Look for a Pattern

Shells
Laura looks for her favourite shells on the beach every morning. The first day, she finds three shells. The next day, she finds eight shells. On the third day, she finds thirteen shells in the cove. On the fourth day, she finds eighteen shells as she walks by the water. If Laura keeps finding shells in this way, how many will she find on the eighth day? Explain how you got your answer and how you know your answer is correct.

Parade
It’s time for the annual school fall parade. The Year Fours have decided to march in a special formation this year. One person walks in the first row, two people walk in the second row and three people walk in the third row. This pattern continues on and on.
- If the whole fourth grade marches in 10 full rows, how many students are in fourth grade?
- Use numbers, words, tables and/or pictures to explain how you know your answer is correct.

Marathon Training
Carla started an exercise plan to prepare to run a marathon. She ran one kilometre on the first day. She ran two kilometres on each of the next two days. Carla ran three kilometres a day for three days. Next, she ran four kilometres a day for four days.
- If Carla continues this training schedule, on what day will she first run six kilometres a day?
- How many kilometres will she have run altogether in her training when she completes that first six kilometre run?

Pumpkin Picking
Allie was picking pumpkins for her school. She picked one pumpkin on the first day. She picked two pumpkins on each of the next two days. Allie picked three pumpkins for three days. Next she picked four pumpkins a day for four days and so on.
- If Allie continues this pumpkin picking schedule, on what day will she first pick six pumpkins?
- How many pumpkins will she have picked altogether for her school when she completes that first 6th day?
Baseball Season
John is trying to get into shape for baseball season. He runs one kilometre on the first day. He runs two kilometres each day for two days. Then he runs three kilometres a day for three days.
- If John keeps following this running schedule, on what day will he reach his goal of running 5 miles in a day?
- How many miles will John have run altogether when he finishes that five kilometre run?

Anthony’s Allowance
Anthony earns an allowance by doing chores around the house. His mom pays him $1 for doing chores the first day, $2 each day for doing his chores on the next two days, $3 for doing his chores on the next three days, and so on and so on.
- If Anthony keeps earning money this way, on what day will he first earn $6?
- Anthony saves all the money he earns for chores because he wants to buy a $59.99 video game. How much money will he have saved on the first day his Mum pays him $6 for doing chores?
- Will Anthony have enough money to buy the video game? Explain.

Saving Money
Morgan is saving money to buy a new CD. On Sunday, she has $4 in her bank. Morgan is going to feed and walk the neighbour’s dog each day from Monday through Friday while they are away on vacation. She will earn $2 each day for taking care of the dog. The neighbours will pay her when they get home on Friday night.
- How much money will Morgan have after the neighbours pay her on Friday night?
- The new CD is on sale for $12.99 at Target this week.
- Will Morgan have enough money to buy the CD on Saturday morning? Explain your answer.

Saving Money Again
Chris is saving money to buy a new DVD. On Sunday, he has $8 in his bank. Chris is going to help his dad rake leaves and put them in bags. He will earn $2 each day for raking one bag of leaves. Chris rakes one bag of leaves each day from Monday through Friday.
- How much money will Chris have on Friday night?
- The DVD is on sale for $15.99 at Best Buy this week. Will Chris have enough money to buy the DVD on Saturday? Explain your answer.
Garage Sale
Mrs Kane teaches Year Three and loves to find bargains at garage sales. Today she is searching for games for her classroom. She found a box of dominoes on sale at one house but she wants to make sure that she has a whole set before she buys this double six set.
- How many different dominoes should there be?
- Use your best thinking to explain your answer using words, pictures and numbers

Odd Combo
List all the different four digit whole numbers that can be written using the digits 1, 3, 5 and 7. Use each digit only once in a number.

Palindromes
Numbers that read the same forwards and backwards are called palindromes or palindromic numbers. Some examples are 45354, 77, 404, 919, 22222, 6776, 11, and 1518.
- Make a list of all the three digit palindromes that begin with a 7.
- Make a list of all the three digit palindromes whose digit sum is 10.
- What is the least three digit palindrome that is a square number?
- Make a list of all the three digit palindromes whose sum is 8.

Odometer
An odometer measures the distance a vehicle travels. The odometer in the space shuttle shows the palindromic number of 35953. What will be the next palindromic number to appear on the odometer?

Pattern Search
Find a common pattern in each set of numbers below
1. 34, 45, 78, 123, 678, 89
2. 34, 43, 223, 70, 61, 52, 16, 1222, 331, 111111
3. 46, 68, 96, 20, 35, 75, 13
4. 93, 552, 66, 105303, 2226, 110011800
5. 19, 31, 515, 142, 617, 501, 11111, 821812, 91
6. 7321, 4520, 6848, 7963, 3412, 5525, 236, 313, 9981
7. 50, 35, 15, 145, 29467310, 700065
8. 343, 7887, 21212, 55, 67076, 27772
9. 7, 9, 21, 33, 101, 455, 87, 2468107, 135791113
10. 75, 641, 975, 5320, 54, 975430, 876543210

Traffic Jam
A stoplight flashed red for fifty seconds, yellow for five seconds and green for sixty five seconds. For what fraction of a twenty four hour day is the stoplight yellow?
Restaurant Orders
How many different two course meals can I make given a choice of eight main courses and sixteen desserts?

Rugby Uniforms
A club rugby team has five different shirt colours and four shorts colours. How many different uniforms are possible?

New Housing Division
Three Fences are used to divide land into square blocks. One side of each block faces the river and is unfenced.
- How many fence lengths are required to make 45 blocks?
- How many top and bottom rails would be needed to complete a straight fence with 55 posts?

Number Puzzle
How many 27 digit numbers have digits which sum to 2?

Paper Folding
A rectangular piece of paper is folded in half 7 times. When the paper is unfolded, how many sections will it be divided into?

Polygon Puzzle
How many diagonals does a twelve sided polygon have? Remember that a diagonal is a straight line that joins two vertices of a polygon but is not a side of the polygon.
Remember,
- a rectangle 2 diagonals
- a pentagon has 5 diagonals

Book Club
The ladies who belong to the Library’s Book Club met on May 17th, June 14th and July 12th. If this pattern was to continue, when is there next scheduled meeting?

Valentine’s Day
Five good friends exchange Valentine’s Day cards each year. How many Valentine’s Day cards are actually exchanged?

Tuna
Can of tuna are arranged in a display that has four rows. Each row has one more can than the row above it. If the last row has ten cans, how many cans are there in the display?
Cheerleaders

The local cheerleading team are using red, blue and green for their uniforms.

The uniform is red, blue and green for each piece of clothing.

Two different colors of uniforms could be made:

<table>
<thead>
<tr>
<th>Hat</th>
<th>Green</th>
</tr>
</thead>
<tbody>
<tr>
<td>T-Shirt</td>
<td>Red</td>
</tr>
<tr>
<td>Shorts</td>
<td>Blue</td>
</tr>
</tbody>
</table>

The uniform must contain red and green for only one piece of clothing.

Apprentice Builder

A group of 54 pupils have applied to be apprentice bricklayers. The teacher asks the pupils to look at the small brick pyramid he is building and work out how many bricks are needed to build it.

"That's easy," says Tim. "It's 4 steps high and the total number of bricks required is 64."

"Excellent, but this is just a model. We will have to work out how many bricks are required for larger walls, right like the church. How many bricks are required for a 4-step pyramid?"

"That's easy," says Tim. "It's 4 steps high and the total number of bricks required is 64."

The 4-step brick pyramid

Chessboard Challenge

Jim and Tim are playing chess when Jim suggests that they count the number of squares on the chessboard.

"Easy," says Tim. "There are only possibly 64!"

"Definitely not. There are more than 100!" replies Jim.

The problem

Find how many squares there are on a chessboard.

The squares can be of 1 by 1 or 2 by 2, etc.

Deca-dominoes

Kurt, Al and Mary enjoy playing dominoes and decide that it would be fun if all the class could play the same game of dominoes at the same time.

All suggest that each pupil in the class must have at least 2 dominoes to make the games fair.

Mary notes that they would not have enough dominoes for the class of 20 pupils to have at least two each. John says that they will have to make a special set of dominoes and that the rest of the dominoes should be numbered 0 to 9.

Problem

Would a set of dominoes numbered zero to nine be sufficient to allow 20 pupils two dominoes each?

Crazy Towers

An architect is designing a new building. The building is to be in the shape of a tall tower. The architect decides that the tower will be a combination of black and white marble or white and black marble.

Each level of the building will be either completely white or completely black.

A builder is asked to build the black and white tower.

The builder is told the tower is to be 10 floors high, but not what combination of black and white the final design is to use.

The builder is confused and says, "There are lots of different combinations of black and white. Which one should I build?"

The problem

How many different combinations of black and white or completely black or white are there for a tower with 10 floors?

One possible example of the tower is shown.

Lights

A hotel has installed a lighting system.

The lighting system contains eight different lights, with each light different in color.

This hotel is often floodlit with the most colors. He can turn each light on or off.

They have developed different combinations of lights and that this will not affect the mood of the hotel.

The hotel has a daughter in search of a hotel that turns off all lights with eight lights which can be either on or off. There are more than 100 different combinations.

The problem

Find out how many different ways eight lights can be arranged, either on or off.

Pupil statement

Task 1

Write in a table what strategies could be used to help analyse the problem.

There are only 8 different combinations of the OFF or ON

There are only 8 different combinations of the OFF or ON.

There are only 8 different combinations of the OFF or ON.

Task 2

Name two lights that both could be turned on and off.

There are only 8 different combinations of the OFF or ON.

There are only 8 different combinations of the OFF or ON.

Task 3

Select the problem with your partner again.

There are only 8 different combinations of the OFF or ON.

There are only 8 different combinations of the OFF or ON.

There are only 8 different combinations of the OFF or ON.
Olympic Medals

At the Olympic Games, athletes stand on a podium to receive their medals.

For these medals athletes need to give the medals.

Use your cubes to make these shapes.

The problems

a. So that 5 people can get medals more boxes are added.

b. For 7 people to get medals more boxes again will be added.

Use your cubes to make these shapes.

How many cubes did you need to make these shapes?

School Trip

A group of pupils are visiting the Science Centre, where there is a number of hours decided however can only go to the top of the tower.

Unfortunately only have two lift cars and the leader says "Take the lift cars both the lift cars!"

The problems

a. What is the different ways 7 pupils can use both lift cars to get to the top of the tower, remember at least one pupil must go in each lift.
b. What is the different ways 6 pupils can use both lift cars to get to the top of the tower.
c. What is the different ways 10 pupils can use both lift cars to get to the top of the tower.
d. Work out how many ways 50 pupils can use both lift cars to get to the top of the tower.
e. Write a rule for working out how many different ways pupils can use both lift cars to go to the top of the tower.

Extension

Three lifts are working of the tower. How many different ways can 6 pupils, 7 pupils, and 7 pupils go to the top of the tower?

Remember each pupil must go in each lift.

Can you write a rule for pupils using these lifts to go to the top?

School Yard

Class 3 is planning to build a playground that has two rectangles. One is a rectangle that is 9 m by 4 m and the other is 6 m by 3 m.

The problem

a. What is the total area of the playground?

Pop Up 4

Task 1
With pop-up 3, choose which strategies you would use to work out the problems.

Task 2
If a triangle has three sides being 5 m, 6 m, and 7 m, find the area.

Task 3
If a rectangle has a length of 10 m and a width of 5 m, find the area.

Task 4
Draw a square with a side length of 4 cm. Find its area.

Extension

Find a formula connecting the number of sides and the area of a regular polygon.

New Town

Here are some interesting problems to test your logical thinking.

The problems

a. The height of the building is 300 trees.

b. The height of the building is 600 trees.

c. The height of the building is 1200 trees.

d. The height of the building is 1800 trees.

Radio Ga-Ga

A local radio station is running a competition. To win you must phone in the correct answer to their question. But only the first ten correct callers receive a prize.

The prize is a U-Express CD and a head-to-head tournament of 20 discs.

The problem

If you are the 19th caller how much money will you win?

Stepladders

The ladder has four square steps. The ladder is made up of three square steps.

The problems

a. Which step(s) can you add to the ladder to make it taller?

b. How many different ways can you add to the ladder to make it taller?

Pop Up 5

Task 1
With pop-up 4, choose which strategies you would use to work out the problems.

Task 2
If the ladder had three steps how many different ways could you draw the ladder?

Task 3
If the ladder had four steps how many different ways could you draw the ladder?

Task 4
How many different ways can you arrange the step(s) of the ladder?

Extension

What if you only had 100 steps and you could add 1 or 2 or 3 steps at a time? How many different ways could you draw the ladder?