THIRD SPACE LEARNING

Ultimate Guide to Problem Solving Techniques

9 techniques for approaching problem solving questions in KS2 Maths

How will this resource help my pupils, and me?

The problem solving questions in this resource encourage pupils to think more deeply in order to find solutions, and question the methods that they use to reach an answer. This resource is designed to help teachers develop problems that can be solved in one way and require different solutions in different contexts with the aim of exposing pupils to more challenging content and encouraging a culture of exploratory talk. Moreover the tasks are created to empower pupils by giving them the tools they need to approach problem solving questions without the teacher's assistance, and encourages them to explain their thinking as well as consider a wide range of responses.

How to navigate this resource

The resource is split into Teacher Notes, and Pupil Resources. The Teacher Notes are organised with an explanation of each problem, followed by a pupil guide on the next page, followed by a challenge question complete with the answer. The Pupil Resource is contains a challenge question worksheet for each problem - these may be printed out or shown on the interactive whiteboard. Unlike the Teacher Notes, the answers are not included.

What is included in my problem solving techniques resource?

This resource contains multiple techniques for problem solving questions in KS2 Maths for a variety situations. Each technique has its own context, and is worked through using the Understand, Communicate, and Reflect method.
Problems like 'the fruity problem' help pupils with organisational skills and visualizing their work, whereas 'the age problem' promotes self-reflexivity and requires pupils to consider a wide range of approaches to the question. Below is a full list of the problems as well as their corresponding page numbers in both the teacher's notes and pupil resource.

Problem solving strategies included - contents

Each technique comes with an example problem complete with a walkthrough for pupils that demonstrates the steps to success - whether it be a correct answer or correct methodology. You can choose to hand this out to pupils as scaffolding or not, depending on your class. Moreover, it can be discussed as a whole class, in small groups, or 1-to-1 and also includes a challenge question for individual, partnered, or group work. Challenge questions and answers are included in the teacher notes, after the explanation of each problem.

The teacher notes also contain key questioning strategies that can be applied used in lesson for any of the problems presented. You may find it useful to give pupils some of the questions from the questioning strategy if they are working in groups to solve the problems - in much the same way this helps the teacher to promote effective thinking from the pupils - they can be used in a peer-to-peer context to the same effect.

Models for approaching problem solving - UCR

Understand, Communicate, and Reflect, is a simplified version of George Polya's 4 stages of problem solving, namely:

1. Understand the problem
2. Devise a strategy for solving it
3. Carry out the strategy
4. Check the result.

Simply put, UCR is an easy to remember acronym that simplifies approaching a new problem for your pupils that works in a variety of contexts. You may choose to use a different version of the Polya model depending on the ability and age of the class you are teaching. For many more versions of Polya's model see the following list.

Problem Solving Models

CUBES

C	Circle the question words
U	Underline key words
B	Box any key numbers
E	Evaluate (what steps do I take?)
S	Solve and check (does my answer make sense and how can I double check?)

RIDE

R	Read the problem correctly.
I	Identify the relevant information.
D	Determine the operation and unit for expressing the answer.
E	Enter the correct numbers and calculate

IDEAL

I	Identify the problem
D	Define the problem
E	Examine the options
A	Act on a plan
L	Look at the consequences

RICE

R Read and record the problem
I Illustrate your thinking with pictures, models, number lines etc
C Compute, calculate and check
E Explain your thinking

RUCSAC

R Read the question and underline the important bits
U Understand: think about what to do and write the number sentences you will need
C Choose how you will work it out
S Solve the problem
A Answer
C Check

QUACK

Q Question – read it carefully
U Understand – underline or circle key elements
A Approximate – think about the size of your answer
C Calculate
K Know if the answer is sensible or not

TEAR

T Think about the problem and ponder
E Explore and get to the root of the problem
A Act by selecting a strategy
R Reassess and scrutinise and evaluate the efficiency of the method

The idea behind these models is the same: to give pupils a structure and to build an internal monitor so they have a business-like way of working through a problem.

The model you choose is less important than knowing that pupils can draw upon a model to follow, ensuring they approach problems in a systematic and meaningful way.

About Third Space Learning

At Third Space Learning we specialise in Maths interventions for primary school. As well as many free Key Stage 2 classroom resources, diagnostic tests, and sample SATs questions, we also provide 1-to-1 Maths interventions for pupils at primary schools. Maths specialist tutors work 1-to-1 each week with KS2 pupils, who are at risk of not meeting their age-related expectations, to help them accelerate their progress and boost their confidence and love of Maths. Over 6,000 pupils are currently being supported through SATs with these 1-to- 1 lessons every week. For free Maths resources and information on catch-up and booster Maths interventions for Years 3 to Year 6, visit:

www.thirdspacelearning.com

Technique 1: Open-ended problem solving

Summary

Open-ended problem solving does what it says on the tin. It involves a problem that has multiple correct answers, and can be approached in several different ways. Problems that are open-ended often - though not always - require significant mathematics. They can include several pieces of information, some of which may be superfluous.

Pupils may often believe there is only one way to solve a problem, but open-ended problems require them to explain their thinking and encourage them to consider a wide range of responses.

For example, think about the following question:

Which is the odd one out in the following numbers? **2, 4, 9, 15, 30**

This is open to interpretation and various - equally valid - responses can be given. For example, 2 is the only even prime, 9 is the only odd square, 30 has the most factors and so on.

Worked Example

The age problem
Read through the problem below, follow the steps and see how the question was answered. Then use the same method on a new question in the 'Challenge Question':

Maisy, Heidi and Freddie are children in the same family.
The product of their ages is a score. How old might they be?

Understand the problem
There are three people.
There are three numbers that multiply together to make twenty (a score is equal to 20).
There will be lots of answers, but no 'right' answer.

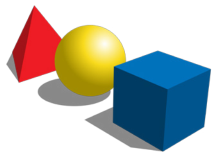
Communicate
To solve the problem we need to find the numbers that will go into 20 without a remainder (the factors).
The factors of 20 are 1,2,4,5,10,20
Combinations of numbers that could work are: 1,1,20   1,2,10   1,4,5   2,2,5

Reflect
The question says children which means 'under 18 years' so that would mean we could remove 1,1,20 from our list of possibilities.

Technique 1: Challenge question and answer

Challenge Question

The area problem
A rectangle has an area of 24 squared cm. What are the length of its sides?



Challenge Answer

1cm x 24cm
2cm x 12cm
3cm x 8cm
4cm x 6cm
2.5cm x 9.6cm
2.4cm x 10cm
3.2cm x 7.5cm
1.5cm x 16cm

Technique 2: Using logical reasoning

Summary

When reasoning logically pupils are connecting information together in a sequence of steps. There is no guesswork involved in this approach but a concerted effort to put pieces of a jigsaw together to solve the puzzle. Pupils can solve these types of problems in different ways but the use of a sorting table or grid is an excellent tool to use as it helps to visualise the problem. When information is placed inside a table like this it can be systematically filled in with ticks and crosses or with yes/no and true/false.

Reading each clue carefully is essential and so pupils need to take the time to read the problem and decide where to begin. Sometimes the clues need to be managed in a different order to the order they appear.

Worked Example

The zoo problem

After a trip to the zoo 5 children Ani, Johnnie, Nadia, Raul and Khoza are talking about their favourite animals. They are Puffin, Alpaca, Armadillo, Giraffe and Panda. Use the clues to work out who likes which animal.

Johnnie's favourite is a Panda. Ani's favourite animal starts with the same letter. Nadia and Raul's favourite don't start with the same letter. Nadia likes Alpacas.

Understand the problem

There are 5 children and 5 animals.
The names of the children and animals are important solving this problem.
There can only be one right answer.

Communicate

For this problem we can draw a grid.
Write the names of the children down the left and the animals along the top.
We already know that Johnnie likes pandas and that Ani's favourite starts with the same letter so her favourite must be a puffin.
We know that Nadia likes alpacas.

Reflect

The information in the table acted as a good visual check and the ticks and crosses help us to see the clues more clearly in a concrete form.

	puffin	alpaca	panda	giraffe	armadillo
Ani	/	X	X	X	X
Johnnie	X	X	/	X	X
Nadia	X	/	X	X	X
Raul	X	X	X	/	X
Khoza	X	X	X	X	/

Technique 2: Challenge question and answer

Challenge Question

The size problem
5 children left their shoes in the hallway. Each child was a different size: 2,3,4,5,6

Tess knew that her were the smallest. Kyle thought his were bigger than Charlie's but smaller than Deeptak's. Balroop knew his were the biggest.

Which size shoes did each child have?

Challenge Answer

	2	3	4	5	6
Tess	/	X	X	X	X
Kyle	X	X	/	X	X
Charlie	X	/	X	X	X
Deeptak	X	X	X	/	X
Balroop	X	X	X	X	/

Technique 3: Working backwards

Summary

Using a working backwards strategy means that pupils can solve a problem by starting with the solution and then methodically stepping backwards to find the missing information.

This particular strategy is useful for solving problems that include a sequence of events where some or part of the information has deliberately been omitted. In a problem with linked information the events follow each other or a piece of information is influenced by what comes next.

Working backwards might feel odd to pupils but beginning at the end is a common way to solve a problem and working in reverse order is good practice for double-checking. It often helps to find out what happened in the first place.

The key to making this strategy work is for pupils to understand that whatever maths operations they come across will have to be reversed. So if going forwards there is a multiplication then working backwards means this will be a division.

Worked Example

The weighty problem
4 gorillas weighed themselves. Clint was 15kg lighter than Amish. Gibbo was twice as heavy as Clint and Jimmy was 7kg heavier than Gibbo. If Jimmy weighed 71kg what was Amish's weight?

Understand the problem

There are 4 gorillas.
Clint was 15kg lighter than Amish.
Gibbo was twice as heavy as Clint.
Jimmy was 7kg heavier than Gibbo.
Jimmy weighed 71kg.

Communicate

We need to start at the end of the problem with Jimmy's weight which we know is 71kg.
We can begin with working out Gibbo's weight because Jimmy is 7kg heavier than Gibbo so we subtract 7 from 71.
Gibbo's weight is therefore 71 – 7 = 64kg.
Gibbo is twice as heavy as Clint so now we know Gibbo's weight we can divide this by 2.
Clint's weight is therefore 64 -:- 2 = 32kg
Amish's weight is Clint's weight plus 15kg so 32 + 15 = 47
Amish's weight is therefore 47kg.

Reflect

Working backwards enabled us to get at the solution quicker because we had a method and this helped us to be systematic in our approach. Not working methodically may have resulted in us using the wrong operations or missing parts out.

Technique 3: Challenge question and answer

Challenge Question

The money problem
Jack has twice as much money as Matilda. Jack has 4 times as much money as Seb. Seb has £3 more than August. If Matilda has £14, how much money do the other children have?

Challenge Answer

Matilda = £14
Jack £14 x 2 = £28
Seb £28 ÷ 4 = £7
August = £7 – 3 = £4

Technique 4: Drawing a diagram

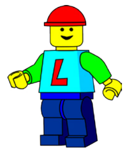
Summary

One of the most effective ways to bring a problem to life and to solve a problem is to draw a picture. This helps to reveal parts of the problem that might be difficult to imagine or may not be immediately obvious on first consideration. Drawing a problem helps you draw on different skills too and supports pupils keep a check and track on the stages of a problem.

Sometimes a basic line can help pupils visualise a problem more easily. Number lines are a good example of this. Other examples include mapping, using arrows, drawing dots and making connections.

Worked Example

The sticky problem
For her DT project Milly is making a new toy. She has to cut a stick into 8 equal pieces. It takes her half a minute to make each cut. How long will it take her to cut the stick into 8 pieces?



Understand the problem

We know that Millie has a stick and she needs to cut it into 8 pieces.
We don't know how long the stick is but for this problem that isn't important.
We know that it takes 30 secs per cut.

Communicate

We can draw a line to symbolise the stick and then divide that line up according to the number of cuts needed.
In order to get 8 pieces then we have to make 7 cuts
If 1 cut = 30s then 7 cuts will be 7 x 30s = 210 seconds
210 seconds is 2 minutes and 30 seconds.

Reflect

If we hadn't drawn the line then we might have made the mistake of dividing 30 by 8.
A good way to do this problem would be to get a strip of paper and then cut it up into pieces. We could also use some plasticine and do the same thing.

Technique 4: Challenge question and answer

Challenge Question

The Lego problem
Jasmin is building a Lego tower using rectangular bricks. It takes her 1.75 secs to join 2 pieces together. How long will it take her to join 9 pieces together?

Challenge Answer

Jasmin has to make 8 joins to connect 9 pieces together so 8 x 1.75 = 14 seconds

Technique 5: Drawing a table

Summary

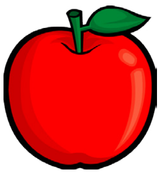
This strategy shares similarities with Using Logical Reasoning as it involves presenting information inside a table, although drawing a table isn't the only option within a reasoning problem.

A table can help to organise information so that it can be easily understood, as numbers and words can be made clearer and relationships between them made more obvious.

A table can also show a pattern or part of a solution that would otherwise be difficult to visualise. Using a table helps to cut down on errors as the information has nowhere to hide! Identifying how many variables are at work can be tricky so pupils may need help deciding how many rows and columns their table will need and what headings to choose. Using symbols and abbreviations may also help.

Worked Example

The fruity problem
Donny has 3 apple and 3 pear trees in his garden. For every 8 ripe apples he picks, he picks 3 ripe pears. When the trees were empty he had 64 apples. How many pieces of fruit did he collect in total?



Understand the problem
We know that there are 6 trees in Donny's garden: 3 apple trees and 3 pear trees.
We know that each time he picks 8 apples he picks 3 pears.
We know that he had collected 64 apples.

Communicate
Drawing a table will help us see step by step how many pieces of fruit are being collected.
Each time Donny picks 8 apples he picks 3 pears so we can go up in 8s and 3s each step of the way until we reach 64 apples. This problem uses the 8x table and 3x table.
When we get to 64 apples we can see that Donny has picked 24 pears. If we add these together then we get 88 pieces of fruit.

Reflect
Drawing a table enabled us to see that the problem involved adding 8 and 3 each time so it was useful to see a pattern. The totals jumped up by 11 each time.

Apples picked	Pears picked	Total
8	3	11
16	6	22
24	9	33
32	12	44
40	15	55
48	18	66
56	21	77
64	24	88

Technique 5: Challenge question and answer

Challenge Question

The bike problem
Harry is doing a charity cycle ride. Each day he cycles less because he gets more tired. On the first day he covers 38km, the second day 35 km and the third day 32 km. How many days will it take him to cover a distance of 220km?

Challenge Answer

1cm x 24cm
2cm x 12cm
3cm x 8cm
4cm x 6cm
2.5cm, x 9.6cm
2.4cm x 10cm
3.2cm x 7.5cm
1.5cm x 16cm

Day	Km cycled	Distance covered
1	38	38
2	35	73
3	32	105
4	29	134
5	26	160
6	23	183
7	20	203
8	17	220

Technique 6: Creating an organised list

Summary

This strategy is not dissimilar to Drawing a Table but it tends to be used where there is a large volume of data or information that requires things to be set out in a more systematic way so that solutions can be seen with more clarity.

Creating an organised list means that pupils follow a procedure or sequence to so that they cover all bases and repetition is prevented.

To create an organised list pupils keep 1 thing the same whilst changing the others. It involves working sequentially, filling in the gaps after working out a pattern and finding combinations of numbers.

Worked Example

The baby problem

Mrs Donovan has just given birth to a baby boy. She wants to name her son James, Liam, Kevin or Aaron, Mr Donovan wants his son's middle name to be either Ross, Patrick, Michael or Sean. How many different name possibilities are there?

Understand the problem

We know that there are 8 names in the hat.
We know that there will be two names out of the 8 chosen.
We know that there are lots of different possibilities but these are not endless.

Communicate

Making a list of the names will help Mr and Mrs Donovan and so we can organise this using each of the first name options combined with each of the second names as so:

James Ross	James Patrick	James Michael	James Sean
Liam Ross	Liam Patrick Liam	Michael	Liam Sean
Kevin Ross	Kevin Patrick	Kevin Michael	Kevin Sean
Aaron Ross	Aaron PatrickAaron	Michael	Aaron Sean

This list shows us that there are 16 possible name combinations.

Reflect

Using each of the first names and combining with each of the second names helped us to group the combinations and then count them together at the end.

Technique 6: Challenge question and answer

Challenge Question

The bus stop problem
Deeptesh, Bikram, Jagdip and Charan are waiting in line at the bus stop. How many different ways can they line up?

Challenge Answer

Starting with any particular child, there will be 6 combinations therefore there are 6 x 4= 24
combinations in total:

Deeptesh, Bikram, Jagdip, Charan Deeptesh, Bikram, Charan, Jagdip
Deeptesh, Jagdip, Bikram, Charan Deeptesh, Jagdip, Charan, Bikram
Deeptesh, Charan, Bikram, Jagdip Deepetesh, Charan, Jagdip, Bikram

Technique 7: Looking for a pattern

Summary

This strategy is really an extension of the Drawing a Table and Organised List strategies and is one of the most common problem solving strategies used. Pupils will often encounter patterns within their everyday lives such as shapes and numbers in the natural and man-made environment and can become quite adept at spotting them.

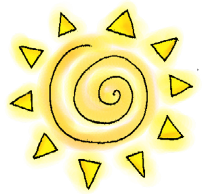
When pupils identify a pattern, they can easily predict what comes next. When pattern spotting in maths the most common ways to check are to find differences between numbers that are consecutive, decide what operation exists between the numbers, and find out if the numbers increase or decrease. The pattern can then easily be continued and extended.

Once again, drawing a table will help pupils tease out what's what and locate information with greater power and confidence.

Worked Example

The summer problem

At the beginning of the summer term, maths wizard Chandri challenges herself to do a maths problem on the 1st day, 2 problems on the 2nd, 4 on the 3rd day, 8 on the 4th and so on.
How many problems will she have done by the 10th day of her holiday?
How many will she have done by the 15th day of her holiday?



Understand the problem

We know that Chandri is doing a different number of maths problems each day.
The pattern starts at 1 and then doubles each time.
The pattern can be done mentally to start with but builds to a higher number so a table will help organise the information.

Communicate

On the 10th day Chandri completes 512 problems and by the 19th day she has completed 131,072.

Reflect

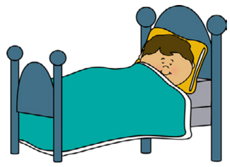
Once the table is drawn up it is easy to see that the pattern is a doubling pattern and so this involves multiplying by 2 each time.

Day	Number of maths problems
1	1
2	2
3	4
4	8
5	16
6	32
7	64
8	128
9	256
10	512
11	1024
12	2048
13	4096
14	8192
15	16384
16	32768
17	65536
18	131072
19	262144

Technique 7: Challenge question and answer

Challenge Question

The dream problem
Chandri went to see the doctor about her dreams. She said that one night she had 2 dreams, the next night she had 5 dreams, on the 3rd night she had 9 dreams and on the 4th day she had 14. Her doctor asked her how many dreams she had on the 8th night...how many did she say?



Challenge Answer

Day	1	2	3	4	5	6	7	8
Dreams	2	5	9	14	20	27	35	44

The pattern is +3, +4, +5, +6, +7, +8, +9 so on the 8th day Chandri had 44 dreams.

Technique 8: Acting it out

Summary

Sometimes the most effective way to get at a problem is to physically involve yourself and become part of it by acting it out. This makes something quite abstract suddenly 'doable' and helps you see the problem more clearly. Depending on the problem, there are lots of concrete objects that might come in handy to help you such as containers, blocks, counters, pencils, rulers, boxes and so on. The objects are very often 'actors' in the problem so seeing them and what part they play really helps see the problem in the flesh and 'live'.

Where possible, try to have plenty of resources as part of your classroom set-up that can be incorporated into problems to help pupils make sense of a question. The pupils themselves make the best resources and can sometimes take on a role within a problem with minimum effort.

Worked Example

Water problem we have here!
Jake and Flossie have to give a tree exactly 7 litres of water every week. The problem is they don't have a 7 litre watering can. They have a 5 litre watering can and a 3 litre watering can instead.

Without guessing, how can they use the 5 litre and 3 litre containers to measure out 7 litres of water exactly?

Understand the problem
There are 2 watering cans: one that holds 5 litres and the other which holds 8 litres.
They have to measure out precisely 7 litres.
They can't guesstimate it.

Communicate
For this problem we used 2 watering cans and acted out the problem.
First we filled the 5 litre watering can with water.
Using the 5 litres of water we poured 3 litres into the 3 litre watering can. This left exactly 2 litres of water in the 5 litre watering can.
We then pour the 2 litres remaining onto the tree and then fill up the five litre watering can again and pour this onto the tree: this means the tree gets 7 litres of water exactly.

Reflect
The problem is made easier by experimenting and having a go. We can try different combinations and this helps us work out how to make 2 litres of water.

Technique 8: Challenge question and answer

Challenge Question

The birthday problem
A dozen friends had a party to celebrate a birthday. Each person shakes hands with every one of the other 12 guests. How many handshakes were there?

Challenge Answer

The 1st guest shook 11 hands, the 2nd guest only needed to shake 10 hands because he had already shaken the hand of the 1st person, the 3rd guest shook 9 hands and so on.

So 11 + 10 + 9 + 8 + 7 + 6 + 5 + 4 + 3 + 2 + 1 = 66

There were 66 handshakes.

Technique 9: Guessing and checking

Summary

This is a strategy that involves making educated guesses or guesstimates. It is a trial and error approach that may suit particular problems more than others but can be useful. The guess and check strategy is not a wild or blind guess option but helps pupils come to understand what sensible estimates are based on limited information.

Guessing and checking involves making a note of important data or information, finding a starting point, drawing up a table, testing and solving.

Worked Example

The meaty problem

Zara bought a chicken burger and some fries for £2.85. The chicken burger cost twice as much as the fries. What was the cost of each one?

Understand the problem

We know that the meal total was £2.85
We know that the burger was twice the cost of the fries.
We know that halving the burger will not give us the price of each.

Communicate

To help us solve this problem we can make some guesses. If the guess doesn't solve the problem then we can raise or lower the guess until we find the amounts that add up to £2.85.

Reflect

Guessing helped us because we still worked systematically by choosing values that weren't 'silly' or wild. As we guessed we were able to see how close we were getting and so we could adapt and revise our guesstimates to get even closer until we found the solution.

	Fries	Chicken Burger	Total	Assessment
Guesstimate 1	£0.80	£1.60	£2.40	Too low
Guesstimate 2	£0.85	£1.70	£2.55	Too low
Guesstimate 3	£1.00	£2.00	£3.00	Too high
Guesstimate 4	£0.95	£1.90	£2.85	Spot on

Technique 9: Challenge question and answer

Challenge Question

The present problem

3 brothers saved some money to but their parents a present for Christmas. Between them, Max, Lennie and Harrison saved £20. Max saved £3 more than Lennie, and Lennie saved £4 more than Harrison. How much did each save?

Challenge Answer

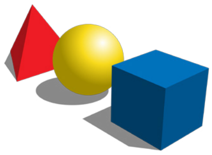
	Max	Lennie	Harrison	Total	Assessment
Guesstimate 1	£8	£5	£1	£14	Too low
Guesstimate 2	£15	£12	£8	£35	Too high
Guesstimate 3	£10	£7	£3	£20	Spot on

Question prompts for all problems

Whichever problem solving strategy you choose to focus on then there are some questioning prompts that pupils could be presented with to help encourage their independence. For example:

- What do you think the problem is asking?
- Have you encountered this type of problem before?
- What other information is needed in order to answer the question?
- What have you tried already?
- What do you want to know now?
- What else could you work out?
- How else could you represent the problem?
- Are you being systematic?
- Would anything else work?
- What might help you get 'unstuck'?
- Can you reword the problem and explain it in a different way?
- What else can you find out?
- Could you teach a friend how you did it?
- What parts of the problem do you understand?
- Would it help to act out the problem?
- Would a picture or a diagram help solve the problem?
- Would any specific resources help you such as counters, cubes, a number line etc?
- Does your answer seem reasonable?
- Can you explain your thinking?
- How can you organise your work? Would a table or a list help?
- Is there anything you would change?

Technique 1
Open ended problem solving



The area problem

A rectangle has an area of 24 squared cm. What are the length of its sides?

Technique 2
Using logical reasoning

The size problem

5 children left their shoes in the hallway.

Each child was a different size: 2,3,4,5,6
Tess knew that her were the smallest.
Kyle thought his were bigger than Charlie's but smaller than Deeptak's.
Balroop knew his were the biggest.

Which size shoes did each child have?

Technique 3 Working backwards

The money problem

Jack has twice as much money as Matilda. Jack has 4 times as much money as Seb. Seb has £3 more than August. If Matilda has £14, how much money do the other children have?

Technique 4 Drawing a diagram

The Lego problem

Jasmin is building a Lego tower using rectangular bricks. It takes her 1.75 secs to join 2 pieces together. How long will it take her to join 9 pieces together?

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Harry is doing a charity cycle ride. Each day he cycles less because he gets more tired. On the first day he covers 38km, the second day 35km and the third day 32km. How many days will it take him to cover a distance of 220km.

Technique 6 Creating an organised list

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Deeptesh, Bikram, Jagdip and Charan are waiting in line at the bus stop. How many different ways can they line up?

Technique 7 Looking for a pattern

The dream problem

Chandri went to see the doctor about her dreams. She said that one night she had 2 dreams, the next night she had 5 dreams, on the 3rd night she had 9 dreams and on the 4th day she had 14. Her doctor asked her how many dreams she had on the 8th night...how many did she say?

Technique 8 Acting it out

The birthday problem

A dozen friends had a party to celebrate a birthday. Each person shakes hands with every one of the other 12 guests. How many handshakes were there?

Technique 9 Guessing and checking

The present problem

3 brothers saved some money to but their parents a present for Christmas. Between them, Max, Lennie and Harrison saved £20. Max saved £3 more than Lennie, and Lennie saved £4 more than Harrison. How much did each save?