# Math 6 Unit 1 worksheet: Every number has exactly one prime factorization

Name _____ Date _____ Period _____

**1.** Each product is made of whole numbers greater than 1. Rewrite it as a prime factorization in tidy form (primes from smallest to largest, repeats gathered into powers). Do not multiply it out.

(a) $3 \cdot 2 \cdot 5 \cdot 2$

(b) $7 \cdot 2 \cdot 7 \cdot 3 \cdot 2 \cdot 2$

(c) $9 \cdot 2 \cdot 5$

(d) $4 \cdot 6 \cdot 11$

(e) $15 \cdot 21$

(f) $10 \cdot 10 \cdot 10$

**2.** $88 = 2^3 \cdot 11$. Every factor of 88 is built from these primes.

(a) Make a table of the factors. Label the rows 1, 2, 4 and 8 (no 2s, one 2, and so on) and the columns 1 and 11. Fill each cell with its row label times its column label.

(b) List all the factors of 88 from smallest to largest. How many are there?

(c) How many of the factors are even?

**3.** $n = 2^5 \cdot 3^3 \cdot 7$. Without multiplying it out, find

(a) the largest odd factor of $n$;

(b) the largest factor of $n$ that is even but not a multiple of 4.

**4.** A number ends in a 0 when 10 = 2 · 5 divides it, in two 0s when $100 = 2^2 \cdot 5^2$ divides it, and so on.

(a) Without multiplying it out, how many zeros does $2^5 \cdot 3^2 \cdot 5^3$ end in?

(b) How many zeros does $8 \cdot 15 \cdot 35 \cdot 12$ end in?


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**5.** Without multiplying out $34 \cdot 45 \cdot 91$, find the smallest whole number you could multiply it by so that the result is divisible by

(a) 98;

(b) 100.

**6.** (a) Isaac says he can write 91 as a product of three whole numbers, each greater than 1. Explain why he cannot.

(b) What is the greatest number of whole numbers, each greater than 1, that multiply to 600? Give an example.

**7.** Zoe lists the powers of 6: 6, 36, 216, ... Ben lists the powers of 36: 36, 1,296, ... Jin lists the powers of 4: 4, 16, 64, ...

(a) Show that Zoe's list and Ben's list share a number.

(b) Will Zoe's list and Jin's list ever share a number, however far they go? Explain using prime factorizations.


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