Chapter 1: Number Systems

Standard 10th CBSE/ICSE

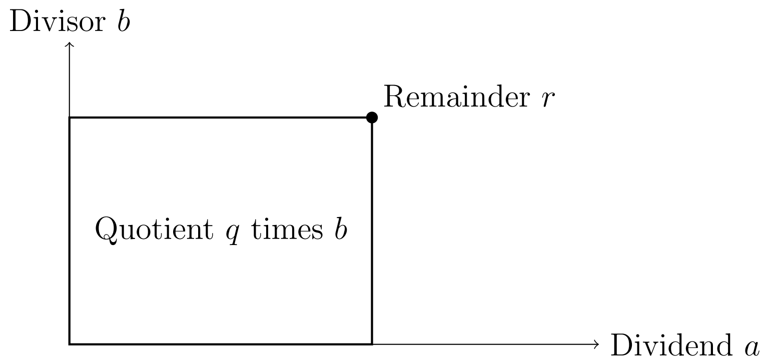
1 1.1 Euclid's Division Lemma

Theory

Euclid's Division Lemma is a fundamental tool in number theory that expresses the process of division with remainder. It states that for any two positive integers a and b (with $a > b$), there exist unique integers q and r such that:

$$a = bq + r, \quad 0 \leq r < b$$

Here, q is called the quotient and r is the remainder. This lemma forms the basis for the Euclidean Algorithm, which is used to compute the Highest Common Factor (HCF) of two numbers. It is extremely useful in problems involving divisibility, HCF, and simplification of ratios.



This lemma can be visualized as fitting multiple copies of b into a until a remainder r is left that is smaller than b.

Solved Problems

Problem 1: Find the quotient and remainder when 69 is divided by 8.
Solution:
Using Euclid's Division Lemma:

$$69 = 8 \times 8 + 5$$

Thus, quotient $q = 8$ and remainder $r = 5$.

Problem 2: Find HCF of 96 and 36 using Euclid's Algorithm.
Solution:
Apply Euclid's Division Lemma:

$$96 = 36 \times 2 + 24$$

$$36 = 24 \times 1 + 12$$
$$24 = 12 \times 2 + 0$$

Hence, HCF is 12.

Problem 3: Using Euclid's Lemma, find the HCF of 65 and 117.
Solution:

$$117 = 65 \times 1 + 52$$
$$65 = 52 \times 1 + 13$$
$$52 = 13 \times 4 + 0$$

Thus, HCF is 13.

Problem 4: Find the HCF of 102 and 38 using Euclid's division lemma.
Solution:

$$102 = 38 \times 2 + 26$$
$$38 = 26 \times 1 + 12$$
$$26 = 12 \times 2 + 2$$
$$12 = 2 \times 6 + 0$$

Hence, HCF = 2.

Problem 5: Find the HCF of 225 and 135 using Euclid's division lemma.
Solution:

$$225 = 135 \times 1 + 90$$
$$135 = 90 \times 1 + 45$$
$$90 = 45 \times 2 + 0$$

Thus, HCF = 45.

Problem 6: Find the HCF of 867 and 255.
Solution:

$$867 = 255 \times 3 + 102$$
$$255 = 102 \times 2 + 51$$
$$102 = 51 \times 2 + 0$$

Thus, HCF = 51.

Problem 7: Find the HCF of 414 and 662.
Solution:

$$662 = 414 \times 1 + 248$$
$$414 = 248 \times 1 + 166$$
$$248 = 166 \times 1 + 82$$
$$166 = 82 \times 2 + 2$$
$$82 = 2 \times 41 + 0$$

Thus, HCF = 2.

Problem 8: Using Euclid's Lemma, show that 35 and 50 are coprime.
Solution:

$$50 = 35 \times 1 + 15$$

$$35 = 15 \times 2 + 5$$

$$15 = 5 \times 3 + 0$$

Thus, HCF $= 5 \neq 1$. Hence, they are not coprime.

Problem 9: Find the HCF of 291 and 252.
Solution:

$$291 = 252 \times 1 + 39$$

$$252 = 39 \times 6 + 18$$

$$39 = 18 \times 2 + 3$$

$$18 = 3 \times 6 + 0$$

Thus, HCF $= 3$.

Problem 10: Find the HCF of 520 and 80.
Solution:

$$520 = 80 \times 6 + 40$$

$$80 = 40 \times 2 + 0$$

Thus, HCF $= 40$.

Self Practice Problems (With Answers)

Q1. Find HCF of 72 and 120 using Euclid's Lemma.
Answer: 24
Q2. Find HCF of 208 and 360.
Answer: 8
Q3. Find the quotient and remainder when 92 is divided by 7.
Answer: Quotient = 13, Remainder = 1
Q4. Using Euclid's Lemma, find HCF of 161 and 28.
Answer: 7
Q5. Using Euclid's division lemma, find HCF of 765 and 225.
Answer: 15
Q6. Find HCF of 187 and 119.
Answer: 17
Q7. Find HCF of 5445 and 7007.
Answer: 37
Q8. Find HCF of 357 and 234.
Answer: 39
Q9. Find HCF of 867 and 255.
Answer: 51
Q10. Find HCF of 616 and 32.
Answer: 8
Q11. Find HCF of 196 and 42.
Answer: 14
Q12. Find HCF of 105 and 280.
Answer: 35
Q13. Find HCF of 999 and 78.
Answer: 3
Q14. Find HCF of 825 and 315.
Answer: 15
Q15. Find HCF of 128 and 48.
Answer: 16

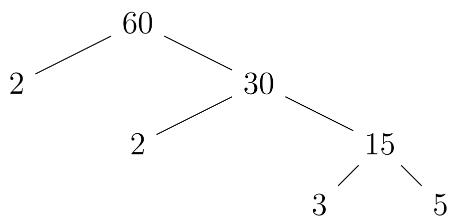
2 1.2 Fundamental Theorem of Arithmetic

Theory

The Fundamental Theorem of Arithmetic states that every composite number can be expressed (factorized) as a product of prime numbers, and this factorization is unique, apart from the order of the prime factors. In simple terms, each number greater than 1 can be uniquely written as a multiplication of prime numbers. This concept is fundamental in number theory and is used extensively in topics like divisibility, finding HCF, LCM, and simplifying fractions.
For example, 60 can be factorized as:

$$60 = 2^2 \times 3 \times 5$$

This prime factorization is unique except for the order of the factors.



This theorem ensures that prime numbers are the "building blocks" of all integers greater than 1.

Solved Problems

Problem 1: Find the prime factorization of 84.
Solution:

$$84 = 2^2 \times 3 \times 7$$

Problem 2: Express 210 as a product of prime numbers.
Solution:

$$210 = 2 \times 3 \times 5 \times 7$$

Problem 3: Find the LCM and HCF of 12 and 18 using prime factorization method.
Solution:
Prime factorization:

$$12 = 2^2 \times 3, \quad 18 = 2 \times 3^2$$

HCF $= 2^1 \times 3^1 = 6$
LCM $= 2^2 \times 3^2 = 36$

Problem 4: Express 360 as a product of its prime factors.
Solution:

$$360 = 2^3 \times 3^2 \times 5$$

Problem 5: Find the prime factors of 495.
Solution:

$$495 = 3^2 \times 5 \times 11$$

Problem 6: Find the prime factors of 128.
Solution:

$$128 = 2^7$$

Problem 7: Find the HCF of 96 and 404 using prime factorization.
Solution:
Prime factorizations:

$$96 = 2^5 \times 3, \quad 404 = 2^2 \times 101$$

HCF $= 2^2 = 4$

Problem 8: Find LCM of 24 and 90 using prime factorization.
Solution:

$$24 = 2^3 \times 3, \quad 90 = 2 \times 3^2 \times 5$$

LCM $= 2^3 \times 3^2 \times 5 = 360$

Problem 9: Express 490 as a product of primes.
Solution:

$$490 = 2 \times 5 \times 7^2$$

Problem 10: Find the prime factorization of 625.
Solution:

$$625 = 5^4$$

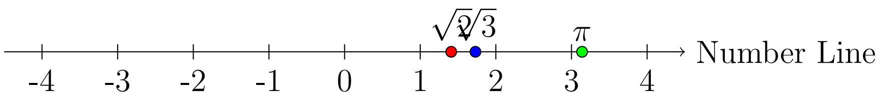
Self Practice Problems (With Answers)

Q1. Express 504 as a product of primes.
Answer: $2^3 \times 3^2 \times 7$
Q2. Find prime factorization of 216.
Answer: $2^3 \times 3^3$
Q3. Find prime factorization of 980.
Answer: $2^2 \times 5 \times 7^2$
Q4. Find LCM of 8 and 9 using prime factorization.
Answer: 72
Q5. Find HCF of 56 and 96 using prime factorization.
Answer: 8
Q6. Express 1024 as a product of primes.
Answer: 2^{10}
Q7. Find the prime factors of 81.
Answer: 3^4
Q8. Find prime factorization of 600.
Answer: $2^3 \times 3 \times 5^2$
Q9. Find LCM of 15 and 25 using prime factorization.
Answer: 75
Q10. Find HCF of 50 and 150 using prime factorization.
Answer: 50
Q11. Find the prime factorization of 126.
Answer: $2 \times 3^2 \times 7$
Q12. Find prime factorization of 150.
Answer: $2 \times 3 \times 5^2$
Q13. Find the prime factors of 999.
Answer: $3^3 \times 37$
Q14. Find prime factorization of 320.
Answer: $2^6 \times 5$
Q15. Find prime factorization of 729.
Answer: 3^6

3 1.3 Revisiting Irrational Numbers

Theory

An irrational number is a number that cannot be expressed as a ratio of two integers. In decimal form, irrational numbers neither terminate nor repeat. Famous examples of irrational numbers include π, $\sqrt{2}$, and e. The concept of irrational numbers was first discovered when it was proven that $\sqrt{2}$ cannot be expressed as a fraction.
For instance, $\sqrt{2} = 1.4142135...$, the decimal expansion is non-terminating and non-repeating.
Similarly, numbers like $\sqrt{3}$, $\sqrt{5}$, and π fall into this category. Irrational numbers fill the gaps between rational numbers on the number line, making the real number line complete.



Thus, irrational numbers are essential to complete the set of real numbers.

Solved Problems

Problem 1: Prove that $\sqrt{2}$ is irrational.
Solution: Assume $\sqrt{2} = \frac{p}{q}$ where p and q are co-prime integers. Squaring both sides:

$$2 = \frac{p^2}{q^2} \Rightarrow p^2 = 2q^2$$

Thus, p^2 is even, implying p is even. Let $p = 2k$. Substituting:

$$(2k)^2 = 2q^2 \Rightarrow 4k^2 = 2q^2 \Rightarrow q^2 = 2k^2$$

Thus, q^2 is even, so q is also even. But p and q cannot both be even. Hence, $\sqrt{2}$ is irrational.

Problem 2: Classify π as rational or irrational.
Solution: π is irrational because it is non-terminating and non-repeating in decimal form.

Problem 3: Is $\sqrt{4}$ rational or irrational?
Solution: $\sqrt{4} = 2$ (an integer), so it is rational.

Problem 4: Find whether $0.101001000100001\ldots$ is rational or irrational.
Solution: Since the decimal neither terminates nor repeats, it is irrational.

Problem 5: Check whether $\sqrt{49}$ is rational.
Solution: $\sqrt{49} = 7$, hence rational.

Problem 6: Is $22/7$ irrational?
Solution: $22/7$ is rational because it is a fraction of two integers.

Problem 7: Is $0.3333\ldots$ irrational?
Solution: $0.3333\ldots = 1/3$, hence rational.

Problem 8: Classify $\sqrt{5}$ as rational or irrational.
Solution: $\sqrt{5}$ is irrational because it has a non-terminating non-repeating decimal expansion.

Problem 9: Classify $\sqrt{81}$ as rational or irrational.
Solution: $\sqrt{81} = 9$, rational.

Problem 10: Is $\sqrt{8}$ rational?
Solution: $\sqrt{8} = 2\sqrt{2}$, irrational.

Self Practice Problems (With Answers)

Q1. Is $\sqrt{3}$ rational or irrational?
Answer: Irrational
Q2. Is $1.4142135\ldots$ rational?
Answer: Irrational
Q3. Is $\sqrt{36}$ rational?
Answer: Rational
Q4. Is π rational?
Answer: Irrational
Q5. Is 0.25 rational?
Answer: Rational
Q6. Is $\sqrt{7}$ irrational?
Answer: Irrational
Q7. Is $1/7$ rational?
Answer: Rational
Q8. Is $\sqrt{50}$ rational?
Answer: Irrational
Q9. Is $0.6666\ldots$ rational?
Answer: Rational
Q10. Is $2.3567\ldots$ without repetition rational?
Answer: Irrational
Q11. Check $\sqrt{121}$.
Answer: Rational
Q12. Check $\sqrt{10}$.
Answer: Irrational
Q13. Is $3/11$ rational?
Answer: Rational
Q14. Is $\sqrt{1.5}$ irrational?
Answer: Irrational
Q15. Is $0.123123123\ldots$ rational?
Answer: Rational

4 1.4 Decimal Expansions of Rational Numbers

Theory

A rational number is a number that can be expressed as the ratio $\frac{p}{q}$, where p and q are integers and $q \neq 0$.
The decimal expansion of rational numbers can either be:

- Terminating
- Non-terminating but repeating (recurring)

If after a finite number of steps, the division ends, then the decimal expansion terminates. Otherwise, if the decimal continues endlessly but with a repeating pattern, it is non-terminating repeating.

Important Rule: A rational number $\frac{p}{q}$ in simplest form will have a terminating decimal expansion if and only if the prime factorization of q is of the form $2^n 5^m$, where $n, m \geq 0$.

Example:

$$\frac{1}{8} = 0.125 \quad \text{(Terminating)}$$

$$\frac{1}{3} = 0.3333\ldots \quad \text{(Non-terminating, repeating)}$$

Thus, every rational number has either a terminating or non-terminating repeating decimal expansion.

Solved Problems

Problem 1: Find the decimal expansion of $\frac{3}{4}$.
Solution:

$$\frac{3}{4} = 0.75 \quad \text{(Terminating)}$$

Problem 2: Find the decimal expansion of $\frac{2}{11}$.
Solution:

$$\frac{2}{11} = 0.181818\ldots \quad \text{(Non-terminating repeating)}$$

Problem 3: Determine if $\frac{7}{20}$ has a terminating decimal.
Solution: Prime factors of 20: $2^2 \times 5$ Only 2 and 5 are present. Hence, terminating decimal: $\frac{7}{20} = 0.35$.

Problem 4: Find the decimal expansion of $\frac{5}{6}$.
Solution:

$$\frac{5}{6} = 0.8333\ldots \quad \text{(Non-terminating repeating)}$$

Problem 5: Check if $\frac{17}{40}$ has a terminating decimal.
Solution: Prime factors of 40: $2^3 \times 5$ Hence, terminating decimal: $\frac{17}{40} = 0.425$.

Problem 6: Find the decimal expansion of $\frac{2}{9}$.
Solution:

$$\frac{2}{9} = 0.2222\ldots \quad \text{(Non-terminating repeating)}$$

Problem 7: Find the decimal form of $\frac{7}{8}$.
Solution:

$$\frac{7}{8} = 0.875 \quad \text{(Terminating)}$$

Problem 8: Classify $\frac{5}{12}$ as terminating or non-terminating repeating.
Solution: Prime factors of 12: $2^2 \times 3$ (has a prime factor other than 2 or 5). Hence, non-terminating repeating.

Problem 9: Find decimal expansion of $\frac{4}{5}$.
Solution:

$$\frac{4}{5} = 0.8 \quad \text{(Terminating)}$$

Problem 10: Is $\frac{1}{7}$ terminating?
Solution: No, $\frac{1}{7} = 0.142857142857\ldots \quad$ (Non-terminating repeating)

Self Practice Problems (With Answers)

Q1. Find the decimal expansion of $\frac{2}{5}$.
Answer: 0.4 (Terminating)
Q2. Find the decimal expansion of $\frac{5}{9}$.
Answer: 0.5555... (Non-terminating repeating)
Q3. Find decimal expansion of $\frac{11}{25}$.
Answer: 0.44 (Terminating)
Q4. Classify $\frac{1}{6}$ as terminating or non-terminating repeating.
Answer: Non-terminating repeating
Q5. Find the decimal form of $\frac{7}{10}$.
Answer: 0.7 (Terminating)
Q6. Find decimal form of $\frac{8}{15}$.
Answer: 0.5333... (Non-terminating repeating)
Q7. Decimal expansion of $\frac{3}{5}$ is?
Answer: 0.6 (Terminating)
Q8. Find decimal expansion of $\frac{13}{50}$.
Answer: 0.26 (Terminating)
Q9. Decimal form of $\frac{4}{7}$?
Answer: 0.571428571428... (Non-terminating repeating)
Q10. Find decimal form of $\frac{6}{25}$.
Answer: 0.24 (Terminating)
Q11. Decimal form of $\frac{2}{3}$?
Answer: 0.6666... (Non-terminating repeating)
Q12. Find decimal form of $\frac{9}{20}$.
Answer: 0.45 (Terminating)
Q13. Classify $\frac{5}{7}$ as terminating or non-terminating repeating.
Answer: Non-terminating repeating
Q14. Decimal expansion of $\frac{17}{50}$ is?
Answer: 0.34 (Terminating)
Q15. Find decimal expansion of $\frac{7}{25}$.
Answer: 0.28 (Terminating)

Self Assessment Test (MCQ)

Instructions: Choose the correct option for each question. Each question carries 1 mark.

1. Which of the following is a rational number?
   a) $\sqrt{2}$
   b) $\frac{5}{7}$
   c) π
   d) None of these
2. The decimal expansion of $\frac{1}{3}$ is:
   a) Terminating

   b) Non-terminating non-repeating
   c) Non-terminating repeating
   d) Finite

3. Which of the following numbers is irrational?
   a) $\sqrt{16}$
   b) $\sqrt{2}$
   c) $\frac{4}{5}$
   d) 0.8

4. Euclid's Division Lemma states that for any two positive integers a and b, there exist integers q and r such that:
   a) $a = bq + r$ where $0 \leq r < b$
   b) $a = bq + r$ where $0 < r < a$
   c) $a = bq - r$
   d) $a = qb - r$

5. $\sqrt{5}$ is:
   a) Rational
   b) Irrational
   c) Natural
   d) Integer

6. The decimal expansion of $\frac{7}{8}$ is:
   a) Non-terminating
   b) Terminating
   c) Recurring
   d) Infinite

7. Fundamental Theorem of Arithmetic states:
   a) Every number has only one factor
   b) Every composite number can be expressed as a product of primes uniquely
   c) Every prime number is a composite number
   d) None of these

8. $\frac{22}{7}$ is:
   a) Rational
   b) Irrational
   c) Integer
   d) Whole number

9. The decimal form of $\frac{11}{30}$ is:
   a) Terminating
   b) Non-terminating repeating
   c) Non-terminating non-repeating
   d) Infinite
10. Which of these has a terminating decimal expansion?
   a) $\frac{1}{3}$
   b) $\frac{7}{8}$
   c) $\frac{2}{11}$
   d) $\frac{5}{12}$
11. Which of the following is a composite number?
   a) 7
   b) 9
   c) 11
   d) 13
12. Fundamental Theorem of Arithmetic helps to find:
   a) LCM
   b) HCF
   c) Prime factorization
   d) All of these
13. The value of $2\sqrt{2}$ is:
   a) Rational
   b) Irrational
   c) Integer
   d) Prime
14. If q has prime factors other than 2 and 5, then $\frac{p}{q}$ will have:
   a) Terminating decimal
   b) Non-terminating non-repeating decimal
   c) Non-terminating repeating decimal
   d) Exact value
15. $\sqrt{49}$ is:
   a) Rational
   b) Irrational

c) Prime
d) Composite

16. LCM of 4 and 6 is:
a) 12
b) 24
c) 6
d) 8

17. HCF of 18 and 24 is:
a) 3
b) 6
c) 9
d) 12

18. Which of the following is irrational?
a) 0.142857
b) $\frac{22}{7}$
c) $\sqrt{7}$
d) 3.5

19. A non-terminating repeating decimal is:
a) Rational
b) Irrational
c) Natural
d) Integer

20. What is $\frac{7}{20}$ in decimal form?
a) 0.35
b) 0.375
c) 0.7
d) 1.75

21. Which is a prime number?
a) 9
b) 15
c) 11
d) 21

22. 0.666... can be written as:

a) $\frac{2}{3}$
b) $\frac{3}{5}$
c) $\frac{1}{3}$
d) $\frac{4}{5}$

23. Which of these is NOT a rational number?

a) $\frac{-3}{5}$
b) $\sqrt{3}$
c) 0
d) $\frac{5}{1}$

24. Prime factorization of 36 is:

a) $2^2 \times 3^2$
b) $2^3 \times 3$
c) 2×3^2
d) $2^2 \times 3$

25. How many prime numbers between 1 and 20?

a) 8
b) 9
c) 7
d) 6

Answer Key

Q. No	Answer	Q. No	Answer	Q. No	Answer
1	b	2	c	3	b
4	a	5	b	6	b
7	b	8	a	9	b
10	b	11	b	12	d
13	b	14	c	15	a
16	a	17	b	18	c
19	a	20	c	21	c
22	a	23	b	24	a
25	b				

Self Assessment Test Paper - Chapter 1: Number Systems Standard 10th CBSE/ICSE

Instructions

- All questions are compulsory.
- Attempt all sections.
- Use proper steps and methods wherever required.

Section A (8 Marks)

Each question carries 1 mark. Choose the correct option.

1. Which of the following is irrational?
   a) $\sqrt{2}$
   b) 0.75
   c) 1.5
   d) 3
2. Decimal expansion of $\frac{1}{8}$ is:
   a) 0.125
   b) 0.25
   c) 0.333...
   d) Infinite
3. HCF of 60 and 72 is:
   a) 12
   b) 18
   c) 6
   d) 24

4. The value of $\sqrt{81}$ is:
   a) 8
   b) 9
   c) 7
   d) 6
5. If a rational number's denominator has prime factors other than 2 or 5, its decimal expansion is:
   a) Terminating
   b) Non-terminating repeating
   c) Non-terminating non-repeating
   d) Finite
6. Prime factorisation of 120 is:
   a) $2^3 \times 3 \times 5$
   b) $2^2 \times 3 \times 5$
   c) $2^3 \times 3^2 \times 5$
   d) $2^2 \times 5$
7. Fundamental Theorem of Arithmetic is used to find:
   a) Only HCF
   b) Only LCM
   c) Both HCF and LCM
   d) None
8. The number $0.\overline{6}$ can be written as:
   a) $\frac{1}{2}$
   b) $\frac{2}{3}$
   c) $\frac{1}{3}$
   d) $\frac{3}{5}$

Section B (12 Marks)

Each question carries 2 marks. Short Answer Type Questions.

1. Find the HCF of 96 and 404 by Euclid's division algorithm.
2. Express 84 as a product of its prime factors.
3. Show that $\sqrt{7}$ is irrational.
4. Write the decimal expansion of $\frac{7}{16}$ and state whether it is terminating or non-terminating.
5. Find LCM of 26 and 91 using prime factorization method.
6. Express 0.777... in the form $\frac{p}{q}$.

Section C (12 Marks)

Each question carries 3 marks. Long Answer Type Questions.

1. Using Euclid's division algorithm, find the HCF of 867 and 255.
2. Without actual division, find whether $\frac{7}{15}$ has a terminating or non-terminating repeating decimal expansion.
3. Prove that $\sqrt{5}$ is an irrational number.
4. Find the prime factorization of 960 and hence find its LCM with 360.

Section D (6 Marks)

Case Study Based Question. Read the case carefully and answer the following:

Case Study: Riya and Aman are playing a number game. They pick two random numbers and find their HCF and LCM. Riya picks 24 and 36, while Aman picks 40 and 60. Riya uses prime factorization to find the HCF and LCM, while Aman uses Euclid's algorithm. After solving, they discuss the properties of rational and irrational numbers and how decimal expansions help in identifying rational numbers. They also realize that certain decimal expansions terminate while others repeat infinitely.
Answer the following:

1. What is the HCF of 24 and 36?
   a) 12
   b) 18
   c) 6
   d) 24
2. What is the LCM of 24 and 36?

a) 144
b) 72
c) 60
d) 84

3. What is the HCF of 40 and 60 using Euclid's algorithm?

a) 10
b) 20
c) 30
d) 15

4. Which type of decimal expansion does $\frac{2}{5}$ have?

a) Non-terminating
b) Non-terminating repeating
c) Terminating
d) None

5. Which of the following is an irrational number?

a) $\sqrt{9}$
b) 0.5
c) $\sqrt{2}$
d) $\frac{7}{8}$

Answer Key

Section A:

Q. No	Answer	Q. No	Answer
1	a	2	a
3	a	4	b
5	b	6	a
7	c	8	b

Section B:

1. 4
2. $2^2 \times 3 \times 7$
3. Proved
4. Terminating
5. 182
6. $\frac{7}{9}$

Section C:

1. 51
2. Non-terminating repeating
3. Proved
4. 2880

Section D:

1. a
2. b
3. b
4. c
5. c

Quick Revision Table - Chapter 1: Number Systems Standard 10th CBSE/ICSE

Quick Revision - Important Concepts at a Glance

Topic	Key Points
Euclid's Division Lemma	For any two positive integers a and b, there exist unique integers q and r such that $a = bq + r$, where $0 \leq r < b$. Used to find HCF.
Fundamental Theorem of Arithmetic	Every composite number can be expressed (factorised) as a product of primes, and this factorisation is unique, apart from the order of the factors.
Irrational Numbers	Numbers that cannot be expressed as $\frac{p}{q}$, where p and q are integers and $q \neq 0$. Examples: $\sqrt{2}$, π, etc.
Rational Numbers	Numbers that can be expressed in the form $\frac{p}{q}$ with p, q integers and $q \neq 0$. Their decimal expansions either terminate or are non-terminating repeating.
Terminating Decimal	If the denominator (after simplification) has only 2 and/or 5 as its prime factors, the decimal expansion is terminating. Example: $\frac{1}{8} = 0.125$.
Non-Terminating Repeating Decimal	If the denominator (after simplification) has prime factors other than 2 or 5, the decimal expansion is non-terminating repeating. Example: $\frac{1}{3} = 0.333\ldots$
HCF (Highest Common Factor)	Largest number that divides two or more numbers exactly. Found using prime factorization or Euclid's Division Algorithm.
LCM (Lowest Common Multiple)	Smallest number that is a multiple of two or more numbers. Can be found using prime factorization.
Properties of Irrational Numbers	• Sum of a rational and an irrational number is irrational. • Product of a non-zero rational and irrational number is irrational.
Important Irrational Numbers	$\sqrt{2}, \sqrt{3}, \sqrt{5}, \pi, e$ are examples. Their decimal expansions are non-terminating, non-repeating.
Important Formulas	• Euclid's Algorithm: $a = bq + r$ • Relationship: HCF $\times$ LCM $=$ Product of the numbers