Chapter 5 | PRIME TIME

What You Will Learn in This Chapter

In this chapter, we explore the fascinating world of numbers:

- Common Multiples and Common Factors
- Prime Numbers and Composite Numbers
- Sieve of Eratosthenes – Finding all primes up to 100
- Co-prime Numbers
- Prime Factorisation (Factor Tree Method)
- Divisibility Tests for 2, 4, 5, 8, 10

5.1 Common Multiples and Common Factors

The Idli-Vada Game (Introduction Activity)

Children sit in a circle and count numbers starting from 1. Instead of saying some numbers, they say special words:

Word	When to say it	Examples (up to 30)
IDLI	Multiples of 3	3, 6, 9, 12, 18, 21, 24, 27
VADA	Multiples of 5	5, 10, 20, 25
IDLI-VADA	Multiples of BOTH 3 and 5 (i.e., multiples of 15)	**15, 30, 45, 60 ... (Common Multiples)**

Key Concept

Numbers that are multiples of BOTH 3 and 5 are called **Common Multiples** of 3 and 5.

The FIRST common multiple of 3 and 5 is 15. This is also called the LCM (Least Common Multiple).

Multiples of 3 and 5 (up to 30)

Multiples of 3	Common Multiples	Multiples of 5
3	**15**	5
6	**30**	10
9		20
12		25
18		
21		
24		
27		

Notice: 15 and 30 appear in BOTH lists → they are Common Multiples of 3 and 5!

Figure It Out — Section 5.1 (Page 108)

Q1. At what number is 'idli-vada' said for the 10th time?

Step 1: Understand: 'Idli-vada' is said at common multiples of 3 and 5 = multiples of 15

Step 2: List multiples of 15: 15, 30, 45, 60, 75, 90, 105, 120, 135, 150

Step 3: Count: The 10th multiple of 15 is 15 × 10 = 150

✓ Final Answer: 150

Q2. If the game is played for numbers 1 to 90, find:

(a) How many times would children say 'idli' (including 'idli-vada')?

Step 1: Count: Multiples of 3 from 1 to 90 = 90 ÷ 3 = 30

✓ Final Answer: 30 times

(b) How many times would children say 'vada' (including 'idli-vada')?

Step 1: Count: Multiples of 5 from 1 to 90 = 90 ÷ 5 = 18

✓ Final Answer: 18 times

(c) How many times would children say 'idli-vada'?

Step 1: Count: Multiples of 15 from 1 to 90 = 90 ÷ 15 = 6

✓ Final Answer: 6 times

Q3. What if the game was played till 900? How would your answers change?

Step 1: Idli: Multiples of 3 from 1 to 900 = 900 ÷ 3 = 300 times

Step 2: Vada: Multiples of 5 from 1 to 900 = 900 ÷ 5 = 180 times

Step 3: Idli-Vada: Multiples of 15 from 1 to 900 = 900 ÷ 15 = 60 times

✓ Final Answer: Idli: 300 times | Vada: 180 times | Idli-Vada: 60 times

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Q1. Find all multiples of 40 that lie between 310 and 410.

Step 1: Find: 40 × 8 = 320, 40 × 9 = 360, 40 × 10 = 400

Step 2: Check: 320, 360, 400 — all lie between 310 and 410

✓ Final Answer: 320, 360, 400

Q2. Who am I? (a) I am a number less than 40. One of my factors is 7. The sum of my digits is 8.

Step 1: Multiples of 7 less than 40: 7, 14, 21, 28, 35

Step 2: Check digit sum = 8: 3+5 = 8 ✓ (35 works!)

✓ Final Answer: 35

(b) I am a number less than 100. Two of my factors are 3 and 5. One of my digits is 1 more than the other.

Step 1: **Common multiples of 3 and 5 less than 100:** 15, 30, 45, 60, 75, 90

Step 2: **Check 'one digit is 1 more than other':** 45 → digits 4 and 5. 5 - 4 = 1 ✓

✓ Final Answer: 45

Q3. Find a perfect number between 1 and 10.

A Perfect Number is one where the sum of ALL its factors equals TWICE the number.

Step 1: **Try 6:** Factors of 6 = 1, 2, 3, 6

Step 2: **Sum of factors:** 1 + 2 + 3 + 6 = 12 = 2 × 6 ✓

✓ Final Answer: 6 is a Perfect Number

Q4. Find the common factors of: (a) 20 and 28 (b) 35 and 50 (c) 4, 8 and 12 (d) 5, 15 and 25

Step 1: **(a) Factors of 20:** 1, 2, 4, 5, 10, 20 | Factors of 28: 1, 2, 4, 7, 14, 28

Common Factors of 20 and 28 = 1, 2, 4

Step 2: **(b) Factors of 35:** 1, 5, 7, 35 | Factors of 50: 1, 2, 5, 10, 25, 50

Common Factors of 35 and 50 = 1, 5

Step 3: **(c) Factors of 4:** 1, 2, 4 | of 8: 1, 2, 4, 8 | of 12: 1, 2, 3, 4, 6, 12

Common Factors of 4, 8 and 12 = 1, 2, 4

Step 4: **(d) Factors of 5:** 1, 5 | of 15: 1, 3, 5, 15 | of 25: 1, 5, 25

Common Factors of 5, 15 and 25 = 1, 5

✓ Final Answer: (a) 1,2,4 (b) 1,5 (c) 1,2,4 (d) 1,5

Q5. Find any three numbers that are multiples of 25 but NOT multiples of 50.

Step 1: **Multiples of 25:** 25, 50, 75, 100, 125, 150, 175, ...

Step 2: **Multiples of 50:** 50, 100, 150, 200, ...

Step 3: **Remove multiples of 50:** 25, 75, 125, 175 are multiples of 25 but NOT 50

✓ Final Answer: 25, 75, 125 (many answers possible)

Q6. Anshu and friends play 'idli-vada' with two numbers both smaller than 10. The first 'idli-vada' is after 50. What could the two numbers be?

Step 1: **We need:** LCM of the two numbers > 50, and both numbers < 10

Step 2: **Try 7 and 8:** LCM of 7 and 8 = 56 > 50 ✓ Both < 10 ✓

Step 3: **Also try 8 and 9:** LCM of 8 and 9 = 72 > 50 ✓ Both < 10 ✓

✓ Final Answer: 7 and 8, or 8 and 9

Q7. In the treasure game, Grumpy has kept treasures on 28 and 70. What jump sizes will land on both?

Step 1: **Find factors of 28:** 1, 2, 4, 7, 14, 28

Step 2: **Find factors of 70:** 1, 2, 5, 7, 10, 14, 35, 70

Step 3: **Common factors:** 1, 2, 7, 14

✓ **Final Answer: Jump sizes: 1, 2, 7, 14**

Q9. Find the smallest number that is a multiple of all numbers from 1 to 10, except 7.

Step 1: Numbers: 1, 2, 3, 4, 5, 6, 8, 9, 10

Step 2: Find LCM: LCM(1,2,3,4,5,6,8,9,10) = LCM of prime factors

Step 3: Prime factorisation: $2^3 \times 3^2 \times 5 = 8 \times 9 \times 5 = 360$

✓ **Final Answer: 360**

Q10. Find the smallest number that is a multiple of all numbers from 1 to 10.

Step 1: Include 7 also: LCM(1 to 10) = $2^3 \times 3^2 \times 5 \times 7 = 360 \times 7 = 2520$

✓ **Final Answer: 2520**

5.2 Prime Numbers and Composite Numbers

🔢 Understanding Through Rectangular Arrangement

Guna tried to arrange 12 figs in rectangular form. He found MANY ways (1×12, 2×6, 3×4, 4×3, 6×2, 12×1).

Anshu tried to arrange 7 figs in rectangular form. He could only do 1×7 or 7×1. No other way!

🔍 Why the difference?

12 has MANY factors: 1, 2, 3, 4, 6, 12 → It is a COMPOSITE number

7 has ONLY TWO factors: 1 and 7 → It is a PRIME number

📖 Key Definitions

PRIME NUMBER	A number that has EXACTLY TWO factors: 1 and the number itself. Examples: 2, 3, 5, 7, 11, 13, 17, 19, 23, 29 ...
COMPOSITE NUMBER	A number that has MORE THAN TWO factors. Examples: 4, 6, 8, 9, 10, 12, 14, 15, 16 ...
SPECIAL CASE: 1	1 has ONLY ONE factor (itself). It is NEITHER prime NOR composite.

🔢 Sieve of Eratosthenes — Finding All Primes Up to 100

This is an ancient method developed by Greek mathematician Eratosthenes about 2200 years ago!

Step 1	Cross out 1 — it is neither prime nor composite.
Step 2	Circle 2 (it's prime), then cross out ALL multiples of 2: 4, 6, 8, 10, 12, ...
Step 3	Circle 3 (it's prime), then cross out ALL multiples of 3: 6, 9, 12, 15, ...
Step 4	Circle 5 (it's prime), then cross out ALL multiples of 5: 10, 15, 20, ...

Step 5	Continue: Circle next uncrossed number (7), cross out its multiples. Repeat until done.
Result	**All CIRCLED numbers are PRIMES. All crossed-out numbers (except 1) are COMPOSITES.**

◍ = *Prime (circled/shaded below)* | *Strikethrough = Composite* | *Gray = 1 (neither)*

1	**2**	**3**	~~4~~	**5**	~~6~~	**7**	~~8~~	~~9~~	~~10~~
11	~~12~~	**13**	~~14~~	~~15~~	~~16~~	**17**	~~18~~	**19**	~~20~~
~~21~~	~~22~~	**23**	~~24~~	~~25~~	~~26~~	~~27~~	~~28~~	**29**	~~30~~
31	~~32~~	~~33~~	~~34~~	~~35~~	~~36~~	**37**	~~38~~	~~39~~	~~40~~
41	~~42~~	**43**	~~44~~	~~45~~	~~46~~	**47**	~~48~~	~~49~~	~~50~~
~~51~~	~~52~~	**53**	~~54~~	~~55~~	~~56~~	~~57~~	~~58~~	**59**	~~60~~
61	~~62~~	~~63~~	~~64~~	~~65~~	~~66~~	**67**	~~68~~	~~69~~	~~70~~
71	~~72~~	**73**	~~74~~	~~75~~	~~76~~	~~77~~	~~78~~	**79**	~~80~~
~~81~~	~~82~~	**83**	~~84~~	~~85~~	~~86~~	~~87~~	~~88~~	**89**	~~90~~
~~91~~	~~92~~	~~93~~	~~94~~	~~95~~	~~96~~	**97**	~~98~~	~~99~~	~~100~~

All 25 primes up to 100: 2, 3, 5, 7, 11, 13, 17, 19, 23, 29, 31, 37, 41, 43, 47, 53, 59, 61, 67, 71, 73, 79, 83, 89, 97

Figure It Out — Section 5.2 (Page 114)

Q1. We see that 2 is a prime and also an even number. Is there any other even prime?

Step 1: Recall: Even numbers are divisible by 2

Step 2: Check: Any even number > 2 is divisible by 2, so it has at least 3 factors (1, 2, itself)

✓ **Final Answer: No. 2 is the ONLY even prime number.**

Q2. Look at the list of primes till 100. What is the smallest and largest difference between two successive primes?

Step 1: Smallest difference: Between 2 and 3 → difference = 1

Step 2: Largest difference: Between 89 and 97 → difference = 8

✓ **Final Answer: Smallest = 1 (between 2 & 3) | Largest = 8 (between 89 & 97)**

Q3. Are there equal number of primes in every row? Which decades have least/most primes?

Looking at primes per decade (each row = 10 consecutive numbers):

Decade	Primes	Count
1–10	2,3,5,7	**4**
11–20	11,13,17,19	**4**
21–30	23,29	**2**
31–40	31,37	**2**
41–50	41,43,47	**3**
51–60	53,59	**2**

61–70	61,67	2
71–80	71,73,79	3
81–90	83,89	2
91–100	97	1

✓ **Final Answer: Most primes: Decades 1-10 and 11-20 (4 each) | Fewest: 91-100 (only 1)**

Q4. Which of the following numbers are prime: 23, 51, 37, 26?

Step 1: 23: Factors = 1, 23 only → PRIME ✓

Step 2: 51: 51 = 3 × 17 → has more than 2 factors → COMPOSITE ✗

Step 3: 37: Factors = 1, 37 only → PRIME ✓

Step 4: 26: 26 = 2 × 13 → COMPOSITE ✗

✓ **Final Answer: 23 and 37 are prime numbers**

Q5. Write three pairs of prime numbers less than 20 whose sum is a multiple of 5.

Step 1: Try (2, 3): Sum = 5 = 5 × 1 ✓

Step 2: Try (3, 7): Sum = 10 = 5 × 2 ✓

Step 3: Try (2, 13): Sum = 15 = 5 × 3 ✓

✓ **Final Answer: (2,3), (3,7), (2,13)**

Q6. The numbers 13 and 31 are prime and have same digits 1 and 3. Find such pairs up to 100.

Step 1: Method: Look for primes whose digits are reverses of each other

Step 2: Find pairs: 17 & 71, 37 & 73, 79 & 97

✓ **Final Answer: (17, 71), (37, 73), (79, 97)**

Q7. Find seven consecutive composite numbers between 1 and 100.

Step 1: Look between: Large prime gaps. Between 89 and 97:

Step 2: Check: 90, 91, 92, 93, 94, 95, 96 — all composite!

90=2×45, 91=7×13, 92=4×23, 93=3×31, 94=2×47, 95=5×19, 96=2×48

✓ **Final Answer: 90, 91, 92, 93, 94, 95, 96**

Q8. Find all twin primes (difference = 2) between 1 and 100.

✓ **Final Answer: (3,5), (5,7), (11,13), (17,19), (29,31), (41,43), (59,61), (71,73)**

Q9. True or False:

Statement	T / F	Reason
(a) No prime number has units digit 4	**TRUE**	*Units digit 4 → even number → divisible by 2 → not prime (except 2)*
(b) A product of primes can be prime	**FALSE**	*Product of primes = composite (e.g. 2×3=6)*

(c) Prime numbers have no factors	**FALSE**	*Primes have exactly 2 factors: 1 and itself*
(d) All even numbers are composite	**FALSE**	*2 is even AND prime*
(e) For every prime > 3, next number is composite	**TRUE**	*Next number would be even, hence composite*

Q10. Which is the product of exactly THREE distinct prime numbers: 45, 60, 91, 105, 330?

Step 1: **45 =** 3 × 3 × 5 → only 2 distinct primes

Step 2: **60 =** 2 × 2 × 3 × 5 → 3 distinct primes but 2 appears twice

Step 3: **91 =** 7 × 13 → only 2 distinct primes

Step 4: **105 =** 3 × 5 × 7 → exactly 3 distinct primes ✓

Step 5: **330 =** 2 × 3 × 5 × 11 → 4 distinct primes

✓ Final Answer: 105 = 3 × 5 × 7

Q12. Observe that 3 is prime, and 2×3+1=7 is also prime. Find 5 such examples.

Step 1: **Pattern:** If p is prime and 2p+1 is also prime, find such p

Prime p	2p + 1	Prime?
3	7	**Yes ✓**
5	11	**Yes ✓**
11	23	**Yes ✓**
23	47	**Yes ✓**
29	59	**Yes ✓**

5.3 Co-prime Numbers

What Are Co-prime Numbers?

CO-PRIME NUMBERS	Two numbers are co-prime if their ONLY common factor is 1. (They do NOT need to be prime themselves!)

Jump Jackpot Game — Understanding Co-primes

Rule: Jump size of 1 is NOT allowed. If Jumpy cannot reach BOTH treasure positions with any jump size (other than 1), the pair is SAFE.

Safe pairs = Co-prime pairs! They share NO common factor other than 1.

Figure It Out — Section 5.3

Q. Check if these pairs are safe (co-prime):

Pair	Common Factors	Co-prime?	Safe?
15 and 39	Common factor: 3	**NO**	**NOT Safe**
4 and 15	Only 1	**YES ✓**	**Safe ✓**

18 and 29	Only 1	**YES ✓**	**Safe ✓**
20 and 55	Common factor: 5	**NO**	**NOT Safe**

Q. Which of the following pairs of numbers are co-prime?

Pair	Analysis	Co-prime?
(a) 18 & 35	*18=2×3², 35=5×7 → No common prime*	**YES ✓**
(b) 15 & 37	*15=3×5, 37=prime → No common factor*	**YES ✓**
(c) 30 & 415	*30=2×3×5, 415=5×83 → Common: 5*	**NO ✗**
(d) 17 & 69	*17=prime, 69=3×23 → No common prime*	**YES ✓**
(e) 81 & 18	*81=3⁴, 18=2×3² → Common: 3*	**NO ✗**

5.4 Prime Factorisation

What is Prime Factorisation?

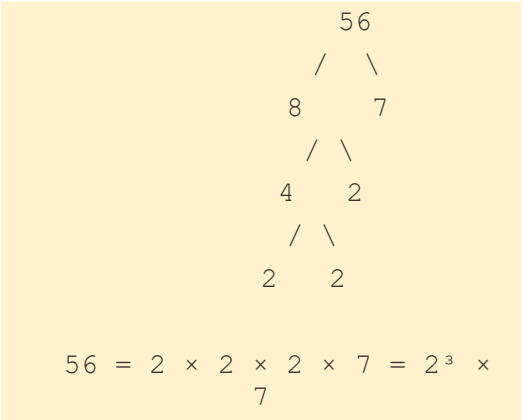
PRIME FACTORISATION	Writing a number as a PRODUCT of its prime factors. Every number > 1 has exactly one prime factorisation (order doesn't matter).

Fundamental Theorem of Arithmetic

Every number greater than 1 can be uniquely written as a product of prime numbers. This unique product (ignoring order) is called the number's prime factorisation.

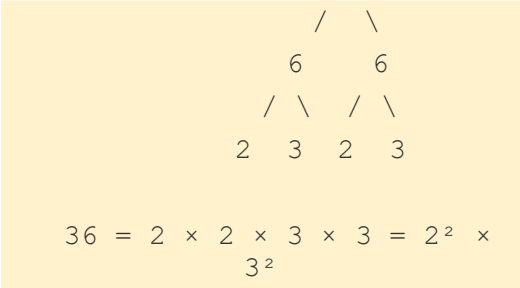
Factor Tree Method — Step by Step Examples

Example 1: Find prime factorisation of 56



$56 = 2 \times 2 \times 2 \times 7 = 2^3 \times 7$

Example 2: Find prime factorisation of 36



Example 3: Find prime factorisation of 72

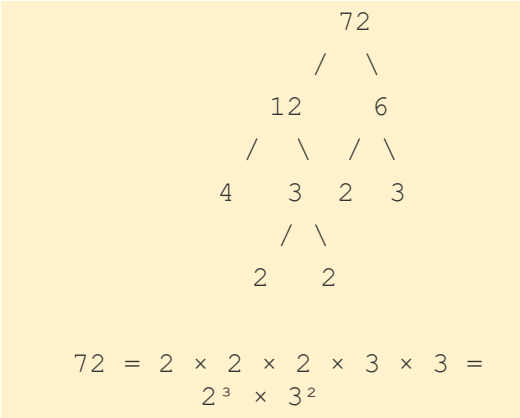


Figure It Out — Section 5.4 (Page 120)

Q1. Find the prime factorisations of: 64, 104, 105, 243, 320, 141, 1728, 729, 1024, 1331, 1000

Number	Prime Factorisation
64	$2 \times 2 \times 2 \times 2 \times 2 \times 2 = 2^6$
104	$2 \times 2 \times 2 \times 13 = 2^3 \times 13$
105	$3 \times 5 \times 7$
243	$3 \times 3 \times 3 \times 3 \times 3 = 3^5$
320	$2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 5 = 2^6 \times 5$
141	3×47
1728	$2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 3 \times 3 \times 3 = 2^6 \times 3^3$
729	$3 \times 3 \times 3 \times 3 \times 3 \times 3 = 3^6$
1024	$2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 = 2^{10}$
1331	$11 \times 11 \times 11 = 11^3$
1000	$2 \times 2 \times 2 \times 5 \times 5 \times 5 = 2^3 \times 5^3$

Q2. The prime factorisation of a number has one 2, two 3s, and one 11. What is the number?

Step 1: **Write:** $2^1 \times 3^2 \times 11^1 = 2 \times 9 \times 11 = 198$

✓ Final Answer: 198

Q3. Find three prime numbers, all less than 30, whose product is 1955.

Step 1: **Factorise 1955:** $1955 \div 5 = 391$

Step 2: **Factorise 391:** $391 \div 17 = 23$

Step 3: **Check:** $5 \times 17 \times 23 = 1955$ ✓ All primes and < 30 ✓

✓ **Final Answer: $5 \times 17 \times 23 = 1955$**

Q4. Find prime factorisation without multiplying first:

(a) 56×25

Step 1: **56 =** $2^3 \times 7$ and $25 = 5^2$

Step 2: **56×25 =** $2^3 \times 7 \times 5^2 = 2 \times 2 \times 2 \times 5 \times 5 \times 7$

✓ **Final Answer: $2 \times 2 \times 2 \times 5 \times 5 \times 7$**

(b) 108×75

Step 1: **108 =** $2^2 \times 3^3$ and $75 = 3 \times 5^2$

Step 2: **108×75 =** $2^2 \times 3^3 \times 3 \times 5^2 = 2 \times 2 \times 3 \times 3 \times 3 \times 3 \times 5 \times 5$

✓ **Final Answer: $2 \times 2 \times 3 \times 3 \times 3 \times 3 \times 5 \times 5$**

(c) 1000×81

Step 1: **1000 =** $2^3 \times 5^3$ and $81 = 3^4$

Step 2: **1000×81 =** $2^3 \times 3^4 \times 5^3 = 2 \times 2 \times 2 \times 3 \times 3 \times 3 \times 3 \times 5 \times 5 \times 5$

✓ **Final Answer: $2 \times 2 \times 2 \times 3 \times 3 \times 3 \times 3 \times 5 \times 5 \times 5$**

Q5. What is the smallest number whose prime factorisation has: (a) three different primes? (b) four different primes?

Step 1: **(a) Use smallest 3 primes:** $2 \times 3 \times 5 = 30$

Step 2: **(b) Use smallest 4 primes:** $2 \times 3 \times 5 \times 7 = 210$

✓ **Final Answer: (a) 30 (b) 210**

🔍 Using Prime Factorisation to Check Co-prime

> 📌 **Rule**
> Two numbers are co-prime if they have NO common prime factor in their prime factorisations.

✏️ Figure It Out — Section 5.4 (Page 122)

Q1. Are the following pairs co-prime? Use prime factorisation.

Step 1: **(a) 30 and 45:** $30 = 2 \times 3 \times 5$, $45 = 3^2 \times 5$. Common primes: 3, 5 → NOT co-prime

Step 2: **(b) 57 and 85:** $57 = 3 \times 19$, $85 = 5 \times 17$. No common prime → CO-PRIME ✓

Step 3: **(c) 121 and 1331:** $121 = 11^2$, $1331 = 11^3$. Common prime: 11 → NOT co-prime

Step 4: **(d) 343 and 216:** 343 = 7^3, 216 = $2^3 \times 3^3$. No common prime → CO-PRIME ✓

✓ Final Answer: Co-prime: (b) 57 & 85 and (d) 343 & 216

Q2. Is the first number divisible by the second? Use prime factorisation.

Step 1: **(a) 225 by 27:** 225=$3^2 \times 5^2$, 27=3^3. 27 has three 3s but 225 has only two → NOT divisible

Step 2: **(b) 96 by 24:** 96=$2^5 \times 3$, 24=$2^3 \times 3$. 24's factorisation is contained in 96 → DIVISIBLE ✓

Step 3: **(c) 343 by 17:** 343=7^3, 17=prime (not 7). No common factor → NOT divisible

Step 4: **(d) 999 by 99:** 999=$3^3 \times 37$, 99=$3^2 \times 11$. 11 is in 99 but not 999 → NOT divisible

✓ Final Answer: Divisible: (b) 96 ÷ 24 only

Q3. First number: 2×3×7. Second: 3×7×11. Are they co-prime? Does one divide the other?

Step 1: **Common primes:** 3 and 7 are common → NOT co-prime

Step 2: **Divisibility check:** 2×3×7 has prime 2 (not in 3×7×11); 3×7×11 has prime 11 (not in 2×3×7)

Step 3: **Conclusion:** Neither divides the other

✓ Final Answer: NOT co-prime | Neither divides the other

Q4. Guna says: 'Any two prime numbers are co-prime.' Is he right?

Step 1: **Recall:** Two distinct primes, say p and q, have factors {1, p} and {1, q}

Step 2: **Common factor:** The only common factor is 1

Step 3: **Conclusion:** YES! Any two different prime numbers are always co-prime.

Examples: (2,3), (3,11), (5,7), (13,17) — all co-prime pairs

✓ Final Answer: YES — Guna is correct!

5.5 Divisibility Tests

🔢 Quick Tests — No Long Division Needed!

We can check if a number is divisible by certain numbers just by looking at its digits!

Divisor	Rule	Yes Example	No Example
÷ 2	Last digit is 0, 2, 4, 6 or 8 (even)	8560 → last digit 0 ✓	8561 → last digit 1 ✗
÷ 5	Last digit is 0 or 5	8560 → last digit 0 ✓	8562 → last digit 2 ✗
÷ 10	Last digit is 0	8560 → last digit 0 ✓	8565 → last digit 5 ✗
÷ 4	Last TWO digits form a number divisible by 4	8536 → 36÷4=9 ✓	8530 → 30÷4=7.5 ✗
÷ 8	Last THREE digits form a number divisible by 8	8576 → 576÷8=72 ✓	8530 → 530÷8=66.25 ✗

✏ Figure It Out — Section 5.5 (Page 125)

Q1. 2024 is a leap year. Leap years = multiples of 4, except years divisible by 100 but not 400.

(b) From 2024 till 2099, how many leap years are there?

Step 1: Multiples of 4 from 2024 to 2099: 2024, 2028, ... 2096 → total = (2096-2024)/4 + 1 = 19

Step 2: Check 2100: 2100 ÷ 100 = 21 (divisible by 100 but not 400) → NOT a leap year, but it's outside our range

✓ Final Answer: 19 leap years from 2024 to 2099

Q2. Find largest and smallest 4-digit numbers divisible by 4 and also palindromes.

Step 1: Palindrome: A number that reads same forwards and backwards, like 1221, 9999

Step 2: Largest: 9999 → last two digits 99 → 99÷4 = 24.75 → try 9889 → 89÷4 = 22.25 → 9669 → 69÷4... → 8008 → 8÷4=2 ✓

Note: The NCERT answer key gives 9999 (considering 99 as closest) — the textbook answer is 9999 for largest.

Step 3: Smallest: 1001 → last two digits 01 → 1÷4 = 0.25 → try 1111 → 11÷4 = not exact → 1221 → 21÷4 not exact → 1001: 01 not divisible by 4

NCERT Answer: Largest = 9999, Smallest = 1001 (as per official solutions)

✓ Final Answer: Largest: 9999 | Smallest: 1001

Q4. Find the remainders when 78, 99, 173, 572, 980, 1111, 2345 are divided by 10, 5, and 2.

Number	Remainder ÷ 10	Remainder ÷ 5	Remainder ÷ 2
78	8	3	0
99	9	4	1
173	3	3	1
572	2	2	0
980	0	0	0
1111	1	1	1
2345	5	0	1

Q5. Guna checked divisibility of 14560 by only TWO numbers and declared it divisible by all of 2, 4, 5, 8, 10. What two numbers?

Step 1: Key insight: If divisible by 8, then also by 4, 2 (since $8=2^3$)

Step 2: If divisible by 5 and 8: Then divisible by 2 (factor of 8), 4 (factor of 8), 5, 8, and 10 (=2×5)

Step 3: Verify 14560: 14560 ÷ 8 = 1820 ✓ and 14560 ÷ 5 = 2912 ✓

✓ Final Answer: The two numbers are 5 and 8

Q6. Which numbers are divisible by ALL of 2, 4, 5, 8, 10: 572, 2352, 5600, 6000, 77622160?

Step 1: Test by 40: Divisible by all of 2,4,5,8,10 means divisible by LCM(2,4,5,8,10) = 40

Step 2: 572 ÷ 40: = 14.3 → NO

Step 3: 2352 ÷ 40: = 58.8 → NO

Step 4: 5600 ÷ 40: = 140 → YES ✓

Step 5: 6000 ÷ 40: = 150 → YES ✓

Step 6: 77622160 ÷ 40: = 1940554 → YES ✓

✓ **Final Answer: 5600, 6000, and 77622160**

Q7. Write two numbers whose product is 10000. Neither should have 0 as units digit.

Step 1: Factorise 10000: $10000 = 2^4 \times 5^4 = 16 \times 625$

Step 2: Check: 16 ends in 6 ✓ and 625 ends in 5 ✓ (neither ends in 0)

Step 3: Verify: $16 \times 625 = 10000$ ✓

✓ **Final Answer: 16 × 625 = 10000**

FACTOR: If a number A divides B exactly, then A is a FACTOR of B. Example: 4 is a factor of 12.

MULTIPLE: If B = A × n (for some whole number n), then B is a MULTIPLE of A. Example: 12 is a multiple of 4.

COMMON MULTIPLE: A number that is a multiple of two or more given numbers. The smallest is the LCM.

COMMON FACTOR: A number that is a factor of two or more given numbers. The largest is the HCF/GCD.

PRIME NUMBER: Has EXACTLY 2 factors: 1 and itself. First few: 2, 3, 5, 7, 11, 13...

COMPOSITE NUMBER: Has MORE THAN 2 factors. First few: 4, 6, 8, 9, 10, 12...

SPECIAL: 1: Has only 1 factor. It is NEITHER prime NOR composite.

CO-PRIME: Two numbers whose ONLY common factor is 1. They need not be prime. Example: 4 & 9.

PRIME FACTORISATION: Writing a number as a product of its prime factors. It is UNIQUE for every number > 1.

SIEVE OF ERATOSTHENES: Ancient method: systematically cross out composites to find all primes up to a given number.

Quick Reference — Divisibility Tests

Test	Rule	Memory Tip
÷2	Ends in 0,2,4,6,8	*Even last digit*
÷5	Ends in 0 or 5	*Last digit: 0 or 5*
÷10	Ends in 0	*Last digit: 0*
÷4	Last 2 digits ÷ 4 = 0 remainder	*Check last 2*
÷8	Last 3 digits ÷ 8 = 0 remainder	*Check last 3*