

AMC 8 Training - Logic Problems

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1 Introduction

Logic problems test your ability to think critically and quickly.

Generally, logic problems are the ones that can give you an “Aha!” moment when you find out the trick.

2 Faster ways to do things

2.1 Faster and Slower Solutions

Some logic problems will present you with a straightforward, but long and tiring solution.

But the fastest way to solve them is to find the trick behind the problem.

So, let's start off with an example of a long and tiring, but unnecessary solution.

41 players sign up for a 32 person Best-of-1 ping pong competition, where if you lose a game, you're out. To decrease the number of players, 18 of them are randomly chosen to play against each other in pairs, with the 9 winners moving on.

Then, the remaining 32 players face off in an elimination bracket. In each round, players go against a random opponent, with the winner progressing and the loser out. This continues until a single winner is left.

In total, how many games are played?

Long Solution:

When decreasing the numbers, the 18 players paired into $18 \div 2 = 9$ pairs, resulting in 9 games.

In the first round, 32 players pair up into 16 pairs, resulting in 16 games.

In the second round, 16 players pair up into 8 pairs, resulting in 8 games.

We can notice a pattern and say that in the third round, there are 4 games, in the fifth round, there are 2 games, and in the sixth round, there is 1 game.

That means there are a total of $9 + 16 + 8 + 4 + 2 + 1 = 40$ games played.

Now, can anyone see a faster solution that gives the same answer?

This problem is an example of a common type of logic puzzle where you receive more information than you need, and seeing an efficient pattern is necessary to solve the question quickly.

2.1.1 Exercise 1

How many factors of 2020 have more than 3 factors?

2.2 Repetition

Another type of logic problem presents you with repetition.

Sometimes, the problem will ask you to do the same things far 10's of times, or at least more than you should, and condensing what you're repeating makes it much faster.

Jenny has 3 different books, a Dictionary, Thesaurus, and English Textbook. She puts them on a shelf in the order, from left to right, of Dictionary, Thesaurus, and Textbook. For 24 days, at 1 pm and 3 pm each day, she switches the places of the 2 leftmost books. At

2 pm each day, she switches the place of the 2 rightmost books.

At 1:30 pm on the thirteenth day, what book is in the leftmost position?

After 1 pm on the first day, the order of the books is Thesaurus, Dictionary, then Textbook.

After 2 pm, the order of the books is Thesaurus, Textbook, then Dictionary.

After 3 pm, the order of the books is Textbook, Thesaurus, then Dictionary.

We could continue onto the second day, but now we can notice that the order of the books has been reversed. Realizing this, we can note that after every 2 days, the books return to their original position,

So, after 12 days, the books would be in the same position. After the switch at 1 pm, the leftmost book would be the **Thesaurus**.

Now, let's move onto the problem set.