BOWLAND MATHS
Professional development

Tackling unstructured problems

'Do I stand back and watch, or intervene and tell them what to do?'

Into the classroom

The following suggestions describe one possible approach to using the problems with pupils. This may take one or two lessons, depending on the class.

Introduce the problem to the class — 10 minutes

Give each pupil with one of the three problems.
Explain the purpose of the lesson:

> *The aim of today's lesson is to see how you go about tackling a problem from the real world without my help. This problem is a bit different to problems that you normally see in maths lessons - it's more like a problem from everyday life.*
>
> - *You will not be told which bits of maths to use.*
> - *There are many ways to tackle the problem - you choose.*
> - *There may be more than one 'right answer'.*
>
> *I want to see how creative you can be, and see if you can think of a good way to solve the problem. Later in the lesson we will compare the different approaches we have used.*

Explain how pupils are expected to work on the problem:

> *I want you to read and think about the problem on your own for five minutes. Then I'll ask you to share ideas in pairs or threes. From then on, you should work together with your partner(s) to find a good way to tackle the problem.*

Describe the resources that are available for working on the problem. Where appropriate, leave these at the side of the room, so that pupils can choose whether or not they use them:

> ***Table tennis tournament***
> *For making your poster we have some large sheets of A3 paper and felt-tipped pens.*
>
> ***Box for sweets***
> *To help you design and make the box, we have some A4 card, scissors, glue sticks, squared and isometric dotted paper and even some sweets available, should you choose to use them!*
>
> ***Body Mass Index Calculator***
> *You will need one computer between two. There is also a supply of calculators, squared paper and graph paper, should you choose to use them.*

Explain what pupils should do when they are stuck:

> *If you get stuck, then don't ask me what to do! I'm not going to do the problem for you. Everyone gets stuck from time to time. You might just need a few more minutes to think more carefully. You might need to experiment with a few ideas. You might need to talk through the problem with your partner. Try to find something in the problem that you can do to get started.*

Now set a target:

> *Right, now I'm giving you twenty minutes to work on the problem by yourselves. Then I'm going to ask some of you to come out and talk about the different approaches you are using.*

Pupils work on the task 20 minutes

Allow pupils time to engage with the problems. When they ask questions, offer strategic guidance rather than technical help. Use questions such as those found on Handout 4. For example:

Take you time, don't rush.
What do you know?
What are you trying to do?
What do you need to find out?
What is fixed? What can be changed?
Don't ask for help too quickly - try to think it out between you.

Pupils share different approaches 10 minutes

When most pupils have made significant progress with the problem, invite pairs of pupils to come to the front and share their ideas:

Let's stop and share some of the different approaches we have used and consider what has been helpful and unhelpful about each method.
Not everyone has finished, so I don't want to know about your answers.
I want you to offer your advice for helpful ways to make progress with problems like this.

Table tennis tournament
"We decided to use 7 counters for the different players and we drew little table tennis tables. Then we tried to find a way of moving the players round the tables so that they all played each other."

"We made a list of all the matches that we needed first. Then we tried to place these in a two-way table, so that each person only appears once on each row."

Box for sweets
"We arranged 8 sweets on the table in different ways and sketched different possible boxes that would fit. Then we drew round the sweets on the table to see how big the sides of the box would be. Then we tried to fit the sides together."

"We didn't use sweets at all. We worked out the dimensions of the box and then tried to draw it on squared paper. It was tricky trying to imagine where all the flaps would go."

Body Mass Index Calculator

"We experimented for a bit, then we decided to fix the height at 1 metre and made a table of BMI against weight. We plotted a graph to look for patterns and found that it goes up in equal steps."

"We made a two-way table with height going up the page and weight going across. Then we filled in the BMI values and looked for patterns."

As pupils present their ideas, ask other pupils to comment on the advantages and disadvantages of each approach.

Pupils continue with the problem 20 minutes

Encourage pupils to return to the problem and continue working on it using some of the ideas that have been shared. Collect examples of pupils' work for the follow-up session.