

Bridge Crossing

Four friends are walking after dark. They come across a bridge. The bridge can only carry 2 people at a time. They have one flashlight and the bridge must be crossed with a flashlight to be safe. Everyone walks at a different speed: person A can cross the bridge in 1 minute, person B in 2 minutes, C in 5 minutes, D in 10 minutes. Can they cross in 17 minutes?

Extensions

1. What if the times are 1, 2, 5 and 8 minutes? How long to cross the bridge?
2. What if the times are 5, 10, 20 and 25 minutes? How long to cross the bridge?
3. What is the equation to determine bridge crossing time?
4. What if there are 5 people? 1, 2, 5, 10, 15. What is the shortest time?

Nickels, Dimes, Quarters

- How many ways are there to make a dollar using only nickels, dimes and quarters?

Extensions

1. There are 28 pennies lined up on a table. Starting at one end of the line, I replace every second coin with a nickel. I then go back to the beginning and replace every third coin with a dime. Finally, I go back to the beginning and replace every fourth coin with a quarter. How much money is now on the table?
2. Consider the above problem, but with 1001 coins?

Split 25

Decompose 25 using addition. For example,

$$25 = 10 + 15$$

$$25 = 10 + 10 + 5$$

$$25 = 3 + 3 + 3 + 16$$

What is the biggest product you can make if you multiply the addends together?

Counterfeit Coin

- You have 12 coins, one of which – you don't know which – is fake. The counterfeit coin weighs less than the others.
- You have a balance scale. You can only determine if one side weighs less or more than the others.

Extensions

1. Can you reduce the number of times you use the scale? What is the lowest number of weighings?
2. What is the algorithm you can use if you generalize the number of coins?