up to 61 pounds. This total counts the third sack's weight three times, and the weights of all the other sacks twice.

Subtracting twice the sum of the first and fourth weighing results from 61 pounds shows that three times the third sack's weight is 21 pounds. The third sack therefore weighs 7 pounds.

The second and third weighing results show that the second sack weighs 6.5 pounds and the fourth 4.5 pounds.

Finally, the first and fourth results give weights of 5.5 and 3.5 pounds for the first and fifth sacks.

Answer: 5.5; 6.5; 7; 4.5; 3.5.