Notes for parents (1).

The purpose of the activity is to help your student to:

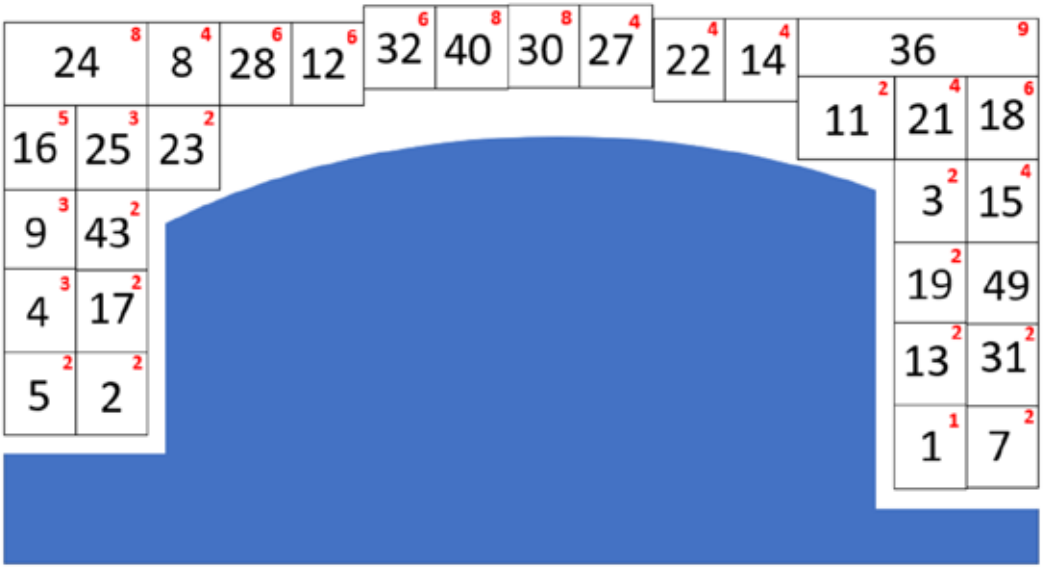
- Recognise prime numbers and composite numbers.
- Find the number of factors of prime and composite numbers.

Here is what to do:

Read the task together. Clarify that the height of an apartment block is dictated by the number of factors of the lot number. Be sure that your student understands that factors are numbers that multily to give a particular number. For example,
1 x 25 and 5 x 5 both give 25. They are the only multiplications with a product of 25. Therefore, 25 has three factors, 1, 5, and 25. Note that five is counted once as a factor.

Let him or her explore the heights of buildings that will be on each lot. Encourage them to list the factors systematically and record the number of factors on the diagram page.

They should produce a diagram like this. The red numbers show the height of building for each lot.



What do the Lot numbers with the shortest buildings have in common?
An obvious answer is that the numbers have few factors. The lots with the shortest buildings are on the water side of the development and at the front. There are many numbers that have only two factors.

What are these numbers called?
Prime numbers are those that have only two factors themselves and one. Note that one is not prime as it has only one factor, itself.

Notes for parents (2). Activity next page.

Which Lot numbers have the tallest buildings?
The Lot numbers with the tallest buildings are 36, 24, 30 and 40. Obviously the lot numbers have many factors. All four numbers are even which means two and another number are one pair of factors.

Do any Lot numbers have buildings with an odd number of stories?

What is the same about those Lot numbers?
These lot numbers have an odd number of factors; 1, 4, 9, 16, 25, 36 and 49. All of these numbers are square numbers. Like 25 the square root of the number is only counted as one factor, e.g. 6 x 6 = 36 but six is counted once in the list of factors; 1, 2, 3, 4, 6, 9, 12, 18, 36.

Points to note

Prime numbers are the fundamental building blocks of arithmetic. Each number has a unique combination of prime numbers that multiply to make it. For example, 24 = 2 x 2 x 2 x 3 and 42 = 2 x 3 x 7.

The best way to check if a number is prime is to apply divisibility tests. Let's try 51 as an example since it looks at first glance that it may be prime.

- 51 is not even so it does not have two as a factor. All even numbers end in 0, 2, 4, 6, or 8.
- 51 cannot have four as a factor since all multiples of four are even.
- 51 does not have five as a factor since all multiples of five end in 0 or 5.
- However, we have not checked to see if three is a factor. All multiples of three have a digital sum that can divide by three. 5 + 1 = 6 and six is a multiple of three. 51 has three as a factor so it is not prime.
- 51 ÷ 3 = 17 so both 3 and 17 are factors of 51.

To find out if a number is prime check if it has primes as factors until you reach the square root. Let's try 97 as an example. The square root of 97 is less than 10 (√97 = 9.8488…) so we only need to check up to ten.

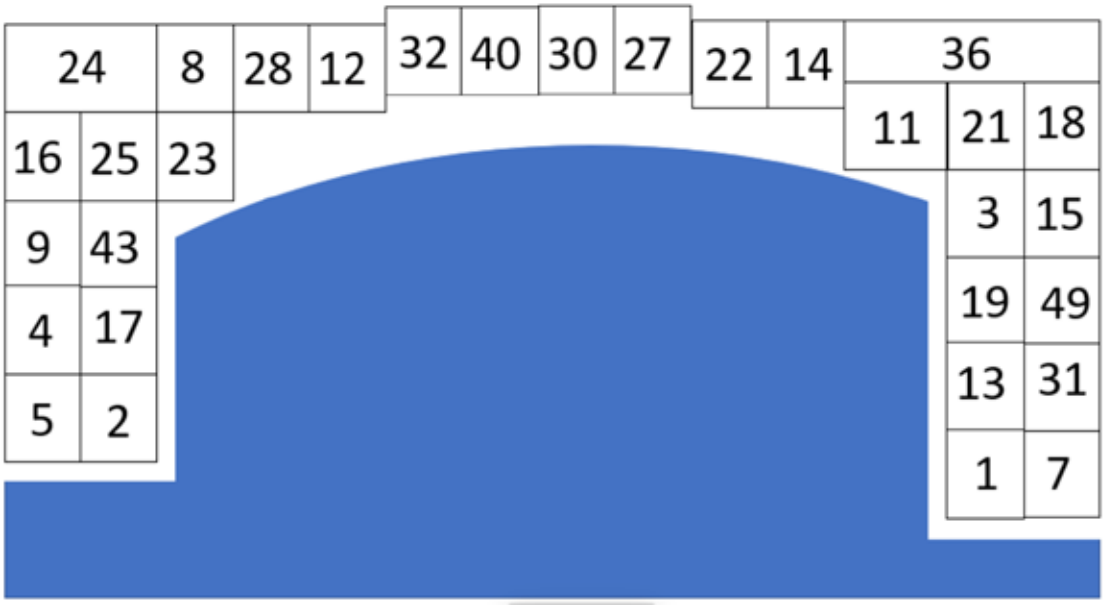
Prime factor?	Division	Is the prime number a factor?
2	97 ÷ 2 = 48.5	No
3	97 ÷ 3 = 32.3333333…	No
5	97 ÷ 5 = 19.4	No
7	97 ÷ 7 = 13.8571…	No
11	97 ÷ 11 = 8.8181…	No

In the table above we did not need to check eleven as the other factor must be less than the square root. 97 is prime.

Nautica is a new waterfront development in Auckland.

A mathematical town planner is limiting how high the apartment blocks can be, based on factors of the lot number.

For Lot 6 the building must be four stories high because six has four factors, 1, 2, 3, 6. For Lot 9 the building must have three stories since 9 has three factors, 1, 3, and 9.



Where are the shortest apartment blocks located?
Why do those lot numbers have short buildings?
Where are the tallest apartment blocks located?
Why do those lot numbers have tall buildings?