Lesson 4

Number Theory : Year 9

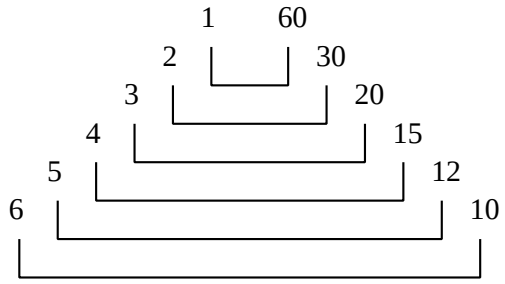
Calculator needed

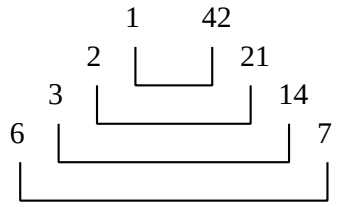
4.1 Factors and Multiples

4.1.1 Example involving factors

The factors of 60 are the whole numbers that divide into 60 without remainder.
The factors of 42 are the whole numbers that divide into 42 without remainder.

There is a good way of setting this out that lessens the chances of missing any **factors**:





This gives us a second method of finding an *hcf*, a *highest common* ***factor***

To find *hcf* {60, 42} look at both factor pyramids.
Which is the largest (the **highest**) number that is **common** to both **factor** pyramids ?

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4.1.2 Example involving Multiples

The multiples of 4 are the numbers in the 4-times **multipl**ication table:
4, 8, 12, 16, 20, 24, 28, 32, 36, 40, 44, 48, 52, 56, 60, 64, 68, 72, 76, 80, 84, 88, 92, ...

The multiples of 21 are the numbers in the 21-times **multipl**ication table:
21, 42, 63, 84, 105, 126, 147, 168, 189, 210, 231, 252, 273, 294, ...

This gives us a **second method** of finding a *lcm*, a *lowest common* ***multiple***

To find *lcm* {4, 21} look through the multiple lists for both 4 and 21.
Which is the first (the **lowest**) number that is **common** to both **multiple** lists ?

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What is the disadvantage of this method ?

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4.2 Exercise

Question 1

(i) Draw a factor pyramid for 24.

(ii) Draw a factor pyramid for 40.

(iii) What is the highest common factor of 24 and 40 ?

(iv) Draw a circle around *hcf* {24,40} on each of your factor pyramids.

(v) What is the highest common **PRIME** factor of 24 and 40 ?

(vi) List **ALL** the common factors of 24 and 40.

Question 2

(i) Write out a list containing, in order, the first twelve multiples of 9.

(ii) Write out a list containing, in order, the first twelve multiples of 15.

(iii) What is the lowest common multiple of 9 and 15 ?

(iv) Draw a circle around $lcm\{9,15\}$ on each of your multiple lists.

(v) What is the second lowest common multiple of 9 and 15 ?

(vi) What do you think the third lowest common multiple of 9 and 15 will be ?

Question 3

(i) Write 195 as a product of primes.

(ii) Hence, or otherwise, draw the factor pyramid for 195

Question 4

(i) Draw a factor pyramid for 54.

(ii) Draw a factor pyramid for 36

(iii) Draw a factor pyramid for 64

(iv) Use your factor pyramids to state *hcf* {54, 36, 64}

(v) Circle the *hcf* on each of your factor pyramids.

Question 5

(i) Write out a list containing, in order, multiples of 6 less than 100

(ii) Write out a list containing, in order, multiples of 14 less than 100

(iii) Write out a list containing, in order, multiples of 12 less than 100

(iv) What is the lowest common multiple of 6 and 14 and 12 ?

(v) Draw a circle around *lcm* {6,14, 12} on each of your multiple lists

Question 6

Here is another way of finding the lowest common multiple of three numbers.
Suppose we wish to find *lcm*{10, 25, 30}

(i) Pick any two numbers from the three, say 10 and 25
Write down *lcm*{10, 25}

(ii) Pick any two different numbers from the three, say10 and 30
Write down *lcm*{10, 30}

(iii) Now find the *lcm* of your answers to part **(i)** and part **(ii)**
This is also the *lcm* of all three numbers.

Question 7

Use the method of question 6 to find *lcm*{14, 32, 40}