

Know what a Prime Number is – NA2

A **prime number** is special because it only has TWO factors: 1 and itself.

Here is a list of factors for the first few whole numbers.

- | | |
|----------------|---|
| 1: 1 | × |
| 2: 1, 2. | ✓ |
| 3: 1, 3. | ✓ |
| 4: 1, 2, 4. | × |
| 5: 1, 5. | ✓ |
| 6: 1, 2, 3, 6. | × |
| 7: 1, 7. | ✓ |

Which numbers have exactly TWO factors?

Prime Numbers

The first seven prime numbers are: 2, 3, 5, 7, 11, 13, 17,...

Don't forget...

1 is not a prime number as it has only ONE factor

Example

Are either of 101 or 1001 prime?

Strategy

Look for the factors systematically by dividing the number using the prime numbers

Solution

Ask the question

- Does 2 go into 101 exactly? ×
- Does 3 go into 101 exactly? ×
- Does 5 go into 101 exactly? ×
- Does 7 go into 101 exactly? ×
- Does 13 go into 101 exactly? ×

Try the next prime

You can keep trying but you will find no additional factors!

101 is prime.

- Does 2 go into 1001 exactly? ×
- Does 3 go into 1001 exactly? ×
- Does 5 go into 1001 exactly? ×
- Does 7 go into 1001 exactly? ✓

If you find another factor stop!

1001 is NOT prime because it has at least three factors i.e. 1, 1001 and 7!

Your Turn!!

a) Blank out the above before you start; now list the numbers 1 to 25 and decide which are prime.

Extra

When do you stop trying to find factors?

Strategy

Stop looking when you have tried all of the prime numbers up to the square root of the number.

Example

Continuing from the example of whether 101 is a prime number, 13×13 is bigger than 101 so there is no factor between 1 and $\sqrt{101}$ i.e. 10.05.

There is no additional factor between 1 and $\sqrt{101}$, so there are no additional factors.

If there is an additional factor pair, then the smallest factor of the pair must be between 1 and the square root of the number.

Hey...

Why stop there?

It is based on the idea that factors come in pairs AND (in this example) that the missing factor pair lies between 1×101 and 10.05×10.05 .

Write Whole Numbers as the Product of Primes – NA2

Example

Write 90 as the **product** of primes.

Method

Draw a factor tree

Strategy

Begin by dividing by the first prime number, 2. If the number does not divide by this prime, then try dividing by the next prime and then the next etc.

Solution

90 does divide by 2 exactly!

Remember...

Product means multiplication

So 90 written as a **product of primes**: $90 = 2 \times 3 \times 3 \times 5$

Hey Look...

This is 90 written as its product of prime factors

Your Turn!!

b) Write 1260 as the product of primes.

RAPID 'ACID' TEST – Blank out the page above before answering these!

1. What is a prime number?
2. Which of 2, 19, 77, 100 are prime?
3. Write 100 as the product of primes.