Dr Oliver Mathematics
Prime Factorisation

In this note, we will consider the prime factorisation of a number.

We try to divide by the smallest prime that there is (2) until we can divide by it no more, then we move to the next smallest prime (3), and continue in this way until we are left with 1.

Up to order in which the prime factors are written, there is only one possible answer to such a question.

1. Express 147 as a product of prime factors.

Solution

Is 2 a factor of 147? No, so we will proceed to 3.

Is 3 a factor of 147? Yes: $147 = 3 \times 49$ and we can write down

	147
3	49

Is 3 a factor of 49? No, so we will proceed to 5.

Is 5 a factor of 49? No, so we will proceed to 7.

Is 7 a factor of 49? Yes: $49 = 7 \times 7$ and we can write down

	147
3	49
7	7

Is 7 a factor of 7? Yes: $7 = 7 \times 1$ and we can write down

	147
3	49
7	7
7	1

Hence

$$\begin{aligned} 147 &= 3 \times 7 \times 7 \\ &= \underline{\underline{3 \times 7^2}}. \end{aligned}$$

2. Express 126 as a product of prime factors.

Solution

	126
2	63
3	21
3	7
7	1

and so

$$\begin{aligned} 126 &= 2 \times 3 \times 3 \times 7 \\ &= \underline{\underline{2 \times 3^2 \times 7}}. \end{aligned}$$

3. Express 5 940 as a product of prime factors.

Solution

	5 940
2	2 970
2	1 485
3	495
3	165
3	55
5	11
11	1

and so

$$\begin{aligned} 5940 &= 2 \times 2 \times 3 \times 3 \times 3 \times 5 \times 11 \\ &= \underline{\underline{2^2 \times 3^3 \times 5 \times 11}}. \end{aligned}$$