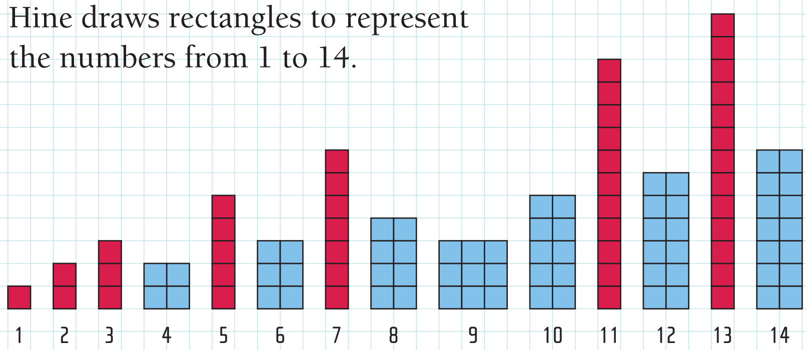
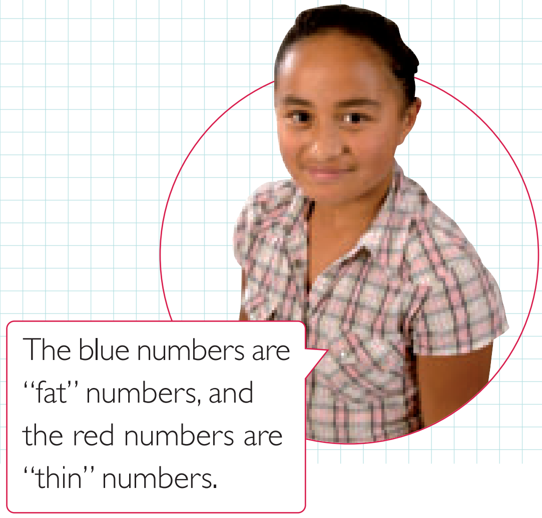
Primes and Emirps

You need ☑ a 1–100 chart (NP material master 4-4) and a 1–200 chart (see copymaster)
☑ square grid paper ☑ a calculator (optional, for **Investigation Two**)

Activity One

Hine draws rectangles to represent the numbers from 1 to 14.



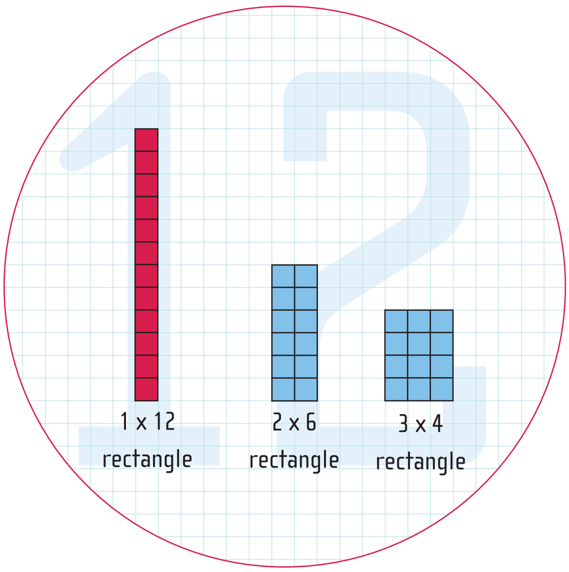


1. a. Hine claims that the blue numbers can also be drawn as thin numbers but the red numbers can't be drawn as fat numbers. Is she correct? Explain your answer.

   b. On your square grid paper, draw the numbers from 15 to 32 as either fat or thin numbers. If a number can be thin or fat, draw it as a fat number.

2. a. A fat number can also be described as a composite number because it can be represented by more than one rectangle. For example, for 12: a 1 by 12 rectangle, a 2 by 6 rectangle, or a 3 by 4 rectangle. 1 x 12 = 12, 2 x 6 = 12, and 3 x 4 = 12, so the numbers 1, 2, 3, 4, 6, and 12 are all factors of 12.

   Find all the factors of the numbers from 1 to 32.



   b. The thin numbers in Hine's chart have just two factors, themselves and 1, and are called prime numbers.

   The number 1 is a special number. It is neither prime nor composite. Explain why this is so.

   c. Find all the prime numbers up to 100. Colour them in on your 1–100 chart.

Activity Two

Two thousand years ago, a Greek mathematician called Eratosthenes devised a way to find primes up to 100. He called his method a sieve because it sorts out all the composite numbers, leaving the prime numbers behind. Using the first half of your 1–200 chart, follow the instructions below to see how the "Sieve of Eratosthenes" works for primes up to 100.

The Sieve of Eratosthenes

1. Cross out 1 because it is neither prime nor composite.
2. Circle 2 because it is prime, and then cross out all the other multiples of 2.
3. Circle 3 because it is prime, and then cross out all the other multiples of 3.
4. Circle 5 because it is prime, and then cross out all the other multiples of 5.
5. Circle 7 because it is prime, and then cross out all the other multiples of 7.
6. Now circle all the numbers that have not been circled or crossed out.

Check to see if making the sieve gives you the same numbers that you decided were prime in **Activity One**, question **2c**.

Investigation One

See if you can work out a way to extend the instructions for Eratosthenes' Sieve to find the prime numbers up to 200.

Primes greater than 3 are always 1 more or 1 less than a multiple of 6. For example, 41 and 43 are prime numbers.

Investigation Two

Here are two special types of prime numbers.

Palindromic Primes

Numbers such as 131 and 181 are palindromic numbers because they are the same number forwards as backwards.

Emirps

An emirp is a prime number that gives a different prime when written backwards. For example, 13 is an emirp because written backwards, it gives 31, which is also a prime number.

What does emirp spell backwards?

1. a. Are all palindromic numbers prime? Explain your answer.

b. Try to find a 5-digit prime number.

2. a. Find some 2- and 3-digit emirps.

There are 8 emirps between 1 and 100. That will get you started!

b. Try to find a 4-digit emirp.