Your notes

GCSE Maths: revision notes

Factors, multiples and primes (HCF and LCM)

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Factors and multiples

- A **factor** of a number divides into it exactly. The **factors** of 12 are 1, 2, 3, 4, 6 and 12.
- A **multiple** of a number is in its times table. The **multiples** of 7 are 7, 14, 21, 28...
- Find **factors** in pairs: 1×12, 2×6, 3×4.

Prime numbers

- A **prime number** has exactly two **factors**: 1 and itself. 1 is not prime.
- The primes below 30 are 2, 3, 5, 7, 11, 13, 17, 19, 23 and 29. 2 is the only even prime.

Prime factor decomposition

- Every whole number greater than 1 can be written as a **product of prime factors**.
- Use a **factor** tree: $60 = 6 \times 10 = 2 \times 3 \times 2 \times 5 = 2^2 \times 3 \times 5$ (in **index form**).

HCF and LCM

- The highest common **factor** (HCF) is the biggest number that is a **factor** of both numbers. HCF of 12 and 18 is 6.
- The lowest common **multiple** (LCM) is the smallest number that is a **multiple** of both. LCM of 4 and 6 is 12.
- With **prime factors**: the HCF uses the primes they share (lowest powers); the LCM uses every prime (highest powers). A Venn diagram helps.

Using HCF and LCM

- HCF problems: sharing things into the largest possible equal groups.
- LCM problems: finding when things happen together again, such as buses that leave every 12 and 15 minutes (together again after 60 minutes).

Worked examples

Write 360 as a product of its prime factors

Keep dividing by the smallest prime that goes in. **$360 = 2 \times 180 = 2 \times 2 \times 90 = 2 \times 2 \times 2 \times 45$**

45 isn't even, so try 3. **$45 = 3 \times 15 = 3 \times 3 \times 5$**

Write all the primes, using powers. **$2 \times 2 \times 2 \times 3 \times 3 \times 5 = 2^3 \times 3^2 \times 5$**

Answer: $2^3 \times 3^2 \times 5$

Find the HCF and LCM of 24 and 36

Write each as a product of primes. **$24 = 2^3 \times 3$ and $36 = 2^2 \times 3^2$**

HCF: the lowest power of each prime in both. **$2^2 \times 3 = 12$**

LCM: the highest power of each prime. **$2^3 \times 3^2 = 72$**

Answer: HCF = 12, LCM = 72

Key terms

Factor	A number that divides exactly into another number.
Multiple	A number in the times table of another number.
Prime number	A number with exactly two factors: 1 and itself.
Prime factor	A factor that is a prime number.
Product of prime factors	A number written as prime numbers multiplied together.
Index form	Writing repeated factors as powers, such as $2^3 \times 5$.
Highest common factor (HCF)	The largest number that is a factor of two or more numbers.
Lowest common multiple (LCM)	The smallest number that is a multiple of two or more numbers.

Quick questions

Cover the answers and test yourself: remembering is what makes it stick.

1. Which list contains all the factors of 12?
2. Which of these is a prime number?
3. Is 1 a prime number?
4. What are the first four multiples of 7?
5. Write 60 as a product of prime factors.

Your notes

6. What is the HCF of 12 and 18?
7. What is the LCM of 4 and 6?
8. What is the HCF of 24 and 36?

Answers

1. 1, 2, 3, 4, 6, 12
2. 29
3. No, it has only one factor
4. 7, 14, 21, 28
5. $2^2 \times 3 \times 5$
6. 6
7. 12
8. 12

What to do next

Practise 12 questions on this topic

Try 7 exam questions, with mark schemes

Read the lesson, one step at a time

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