

# Student Worksheet 2

## TI-15 Explorer™: Prime Factors

W2

Name:

1. The number 72 can be factored to  $9 \times 8$  or  $12 \times 6$  or ...?

a) Find some other ways to factorise 72 into the product of two whole numbers.  
How will you know if you have all the possible pairs?

$9 \times 8$   $12 \times 6$

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b) Find a way to factorise 72 into the product of 3 **different** factors.  
Are there any other ways to do this? Find as many as you can with a partner.  
You can use the calculator if needed.

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c) What about 4 **different** factors or 5 **different** factors ...? Investigate.

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You can write 72 as the product of only its **PRIME** factors which means that only prime numbers can be used so the prime factorisation of:

72 is  $2 \times 2 \times 2 \times 3 \times 3$  (called expanded form) which is usually written in shorthand form as:

72 is  $2^3 \times 3^2$  (called the index or exponent form)

(The small 3 indicates that there are 3 twos multiplied together and the small 2 indicates that there are 2 threes multiplied together.)

To do this, divide the original number by 2 as many times as you can, then by 3 and so on with prime numbers only, recording as you go.

- d) Write each of the numbers from the table in worksheet 1 as the product of **ONLY** its Prime factors in the table below. **You may need to use a prime factor more than once!**  
- as you can see with 72.

Number	As the product of only PRIME Factors	How many factors does this number have altogether? Refer back to Worksheet 1
24		
17		
36		
25		
50		
64		
72	$2 \times 2 \times 2 \times 3 \times 3 = 2^3 \times 3^2$	12

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2. Use the calculator to find the number represented by:

a)  $2^4$  (Press either  $2 \times 2 \times 2 \times 2$  or  $2 \wedge 4$ . This is called the **EXPANDED** form.)

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b)  $2^2 \times 3^2$

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c)  $2 \times 3^3 \times 5$

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d)  $2^3 \times 3 \times 5^2 \times 7$

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3. To write 24 as the product of its prime factors follow these steps on the calculator:

**First: Set up the TI-15 as indicated below**

a) Press  $\boxed{\text{Frac}}$  button to enter the Fraction Menu. The selection **n/d** **n/d** is displayed. This lets you choose to display fractions results as mixed numbers (**n/d**) or improper fractions (**n/d**).

b) Press the left  $\blacktriangleleft$  and right  $\blacktriangleright$  arrow keys to move the underline to choose the display you want.

c) In this case, move the underline to **n/d**.

d) Press the down arrow  $\blacktriangledown$ , and move the underline to **MAN**. This lets you choose to simplify fractions manually (using the  $\boxed{\text{Simp}}$  key).

e) Select  $\boxed{\text{Enter}}$ .

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Enter the fraction  $\frac{24}{24}$

1. Press  $\boxed{2}\boxed{4}\boxed{\div}\boxed{2}\boxed{4}\boxed{=}\boxed{\text{Enter}}$

2. Press  $\boxed{\text{Simp}}\boxed{\text{Enter}}$ . The fraction  $\frac{12}{12}$  is displayed and at the top of the screen is  $\frac{n}{d} \div \frac{N}{D} \rightarrow \frac{n}{d}$  is visible.

This means that the fraction  $\frac{12}{12}$  can be simplified further.

3. Press  $\boxed{\text{Fac}}$  and a 2 is shown, meaning that the fraction has been simplified by dividing numerator and denominator by 2.

4. This is the first prime factor of 24. Press  $\boxed{\text{Enter}}$  and the fraction reappears.

5. Press  $\boxed{\text{Simp}}\boxed{\text{Enter}}$ . The fraction  $\frac{6}{6}$  is displayed and at the top of the screen is  $\frac{n}{d} \div \frac{N}{D} \rightarrow \frac{n}{d}$  is still visible.

Press  $\boxed{\text{Fac}}$  and a 2 is again shown. This means we have another factor of 2.

**Record the factors as you find them.**

6. Repeat these steps until  $\frac{1}{1}$  appears and the symbols at the top are now  $\frac{n}{d} \div$  which indicates that no further simplification is possible.

7. Now we have the prime factors of 24 as  $2 \times 2 \times 2 \times 3 = 2^3 \times 3$

4. Use this method to check the prime factors of 72 found above in Q 4.

5. Try these:

a)  $\frac{30}{30}$  \_\_\_\_\_

b)  $\frac{48}{48}$  \_\_\_\_\_

c)  $\frac{67}{67}$  \_\_\_\_\_

Each time you think you have the factors of the given number check using the calculator to multiply the factors together.

6. Find a number with **exactly 6 different** factors. How many others are there with exactly 6 different factors.

(Hint:  $8 = 2 \times 2 \times 2 = 2^3$  which has 4 factors : 1, 2, 4 and 8)

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7. Find a number with **exactly 6 different PRIME** factors. How many others are there?

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8. Find the **SMALLEST** number with exactly 6 factors, which need not be prime factors.

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9. **Challenge:** Find the smallest number with exactly 20 factors.

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