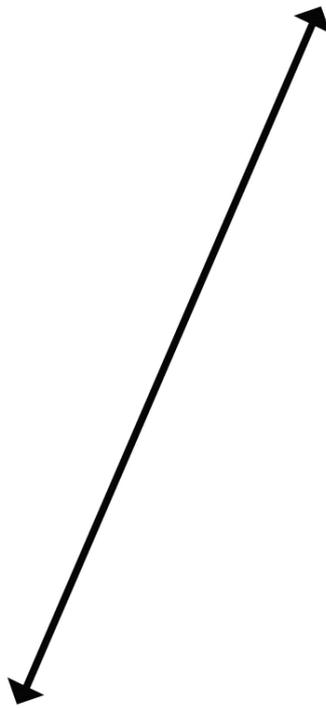


Hillhead High School



**Department of Mathematics**



**Problem Book 0**

The problems in this book are designed to challenge your thinking.

Your teacher may use this book in class or as homework. It may be something you work on with other people or on your own.

It is unlikely that you will be able to solve any of these problems immediately. It could be that a problem takes you an hour, it could be days. You might never solve some of them.

The key is to stick at it and try different strategies. Report what you notice to your teacher, your classmates, whoever looks after you at home. These things are just as important as your working.

It might also be that there are words that you have not heard of before or information that has not been given. That is normal, there are lots of ways of finding this stuff out.

At the end of this book is a series of reflective questions. It may be useful to turn to these at as you work on a problem and/or when you are finished working on it. Your teacher may also use these in class.

**You** can think mathematically.

Mathematical thinking can be **improved** by practice with reflection.

Mathematical thinking is **provoked** by contradiction, tension and surprise.

Mathematical thinking is **supported** by an atmosphere of questioning, challenging and reflecting.

Mathematical thinking helps in **understanding** yourself and the world.

### Problem 0.1

When the seven dwarfs waved goodbye to Snow White, they walked home in single file. Happy was as many places in front of Sleepy as Dopey was behind Doc.

Sleepy and Grumpy were in even numbered places and Dopey was in an odd numbered place.

Sneezy was behind Dopey and Doc was behind Sleepy, but there is no information about Bashful's place.

In what order did the dwarfs walk home? Explain your reasoning.

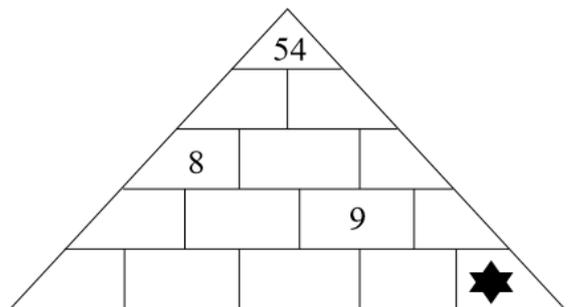
### Problem 0.2

A school has fewer than 200 pupils. When they line up in rows of 4 there is 1 extra pupil. When they line up in rows of 5 there are 2 extra pupils. When they line up in rows of 6 there are 3 extra pupils.

How many pupils could there be in the school?

### Problem 0.3

In each region of the triangle shown there is a whole number, three of which are given. Each number is the sum of the two numbers immediately below it and all numbers are different. Find out which number must be in the region marked with the star and explain why.



### Problem 0.4

Four very hungry children were given a plate of cakes.

Alfred ate one quarter of the cakes on the plate. Beatrice ate one third of the remaining cakes. Then Catriona ate half of the cakes that were left and finally, Douglas ate the six cakes that were left

How many cakes were on the plate at the start and how many did each child eat?

**Problem 0.5**

When the new library opened there were step-stools so the pupils could reach the books on the top shelf.

When Anne stood on the stool, she was 36 cm taller than her brother Ben.

When Ben stood on the stool, he was 22 cm taller than Anne.

What is the height of the stool?

**Problem 0.6a**

Mr Green and his son Michael live next door to each other. Each has a big garden and his own mower.

Mr Green can mow his lawn with the little mower in 45 minutes. His son Michael can handle the big mower and takes 30 minutes to do the same job.

Last Saturday they were in a rush so they worked together using both mowers. How long did it take for them to mow the lawn?

**Problem 0.7**

A quiz had only 3-point questions and 5-point questions.

The best possible score is 100 and there are 26 questions.

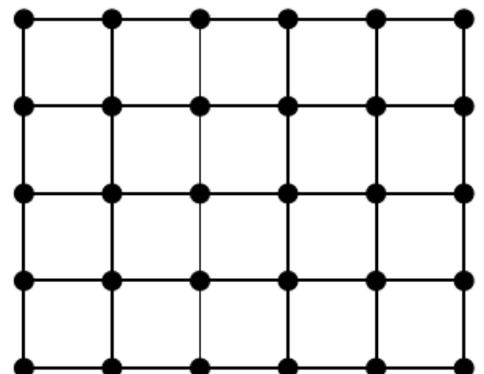
How many of each type are there?

**Problem 0.8**

The diagram represents a rectangular net. The net is made from string knotted together at the points shown.

The strings are cut a number of times; each cut severs precisely one section of string between two adjacent knots.

What is the largest number of such cuts that can be made without splitting the net into two separate pieces?



## **Some Reflective Questions**

Explain what you did to work on the problem.

What was the most important moment?

What was the problem really about?

How did you feel while you worked on it?

What ideas did you have that might be useful in the future?

Can you create your own problem like this?