Dot Connecting

Suppose you draw 10 dots on a circle. If you draw lines connecting every dot to every other dot, how many lines will you draw?

With just one dot, there will be zero lines.	With two dots, you can draw one line.	How many lines will you draw for three dots? Four? Make a chart.

With just one dot, there will be zero lines.

DOTS	LINES
1	⓪

With two dots, you can draw one line.

| DOTS	LINES
1	⓪
2	1

Paper Tearing

Suppose you tear a piece of paper in half and give half to someone else. Then each of you tears your piece in half and passes half on to someone else. How many people will have a piece of paper after 10 rounds of tearing like this?

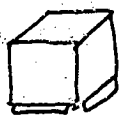|		
With one tear, there will be pieces for two people.	After the second round of tears, there will be pieces for four people.	Continue tearing the paper. Record on a chart. Look for patterns.
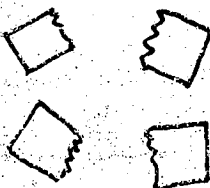
Continue tearing the paper. Record on a chart. Look for patterns.

TEARS	PIECES
1	2
2	4
3	

Burns, Marilyn, *About Teaching Mathematics*, Math Solutions 2007

More Painting Towers
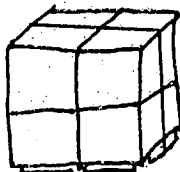
You need: interlocking cubes

Suppose you build a cubical tower that is 99 cubes tall. And suppose, as you did for *Painting Towers* on page 115, you have to paint every square on the four sides and the top of the tower. (You don't have to paint the base of the tower.) How many squares do you have to paint?

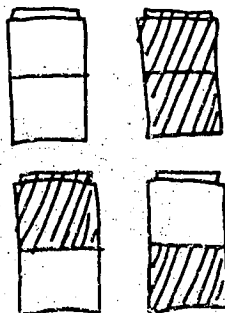| With a cubical tower that is only one cube high, there are five squares to paint — four sides and a top.	With a cubical tower that is two cubes high, there are 20 squares.	How many squares for a cubical tower three cubes high? Four? Make a chart.
Don't count the bottom.		HEIGHT / SQUARES: 1 / 5, 2 / 20, 3 /

Interlocking Trains

If you make trains ten cubes long using two colors of interlocking cubes, how many different arrangements can you make? (**Note:** The order of the colors matters. For example, for a train that is three cubes long, red-red-blue and red-blue-red each count as a different arrangement.)

A train that is one cube long has two arrangements.	A train that is two cubes long has four arrangements.	How many arrangements would there be for trains that are three cubes long? Four? Make a chart.
		LENGTH / WAYS: 1 / 2, 2 / 4, 3 /

The Diagonal Problem

If you have a 12-sided polygon (a dodecagon), how many diagonals can you draw? Remember that diagonals connect the corners of shapes.

A triangle has three sides and no diagonals.	A four-sided figure (a quadrilateral) has two diagonals.	What about a pentagon? A hexagon? And so on?

A triangle has three sides and no diagonals.

SIDES	DIAGONALS
3	0

A four-sided figure (a quadrilateral) has two diagonals.

SIDES	DIAGONALS
3	0
4	2

What about a pentagon? A hexagon? And so on?

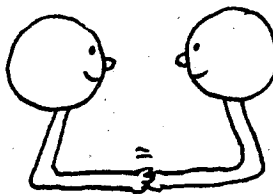| SIDES	DIAGONALS
3	0
4	2
5	

The Handshake Problem

Suppose everyone in this room shakes hands with every other person in the room. How many handshakes will that be?

With only one person in the room, there will be no handshake.

PEOPLE	HAND-SHAKES
1	0

With two people, there will be one handshake.

PEOPLE	HAND-SHAKES
1	0
2	1

How many handshakes will there be with three people? Four? Continue the chart.