# Teachers Explanatory Notes
## TI-15 Explorer™: Prime Factors

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1. Check that students understand the meaning of prime and composite numbers, and factors of whole numbers.

   A number is a factor of a given number if the given number can be EXACTLY divided by it.

   - e.g. 6 is a factor of 18 because 18 divided by 6 is 3.
     Note that 3 is then also a factor of 18.
   - 5 is not a factor of 18 because 18 cannot be divided exactly by 5.
   - A fun name for 'factor' to aid memory could be 'gozinter' (slang for ***goes into***).

   A PRIME number is one which can be divided ONLY by itself and 1.

   - It has ONLY two factors, itself and 1.
   - 1 is NOT a prime number – it has only 1 factor!

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   All integers (whole numbers) other than 1 and prime numbers are called **COMPOSITE** numbers, e.g. 6 is composite because it can be divided by 2 and 3 as well as 1 and 6, therefore it has more than two factors.

   Students should be able to recall all the primes up to at least 30. They are 2, 3, 5, 7, 11, 13, 17, 19, 23, 29. It could be useful for students to store a list of at least these primes in a workbook or diary. Lists of hundreds of primes can be found on the Internet.

2. The TI-15 Explorer™ can be used here to find factors in a systematic way as shown in WS1. In Q1, students should notice that since they are finding pairs of factors by this method they only need to continue until the factors start to reappear. In fact once they get to the approximate square root they are 'halfway' and should have all the factors listed. *It would be great to get the students to notice and discuss this, possibly via a group discussion rather than just telling them.*

   W1

3. When students have found all factors of a given number, ensure that they understand the difference between any factor and factors which are prime numbers. When students have learned how to create the prime factorisation (or factor tree) they will see that prime factors may be used more than once. e.g. 12 = 1 x 12 = 2 x 6 etc or using only prime numbers, 12 = 2 x 2 x 3. Factors tend to be found in pairs, but a number can usually be written as the product of more than two factors. e.g. 24 = 2 x 12 = 2 x 3 x 4 etc. Since we know 4 = 2 x 2, then 12 = 2 x 3 x 2 x 2 = 2 x 2 x 2 x 3 (for convenience) = $2^3$ x 3 in shorthand or index form. NB Without using lots of 1 which would be meaningless, 24 cannot be written as the product of more than 4 factors because these 4 are prime numbers already.

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4. In Q4 of WS1, the square root is important because it is a sort of 'halfway mark' for finding factors. To decide if a number is prime, check if any one of the primes 2, 3, 5, etc less than the square root is a factor, and if none of these are factors then the number is prime.

5. To use the TI-15 Explorer™ to find prime factors follow the instructions given on the PowerPoint and WS2. It is important that the TI-15 Explorer™ is set up in this way to allow for manual simplification.

   As an initial step, students could investigate what happens when the SIMP and FAC functions are used by entering any fraction e.g. 18/24 and noting what the calculator chooses for the various steps of simplification. It actually divides by the smallest prime factor available so will divide out all factors of 2 first, then move on to the next smallest prime, 3 etc.

W2

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