Student Worksheet 1 Solutions
TI-15 Explorer™: Prime Factors

WS1

1.

Number to try dividing into 60	Answer	Factor? Yes or No 'Gozinter'	Any factors found
1	60	Yes	1, 60
2	30	Yes	2, 30
3	20	Yes	3, 20
4	15	Yes	4, 15
5	12	Yes	5, 12
6	10	Yes	6, 10
7	8.571…	No	
8	7.5	No	
9	6.66…	No	
No more to try			

The factors of 60 are 1, 2, 3, 4, 5, 6, 10, 12, 15, 20, 30, 60

2. 12

3. The factors of 60 are **1**, 2, 3, **4**, 5, **6**, **10, 12, 15, 20, 30, 60**
The factors in bold are not prime. 2, 3 and 5 are prime factors of 60.

4.

Number	List of factors Circle any that are prime numbers	How many factors does this number have altogether?	Any PRIME factors found	$\sqrt{\text{Number}}$ from your TI-15
24	1, 2, 3, 4, 6, 8, 12, 24 Only 2 and 3 are prime	8	2, 3	$\sqrt{24} = 4.89$
17	1, 17	2	17	$\sqrt{17} = 4.12$
36	1, 2, 3, 4, 6, 9, 12, 18, 36	9	2, 3	$\sqrt{36} = 6$
25	1, 5, 25	3	5	$\sqrt{25} = 5$
50	1, 2, 5, 10, 25, 50	6	2, 5	$\sqrt{50} = 7.07$
64	1, 2, 4, 8, 16, 32, 64	7	2	$\sqrt{64} = 8$
72	1, 2, 3, 4, 6, 8, 9, 12, 18, 36, 72	12	2, 3	$\sqrt{72} = 8.48$
Add other numbers to try				

5. Perfect squares have an ODD number of factors because the 'middle' factor is repeated.

6. Any perfect square.

7. You can stop when the numbers start to repeat.

Student Worksheet 2 Solutions
TI-15 Explorer™: Prime Factors

WS2

1. a) 1 x 72, 2 x 36, 3 x 24, 4 x 18, 6 x 12, 8 x 9.
The next number to try would be 9 and we have it already, so we can stop.

b) 1 x 2 x 36, 1 x 3 x 24, 1 x 4 x 18, 1 x 6 x 12, 1 x 8 x 9.
2 x 2 x 18 not all different, 2 x 3 x 12, 2 x 4 x 9, 2 x 6 x 6 – not different, 3 x 4 x 6.
Encourage students to work systematically.

c) If 1 is allowed as a factor, then adding in a multiplier of 1 to any of the above with 3 different not including 1 gives 1 x 2 x 3 x 12, 1 x 2 x 4 x 9, 1 x 3 x 4 x 6. If 1 is not included, it is not possible to have 4 different factors, nor 5 of course.

d)

Number	As the product of PRIME factors	How many factors does this number have altogether?
24	$2 \times 2 \times 2 \times 3 = 2^3 \times 3^1$	8
17	17^1 – Remember 1 is not prime	2
36	$2 \times 2 \times 3 \times 3 = 2^2 \times 3^2$	9
25	$5 \times 5 = 5^2$	3
50	$2 \times 5 \times 5 = 2^1 \times 5^2$	6
64	$2 \times 2 \times 2 \times 2 \times 2 \times 2 = 2^6$	7
72	$2 \times 2 \times 2 \times 3 \times 3 = 2^3 \times 3^2$	12

There is a pattern to see here to find the total number of factors….
Add 1 to each exponent and then multiply, the answer is the number of factors.
e.g. if the number is $2^a \times 3^b$ then the number has (a + 1) x (b + 1) factors.
The same applies if there are more than two primes in the factorisation.

2. a) 16

b) 36

c) 90

d) 4 200

5. a) $30 = 2 \times 3 \times 5$

b) $48 = 2 \times 2 \times 2 \times 2 \times 3 = 2^4 \times 3$

c) $67 = 1 \times 67$ and is prime

6. $2^5 = 32$ which has 6 factors. They are 1, 2, 4, 8, 16 and 32. Note the exponent 5 + 1 = 6

   3^5 or any prime to the power 5 will have 6 factors.

   Any factorisation with a prime to the power 2 multiplied by any other prime to the power 1 will have (2 + 1) x (1 + 1) = 6 factors. Students may use trial and error of course.

7. Any number which is the product of any 6 different primes.
   e.g. 2 x 3 x 5 x 7 x 11 x 13 etc

8. The smallest number with 6 factors is $2^2 \times 3^1$ which is 12. $2^1 \times 3^2 = 18$ etc.

9. This is quite difficult but since 20 = 4 x 5 we could try $2^{(5-1)} \times 3^{(4-1)} = 2^4 \times 3^3 = 16 \times 27 = 432$, but is there a smaller number? Since 20 = 5 x 2 x 2, we could try $2^{(5-1)} \times 3^1 \times 5^1$ which is 16 x 3 x 5 = 240 and this is the smallest one with 20 factors.

Assessment Task Solutions
TI-15 Explorer™: Prime Factors

ATS

1. 1 is not prime by definition, 4 is not because it can be divided by 2 as well as itself and 1,
   15 is not (factors of 3 and 5), 23 is , 6.5 is not a whole number, 133 is not because it can be divided by 7.

2. $2^2 \times 3^4$

3. $3^5 \times 7^2 = 3 \times 3 \times 3 \times 3 \times 3 \times 7 \times 7 = 11\,907$

4. 4 is not a prime number.

5. $30 = 2 \times 3 \times 5$

   $180 = 2 \times 2 \times 3 \times 3 \times 5 = 2^2 \times 3^2 \times 5$

6. $24 = 2^3 \times 3$ and it has 8 factors which are 1, 2, 3, 4, 6, 8, 12 and 24

   $2^1 \times 3^3 = 54$ has 24 factors