

Practice Test: Factorization and Exponents

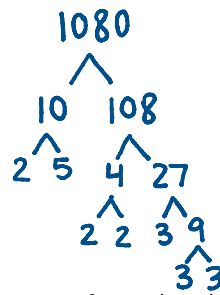
FMP10

Factorization and Exponents Practice Test

Name: _____

/44

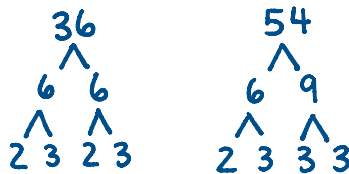
1. Using a tree diagram, determine the prime factorization of 1080. [2]



$$1080 = 2^3 \cdot 3^3 \cdot 5$$

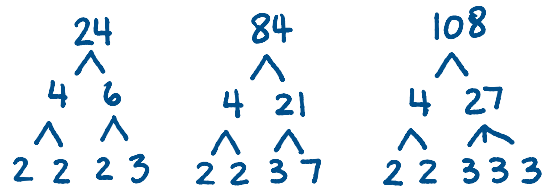
2. Determine the greatest common factor (GCF) of each set of numbers. [4]

- a) 36 and 54



$$\text{GCF} = 2 \cdot 3^2 = 18$$

- b) 24, 84, and 108



$$\text{GCF} = 2^2 \cdot 3 = 12$$

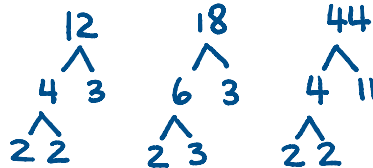
3. Determine the lowest common multiple (LCM) of each set of numbers. [4]

- a) 15 and 21



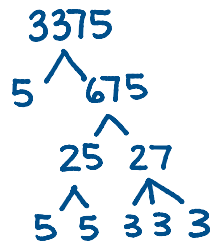
$$\text{LCM} = 3 \cdot 5 \cdot 7 = 105$$

- b) 12, 18, and 44



$$\text{LCM} = 2^2 \cdot 3^2 \cdot 11 = 396$$

4. Use prime factorization to determine if 3375 is a perfect square, a perfect cube, neither, or both. Explain how you know. (Hint: What is the exponent of each prime factor?) [2]



$$3375 = 3^3 \cdot 5^3 = (3 \cdot 5)^3$$

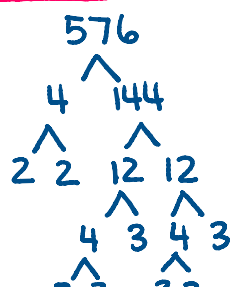
3375 is a perfect cube since each exponent is divisible by 3.

$$2^6 \cdot 7^6 \rightarrow (2^3 \cdot 7^3)^2 \therefore \text{perfect square}$$

$$\rightarrow (2^2 \cdot 7^2)^3 \therefore \text{perfect cube}$$

5. Use prime factorization to determine the square root of 576. [2]

$$\begin{array}{l}
 \sqrt{81} \\
 81 = 9^2 \\
 \sqrt{81} = 9
 \end{array}$$



$$\begin{array}{l}
 576 = 2^6 \cdot 3^2 \\
 = (2^3 \cdot 3)^2 \\
 \therefore \sqrt{576} = 2^3 \cdot 3 \\
 = 24
 \end{array}$$

$$3^4 \cdot 5^2 \rightarrow (3^2 \cdot 5)^2 \therefore \text{perfect square}$$

$$3^2 \cdot 5^3 \rightarrow \text{neither}$$

perfect square \Rightarrow each exponent is divisible by 2

$$\sqrt{81} = 9$$

$$\begin{array}{c} \wedge \quad \wedge \\ 4 \quad 3 \quad 4 \quad 3 \\ \wedge \quad \wedge \\ 2 \quad 2 \quad 2 \quad 2 \end{array}$$

$$= 24$$

divisible by 2

6. Write as a single power (if applicable), and then evaluate. [4]

a) $(-2)^2 \times (-2)^3 = (-2)^5$
 $= -32$

b) $3^8 \div 3^4 = 3^4$
 $= 81$

c) $-7^0 = -1$

d) $(10^2)^4 = 10^8$
 $= 100000000$

7. Use the exponent laws to simplify. [5]

a) $x^8 \times x^5 = x^{13}$ b) $a^{12} \div a^3 = a^9$ c) $(-4y)^2 = 16y^2$ d) $(z^3)^6 = z^{18}$ e) $p^0 = 1$

8. Simplify. [8]

a) $-6a^4 \times a^5 \times -3a = 18a^{10}$

b) $(-4n^2t^7)^3 = -64n^6t^{21}$
 \uparrow
 $(-4)^3$

c) $\frac{-18c^4}{-9c} = 2c^3$

d) $(5x^4y^2) \div (x^3y^2) = 5xy^0$
 $= 5x$

e) $\frac{15(p^2qr^2)^5}{3(p^5q^2r^5)} = \frac{15p^{10}q^5r^{10}}{3p^5q^2r^5}$
 $= 5p^5q^3r^5$

f) $\left(\frac{5y^4 \times 4x^3}{10x^5}\right)^4 = \left(\frac{20x^3y^4}{10x^5}\right)^4$
 $= (2x^3y^4)^4$
 $= 16x^{12}y^{16}$

9. Simplify each expression, using only positive exponents. [6]

a) $x^{-4} = \frac{1}{x^4}$

b) $\left(\frac{k}{2}\right)^{-3} = \left(\frac{2}{k}\right)^3 = \frac{8}{k^3}$

c) $5[n^{-3}] = 5 \cdot \frac{1}{n^3} = \frac{5}{n^3}$
 $(5n)^{-3} = \frac{1}{(5n)^3}$

d) $(-6z)^{-2} = \frac{1}{(-6z)^2} = \frac{1}{36z^2}$

10. Simplify each expression, using only positive exponents. [7]

a) $a^{-6}a^{-4}$
 $= a^{-10}$
 $= \frac{1}{a^{10}}$

b) $(-3x^{-5}y^0z^4)^{-4}$
 $= \frac{1}{(-3x^{-5}z^4)^4}$
 $= \frac{1}{81x^{-20}z^{16}}$
 $= \frac{x^{20}}{81z^{16}}$

c) $\left(\frac{16x^3}{8xy^{-2}}\right)^{-2}$
 $= \left(\frac{2x^2}{y^{-2}}\right)^{-2}$
 $= (2x^2y^2)^{-2}$
 $= \frac{1}{(2x^2y^2)^2}$
 $= \frac{1}{4x^4y^4}$

d) $\frac{16a^3b^2}{4a^{-2}b^{-2}} \times \frac{2a^{-3}}{-1b^{-2}}$
 $= 16a^5b^4 \times -\frac{2a^{-3}}{b^{-2}}$
 $= 16a^5b^4 \times -\frac{2b^2}{a^3}$
 $= \frac{-32a^5b^6}{a^3}$
 $= -32a^2b^6$

$$= \frac{1}{4x^4y^4}$$