

# Mathematical Challenges

Acquire skills & techniques for tackling  
“Heuristic” word problems

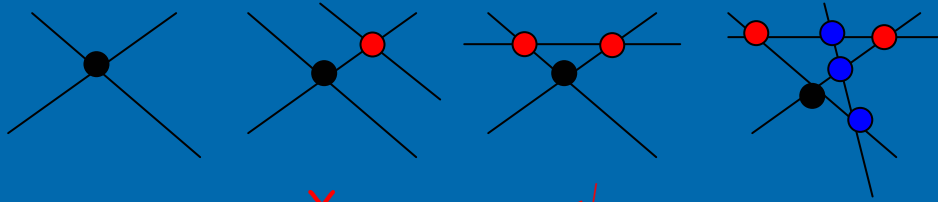


# Example 1: Look for Pattern

By drawing 4 straight lines, we can get at most 6 points of intersection. What is the **maximum number** of points of intersection that we can get by drawing 20 straight lines?

Thinking:

(1) Do you notice the "relationship" between maximum number of points of intersection and the number of straight lines as:  $1+2+\dots$  (number of lines-1)? **Except?**



Points:	1		$1 + 2$	$1 + 2 + 3$
Lines:	(2)		(3)	(4)

... (20) lines  $\rightarrow 1 + 2 + 3 + \dots + 19$  points, cool?

Question: How to add up  $1 + 2 + 3 + \dots + 19$ ?

Hint: Do you know how many pairs of numbers are there that give you the sum of "20"?

E.g.  $(1+19)$ ;  $(2+18)$ ;  $(3+17)$  ... except  $(10)$ , right?

**ANS:** use  $18 \div 2 \times 20$ , then  $+ 10 = \underline{190}$

## Example 2: Make a list or table

In how many different ways can three children share 8 identical sweets so that each child gets at least one?

Consider the different ways that the sweets can be distributed. **Systematically**, tabulate the possibilities, e.g.

Sweets distribution	No. of ways
116, 161, 611	3
125, 152, 215, <del>134</del> ; 512, 521	6 6 (Symmetry Case)
224, ...	3 (Symmetry Case)
233, ...	3 (Symmetry Case)

ANS: **21**

Thinking:

(1) Do you think you should list them in **ascending** or **descending** order in entries?

(2) Do you see we exploit/make use of the "**Symmetry**"?

E.g. Case

1	2	5
↓	↓	↓
1	3	4

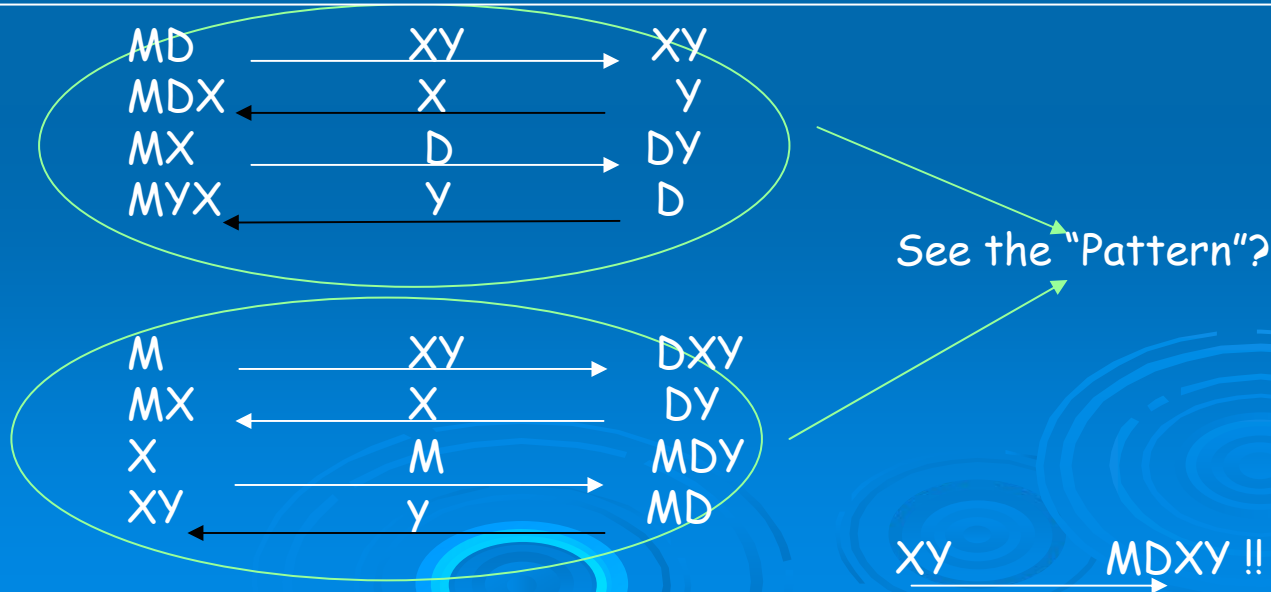
# Example 3: Act it out!

Example: Mum, dad and their 2 children, 1 boy and 1 girl arrive at the river where there is a boat that will hold **one adult or 2 children**. What is the minimum number of trips across the river in either direction to get the family across? AMC03J22

Thinkings:

(1) Do you notice that "1" adult would be carried/ brought across the river after "4" trips? Why?

(2) Remember to include "1" last trip to bring the 2 children over to join their parents, okay? Ans = 9 trips!



# Example 4: IQ Puzzle!

Example: With merely 4 straight lines, join the following nine points together.

Thinkings:

Think out of the

