

1.4 Prime Factorization

- The prime factorization of a composite number is the number written as a product of its prime numbers.
- You can use factor pairs and a factor tree to help find the prime factors of a number.

Ex. $60 = 2 \cdot 2 \cdot 3 \cdot 5$
 or in exponential form
 $60 = 2^2 \cdot 3 \cdot 5$

Factor tree for 60:
 $60 \rightarrow 10 \cdot 6 \rightarrow 2 \cdot 5 \cdot 3 \cdot 2$

1) $20 = 2^2 \cdot 5$ 2) $88 = 2^3 \cdot 11$ 3) $90 = 2 \cdot 3^2 \cdot 5$

Factor trees:
 20: $20 \rightarrow 10 \cdot 2 \rightarrow 2 \cdot 5 \cdot 2$
 88: $88 \rightarrow 11 \cdot 8 \rightarrow 11 \cdot 4 \cdot 2 \rightarrow 11 \cdot 2 \cdot 2 \cdot 2$
 90: $90 \rightarrow 9 \cdot 10 \rightarrow 3 \cdot 3 \cdot 2 \cdot 5$

4) $462 = 2 \cdot 3 \cdot 7 \cdot 11$ 5) $3^2 \cdot 2 \cdot 7 = 9 \cdot 2 \cdot 7 = 126$

Factor tree for 462:
 $462 \rightarrow 154 \cdot 3 \rightarrow 77 \cdot 2 \cdot 3 \rightarrow 7 \cdot 11 \cdot 2 \cdot 3$

Greatest Perfect Square

Ex) $1575 = 9$

Factor tree for 1575:
 $1575 \rightarrow 315 \cdot 5 \rightarrow 63 \cdot 5 \cdot 5 \rightarrow 7 \cdot 3 \cdot 3 \cdot 5 \cdot 5$

The prime factors are 3, 3, 5, 5, 7. The greatest perfect square is $3^2 \cdot 5^2 = 225$.