Introduction to Problem-Solving

Before You Watch

This video is designed to be the first one you watch. It introduces a 4-step method of solving problems that is used throughout this series of videos. So, if you're new to Maths Tune Up, congratulations, you're in the right place!

The Video Content

Here is a simple, systematic 4-step approach to solving mathematical questions, often referred to as "problems" in mathematics. This approach can be applied to many different types of questions.

The 4-Step Problem-Solving Method

Step 1 **Understand the question**
Understand precisely what the question is requiring us to do, and identify the key pieces of information provided in the question.

Step 2 **Develop a plan**
Create a plan to solve the question.

Step 3 **Carry out the plan**
Follow the plan until you have reached a solution.

Step 4 **Reality check**
Make sure your answer makes sense within the context of the question.

Example: the problem

How many squares of any size are there on a chessboard?

Step 1 Understand the question

Let's think about a chessboard. What does the question mean? You may consider the many small squares – 1 square high x 1 square wide – that comprise the checkerboard pattern. Obviously they are squares, but the question says "of any size". So, are there more squares on a chessboard than the obvious small ones that we should consider?

The answer is yes. There are 2 x 2 squares, and there are 3 x 3 squares. We need to also consider that these squares will overlap. So what the question is really asking is: 'how many squares of all different sizes there are in total?'

Step 2 Develop a plan

To create a plan we need to ask ourselves several questions.

The first question is 'What information has the question provided?'

We also need to ask ourselves 'What does the question require us to determine, or provide?' The answer to this question is obvious: what is the total number of squares.

But how do we get from one question to the other? That is the purpose of the plan: figuring out how to get from what has *been provided* to what we *need to provide*.

We could use a systematic counting system, but is this the best way? Maybe we could look at how many squares there are across, and how many there are down, and use this to simplify the question.

There are 8 squares across, and 8 squares down. This gives us 64 of the smallest, 1 x 1 squares. We could use this as our method and expand it to include the larger squares as a way of solving the question.

Now that we have a plan we can continue to Step 3.

Step 3 Carry out the plan

For the 1 x 1 squares, there are 8 across and 8 down:

8 x 8 = 64

What about the 2 x 2 squares? There are 7 across the top, and 7 down. That's 49 of the 2 x 2 squares:

7 x 7 = 49

For the 3 x 3 squares, we can fit 6 across and 6 down:

6 x 6 = 36

So, as our square size increases, the number we can fit across and down decreases. Now we can work out the larger squares, including the whole chessboard as one square:

5 x 5 = 25
4 x 4 = 16
3 x 3 = 9
2 x 2 = 4
1 x 1 = 1

Add it all together:

64 + 49 + 36 + 25 + 16 + 9 + 4 + 1 = 204

and we get 204 squares in total.

We have an answer! But we need to ask ourselves 'is the answer reasonable?' That's Step 4.

Step 4 Reality check

We can ask ourselves 'what is a reasonable number of squares?' and also 'what answers are completely unreasonable?'

For instance, if we get a negative number as our answer, like -76, is that reasonable? What about 21 and 3/4? Depending on the question, there are other ways we may catch a mistake, such as if we found there to be more of the larger squares than the smaller ones, or if we noticed an obvious square that our plan is missing.

All of these are ways in which we can hopefully catch mistakes, and go back and find out what went wrong before submitting an incorrect answer.

That's the 4-step problem solving method. It should come in handy for any mathematical questions you encounter.

Now What?

Think for a moment about what we've just covered. Did you understand the concepts? Do you want to go through it again? A good next step is to check that your foundation in **algebra** is solid. Many areas of mathematics, especially those you need at university, will build upon this basic knowledge

But When Am I Going To Use This?

The 4-step problem-solving technique is a systematic method of approaching complex questions. In mathematics, such questions are referred to as problems. You'll find this technique useful in and beyond mathematics, wherever problems must be solved.