

Prime Numbers, HCF and LCM

Sec 1 Maths Chapter Guide

Learn prime numbers, prime factorisation, index notation, square roots, cube roots, Highest Common Factor and Lowest Common Multiple through clear explanations, worked examples and practice questions.

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Learning section

Learning goals and prerequisites

By the end of this chapter, students should be able to explain the meaning of factors, multiples, prime numbers and composite numbers, and use them to solve HCF and LCM questions confidently.

Understand

Explain factors, multiples, prime numbers, composite numbers, square roots, cube roots, HCF and LCM in clear words.

Apply

Use listing, factor trees and prime factorisation to find HCF and LCM accurately.

Decide

Read word problems carefully and decide whether the situation requires HCF or LCM.

Prerequisite knowledge

Students should be comfortable with basic multiplication, division, even and odd numbers, patterns, word problems and whole numbers.

Concept 1

Factors and multiples

Factors and multiples are opposite ways of thinking about multiplication. A factor goes into a number exactly. A multiple is what we get after multiplying a number.

What is a factor?

A factor of a number is a whole number that divides it exactly without remainder.

$$1 \times 12 = 12$$

$$2 \times 6 = 12$$

$$3 \times 4 = 12$$

Example: Find the factors of 12. The factors of 12 are 1, 2, 3, 4, 6, 12.

A quick way to list factors is to write them in pairs. This helps students avoid missing a factor.

What is a multiple?

A multiple of a number is the result of multiplying that number by 1, 2, 3, 4 and so on.

First six multiples of 4: 4, 8, 12, 16, 20, 24.

Multiples usually keep getting larger. Factors of a whole number are limited.

Checkpoint

List A: 1, 2, 4, 8, 16. List B: 8, 16, 24, 32, 40.

Answer: List A shows factors of 16. List B shows multiples of 8.

Concept 2

Prime and composite numbers

A prime number has exactly two factors. A composite number has more than two factors. This distinction matters because prime numbers are the building blocks of whole numbers.

Prime number

A prime number has exactly two factors: 1 and itself. Examples: 2, 3, 5, 7, 11, 13.

Composite number

A composite number has more than two factors. Examples: 4, 6, 8, 9, 10, 12.

What about 1?

The number 1 is not prime and not composite. It has only one factor: itself.

Why 2 is special

The number 2 is the only even prime number. Every other even number is divisible by 2 and has more than two factors.

How to test whether a number is prime

To test if a number is prime, check whether it is divisible by smaller prime numbers.

Example: 29 is not divisible by 2, 3 or 5. So 29 has exactly two factors: 1 and 29. 29 is a prime number.

A common mistake is to say that all even numbers are composite. That is almost true, but 2 is the exception.

Concept 3

Prime factorisation

Prime factorisation means writing a composite number as a product of prime numbers. This helps students see what a number is made of.

Method 1: Factor tree

Start with the number. Split it into two factors. Continue splitting any composite number until only prime numbers are left.

$12 = 2 \times 6$; $6 = 2 \times 3$; so $12 = 2 \times 2 \times 3 = 2^2 \times 3$.

Method 2: Repeated division

Divide the number by prime numbers step by step until the quotient becomes 1.

$12 \div 2 = 6$; $6 \div 2 = 3$; $3 \div 3 = 1$. So $12 = 2^2 \times 3$.

The final answer should only contain prime numbers. Repeated division is useful when numbers become larger because it keeps the working organised.

Another example: Prime factorise 18

$18 = 2 \times 9$; $9 = 3 \times 3$. So, $18 = 2 \times 3 \times 3 = 2 \times 3^2$.

Checkpoint answer: $20 = 2 \times 2 \times 5 = 2^2 \times 5$.

Concept 4

Index notation

Index notation is a shorter way to write repeated multiplication. In prime factorisation, it helps us write repeated prime factors neatly.

What do the parts mean?

Base: The base is the number being multiplied repeatedly. In 2^3 , the base is 2.

Index: The index tells us how many times the base is used as a factor. In 2^3 , the index is 3.

Common readings

- 2^2 is read as two squared.
- 2^3 is read as two cubed.
- 5^2 means $5 \times 5 = 25$.

Students sometimes multiply the base by the index. For example, 2^3 is not 2×3 . It means $2 \times 2 \times 2$.

Example: Write 72 in index notation

$72 = 8 \times 9$. $8 = 2 \times 4$ and $4 = 2 \times 2$. $9 = 3 \times 3$. So, $72 = 2 \times 2 \times 2 \times 3 \times 3 = 2^3 \times 3^2$.

Checkpoint answers: $3 \times 3 \times 3 \times 5 = 3^3 \times 5$; $2 \times 2 \times 7 \times 7 = 2^2 \times 7^2$; $5 \times 5 \times 5 \times 5 = 5^4$.

Concept 5

Square roots and cube roots

Square roots and cube roots reverse square numbers and cube numbers. They help students connect repeated multiplication with the size of a square or cube.

Square root

A square number is made by multiplying a number by itself. Since $3 \times 3 = 9$, the square root of 9 is 3.

$$\sqrt{9} = 3.$$

Cube root

A cube number is made by multiplying a number by itself three times. Since $3 \times 3 \times 3 = 27$, the cube root of 27 is 3.

$$\sqrt[3]{27} = 3.$$

Useful square numbers and cube numbers

Number	Square	Cube
2	$2^2 = 4$	$2^3 = 8$
3	$3^2 = 9$	$3^3 = 27$
4	$4^2 = 16$	$4^3 = 64$
5	$5^2 = 25$	$5^3 = 125$

Checkpoint answers: $\sqrt{16} = 4$, $\sqrt{25} = 5$, $\sqrt[3]{8} = 2$, $\sqrt[3]{64} = 4$.

Concept 6

Highest Common Factor, HCF

The Highest Common Factor is the greatest factor shared by two or more numbers. It is useful when a question involves the largest equal group, the greatest possible size, or dividing items equally.

Finding HCF by listing factors

To find the HCF, list the factors of each number, identify the common factors, then choose the greatest one.

Factors of 12	1, 2, 3, 4, 6, 12
Factors of 18	1, 2, 3, 6, 9, 18
Common factors	1, 2, 3, 6
HCF	6

Method steps

- List the factors.
- Find the common factors.
- Choose the greatest one.

HCF usually gives an answer that is smaller than or equal to the numbers given.

Worked example: Find the HCF of 24 and 36.

Factors of 24: 1, 2, 3, 4, 6, 8, 12, 24. Factors of 36: 1, 2, 3, 4, 6, 9, 12, 18, 36. Common factors: 1, 2, 3, 4, 6, 12. HCF = 12.

Checkpoint answers: HCF of 10 and 15 = 5; HCF of 16 and 24 = 8; HCF of 18 and 30 = 6.

Concept 7

Lowest Common Multiple, LCM

The Lowest Common Multiple is the smallest multiple shared by two or more numbers. It is useful when a question involves repeated events, matching cycles, common timing, or the first time something happens together.

Finding LCM by listing multiples

To find the LCM, list the multiples of each number, identify the common multiples, then choose the smallest one.

Multiples of 4	4, 8, 12, 16, 20, 24
Multiples of 6	6, 12, 18, 24, 30, 36
Common multiples	12, 24, ...

LCM	12
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Method steps

- List the multiples.
- Find the common multiples.
- Choose the smallest one.

LCM usually gives an answer that is greater than or equal to the numbers given.

Worked example: Find the LCM of 8 and 12.

Multiples of 8: 8, 16, 24, 32, 40, 48. Multiples of 12: 12, 24, 36, 48, 60, 72. Common multiples include 24 and 48. LCM = 24.

Prime factorisation method

$8 = 2^3$. $12 = 2^2 \times 3$. LCM = $2^3 \times 3 = 24$.

Checkpoint answers: LCM of 3 and 5 = 15; LCM of 6 and 9 = 18; LCM of 10 and 15 = 30.

Concept 8

HCF vs LCM word problems

Many students can calculate HCF and LCM, but struggle to decide which one to use in a word problem. The key is to read what the question is really asking.

HCF

Use when dividing things into the greatest possible equal groups.

LCM

Use when finding the first common time, repeat, match or meeting point.

Quick check: HCF answers are usually smaller. LCM answers are usually larger. This is not the only test, but it helps students catch careless mistakes.

Worked example 1: HCF

A teacher has 24 pencils and 36 erasers. She wants to pack them into identical gift bags with no items left over. This is an HCF situation. HCF of 24 and 36 = 12. The teacher can make 12 gift bags.

Worked example 2: LCM

A bell rings every 8 minutes and another bell rings every 12 minutes. They ring together now. This is an LCM situation. LCM of 8 and 12 = 24. They will ring together after 24 minutes.

Practice answers

- Buses every 10 and 15 minutes: LCM = 30 minutes.
- 18 red beads and 30 blue beads: HCF = 6 bracelets.
- Lights every 6 and 9 seconds: LCM = 18 seconds.

Guided practice and chapter review

Use these questions to check whether students can connect factors, multiples, prime numbers, prime factorisation, square roots, cube roots, HCF and LCM.

Core skills

- List all the factors of 28.
- Write the first five multiples of 7.
- Decide whether 29 is prime or composite.
- Write 60 as a product of prime factors using index notation.

Answers: factors of 28 are 1, 2, 4, 7, 14, 28. First five multiples of 7 are 7, 14, 21, 28, 35. 29 is prime.
 $60 = 2^2 \times 3 \times 5$.

Roots, HCF and LCM

- Find $\sqrt{81}$.
- Find $\sqrt[3]{125}$.
- Find the HCF of 18 and 42.
- Find the LCM of 6 and 14.

Answers: $\sqrt{81} = 9$. $\sqrt[3]{125} = 5$. HCF of 18 and 42 = 6. LCM of 6 and 14 = 42.

Mixed word problems

A teacher has 40 stickers and 56 bookmarks to pack into identical sets. HCF of 40 and 56 = 8, so she can make 8 sets.

Two lights flash every 12 seconds and 18 seconds. LCM of 12 and 18 = 36, so they next flash together after 36 seconds.

Teacher and parent support

Common mistakes, teaching notes and FAQs

This final section helps students avoid common errors, while giving teachers and parents a clearer way to support revision.

Common mistakes to watch for

- Confusing factors and multiples.
- Treating 1 as a prime number.
- Stopping prime factorisation too early.
- Mixing up HCF and LCM.

Teacher notes

- Start with meaning before method.
- Use visual comparison often.
- Ask for reasoning in word problems before calculation.

Parent notes

- Ask: “Why did you choose HCF or LCM?”
- For HCF, the answer should divide the given numbers. For LCM, the given numbers should divide the answer.
- Short repeated practice is usually better than rushing many questions in one sitting.

Frequently asked questions

What is the difference between a factor and a multiple? A factor divides a number exactly. A multiple is made when a number is multiplied by 1, 2, 3 and so on.

Is 1 a prime number? No. A prime number has exactly two factors: 1 and itself. The number 1 has only one factor.

When should students use HCF? When a problem asks for the greatest possible equal group, equal size or equal sharing with nothing left over.

When should students use LCM? When a problem involves repeated events, common timing, cycles or the first time two things happen together again.

Need help with Sec 1 Maths?

If your child understands the method but still struggles to apply it in word problems, start by revising the concept slowly before moving to mixed practice.