June 24, 2015

Greatest Common Divisor (Factor)

GCD GCF

Recall: $30 = 6 \cdot 5$

① $6 \mid 30 = 5$

② $5 \mid 30 = 6$

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$600 = 2^3 \cdot 3 \cdot 5^2$

$540 = 2^2 \cdot 3^3 \cdot 5$

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Alternate Factorization

$600 = 2^3 \cdot 3 \cdot 5^2$

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$600 = 2^3 \cdot 3 \cdot 5^2$

$540 = 2^2 \cdot 3^3 \cdot 5$

$600 = 2 \cdot 2 \cdot 2 \cdot 3 \cdot 5 \cdot 5$

$540 = 2 \cdot 2 \cdot 3 \cdot 3 \cdot 5$

GCD $= 2 \cdot 2 \cdot 3 \cdot 5 = 4 \cdot 3 \cdot 5 = 12 \cdot 5 = 60$

e.g. $3 \mid 600 = 200$, $3 \mid 540 = 180$

GCD = 60

① $60 \mid 600 = 10$

② $60 \mid 540 = 9$

$10 = 1 \cdot 2 \cdot 5$

$9 = 1 \cdot 3 \cdot 3$

The Common Factor is "1" GCD = 1

Relatively Prime!

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$600 = 2 \cdot 2 \cdot 2 \cdot 3 \cdot 5 \cdot 5$

$540 = 2 \cdot 2 \cdot 3 \cdot 3 \cdot 3 \cdot 5$

GCD $= 12$

① $12 \mid 600 = 50$

② $12 \mid 540 = 45$

Check

$50 = 2 \cdot 5 \cdot 5$

$45 = 3 \cdot 3 \cdot 5$

→ GCD = 5

*note: not Relatively Prime.

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Find GCD

$216 = 2^3 \cdot 3^3$

$288 = 2^5 \cdot 3^2$

$216 = 2 \cdot 2 \cdot 2 \cdot 3 \cdot 3 \cdot 3$

$288 = 2 \cdot 2 \cdot 2 \cdot 2 \cdot 2 \cdot 3 \cdot 3$

GCD $= 2 \cdot 2 \cdot 2 \cdot 3 \cdot 3 = 8 \cdot 9 = 72$

Ck

$72 \mid 216 = 3$

$72 \mid 288 = 4$

Relatively Prime

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2 6

$2 = \boxed{2}$
$6 = \boxed{2} \cdot 3$

GCD = 2

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Least Common Multiple

LCM

$\boxed{6} = 2 \cdot 3$ $\boxed{8} = 2 \cdot 2 \cdot 2$

$6 = 2^1 \cdot 3^1$

$8 = 2^1 \cdot 2^1 \cdot 2^1$

Highest powers of all the Primes

$2^3 \cdot 3^1 = 8 \cdot 3 = 24$

LCM = 24

Ck

$6 \mid 24 = 4$
$8 \mid 24 = 3$ } Relatively Prime

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A multiple of a Number

What are the multiples of 2?

$\{2, 4, 6, 8, 10, 12, \ldots\}$

$\boxed{2} \cdot 1 = 2$
$\boxed{2} \cdot 2 = 4$
$\boxed{2} \cdot 3 = 6$
$\boxed{2} \cdot 4 = 8$
$\boxed{2} \cdot 5 = 10$
$\vdots \quad \vdots$

} multiples of 2

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Find the LCM

216 288

$216 = 2^3 \cdot 3^3$
$288 = 2^5 \cdot 3^2$

} $LCM = 2^5 \cdot 3^3$
$= 32 \cdot 27$
$= 864$

Ck

$216 \mid 864 = 4$
$288 \mid 864 = 3$ } Relatively Prime

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1, 3, 6, 8, 10, 11, 13, 15, 18, 22, 35, 36, 42, 43, 57

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Find both GCD & LCM

64 56 100

$64 = \boxed{2 \cdot 2} \cdot 2 \cdot 2 \cdot 2 \cdot 2$
$56 = \boxed{2 \cdot 2} \cdot 2 \cdot 7$
$100 = \boxed{2 \cdot 2} \cdot 5 \cdot 5$

4|64
4|56
4|100

GCD = $2 \cdot 2 = \boxed{4}$

$LCM = 2^6 \cdot 5^2 \cdot 7$
$= 64 \cdot 25 \cdot 7$
$= \boxed{11,200}$

64|11200
56|11200
100|11200

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