

# Mathematical Reasoning

Six problems designed to reward modelling, bounds, invariants, and clear explanation.



## The journey to school

If Anya walks to school and takes the bus home, the total journey takes 1.5 hours. If she takes the bus both ways, the total is 30 minutes. How long would the round trip take if she walked both ways?

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## A changing salary

A salary is increased by 20%, then the new amount is reduced by 20%. Is the final salary higher or lower than the original? By what percentage?

Show why the two percentage changes do not cancel.

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## Chocolate rabbits

Grisha has 5,000 rubles. Chocolate rabbits cost 45 rubles each. To carry them home, he must also buy bags at 30 rubles each; one bag holds at most 30 rabbits. He buys the greatest possible number of rabbits and enough bags. How much money remains?

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## Colored pencils

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A box contains 20 blue, red, and green pencils. There are six times as many blue pencils as green pencils, and fewer red pencils than blue pencils. How many red pencils are in the box?

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## Tea bags

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One tea bag can make either two or three cups of tea. Mila and Tanya split a box of tea bags equally. Mila made 57 cups and Tanya made 83 cups. How many tea bags could the original box have contained?

First find the possible range for the number of bags used by each person.

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## Chameleons

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Twenty white and twenty-five black chameleons live on Sunny Island. Whenever two chameleons meet, both switch to the opposite color. Can all the chameleons ever become the same color? Explain.

Look for something whose parity never changes.

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