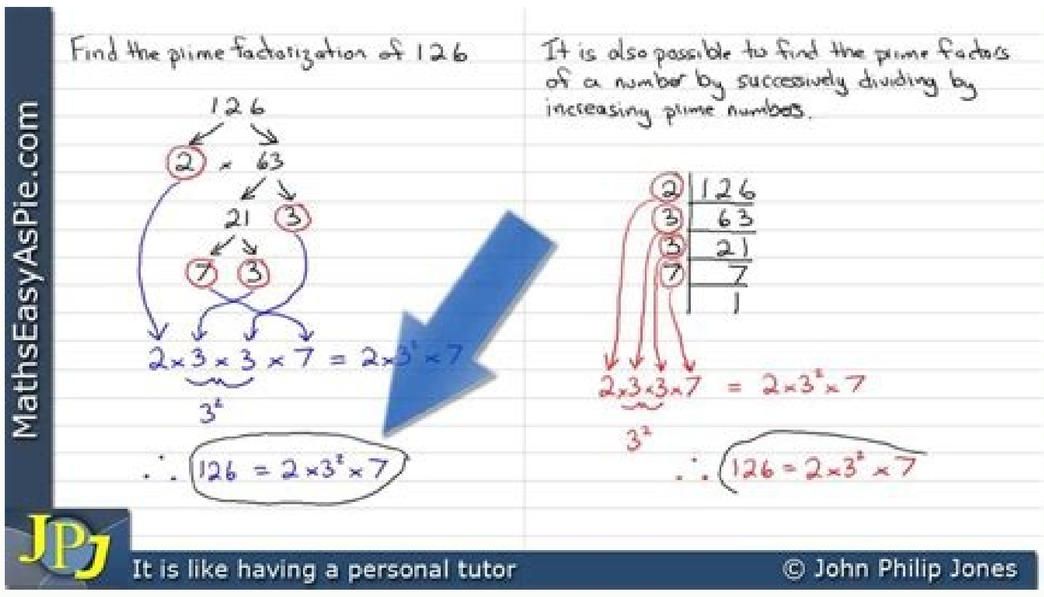
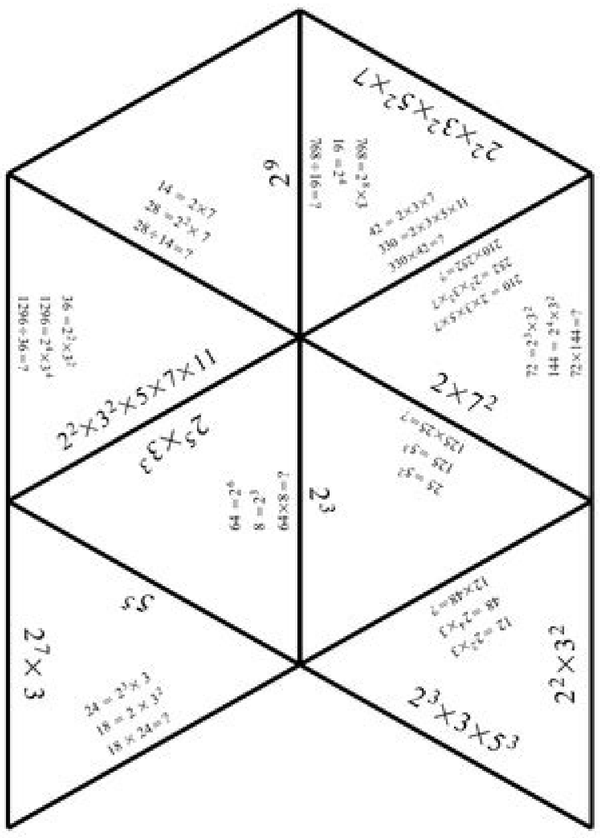
**Product of prime factors worksheet pdf**




| Level 1 – Leave these numbers as a product of their prime numbers. | | Level 2 – Leave these numbers as a product of their prime numbers. | |
|---|---|---|---|
| 1) 52 | 5) 54 | 1) 27 | 5) 540 |
| 2) 30 | 6) 100 | 2) 81 | 6) 17 |
| 3) 76 | 7) 28 | 3) 33 | 7) 9000 |
| 4) 44 | 8) 150 | 4) 105 | 8) 92 |

| +Legend questions | Problem solver |
|---|---|
| Given that 90 = 2 x 3² x 5<br>and that x = 90 ÷ 140<br>Write x as a product of powers of its prime factors. | 1) Write 980 as a product of prime factors. Express your answer in index form.<br><br>2) Find the lowest number by which 980 would need to be multiplied by to give a square number. |

| Exam-style questions | | | |
|---|---|---|---|
| Grade 1 | Grade 2 | Grade 3 | +legend |
| Express 100 as a product of its prime factors. (2marks) | Express 100 as a product of its prime factors. (2marks) | Given that x = 2³ x 5<br>a) Calculate 10x (2marks) | a) Write 1,008 as a product of its prime factors. Give your answer in index form. (2marks) |




Product of Prime Factors

Write the following as a product of prime factors

1) 8 =

2) 12 =

3) 24 =

4) 36 =

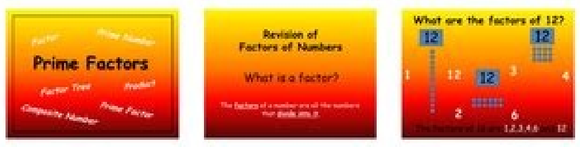
5) 10 =

6) 50 =

7) 100 =

8) 72 =

10/8/2016















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Here we will learn about prime factors including how to express a number as a product of prime factors and use the product of prime factors to recognise special numbers such as square numbers and cube numbers. There are also prime factors worksheets based on Edexcel, AQA and OCR exam questions, along with further guidance on where to go next if you're still stuck. Prime factors are prime numbers that are factors of another number. E.g. A composite number is the product of two or more factors. All of these types of numbers are integers (whole numbers). In number theory, the Fundamental Theorem of Arithmetic states that every integer greater than one is a prime number or can be represented by a product of prime numbers. E.g. \[ \begin{aligned} 240 &= 2 × 2 × 2 × 2 × 3 × 5\\\\ 240 &=2^4 × 3 × 5 \end{aligned}\] This would mean that the number 240 is a composite number with the prime factors of 2, 3 and 5. Expressing a composite number as a product of prime factors can be utilised for a wide variety of problems such as: calculating the highest common factor (HCF)calculating the lowest common multiple (LCM)simplifying surdsdetermining whether a number is a square number or cube numberfactorising,calculating the square roots of numbers and much more. We can also manipulate the prime factorisation of a number to find other numbers. To find the prime factors of a number, we need to continue to divide the composite number by prime numbers until we are left with just prime factors. Looking back at the example of 6 = 2 × 3, we can say: Here, the divisor is 3 as we are dividing 6 by 3 to get a quotient of 2. Any positive integer can be written as a product of its prime factors. This means that we can take any positive number and write it as a series of prime numbers being multiplied. E.g. 6 is a product of 2 and 3, so can be written as 2 × 3 = 6 9 is a product of 3 and 3, so can be written as 3 × 3 = 9 We can use a process called prime factor decomposition using prime factor trees in order to work out the product of prime factors. E.g.  Write 36 as a product of prime factors. 36 ÷ 2 = 18 18 ÷ 2 = 9 9 ÷ 3 = 3 So, 36 = 2 × 2 × 3 × 3 A question may ask you to give your answer in index form. To do this we write the solution using powers, so  36 = 2^{2}×3^{2} E.g. Write 54 as a product of prime factors. Give your answer in index form.  54 ÷ 2 = 27 27 ÷ 3 = 9 9 ÷ 3 = 3 So, 54 = 2 × 3 × 3 × 3 In index form,  54=2×3^{2} When finding prime factors it is useful to use the divisibility rules: In order to find prime factors of a composite number: Divide the composite number by a suitable prime numberDivide the answer by another suitable prime numberContinue until the final answer is a prime number, then state the solution We can also use factor trees to help us to work out the prime factors of a number. Get your free prime factors worksheet of 20+ questions and answers. Includes reasoning and applied questions. DOWNLOAD FREE x Get your free prime factors worksheet of 20+ questions and answers. Includes reasoning and applied questions. DOWNLOAD FREE What are the prime factors of 18? Divide the composite number by a suitable prime number As 18 is an even number, we can divide 18 by 2: The first prime factor of 18 is 2. 9 is not a prime number so we continue to Step 2. 2Divide the answer by another suitable prime number 9 is a multiple of 3 and so we can divide 9 by 3: The second prime factor is 3. 3 is a prime number so the third prime factor is 3. 3Continue until the final answer is a prime number, then state the solution As factors are multiplied together to achieve the composite number, we can say (or in exponent form) 18 = 2 × 32. The final solution is therefore 18 = 2 × 32. Show that 42 = 2 × 3 × 7. Divide the composite number by a suitable prime number As 42 is an even number, we can divide 42 by 2: The first prime factor of 42 is 2. 21 is not a prime number so we continue to Step 2. Divide the answer by another suitable prime number 21 is a multiple of 3 and so we can divide 21 by 3: The second prime factor is 3. 7 is a prime number so the third prime factor is 7. Continue until the final answer is a prime number, then state the solution As factors are multiplied together to achieve the composite number, we can say  An exponent form does not occur for this example as there are no powers we can simplify. The final solution is therefore 42 = 2 × 3 × 7. Express 75 as a product of prime factors. Write your answer in index form. Divide the composite number by a suitable prime number As 75 ends in a 5, we can divide 75 by 5: The first prime factor of 75 is 5. 15 is not a prime number so we continue to Step 2. Divide the answer by another suitable prime number 15 also ends in a 5 and so we can divide 15 by 5: The second prime factor is 5. 3 is a prime number so the third prime factor is 3. Continue until the final answer is a prime number, then state the solution As factors are multiplied together to achieve the composite number, we can say  \begin{aligned} 75 &= 3 × 5 × 5 \\\\ 75 &= 3 × 5^2 \end{aligned} The final solution in index form is therefore 75 = 3 × 52. Express 462 as a product of prime factors. Divide the composite number by a suitable prime number As 462 is an even number, we can divide 462 by 2: The first prime factor of 462 is 2. 231 is not a prime number so we continue to Step 2. Divide the answer by another suitable prime number The sum of the digits of 231 (2 + 3 + 1) = 6 which is a multiple of 3 and so we can divide 231 by 3: The second prime factor is 3. 77  is not a prime number so we need to continue to divide by prime numbers until the final answer is prime. Continue until the final answer is a prime number, then state the solution As 77 is a multiple of 7, we can divide 77 by 7: The third prime factor is 7. 11 is a prime number so the fourth prime factor is 11. As factors are multiplied together to achieve the composite number, we can say The final solution in index form is therefore 462 = 2 × 3 × 7 × 11 Show that 900 is a square number. Divide the composite number by a suitable prime number As the sum of the digits of 900 (9 + 0 + 0) = 9, we can divide 900 by 3: The first prime factor of 900 is 3. 300 is not a prime number so we continue to Step 2. Divide the answer by another suitable prime number The sum of the digits of 300 (3 + 0 + 0) = 3 which is a multiple of 3, so we can divide 300 by 3: The second prime factor is 3. 100 is not a prime number so we need to continue to divide by prime numbers until the final answer is prime. Continue until the final answer is a prime number, then state the solution As 100 is an even number, we can divide 100 by 2: The third prime factor is 2. 50 is an even number so we can divide 50 by 2: The fourth prime factor is 2 25 ends in a 5 so we can divide 25 by 5: The final two prime factors are 5 and 5. As factors are multiplied together to achieve the composite number, we can say \begin{aligned} 900 &= 2 × 2 × 3 × 3 × 5 × 5 \\\\ 900 &= 2^{2} × 3^{2} × 5^{2} \end{aligned} So 900 is a square number. What are the prime factors of 4095? Divide the composite number by a suitable prime number As 4095 ends in a 5, we can divide 4095 by 5: The first prime factor of 4095 is 5. 819 is not a prime number so we continue to Step 2. Divide the answer by another suitable prime number The sum of the digits of 819 (8 + 1 + 9) = 18 which is a multiple of 3 and so we can divide 819 by 3: The second prime factor is 3. 273 is not a prime number so we need to continue to divide by prime numbers until the final answer is prime. Continue until the final answer is a prime number, then state the solution As the sum of the digits of 273 (2 + 7 + 3) = 12, we can divide 273 by 3: The third prime factor is 3. 91 is not a prime number so we need to divide by another prime number. 91 is divisible by 7 (there is no number trick here so use your multiplication tables to help you). The fourth prime factor is 7 13 is a prime number so the final prime factor is 13. As factors are multiplied together to achieve the composite number, we can say \[4095 = 3 × 3 × 5 × 7 × 13\] (in exponent form) \[4095 = 3^2 × 5 × 7 × 13.\] The final solution in index form is therefore 4095 = 32 × 5 × 7 × 13. Listing factors instead of writing them as a product (multiplying) Given example 1, the solution would be incorrectly written as 18 = 2, 3, 3 instead of 18 = 2 × 3 × 3. Factors are multiplied by one another and so the solution should contain the multiplication symbol. Incorrect knowledge of prime numbers It is easy to find a factor of a composite number and not specifically a prime factor. Take example 6 where we were dividing 900 by 3. A more obvious start could have been to divide by 9, however 9 is not a prime number. When we look at larger composite numbers, there is a much more clear and efficient method to expressing the prime factors of a number (see the next lesson on factor trees). Practice prime factors questions 16 \div 2 = 8 8 \div 2 = 4 4 \div 2 = 2

2 is prime so we have found the prime factors. 16=2 \times 2 \times 2 \times 2=2^{4} 63 \div 3 =21 21 \div 3 =7 7 is prime. 63=3 \times 3 \times 7=3^{2} \times 7 2^{2} \times 3^{2} \times 7 2 \times 3 \times 5 \times 7 246 \div 2 =123 123 \div 3 =41 41 is prime. 246=2 \times 3 \times 41 2 \times 3 \times 5 \times 5=150 2 \times 2 \times 3 \times 3 They all show 36 as a product of its prime factors Although 2^{2} \times 9=36 9 is not a prime number. 720 \div 2 =360 360 \div 2 =180 180 \div 2=90 90 \div 2=45 45 \div 3 =15 15 \div 3=5 5 is prime. 720=2^{4} \times 3^{2} \times 5 a=4,\; b=2, c=5 \; Prime factors GCSE questions 1.  Express 126 as a product of prime factors. Write your answer in index form. (3 marks) 126 \div 2=63,63 \div 3=21 \text { and } 21 \div 3=7 (1) 126=2 \times 3 \times 3 \times 7 (1) 126=2 \times 3^{2} \times 7 (1) 2. (a) Express the value 456 in the form 456=\mathrm{a}^{3} \times 3 \times \mathrm{b} where a and b are prime factors. State the values of a and b in your answer. (b) Use your answer to part (a) to write the product of primes for the value of 456 × 9 . (5 marks) (a) 456 \div 2=228,228 \div 2=114,114 \div 2=57,57 \div 3=19 (1) 2 \times 2 \times 2 \times 3 \times 19 \text { or } 456=2^{3} \times 3 \times 19 (1) a=2, b=19 (1) (b) 9=3 \times 3 \text { or } 3^{2} (1) 456 \times 9=2^{3} \times 3 \times 19 \times 3 \times 3=2^{3} \times 3^{3} \times 19 (1) 3. (a) Which of the following options represents the prime factors of 28 \quad \quad 7 × 4 \quad \quad \quad \quad \quad 2^{2} \times 7 \\\\ 1, 2, 4, 7, 14, 28, \quad \quad \quad 2, 7 (b) What is the smallest number that you can multiply 28 by to get a square number? (4 marks) (a) 2^{2} \times 7 (1) (b) \text { Increase the power of } 7 \text { by } 1 (1) 196 \text { or } 2^{2} \times 7 \times 7 \text { implied } (1) 7 (1) You have now learned how to: use the concepts and vocabulary of prime numbers, factors (or divisors), multiples, common factors, common multiples, highest common factor, lowest common multiple, prime factorisation, including using product notation and the unique factorisation property Factor treesHighest common factorLowest common multiple Prepare your KS4 students for maths GCSEs success with Third Space Learning. Weekly online one to one GCSE maths revision lessons delivered by expert maths tutors. Find out more about our GCSE maths revision programme. We use essential and non-essential cookies to improve the experience on our website. Please read our Cookies Policy for information on how we use cookies and how to manage or change your cookie settings.AcceptPrivacy & Cookies Policy