EdOS

Educational Operating System

5th CLASS

MATHEMATICS

OLYMPIAD EXPLORER

STUDY MATERIAL

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VOLUME - II

1. PLACE VALUE

LAKHS AND CRORES

7-Digit Numbers:

In the Indian numbering system, a 7-digit number would be written as a combination of numbers, grouped in sets of two, starting from the right. Here's an example:

If we take the number 12,34,567, it's a 7-digit number in the Indian numbering system.

The last two digits (67) represent the ones and tens place.

The middle two digits (34) represent the hundreds and thousands place.

The first two digits (12) represent the lakhs place.

So, in this example, the number "12,34,567" is a 7-digit number in the Indian system.

Place Value:

The place value for a 7-digit number is also determined by the position of each digit within the number
So a 7-digit number in the Indian place value system would be structured as follows:

Example: 12,34,567

Place value of 1: 1 is in the ten lakhs place (10,00,000)

Place value of 2: 2 is in the lakhs place (2,00,000)

Place value of 3: 3 is in the ten thousands place (30,000)

Place value of 4: 4 is in the thousandsplace (4000)

Place value of 5: 5 is in the hundreds place (500)

Place value of 6: 6 is in the tens place (60)

Place value of 7: 7 is in the ones place (7)

8-Digit Numbers:

An 8-digit number in the Indian numbering system would follow the same structure as a 7-digit number, with an additional position to the left.

Place Value:

So, an 8-digit number in the Indian numbering system would be structured as follows:

Example: 1,23,45,678

Place value of 1: 1 is in the crores place (1,00,00,000)

Place value of 2: 2 is in the ten lakhs place (20,00,000)

Place value of 3: 3 is in the lakhs place (3,00,000)

Place value of 4: 4 is in the ten thousands place (40,000)

Place value of 5: 5 is in the thousands place (5,000)

Place value of 6: 6 is in the hundreds place (600)

Place value of 7: 7 is in the tens place (70)

Place value of 8: 8 is in the ones place (8)

TEACHING TASK

MUTLIPLE CHOICE QUESTIONS:

1. What is the significance of the rightmost set of digits in a 7-digit Indian number?
   a) Represents the largest place value b) Represents the smallest place value
   c) Represents the middle place value
   d) Represents the second-largest place value
2. In a 7-digit Indian number, what do the last two digits represent?
   a) Tens and hundreds place b) Hundreds and thousands place
   c) Ones and tens place d) Thousands and ten thousands place
3. Which place does the digit '1' represent in the number 10,84,590?
   a) Ten Lakhs place b) Tens place c) Ones place d) Hundreds place
4. In the Indian numbering system, how does an 8-digit number differ from a 7-digit number?
   a) It has an additional position to the right
   b) It has an additional position to the left
   c) It has an additional position in the middle
   d) It doesn't differ, they are the same
5. How does the position of the digits change from a 7-digit number to an 8-digit number in the Indian numbering system?
   a) They shift one position to the right b) They shift one position to the left
   c) They remain in the same positions d) They alternate positions
6. What is the value of the digit 9 in 9,89,12,456?
   a) Crores b) Ten Lakhs c) Ten Thousands d) ones

ADVANCED LEVEL

MUTIPLE CORRECT ANSWER QUESTIONS:

7. What is true about the structure of an 8-digit number compared to a 7-digit number in the Indian numbering system?

A) It has an additional position to the right
B) It has an additional position to the left
C) It follows a different grouping pattern
D) It has the same structure but with a different order

8. How does the Indian numbering system determine the place value in a 7-digit number?

A) By the sum of the digits
B) By the sequence of the digits
C) By the grouping of the digits
D) By the position of the digits

FILL IN THE BLANKS:

9. The place value for any number is determined by the _____ of each digit within the number.
10. Moving from right to left, each set of two digits in an 8-digit number represents a _____ increase in place value.

MATCH THE FOLLOWING:

s.no	Column I	Column II
1.	The value of each digit in a number based on its position within the number.	a. Ten Thousand
2.	Place Value of 9 in 12, 90, 788	b. place value determination
3.	Place Value of 5 in 50,89,123	c. Ten Lakhs
		d. Thousands

ANSWER THE FOLLOWING QUESTIONS:

12. How does an 8-digit number differ from a 7-digit number in the Indian number ing system?
13. How is the place value system structured in the Indian numbering system for a 7-digit number?

LEARNER'S TASK

MULTIPLE CHOICE QUESTIONS:

1. Which of the following correctly describes the structure of a 7-digit Indian number?
   a) Ones, tens, hundreds, thousands, ten thousands, lakhs, crores
   b) Lakhs, ten thousands, thousands, hundreds, tens, ones, crores
   c) Ten Lakhs, lakhs, ten thousands, thousands, hundreds, tens, ones
   d) Crores, lakhs, ten lakhs, thousands, hundreds, tens, ones
2. What is the value of the leftmost set of digits in a 7-digit Indian number?
   a) Crores place b) Lakhs place c) Thousands place d) Ten lakhs place

3. Which place value does the digit '5' represent in the number 10,14,587?
   a) Tens place b) Hundreds place c) Ones place d) Ten thousands place
4. How many digits are there in an 8-digit number in the Indian numbering system?
   a) 6 b) 7 c) 8 d) 9
5. In the Indian numbering system, how does an 8-digit number differ from a 7-digit number?
   a) It has an additional position to the right
   b) It has an additional position to the left
   c) It has an additional position in the middle
   d) It doesn't differ, they are the same
6. Which of the following is true about an 8-digit number in the Indian numbering system?
   a) It always starts with a zero b) It always ends with a zero
   c) It can start with any digit other than zero
   d) It can end with any digit other than zero

ADVANCED LEVEL

(i) More Than One Answer Type questions:

7. What position does each set of digits represent in a 7-digit number, moving from right to left?
   A) Ones B) Tens C) Hundreds D) Thousands
8. What is the place value of 0 in 1,20,39,091
   A) Hundreds B) Lakhs C) Crores D) Ones

(ii) Fill in the Blanks:

9. The third set of digits in a 7-digit number, moving from right to left, represents the _____ place value.
10. The place value of third '9' from the left in the number 9,99,00,123 is_____

(iii) Match the Following

11.

s.no	Column I	Column II
1.	Similar structure to a 7-digit number with an added position to the left.	a. Tens
2.	Place Value of 8 in 5,12,90, 781	b. 8-digit number
3.	Place Value of 5 in 5,89,12,309	c. Crores
		d. Thousands

(iv) Answer the following Questions:

12. What is the purpose of the additional position in an 8-digit number in the Indian numbering system?
13. Can you describe the place value system for an 8-digit number in the Indian

numbering system?

INTERNATIONAL NUMBER SYSTEM

The international number system, also known as the International Numeral System, is a way of expressing numbers that is widely used across the globe, especially in science, engineering, and international finance. It is based on the decimal system
(base-10), which uses the digits 0 through 9. The system organizes numbers into groups of three digits, each group separated by commas, to make large numbers easier to read and understand.

Place Value:

Each digit in a number represents a specific value depending on its position. From right to left, the place values are units (ones), tens, hundreds, thousands, ten thousands, hundred thousands, millions, etc.
Names of Large Numbers:
1,000: Thousand
1,000,000: Million
1,000,000,000: Billion
1,000,000,000,000: Trillion
1,000,000,000,000,000: Quadrillion And so on.

Example:

Number: 1,234,567
1 is in the millions place.
234 is in the thousands place.
567 is in the units place.

TEACHING TASK

Mutiple Choice Questions:

1. How are numbers organized in the international number system?
   A) Into groups of two digits B) Into groups of three digits
   C) Into groups of four digits D) Into groups of five digits
2. What is used to separate groups of three digits in large numbers?
   A) Periods B) Colons C) Semicolons D) Commas
3. What is the place value of the digit 7 in the number 7,654,321?
   A) Millions B) Hundreds of thousands
   C) Tens of thousands D) Units (ones)

4. What is the smallest digit used in the International Number System?
   A) 1 B) 9 C) 0 D) 5
5. In the international number system, what is 1,000,000,000 called?
   A) Million B) Billion C) Trillion D) Quadrillion
6. The international number system is based on which numerical system?
   A) Binary system B) Octal system
   C) Decimal system D) Hexadecimal system

ADVANCED LEVEL QUESTIONS

(i) More Than One Answer Type Questions:

7. Which of the following are place values in the international number system?
a) Units b) Hundreds
c) Tens d) Ten Lakhs
8. Which of the following is true about the international number system?
a) It is used primarily in the United States.
b) It is widely used across the globe.
c) It is especially used in science and engineering.
d) It is based on the decimal system.

(ii) Fill In The Blanks:

9. From right to left, the place values are _____ (ones), _____, _____, _____, _____, hundred thousands, millions, etc.

10. The number 1,000,000,000,000 is called _____.

(iii) Match the Following:

11.

s.no	Column I	Column II
1.	Ones	a. Represents International System
2.	Millions	b. Represents the smallest value of decimal system
3.	Hundred Thousands	c. Represents Indian System
4.	Ten Lakhs	d. The place value that comes after millions (left to right)
		e. Represents the largest value of decimal system

(iv) Answer the following Questions:

12. What is the purpose of using commas in the International Numeral System?
13. What is the place value of each digit in a number?

Answer: From right to left, the place values are units (ones), tens, hundreds, thousands, ten thousands, hundred thousands, millions, etc.

LEARNER'S TASK

Multiple Choice Questions:

1. How are numbers read in the international number system?
   A) From left to right B) From right to left
   C) From middle to outward D) From outward to middle
2. What number is represented by 1,000,000 in the international number system?
   A) Million B) Billion C) Thousand D) Trillion
3. What is another name for the international number system?
   A) Global Number System B) International Numeral System
   C) Universal Number System D) Decimal Number System
4. In the number 546,789, what is the place value of the digit 5?
   A) Hundred thousands B) Thousands
   C) Hundreds D) Units (ones)
5. Represent the number 34478916 in international system ?
   A) 3,44,78,916 B) 34,47,89,16 C) 34,478,916 D) 34,478,91,6
6. What is the place value of 5 in 56,789,876?
   A) Million B) Ten Lakhs C) Ten Million D) Hundred Thousands

ADVANCED LEVEL QUESTIONS

(i) Mutiple Answer Type Questions:

7. Which of the following correctly shows the number 7,250,000 in words?
   a) Seven million two hundred fifty thousand
   b) Seven million two hundred and fifty thousand
   c) Seventy-two million five hundred thousand
   d) Seven million twenty-five hundred thousand
8. What are the place values from right to left in the International Number System?
   a) Units, tens, hundreds, thousands
   b) Hundreds, thousands, millions, billions
   c) Ones, tens, hundreds, thousands
   d) Tens, hundreds, thousands, millions

(ii) Fill In The Blanks:

9. The place value of the fourth digit from the right is _____.
10. Which place value comes after millions in the International Number System_____

(iii) Match The Following:

11.

s.no	Column I	Column II
1.	1,000,000	a. Hundred Thousand
2.	10,000,000	b. one million
3.	Place Value of 4 in 23,456,782	c. ten million
4.	Place Value of 5 in 1,305,124	d. Hundred
		e. Thousand

(iv) Answer the Following Questions:

12. How is the value of a digit determined in a number?
13. In which fields is the International Number System commonly used?

ROUNDING OF NUMBERS

Rounding off numbers is the process of approximating a numerical value to a certain degree of precision. This is often done to make numbers more manageable or easier to work with, especially when dealing with large or complex figures.

The rules for rounding off typically involve looking at the digit to the right of the desired precision point. If it's 5 or greater, you round up; if it's less than 5, you round down. If it's exactly 5, you round to the nearest even number.

TEACHER'S TASK

Multiple Choice Questions:

1. What are the rules for rounding off?
   a) Look at the digit to the left of the desired precision point
   b) Look at the digit to the right of the desired precision point
   c) Look at every digit in the number

d) Look at the first digit of the number

2. If the digit to the right of the desired precision point is exactly 5, what do you do?
   a) Round up
   b) Round down
   c) Keep the number the same
   d) Round to the nearest even number
3. Which of the following is NOT a reason for rounding off numbers?
   a) To approximate numerical values
   b) To make numbers more manageable
   c) To make numbers more complex
   d) To make numbers easier to work with
4. Round off 9,876 to the nearest 100.
   a) 9000 b) 9900 c) 9,976 d) None
5. Round off 87,388 to the nearest 1000
   a) 87,400 b) 87,000 c) 88,000 d) none
6. Round off 3350 to the nearest 100
   a) 3400 c) 3300 c) 3000 d) none

ADVANCED LEVEL QUESTIONS

(i) Multiple Correct Answer Type Questions:

7. Rounding off numbers helps in:
   a) Approximating numerical values
   b) Making calculations more complex
   c) Making large numbers easier to work with
   d) Increasing the exactness of numbers
8. Rounding off to a certain degree of precision means:
   a) Adjusting numbers to be less precise
   b) Approximating values for simplicity
   c) Looking at digits beyond the desired precision point
   d) Always increasing the number's value.

(iii) Fill In The Blanks:

9. If the digit to the right of the desired precision point is less than 5, you _____
10. 789,221 rounded off to nearest ten thousand is_____.

(iv) Match the following:

11.

s.no	Column I	Column II
1.	Rounding off	a.77000
2.	Digit is less than 5	b. the process of approximating a numerical value
3.	Digit is exactly 5	c. 76000
4.	76800 is rounded off to nearest thousand is	d. round to the nearest even number
		e. Adjust the number downwards

(v) Answer the following:

12. If the digit to the right of the precision point is 6, what should you do?
13. What does rounding down mean?

LEARNER'S TASK

Multiple Choice Questions:

1. What is rounding off numbers?
   a) Approximating numerical values crct b) Finding exact values
   c) Multiplying numbers d) Dividing numbers
2. Which digit is typically looked at when rounding off numbers?
   a) The digit to the left of the decimal point
   b) The digit to the right of the decimal point
   c) The first digit of the number d) The last digit of the number
3. Why is rounding off numbers often done?
   a) To make numbers smaller b) To make numbers larger
   c) To make numbers more manageable crct
   d) To make numbers more complex
4. What happens if the digit to the right of the desired precision point is less than 5 when rounding off numbers?
   a) Always round up b) Always round down crct
   c) Keep the number the same d) Round to the nearest even number
5. Round off 156 to the nearest 10
   a) 150 b) 157 c) 155 d) 160crct
6. Round off 12,659 to the nearest 1000

a) 13,000crct b) 12,600 c) 12,500 d)none

ADVANCED LEVEL QUESTIONS

(i) Multiple Correct Answer Type Questions:

7. Which of the following statements are true about rounding off numbers?
   a) It involves approximating values
   b) It always makes numbers smaller
   c) It simplifies working with large figures
   d) It makes numbers more complex
8. Which situations typically involve rounding off numbers?
   a) Dealing with large figures b) Handling complex calculations
   c) Simplifying exact values d) Converting fractions to decimals

(ii) Fill In the Blanks:

9. If the digit to the right of the desired precision point is exactly 5, you round to the nearest _____ number.
10. 6254 is rounded off to nearest hundred is_____.

(iii) Matching Type Questions:

11.

s.no	Column I	Column II
1.	2749817 is rounded off to nearest thousand is	a.500000
2.	537021 is rounded off to nearest lakh is	b. 410
3.	6384709 is rounded off to nearest lakh is	c. 2750000
4.	412 is rounded off to nearest ten is	d. 6400000
		e. 540000

(iv) Answer The Following Questions:

12. If the digit to the right of the precision point is 4, what should you do?
13. What does rounding up mean?

NUMBER PATTERNS

Number patterns are sequences of numbers that follow a specific rule or set of rules. These patterns can be simple or complex and can involve a variety of mathematical

operations. Here are some common types of number patterns:

Even and Odd Patterns:

Even numbers are divisible by 2, while odd numbers are not.

Example of even pattern: 2, 4, 6, 8, 10.

Example of odd pattern: 1, 3, 5, 7, 9.

Square Number Patterns:

Square numbers, also known as perfect squares, are numbers that can be expressed as the product of an integer with itself.

Here are the first few square numbers and their corresponding integer multipliers:

$1=1\times1$

$4=2\times2$

$9=3\times3$

$16=4\times4$

$25=5\times5$

Each square number is the sum of consecutive odd numbers. For example,

$1=1$, $4=1+3$, $9=1+3+5$, etc.

Triangular Number Patterns:

These numbers form a pattern with the sum of consecutive natural numbers.

Example: 1, 3, 6, 10, 15 (1+2=3, 1+2+3=6, 1+2+3+4=10, etc.).

TEACHER'S TASK

Mutiple Choice Questions:

1. What is the 4th square number?
   A) 9 B) 12 C) 16 D) 25
2. Which number is a perfect square?
   A) 8 B) 12 C) 15 D) 16
3. Which number is not part of the odd number pattern?
   A) 1 B) 4 C) 5 D) 9
4. What is the 3rd triangular number?
   A) 3 B) 6 C) 9 D) 12
5. Which of the following sequences lists the first four triangular numbers?
   A) 1, 2, 3, 4 B) 1, 3, 6, 10 C) 2, 4, 6, 8 D) 3, 6, 9, 12
6. Which triangular number is equal to the sum 1 + 2 + 3 + 4?
   A) 6 B) 10 C) 15 D) 20

ADVANCED LEVEL QUESTIONS

(i) Multiple Correct answer Type Questions:

7. Which of the following are square numbers?
   A) 1 B) 4 C) 8 D) 9
8. Which of the following statements about square numbers are true?
   A) Each square number is the sum of consecutive odd numbers
   B) They can never be negative

C) They are always prime
D) They are always odd

(ii) Fill In The Blanks:

9. Triangular number pattern: 1, ___, ___, ___, ___.
10. Square numbers are also known as ___.

(iii) Match the following:

11.

s.no	Column I	Column II
1.	1,4,9,16,25	a. Triangular Number Pattern
2.	1,3,5,7,9	b. Square Number Patterns
3.	1,2,3,4,5	c. Odd Number Patterns
4.	1,3,6,10,15	d. Not a Specific Pattern
5.	2,4,6,8,10	e. Even Pattern

(iv) Answer the following Questions:

12. Explain the relationship between square numbers and consecutive odd numbers.
13. What are triangular numbers and how are they formed?

LEARNER'S TASK

Multiple Choice Questions:

1. Which number is not part of the even number pattern:
   A) 2 B) 4 C) 7 D) 10
2. What is 5^2?
   A) 15 B) 20 C) 25 D) 30
3. What is the next square number after 9?
   A) 12 B) 15 C) 16 D) 20
4. What is the sum of the first 4 natural numbers?
   A) 6 B) 10 C) 15 D) 20
5. Which of the following is not a triangular number?
   A) 6 B) 10 C) 14 D) 21
6. Which sequence shows that each square number is the sum of consecutive odd numbers?
   A) 1 = 1, 4 = 1 + 2, 9 = 1 + 2 + 3 B) 1 = 1, 4 = 1 + 3, 9 = 1 + 3 + 5
   C) 1 = 1, 4 = 2 + 2, 9 = 3 + 3 + 3 D) 1 = 1, 4 = 1 + 4, 9 = 1 + 4 + 4

ADVANCED LEVEL QUESTIONS

(i) Mutiple correct Answer Type Questions:

7. Which of the following are examples of triangular number patterns?
   A) 2, 4, 6, 8, 10 B) 1, 3, 6, 10, 15 C) 1, 2, 4, 8, 16 D) 1, 3, 5, 7, 9

8. Which of the following statements about even and odd patterns are correct?
   A) Even numbers are divisible by 2.
   B) Odd numbers are divisible by 2.
   C) The even pattern starts with 1.
   D) The odd pattern includes prime numbers.

(ii) Fill In The Blanks:

9. Each square number is the sum of consecutive ___ numbers.
10. The triangular number 6 is the sum of _____

(iii) Match the Following:

11.

s.no	Column I	Column II
1.	Square number of 5	a.36
2.	Square number of 6	b.4
3.	16 is the square of which number	c. 2,4,6,8,10
4.	Even numbers from 1 to 10 are	d. 25
		e. 2,5,7,9,10

(iv) Answer The Following Questions:

12. Define square numbers and provide an example.
13. Give an example of a triangular number pattern

ROMAN NUMERALS

The Roman numeral system is based on a combination of letters from the Latin alphabet. Each letter represents a specific numeric value.
I: 1, V: 5, X: 10, L: 50, C: 100, D: 500, M: 1000
To form numbers in Roman numerals, different letters are combined, and the values are added together. There are some rules to follow:
If a smaller numeral is placed before a larger one, you subtract the smaller numeral's value from the larger one.
Example: IV represents 4 (5 - 1).

If a smaller numeral is placed after a larger one, you add the smaller numeral's value to the larger one.
Example: VI represents 6 (5 + 1).

The numerals I, X, C, and M can be repeated up to three times in succession.
Example: III represents 3.

The numerals V, L, and D cannot be repeated.

A bar over a numeral multiplies its value by 1000.

Using these rules, various numbers can be represented in Roman numerals. For example:

II represents 2

IX represents 9

XV represents 15

XL represents 40

LXX represents 70

CXC represents 190

DCC represents 700

TEACHER'S TASK

Multiple Choice Questions:

1. If a smaller numeral is placed after a larger one in Roman numerals, what operation is performed?

A) Subtraction B) Multiplication C) Addition D) Division

2. What does the Roman numeral XC represent?

A) 90 B) 100 C) 110 D) 80

3. What is the value of the Roman numeral DCC?

A) 500 B) 600 C) 700 D) 800

4. If the numeral V appears in a Roman numeral, how many times can it be repeated?

A) Once B) Twice C) Thrice D) It cannot be repeated

5. What is the value of the Roman numeral MMM?

A) 300 B) 1000 C) 2000 D) 3000

6. What does the Roman numeral CD represent?

A) 400 B) 100 C) 200 D) 500

ADVANCED LEVEL QUESTIONS

(i)Multiple Correct Answer type:

7. Which of the following sequences are valid Roman numerals?

A) XX B) VVV C) XL D) CC

8. Which of the following statements about Roman numerals is true?

A) The numerals V, L, and D can be repeated.

B) The numerals I, X, C, and M cannot be repeated.

C) A bar over a numeral divides its value by 1000.

D) Multiplication is performed when a smaller numeral is placed before a larger one.

(ii) Fill In The Blanks:

9.Write the roman numerals for odd numbers from 1 to 10_____

10. When there is bar over any roman numeral, the value of the number increase ___

times.

(iii) Match the Following:

11.

s.no	Column I	Column II
1.	Find a in XV-a=X	a.>
2.	Put the sign between these: XL_____XXX	b. 75
3.	The Indo-Arabic numeral for LXXV is	c. V
4.	DXLV means ___.	d. <
		e. 545

(iv) Answer the Following Questions:

12. Explain the rule for subtracting smaller numerals from larger ones in Roman numerals.

13. Write the following in Roman numerals:
(i) 1009 (ii) 3788 (iii) 906 (iv) 379

LEARNER'S TASK

Multiple Choice Questions:

1. Which numeral represents 1000 in Roman numerals?
A) M B) D C) C D) L
2. Which of the following sequences is not a valid Roman numeral?
A) VII B) IIII C) XXI D) XLV
3. What is the Hindu Arabic numerals for CXI?
A) 111 B) 101 C) 109 D) None
4. Choose the roman representation for 85?
A) LXXXV B) DXXV C) LXXV D) None
5. L+X+V=
A) XVIII B) LXV C) XXX D) LXX
6. Which of the following is greatest?
A) L B) LX C) C D) XXX

ADVANCED LEVEL QUESTIONS

(i) Multiple Correct Answer Type Questions:

7. Which of the following Roman numerals are correctly formed according to the rules?
   A) III B) VX C) XC D) LII
8. Which Roman numeral(s) can be repeated up to three times in succession?
   A) I B) X C) C D) M

(ii) Fill in the Blanks:

9.V+XXX=_____

10. If a smaller numeral is placed before a larger one, you _____ the smaller numeral's value from the larger one.

(iii) Match The Following:

11.

s.no	Column I	Column II
1.	8	a.16
2.	LX	b. VIII
3.	XVI	c. LXXX
4.	80	d. 60

(iv) Answer The Following:

12. Describe the rule for repeating numerals in Roman numerals.

13. Write the following in Roman numerals:

(i) 108 (ii) 218 (iii) 390

KEY

LAKHS AND CRORES

TEACHER'S TASK

1	2	3	4	5	6	7	8	9	10	11
B	C	A	B	B	A	B	C, D	Position	Tenfold	1-b, 2-a, 3-c

LEARNER'S TASK

1	2	3	4	5	6	7	8	9	10	11
C	D	B	C	B	C	A, B	A, B	Hundred's	Lakhs	1-b, 2-a, 3-c

INTERNATIONAL NUMBER SYSTEM

TEACHER'S TASK

1	2	3	4	5	6	7	8	9	10	11
A	D	A	C	B	C	A, b, c	B, c, d	units, tens, hundreds, thousands, ten thousand	Trillion	1-b, 2-a, 3-d, 4-c

LEARNER'S TASK

1	2	3	4	5	6	7	8	9	10	11
A	A	B	A	C	C	A, B	A, c	Thousand	Billions	1-b, 2-c, 3-a, 4-e

NUMBER PATTERNS
TEACHER'S TASK

1	2	3	4	5	6	7	8	9	10	11
C	C	B	B	B	B	A, B, D	A, B	3, 6, 10, 15	Perfect squares	1-b, 2-c, 3-d, 4-a, 5-e

LEARNER'S TASK

1	2	3	4	5	6	7	8	9	10	11
C	C	C	B	C	B	B, D	A, D	Odd	1,2,3	1-d, 2-a, 3-b, 4-c

ROUNDING OFF NUMBERS
TEACHER'S TASK

1	2	3	4	5	6	7	8	9	10	11
B	D	C	B	B	a	a, c	a, b, c	Round down	790,000	1-b, 2-e, 3-d, 4-a

LEARNER'S TASK

1	2	3	4	5	6	7	8	9	10	11
A	B	C	B	D	a	a, c	a, b	even	6300	1-c, 2-a, 3-d, 4-b

ROMAN NUMERALS
TEACHER'S TASK

1	2	3	4	5	6	7	8	9	10	11
C	A	C	D	D	A	A, C	B	II, IV, VI, VIII, X	1000	1-c, 2-a, 3-b, 4-e

LEARNER'S TASK

2. ADDITIONS AND SUBTRACTIONS

Addition is a basic arithmetic operation where two or more numbers are combined to find their total sum. In a 6-digit addition, you're adding numbers that have up to six digits each. Here's how it works with an example:

Let's take two 6-digit numbers:

```
  549823
+ 376594
 ----------
  926417
```

With Grouping:

To add these numbers, you start from the rightmost digit (units place) and work your way to the left, carrying over any extra values when necessary.

1. Adding the units (rightmost) column: 3 + 4 = 7. No regrouping needed.

```
  549823
+ 376594
 ----------
        7
```

Adding the tens column: 2 + 9 = 11. Since 11 is greater than 9, we regroup. We write down 1 in the tens place and carry over 1 to the next column.

```
  549823
+ 376594
 ----------
       17
```

Adding the hundreds column: 8 + 5 (from regrouped) + 6 = 14. Again, we regroup. Write down 4 in the hundreds place and carry over 1.

```
  549823
+ 376594
 ----------
      417
```

Adding the thousands column: 9 + 6 (from regrouped) + 7 = 18. Regrouping again, write down 6 in the thousands place and carry over 1.

```
  549823
+ 376594
 ----------
     6417
```

Adding the ten-thousands column: 4 + 7 (from regrouped) + 8 = 12. Regrouping once more, write down 2 in the ten-thousands place and carry over 1.

```
  549823
+ 376594
 ----------
    26417
```

Adding the hundred-thousands column: 5 + 3 (from regrouped) + 4 = 9.

```
   549823
+  376594
  ---------
   926417
```

So, the result of adding 549823 and 376594 is 926417.

With Out Regropuing:

L	TTh	Th	H	T	O
6	5	4	3	2	1
1	2	3	4	5	6
7	7	7	7	7	7

Example: Add 5,31,298, 2,42,367 and 2,10,002.

L	TTh	Th	H	T	O
			1	1	
5	3	1	2	9	8
2	4	2	3	6	7
2	1	0	0	0	2
9	8	3	6	6	7

So, 5,31,298 + 2,42,367 + 2,10,002 = 9,83,667.

SUBTRACTION

With Regroping Subtraction

```
   785432
-  246810
  ----------
   538622
```

Let's go through the process step by step:

Subtracting the units (rightmost) column: 0 from 2 equals 2. No regrouping needed.

```
   785432
-  246810
  ----------
         2
```

Subtracting the tens column: 1 from 3 equals 2. No regrouping needed.

```
   785432
-  246810
  ----------
        22
```

Subtracting the hundreds column: 8 from 4 is not possible without regrouping. We borrow 1 from the next higher column, making it 15 in the tens column.

```
      785432
-     246810
     -----------
          622
```

Subtracting the thousands column: 6 from 5 is not possible without regrouping.
Borrow 1 from the next higher column, making it 14 in the hundreds column.

```
  785432
- 246810
  ----------
     8622
```

Subtracting the ten-thousands column: 7 from 4 equals 3.

```
  785432
- 246810
  ----------
   538622
```

Subtracting the hundred-thousands column: 2 from 7 equals 5.

```
  785432
- 246810
  ----------
   538622
```

So, the result of subtracting 246810 from 785432 is 538622.

Example: Difference between 9,33,285 and 8,50,909

L	TTh	Th	H	T	O
9	3	3	2	8	5
8	5	0	9	0	9
0	8	2	3	7	6

TEACHING TASK

MULTIPLE CHOICE QUESTIONS

1. What is the sum of 234567 and 654321?
   a) 888888 b) 888878 c) 888788 d) 888898
2. Which of the following is the correct result of subtracting 345678 from 876543?
   a) 530865 b) 530875 c) 530865 d) 540865
3. What is the sum of 876543 and 234567?
   a) 1111100 b) 1111110 c) 1111010 d) 1111102
4. Which of the following is the correct result of subtracting 543210 from 987654?
   a) 444444 b) 444544 c) 444454 d) 444444

ADVANCED LEVEL

(I) MORE THAN ONE ANSWER TYPE

5. Which of the following are correct results of adding & subtracting 456789 and 123456?
   a) 580245 b) 333333 c) 579245 d) 569245
6. Which of the following are correct results of subtracting & adding 345678

from 987654?

a) 642876 b) 641976 c) 652876 d) 1333332

(ii) FILL IN THE BLANKS

7. ___ - ___ = 555555, where the first blank is 987654.
8. 666666 + ___ = 987754
9. ___ - ___ = 777777, where the first blank is 987654.

(iii) MATCHING TYPE QUESTIONS

10.

S.No	**Column I**	**Column II**
1.	987654 - 654321	a. 11,11,110
2.	987654 - 123456	b. 9,87,654
3.	987654 - 333333	c. 3,33,333
4.	456789 + 654321	d. 8,64,198
5.	456789 + 530865	e. 6,54,321

(iv) ANSWER THE FOLLOWING QUESTIONS

11. Find the sum.

a. 3,29,043 + 6,23,210
b. 7,53,129 +86,423
c. 48,443+5,15,078+5,233

12. Find the difference.

a. 8,95,009 - 6,38,999
b. 9,98,899 - 9,09,099
c. 8,18,354 - 39,009

LEARNER'S TASK

MULTIPLE CHOICE QUESTIONS

1. What is the sum of 456789 and 123456?
   a) 580245 b) 580235 c) 580345 d) 569245
2. Which of the following is the correct result of subtracting 345678 from 987654?
   a) 642876 b) 641976 c) 652876 d) 642786
3. What is the sum of 789012 and 345678?
   a) 1134690 b) 1131682 c) 1131692 d) 1131582
4. Which of the following is the correct result of subtracting 123456 from 654321?
   a) 530865 b) 531865 c) 520865 d) 530875

ADVANCED LEVEL

MORE THAN ONE ANSWER TYPE

5. Which of the following are correct results of adding & subtracting 876543

and 234567?

a) 1111100 b) 1111110 c) 1111010 d) 641976

6. Which of the following are correct results of subtracting & adding 123456 from 654321?

a) 530865 b) 531865 c) 777777 d) 530875

(ii) FILL IN THE BLANKS

7. ___ - ___ = 543210, where the first blank is 987654.
8. ___ + ___ = 987654, where the first blank is 456789.
9. ___ - ___ = 111111, where the first blank is 987654.

(iii) MATCHING TYPE

10.

S.No	**Column I**	**Column II**
1	123456+864200	A. 3,33,333
2	543210 + 444444	B. 4,44,444
3	333336 + 654321	C. 9,87,654
4	987654 - 543210	D. 9,87,656
5	987654 - 654321	E. 9,87,660

(iv) Answer the Following Questions

11. Find the sum.

a. 1,00,219 + 99,467
b. 1,84,999 + 2,99,999
c. 2,002 + 80,008 + 7,00,700

12. Find the difference

a. 8,18,354 - 4,91,652
b. 7,83,328 - 85,090
c. 7,55,506 - 4,34,443

PROFIT AND LOSS

Cost Price : it is the price at which a seller buys an object. it is written as cost price.

In this example, 25,000 is the cost price of the television set.

Selling Price : It is the price at which n object is sold to a customer. It is writ ten as selling price.

In this example, 27,000 is the selling price of the of the television set.

Finding Profit and Loss

Profit : If the selling price is greater than the cost price, the difference is called 'profit'.

When S.P > C.P , Profit = S.P - C.P.

Loss : If the cost price is greater than the selling price, the difference is called 'loss'.

When C.P > S.P, Loss = C.P - S.P.

Example 1: Harini bought a camera for 4,000 and sold it for 6,000. Find her Profit or Loss.

If selling price (S.P) > cost prise (C.P), there is profit.

Profit = 6000 - 4000
= 2000
Harini made a profit of 2000.

Example 2 : Deekshith bought a cycle for 6,000 and sold it for 5,000. Find his profit or loss.
The cost price of the cycle is 6,000 and the selling price is 5,000.
If cost price (C.P) > selling (s.p), there is loss.
Loss = 6000 - 5000
= 1000
Deekshith had a loss of 1,000.

Finding the Cost Price :
Particularly in the context of commerce and finance, finding the cost price (also known as the cost or purchase price) is a common task. The cost price refers to the price at which an item was originally purchased or acquired. Here's how you can find the cost price:
Cost Price = Selling Price - Profit (if any)
or
Cost Price = Selling Price + Loss (if any)
Let's go through an example:
Suppose you bought an item for $500 and sold it for $700. To find the cost price:
Cost Price = Selling Price - Profit
Cost Price = $700 - $500 = $200
In this case, the cost price of the item is $200.
If instead, you incurred a loss, the calculation would be:
Suppose you bought an item for $700 and sold it for $500. To find the cost price:
Cost Price = Selling Price + Loss
Cost Price = $500 + ($700 - $500) = $500 + $200 = $700
In this case, the cost price of the item is still $700.

Example : Sunitha sold a coffee mug for 80 and made a profit of 20. Find the cost price of the mug.
Cost price is the price at which sunitha had bought the coffee mug.
Selling price of the mug = 80
Profit = 20
So, sunitha made a profit of 20 after selling the mug at 80, then she had bought the mug for 60.
Cost price = Selling Price - Profit
= 80 - 20
= 60
The cost price of the mug is 60.

Finding the Selling Price :

The selling price refers to the price at which an item is sold. To find the selling price, you need to consider the cost price (the price at which the item was acquired), and any profit or loss incurred.

Here are the basic formulas to find the selling price:

1. **Selling Price with Profit:**
   Selling Price = Cost Price + Profit
2. **Selling Price with Loss:**
   Selling Price = Cost Price - Loss

Let's go through examples for both scenarios:

****Example 1:** Selling Price with Profit:**

Suppose you bought an item for $200 and you want to make a profit of $50. To find the selling price:

Selling Price = Cost Price + Profit

Selling Price = $200 + $50 = $250

So, the selling price of the item would be $250.

Example 2: Selling Price with Loss:

Suppose you bought an item for $300 and you incurred a loss of $50. To find the selling price:

Selling Price = Cost Price - Loss

Selling Price = $300 - $50 = $250

So, the selling price of the item, in this case, would also be $250.

Example : A florist bought a bouquet for 100. on selling it, he made a profit of 10. find the price price at which he sold the bouquet.

Selling price is the price at which the florist sold the bouquet .

Cost price of the bouquet = 100

profit = 10

If he made a profit of 10 on the bouquet , which he had bought for 100, then he sold the bouquet for 110.

Selling price = Cost price + Profit

= 100 + 10 = 110

TEACHING TASK

MULTIPLE CHOICE QUESTIONS

1. What is loss?
   a) Revenue minus cost b) Cost minus revenue
   c) Revenue plus cost d) Cost divided by revenue
2. What is the formula to find profit?
   a) Selling Price - Cost Price b) Cost Price - Selling Price
   c) Selling Price + Cost Price d) Cost Price / Selling Price
3. If the cost price of an item is $200 and the selling price is $150, what is the loss?
   a) $50 b) $100 c) $150 d) $200
4. If the cost price of an item is $250 and the profit is $50, what is the selling

price?

a) $200 b) $250 c) $300 d) $350

5. If the selling price of an item is $350 and the loss is $50, what is the cost price?

a) $300 b) $350 c) $400 d) $450

ADVANCED LEVEL

MORE THAN ONE ANSWER TYPE

6. Which of the following formulas are incorrect for calculating profit?
   a) Profit = Selling Price - Cost Price
   b) Profit = Cost Price - Selling Price
   c) Profit = Revenue - Cost Price
   d) Profit = Cost Price - Revenue
7. Which of the following statements about profit is/are true?
   a) Profit is the financial gain obtained when revenue exceeds expenses.
   b) Profit is calculated as Selling Price minus Cost Price.
   c) Profit can be expressed as a percentage of the Cost Price.
   d) Profit is calculated as Cost Price minus Selling Price.

FILL IN THE BLANKS

8. If the cost price is $200 and the profit is $50, then the selling price is $___.
9. If the selling price is $500 and the loss is $100, then the cost price is $___.

MATCHING TYPE

10.

S.No	Column I	Column II
1	Financial gain obtained when revenue exceeds expenses	A. Cost Price
2	Financial loss incurred when expenses exceed revenue	B. Selling Price
3	Price at which an item is originally acquired	C. Loss
4	Price at which an item is sold	D. Profit

(iv) ANSWER THE FOLLOWING QUESTIONS

11. Find the profit or loss c.p = 43000, s.p = 42500
12. Find the cost price if s.p = 2,200 and loss = 100
13. Find the selling price if c.p = 5,600 and loss = 400
14. A refrigerator was bought for 25,000 and sold at a loss of 5000. Find the selling price of the refrigetor.

LEARNERS TASK

MULTIPLE CHOICE QUESTIONS

1. What is profit?

a) Revenue minus cost b) Cost minus revenue
c) Revenue plus cost d) Cost divided by revenue

2. What is the formula to find loss?
a) Selling Price - Cost Price b) Cost Price - Selling Price
c) Selling Price + Cost Price d) Cost Price / Selling Price

3. If the cost price of an item is $100 and the selling price is $150, what is the profit?
a) $50 b) $100 c) $150 d) $200

4. If the cost price of an item is $300 and the loss is $50, what is the selling price?
a) $200 b) $250 c) $300 d) $350

5. If the selling price of an item is $400 and the profit is $100, what is the cost price?
a) $300 b) $350 c) $400 d) $450

ADVANCED LEVEL

(i) MORE THAN ONE ANSWER TYPE

6. Which of the following statements about loss is/are true?
a) Loss occurs when expenses exceed revenue.
b) Loss is calculated as Cost Price minus Selling Price.
c) Loss can be expressed as a percentage of the Selling Price.
d) Loss is calculated as Selling Price minus Cost Price.

7. When calculating profit, which of the following should be considered?
a) Cost Price b) Selling Price c) Loss d) Revenue

(ii) FILL IN THE BLANKS

8. If the selling price is $400 and the profit is $80, then the cost price is $___.
9. If the cost price is $300 and the loss is $60, then the selling price is $___.

(iii) MATCHING TYPE

10.

S.No	Column I	Column II
1	Profit = Selling Price-Cost Price	A. Formua to calculate cost price
2	Loss = Cost Price - Selling Price	B. Formual to calculate profit
3	Cost Price = Selling Price - Profit	C. Formual to calculate selling price
4	Selling Price = Cost Price + Profit	D. Formula to calculate loss

(iv) Answer the Following Questions

11. Find the profit or loss c.p = 19,750, s.p = 20,550
12. Find the cost price if s.p = 150 and profit = 20
13. Find the selling price if c.p = 11,300 and profit = 700
14. Avinash sold a scooter for 40,000 at a loss of 4000.Find the cost price of the scooter.

3. MULTIPLICATION AND DIVISION

Multiplication Of 5-Digt Numbers

Multiplying By a 2- Digit Number

Example Multiply 37581 × 83
Arrange the numbers in columns.
Multiply the multiplicand wuth the ones digit and the tens digit of the multiplier.
Add both the products

```
     37581 ×  83 = 31,19,223
           37581
            ×  83
    ------------------
          112743
    +   300648
------------------------
        3119223
------------------------
```

Multiplying By a 3- Digit Number

Example Multiply 46499 × 851
Arrange the numbers in columns.
Multiply the multiplicand with the ones digit, tens digit, and the hundreds digit of the multiplier.
Add all the products.

```
  46499 × 851
     46499
   ×   851
--------------------
       46499
   232495
371992
--------------------
 39570649
--------------------
```

Mutiplication by Multiples of 10, 100, and 1000

11232 × 40 = 11232 × 4 tens = 44928 tens = 4,49,280
11232 × 400 = 11232 × 4 hundreds = 44928 hundreds = 44,92,800
11232 × 4000 = 11232 × 4 thousands = 44928 thousands = 4,49,28,000

Multiplying with Zeros in the Multiplier

Example Multiply: 25062 × 306
Multiply by 6 ones.
Multiply by 0 tens.
Multiply by 3 hundreds.
Since multiplying by 0 gives 0, we can multiply by ones and hundreds only,taking

care of the place value.
Add the products.
25062 × 306 = 76,68,972

```
   25062
   ×  306
-------------
     150372
     00000
    75186
-----------------
  76,68,972
-----------------
```

TEACHING TASK

Multiple Choice Questions

1. What is the product of 14567 and 236?
   a) 3237128 b) 3437812
   c) 3452879 d) 3325487
2. What is the product of 98461 by 300?
   a) 29538300 b) 29854700
   c) 28534300 d) 29702300
3. What is the result of multiplying 54321 by 567?
   a) 30820907 b) 30820087
   c) 30800007 d) 30820797
4. When you multiply 54321 by 999, what is the product?
   a) 54257679 b) 54257779
   c) 54257689 d) 54266679

ADVANCED LEVEL

MORE THAN ONE ANSWER TYPE

5. When multiplying a 5-digit number by a 3-digit number, which of the follow ing can be the result?
   a) A 7-digit number b) A 6-digit number
   c) A 5-digit number d) A 4-digit number
6. Which of the following are possible products when multiplying by multiples of 10?
   a) A product with an additional zero at the end
   b) A product with the same digits as the multiplicand
   c) A product with one less zero at the end
   d) A product with one more digit than the multiplicand

FILL IN THE BLANKS

7. 46355 × 32=----------

8. 54321 × ___ = 4,83,45,690

MATCHING TYPE

9.

S.No	Column I	Column II
1	58274 × 45	A. 1733567
2	46829 × 270	B. 7070400
3	92486 × 100	C. 12643830
4	14327 × 121	D. 2622330
5	78560 × 90	E. 9248600

ANSWER THE FOLLOWING QUESTIONS

10. Find the product multiply.

i) 53375 × 36

ii) 87083 × 68

iii) 66390 × 551

iv) 31905 × 468

v) 70772 × 800

vi) 81229 × 2000

LEARNER'S TASK

MULTIPLE CHOICE QUESTIONS

1. What is the product of 54321 and 23?
   a) 1250883 b) 1249863
   c) 1250663 d) 1249383
2. When you multiply 54321 by 100, what is the product?
   a) 5432700 b) 5432100
   c) 54321 d) 543210
3. When you multiply 43215 by 0, what is the result?
   a) 0 b) 94321
   c) 5235710 d) 9832100
4. When you multiply 75367 by 45, what is the product?
   a) 3391624 b) 3387452
   c) 3391515 d) 3452670

ADVANCED LEVEL

MORE THAN ONE ANSWER TYPE

5. When multiplying a 5-digit number by 100, what are the possible outcomes?
   a) A 7-digit number b) A 6-digit number
   c) A 5-digit number d) A 4-digit number
6. What are the possible products of multiplying a 5-digit number by a 2-digit number?
   a) A 7-digit number b) A 6-digit number
   c) A 5-digit number d) A 4-digit number

FILL IN THE BLANKS

7. 19455 × 26 =----------
8. 40951 × 500=----------

MATCHING TYPE

9. S.No	Column A	Column B
1	98765 × 123	A. 53581034
2	99593 × 538	B. 2237952
3	11904 × 188	C. 12148095
4	77238 × 0	D. 4304289
6	81213 ×53	E. 0

ANSWER THE FOLLOWING QUESTIONS

10. Find the product multiply.

93691 × 34
75991 × 53
76508 × 312
66390 × 551
68871 × 900
54062 × 3000

DIVISION

Division is an arithmetic operation that represents the process of distributing or partitioning a quantity into equal parts.

Example Divide: 85831 ÷ 43

```
   43 | 8 5 8 3 1 |1 9 9 6
        4 3
       ---------------

         4 2 8
         3 8 7
       ------------
            4 1 3
            3 8 7
      -------------------
                2  6  1
                2  5  8
       ------------------
                     3
```

85831 ÷ 43 = 1996, Remainder = 3

you can also check the answer as given below.

Quotient × Divisor + Remainder = Dividend

(1996 × 43) + 3 = 85831
85828 + 3 = 85831

AVERAGE

Average is the calculated central value of a set of numbers. To find the average, follow

these steps.
1. List the items.
2. Add all the items.
3. Divide the sum by the number of items added.
The Formula for fining the average is

$$Average = \frac{Sum of items}{Number of items}$$

Examples : Consider a set of numbers: 10, 15, 20, 25, 30.
To find the average of these numbers, we sum them up:
Sum of numbers = 10 + 15 + 20 + 25 + 30 = 100
Then, we divide the sum by the number of values (which is 5 in this case):
Average = 100 / 5 = 20
So, the average of the numbers 10, 15, 20, 25, and 30 is 20.

Suppose we want to find the average score of five students in a class. Their scores are as follows: 85, 92, 78, 88, and 90.
To find the average score, we first sum up all the scores:
Sum of scores = 85 + 92 + 78 + 88 + 90 = 433
Then, we divide the sum by the number of values (which is 5 in this case):
Average = 433 / 5 = 86.6
So, the average score of the five students is 86.6.

TEACHING TASK

MULTIPLE CHOICE QUESTIONS

1. Divide 75,289 by 39.
   A) 1930 remainder 20 B) 1932 remainder 24
   C) 1933 remainder 16 D) 1934 remainder 28
2. If a farmer has 48624 eggs and wants to pack them into cartons, each con taining 6 0 eggs, how many cartons will the farmer need?
   A) 690.54 B) 810.4
   C) 105.2 D) 1200
3. If there are 30 930 students in a college and they are to be divided into groups of 54 for a project, how many groups will there be?
   A) 490 B) 573 C) 600 D) 582
4. Find the average of 50, 75, and 100.
   A) 66 B) 75 C) 80 D) 85

ADVANCED LEVEL

MORE THAN ONE ANSWER TYPE

5. Which of the following results in a reminder of 0 when dividing a 5-digit number by a 2-digit number?
   A) 96,244 ÷ 20 B) 96,480 ÷ 20

C) 96,968 ÷ 20 D) 97,200 ÷ 20

6. Choose the divisions that doens't result in a quotient of 3,924.
   A) 98,100 ÷ 25 B) 98,760 ÷ 25
   C) 98,400 ÷ 25 D) 99,060 ÷ 25
7. Identify the sets whose average is 36.
   A) {30, 40, 50} B) {20, 30, 40}
   C) {35, 40, 45} D) {25, 30, 35}
8. Choose the sets with an average of 55.
   A) {50, 60, 70} B) {40, 50, 60}
   C) {45, 55, 65} D) {35, 45, 55}

FILL IN THE BLANKS

9. 50002 ÷ 50 = ----------
10. 96509 ÷ 24=----------
11. 86711 ÷ 37 =----------

MATCHING TYPE

12.

S.No	Column A	Column B
1	1550÷55	A. 85.5
2	1440÷12	B. 151
3	2080÷15	C. 138.66
4	906 ÷ 6	D. 120
5	684 ÷8	E. 28.18

ANSWER THE FOLLOWING QUESTIONS

13. Divide and check the answer.
a. 85248 ÷ 22 b. 56536 ÷ 75 c. 54416 ÷ 68

14. Find the average of the given numbers.
a. 9,18,27,36,45,54, 63
b. 7,5,4,3,2,3

LEARNER'S TASK

MULTIPLE CHOICE QUESTIONS

1. Divide 72,548 by 24.
   A) 3014 remainder 16 B) 3012 remainder 20
   C) 3146 remainder 12 D) 3018 remainder 8
2. Divide 84,329 by 57.
   A) 1477 remainder 10 B) 1479 remainder 11
   C) 1476 remainder 9 D) 1475 remainder 12
3. If a baker uses 120 grams of flour for one loaf of bread, how many loaves can they make with 12,000 grams of flour?

A) 80 B) 100 C) 120 D) 140

4. Find the average of 36, 54, and 72.
A) 50 B) 60 C) 70 D) 54

ADVANCED LEVEL

MORE THAN ONE ANSWER TYPE

5. Which sets have an average of 25?
A) {20, 25, 30} B) {15, 25, 35}
C) {30, 35, 40} D) {10, 25, 40}

6. Identify the sets with an average of 70.
A) {65, 70, 75} B) {55, 65, 75}
C) {60, 70, 80} D) {50, 60, 70}

7. Choose the divisions that yield a quotient of 7,524.
A) 150,480 ÷ 20 B) 150,960 ÷ 20
C) 151,200 ÷ 20 D) 151,680 ÷ 20

8. Select the divisions that result in a quotient of 9,237.
A) 184,740 ÷ 20 B) 184,740 ÷ 21
C) 184,740 ÷ 22 D) 184,740 ÷ 23

FILL IN THE BLANKS

9. 73573 ÷ 33 =----------
10. 40987 ÷ 36=----------
11. 77077 ÷ 77 =----------

MATCHING TYPE

12.

S.No	Column A	Column B
1	1230 ÷ 6	A. 80
2	840 ÷ 8	B. 25
3	960 ÷ 12	C. 205
4	75 ÷ 3	D. 2000
5	10000 ÷ 5	E. 105

ANSWER THE FOLLOWING QUESTIONS

13. Divide and check the answer.
a. 77551 ÷ 23 b. 63135 ÷ 38 c. 83458 ÷ 34

14. Find the average of the given numbers.
a. 12,8,4,16,10
b. 11,22,33,44,55,66,77

4. TYPES OF NUMBERS

NATURAL NUMBERS

Natural Numbers:

The counting numbers are known as natural numbers.

Ex : 1, 2, 3, 4, 5 .....

Properties Of Natural Numbers:

i) The first and the smallest natural number is 1.

ii) Every natural number (except 1) can be obtained by adding 1 to the previous natural number i.e., the difference between any two consecutive natural numbers is 1.

iii) For the natural number 1, there is no previous natural numer.

iv) There is no last or greatest natural number.

v) We cannot c omplete the counting of all natural numbers. We express this fact by saying that there are infinitely many natural numbers.

SOLVED EXAMPLES

Example 1 :

Is 0 a natural number?

Solution:

0 is not a natural number.

Natural numbers start from 1.

Example 2 :

Is 1.5 a natural number?

Solution:

1.5 is not a natural number because natural numbers are always whole numbers (no decimals).

Example 3 :

What is the difference between the largest and smallest number in the list: 3, 5, 7, 2, 9

Solution:

Largest = 9, Smallest = 2

Difference = 9 – 2 = 7

Example 4 :

Can the difference of two natural numbers be a natural number?

Solution:

Sometimes yes, sometimes no.

Example:

7 – 4 = 3, Which is a natural number

But 4 – 7 = –3 , which is not a natural number.

WHOLE NUMBERS

Whole numbers :

The natural numbers together with '0' are known as whole numbers.

Ex : 0, 1, 2, 3 .....

Properties of Whole numbers:

i) The number zero is the first and the smallest whole number.

ii) There is no last or greastest whole number.

iii) There are infinitely many or uncountable numbers of whole numbers.

iv) All natural numbers are whole numbers.

v) All whole numbers are not natural numbers. For example , 0 is a whole number but it is not a natural number.

SOLVED EXAMPLES

Example 1 :

Is –1 a whole number?

Solution:

–1 is not a whole number.

Whole numbers are non-negative only (no negatives).

Example 2 :

Is every whole number also a natural number?

Solution:

Every natural number is a whole number,

but 0 is not a natural number, so not every whole number is a natural number.

Example 3 :

Is subtraction of two whole numbers always a whole number?

Solution:

Not always.

Example:

5 – 2 = 3, which is a whole number.

But 2 – 5 = –3, which is not a whole number.

Example 4 :

Can a whole number be a decimal or fraction?

Solution:

Whole numbers are complete numbers without fractions or decimals.

Example: 3.5 and ½ are not whole numbers.

EVEN NUMBERS

Even numbers :

The numbers when divided by 2 give the remainder as '0' are known as even numbers.

Ex : 2, 4, 6 .....

'0' is also an even number

Properties Of Even Numbers :

1. Numbers that can be expressed in the form of 2n, where 'n' is a whole number.
2. Numbers that can be divided into two equal parts.
3. When we divide an even number by 2, we get the remainder 0.
   Examples: 2, 4, 18, 26,...
4. All numbers ending with 0, 2, 4, 6, 8 are referred to as even numbers
5. The sum of two even numbers is always even
6. The product of two even numbers is always even.

SOLVED EXAMPLES

Example 1 :

Write the first five even numbers.

Solution:

The first five even numbers are: 0, 2, 4, 6, 8

Example 2 :

Can an even number end with 5?

Solution:

No. An even number must end in 0, 2, 4, 6, or 8.
Since 5 is not in this list,
A number ending in 5 is not even.

Example 3 :

Is 2 the smallest even number?

Solution:

No. The smallest even number is 0.

Example 4 :

What is the difference between two even numbers: 14 – 6?

Solution:

$14 - 6 = 8 \Rightarrow$ 8 is an even number
Property: Even – Even = Even.

ODD NUMBERS

Odd numbers :

The numbers when divided by 2 given the remainder as '1' are known as odd numbers.

Ex : 1, 3, 5, ...

Sum of first 'n' odd natural numbers is n^2

Sum of first 'n' even natural numbers is n (n+1)

Properties Of Odd Numbers :

1. Numbers that can be expressed in the form of 2n + 1, where 'n' is a whole number.
2. Numbers that cannot be divided into two equal parts.
3. When we divide an odd number by 2, we get the remainder 1.
   Examples: 1, 5, 7, 9, 23,...
4. All numbers ending with 1, 3, 5, 7, 9 are referred to as odd numbers.
5. The sum of two odd numbers is always even
6. The product of two odd numbers is always odd

SOLVED EXAMPLES

Example 1 :

Write the first five odd numbers.

Solution:

The first five odd numbers are: 1, 3, 5, 7, 9

Example 2 :

Can an odd number end with 0?

Solution:

Odd numbers must end in 1, 3, 5, 7, or 9.

Numbers ending in 0 are even numbers, not odd numbers.

Example 3 :

Is 0 an odd number?

Solution:

0 is divisible by 2,

0 is even number, not odd number.

Example 4 :

What is the difference between two odd numbers: 15 and 7?

Solution:

15 – 7 = 8, 8 is an even number.

Property: Odd number– Odd number = Even number

SUCCESSOR AND PREDECESSOR

Successor And Predecessor:

The **successor** of a number is 1 more than the number and **predecessor** of a number is 1 less than then number.

Ex 1. The successor of the number 6 is 6 + 1 = 7.
The predecessor of the number 6 is 6–1 = 5.

Ex 2. The successor of the number 36 is 36+1 = 37
The predecessor of the number 6 is 36–1 = 35.

Ex 3. The successor of the number -116 is -116+1 = -115
The predecessor of the number -116 is -116–1 = -117

Note:

The successor of a is a + 1.
The predecessor of a is a - 1.

SOLVED EXAMPLES

Example 1:

Find the successor and predecessor of 350.

Solution:

Successor of 350 = 350 + 1 = 351
Predecessor of 350 = 350 – 1 = 349

Example 2:

If the successor of a number is 501, what is the number?

Solution:

Let the number be x. Then,
$x + 1 = 501 \Rightarrow x = 500$

Example 3:

What is the successor of the largest 2-digit number?

Solution:

The largest 2-digit number is 99.
Successor of 99 = 99 + 1 = 100

Example 4:

What is the predecessor of the smallest 3-digit number?

Solution:

The smallest 3-digit number is 100.
Predecessor of 100 = 100 – 1 = 99

CDF POINTS

1. Natural numbers : The counting numbers are known as natural numbers.
2. Whole numbers : The natural numbers together with '0' are known as whole

numbers.

3. Even numbers : The numbers which are exactly divisible by '2'are known as even numbers. A set of even numbers is denoted by the letter 'E'.
4. Odd numbers : The numbers when divided by 2 given the remainder as '1' are known as odd numbers.
5. Successor and Predecessor: The successor of a number is 1 more than the number and predecessor of a number is 1 less than then number.

TEACHING TASK

JEE MAINS LEVEL QUESTIONS

Multiple Choice Type:

1. If John buys twenty-two apples on Monday and thirty four bananas on Tues day, how many pieces of fruits does John have?
   A) 65 B) 56 C) 46 D) 45
2. If m, n and p are odd integers, which of the following must be an odd integer?
   A) m(n+p) B) m x p x (n-1) C) (m-2)n x p D) (m+1) x n
3. If x and y are even integers which of the following must be an odd
   A) $x \times y$ B) $\frac{x}{y}$ C) $(x-1)(y+1)$ D) None of these
4. What is the 10^{th} odd natural number?
   A) 17 B) 19 C) 21 D) 23
5. Numbers that end with the digit 0, 2, 4, 6, 8 are
   A) even B) odd C) even or odd D) None of these

JEE ADVANCED LEVEL QUESTIONS

Multiple Correct type:

1. The numbers which are not divided by 2 are
   A) 4321 B) 9322 C) 5928 D) 8237

Statement Type:

A) Both Statements are True.
B) Both Statements are False.
C) Statement - I is True, Statement - II is False.
D) Statement - I is False, Statement - IIis True.

2. **Statement I :** n is a whole number.
   Statement II : If n = 10, 2n + 1 is an odd number.

Comprehension Type :

The number which ends with 0, 2, 4, 6 or 8 is divisible by 2 and is known as an even number.

3. Which of the following is an even?
   A) 52 B) 97 C) 285 D) 129
4. The number which is an even in the following?
   A) 139 B) 337 C) 334 D) 475

Integer Type :

5. An odd number between 19 and 22 is.

Matrix Matching Type :

6.

Column I	**Column II**
a) Sum of first n odd natural numbers is	p) even
b) Sum of first 'n' even natural numbers is	q) odd
c) Product of any two even numbers is	r) n^2
d) Product of any two odd numbers is	s) n (n + 1)

LEARNERS TASK

CONCEPTUAL UNDERSTANDING QUESTIONS (CUQ's)

Multiple Choice Type :

1. x and y are the whole numbers then ' x + y ' is .....
   A)A natural number B)not a whole number
   C)a whole number D)not an integer
2. Zero is divided by any whole number is ....
   A)0 B)1 C)-1 D)Not defined
3. Division by zero is .....
   A)0 B)1 C)-1 D)Not defined
4. Which of the following natural number does not have a predecessor.....
   A)1 B)2 C)3 D)4
5. Which of the following statements isfalse.....
   A) The difference between two whole numbers is a whole number.
   B) '0' is the least number in the natural number system.
   C) Whole numbers starts with 'one'.
   D) All the above

ADDITIONAL QUESTIONS

Multiple Choice Type :

1. Successor of 32 is
   A) 32 B) 33 C) 31 D) -32
2. Predecessor of 65 is
   A) -65 B) 64 C) 66 D) 61
3. Sum of one even and one odd number is always
   A) odd B) even C) 0 D) None
4. Product of an even and an odd is always
   A) -1 B) 0 C) odd D) even
5. General form of an even number is (where n is a whole number)
   A) $\frac{n}{2}$ B) 2n-1 C) 2n D) 2n +1

JEE MAINS LEVEL QUESTIONS

Multiple Choice Type :

1. Which of the following is NOT an odd number?
   A) 225 B) 233 C) 370 D) 391

2. Which number is an even number?
   A) 23 B) 19 C) 24 D) 31
3. Even numbers are always divisible by which number?
   A) 5 B) 4 C) 3 D) 2
4. Find the odd number.
   A) 458 B) 372 C) 427 D) 260
5. Which set of numbers contains only ODD numbers?
   A) 38, 40,, 51, 61, 83 B) 29, 46, 55, 77, 88
   C) 30, 41, 53, 55, 98 D) 47, 51, 73, 89, 95

JEE ADVANCED LEVEL QUESTIONS

Multiple Correct Type:

1. Which of the following are odd natural numbers?
   A) 321 B) 479 C) 200 D) 598

Statement Type:

A) Both Statements are True.
B) Both Statements are False.
C) Statement - I is True, Statement - II is False.
D) Statement - I is False, Statement - IIis True.

2. **Statement I :** General form of an even number is 2n.Where n is a whole number.
   Statement II : 48 is an even number

Comprehension Type :

The product of an even, an odd and an even number is even
i.e., even $\times$ odd $\times$ even = even
The product of an odd, an even and an odd number is even.
i.e., odd $\times$ even $\times$ odd = even

3. $16 \times 733 \times 42$ is
   A) even B) odd C) even or odd D) None
4. $2025 \times 2024 \times 2027$ is
   A) even B) odd C) even or odd D) None

Integer Type :

5. When we divide an odd number with 2, the remainder is.

Matrix Matching Type :

6.

Column I	Column II
a) The number divisible by 2 is	p) odd
b) Product of an even and an odd number is	q) even
c) The number which is not divisible by 2 is	r) 51
d) Sum of an even and odd	s) 82

KEY

TEACHING TASK				
JEE MAINS LEVEL QUESTIONS				
1	**2**	**3**	**4**	**5**
B	C	C	B	A
JEE ADVANCED LEVEL QUESTIONS				
1	**2**	**3**	**4**	**5**
AD	A	A	C	21
6				
r,s,p,q				
LEARNERS TASK				
CUQ'S				
1	**2**	**3**	**4**	**5**
C	A	D	A	D
ADDITIONAL QUESTIONS				
1	**2**	**3**	**4**	**5**
B	B	A	D	C
JEE MAINS LEVEL QUESTIONS				
1	**2**	**3**	**4**	**5**
C	C	D	C	D
JEE ADVANCED LEVEL QUESTIONS				
1	**2**	**3**	**4**	**5**
AB	A	A	A	1
6				
(qs), q, (pr), q				

5. MULTIPLES AND FACTORS

INTRODUCTION

If a number 'a' divides another number 'b' exactly then we say that 'b' is called multiple of 'a' in other words 'a' is called factor of 'b'.

Ex : a = 3, b =45

clearly $\frac{a}{b}$ (a divides b)

Then 'b' is multiple of 'a' (or) 'a' is a factor or 'b'

The product of a number and counting numbers are known as the mutliples of the number.

Ex : consider the number '6'

$6(6\times1), 12(6\times2), 18(6\times3)$..... are multiples of '6'

$6=6\times1,\ 6=2\times3$

$\therefore$ The factors of 6 are 1,2,3,6.

Note:

1. Every number is muliple of itself and also factor of itself.
2. For every number there are infinite multiples.

Ex : $5(5\times1),\ 10(5\times2), 15(5\times3)$,.....

Note :

Number of factors of a number are finite.

Ex : 125 = 125 x 1

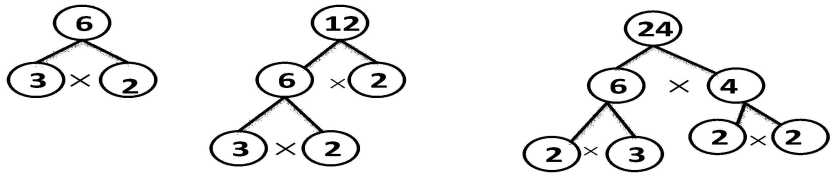
125 = 5 x 5 x 5

$\therefore$ The number of factors of 125 are 3. (1,5,125).

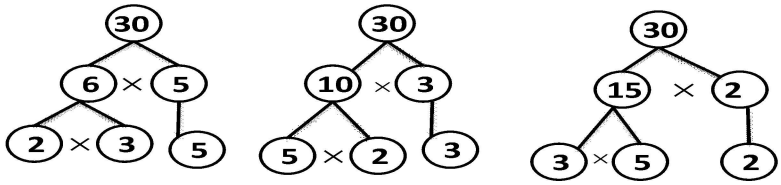
Factor trees :

The diagrams given here, are called as "factor trees".

The factors of a number. A factor divides its mutliple exactly (without remainder) for example let us consider the numbers 6,12 and 24



Look at the different factor trees of 30



The bottom row of each of the trees shows that the factors present cannot be split up any further.

Such numbers which cannot be factorized are called as prime numbers

Numbers	Factors	Number of factors
1	1	1
2	1,2	2
3	1,3	2
4	1,2,4	3
5	1,5	2
6	1,2,3,6	4
7	1,7	2
8	1,2,4,8	4
9	1,3,9	3
10	1,2,5,10	4
11	1,11	2

Note :

i) The numbers that are multiplied to get the product are called the factors of the product

Ex : $12 = 2 \times 2 \times 3$, $12 = 4 \times 3$

$12 = 12 \times 1$ $12 = 6 \times 2$

Factors of 12 are 1,2,3,4,6,12

ii) When two or more numbers are multipled, then each number is a factor of that product

Ex : $24 = 2 \times 2 \times 2 \times 3$

$2 \times 2 = 4$, $2 \times 2 \times 2 = 8$, $2 \times 3 = 6$ etc are factors of 24.

iii) Every factor of a number is an exact divisor of that number.

Ex : $12 = 2 \times 2 \times 3$

$\frac{12}{2} = 2 \times 3 = 6$, $\frac{12}{3} = 2 \times 2 = 4$, $\frac{12}{2\times 2} = \frac{12}{4} = 3$

iv) Every factor of a number is less than or equal to that number

Ex :$6 = 2 \times 3$ $6 = 1 \times 6$

$2 < 6, 3 < 6$ $1 < 6$

v) Number of factors of a given number is finite.

Ex : $24 = 24 \times 1$, $24 = 12 \times 2$, $24 = 8 \times 3$

$24 = 2 \times 2 \times 2 \times 3$, $24 = 4 \times 6$

$\therefore$ The number of factors are (1,2,3,,4,6,8,12,24)

vi) '1' is the least factor of any number

vii) Greatest factor for any number is the number itself.

$x \in N \Rightarrow x$ is a factor of itself.

SOLVED EXAMPLES

Example 1 :

Write the first five multiples of 7.

Solution:

7 × 1 = 7
7 × 2 = 14
7 × 3 = 21
7 × 4 = 28
7 × 5 = 35
So, first five multiples of 7 are: 7, 14, 21, 28, 35

Example 2 :

Write all the factors of 12.

Solution:

Factors of 12 are numbers that divide 12 exactly:
1, 2, 3, 4, 6, 12
Factors of 12: 1, 2, 3, 4, 6, 12

Example 3 :

List the first four multiples of 8.

Solution:

8 × 1 = 8
8 × 2 = 16
8 × 3 = 24
8 × 4 = 32
First four multiples of 8: 8, 16, 24, 32

Example 4 :

Property Question: Are multiples of a number always greater than or equal to the number?

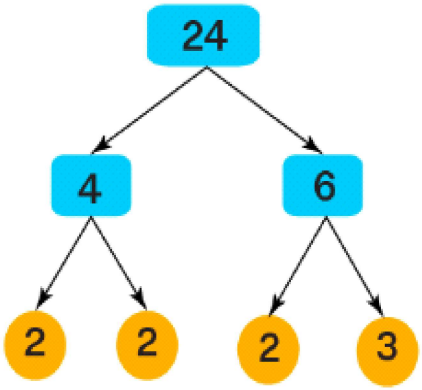
Solution:

Yes, because the first multiple is the number itself (number × 1), and the rest are bigger.

Example 5 :

Give the factor tree daigram of 24.

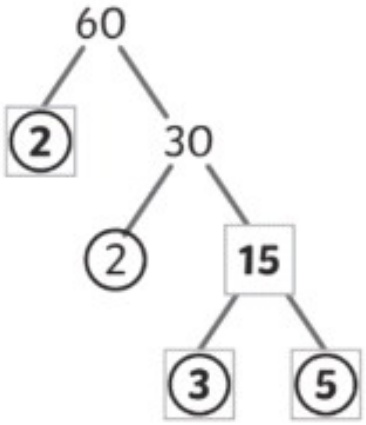
Solution:



Example 6 :

Give the factor tree daigram of 60.

Solution:



PERFECT NUMBER

Perfect number :

The number in which sum of all factors is equal to twice the number is called a perfect number.

Illustration :

The factors of '6' are 1,2,3,6 1+2+3+6+=12 2 x 6 (twice of 6)

Ex : The factors of 28 are 1,2,4,7, 14,28

1+2+4+7+14+28= 56 = 2 (28)

Note :

factors of 15 are 1,3,5,15

$1+3+5+15 \neq 2 \times 15$

$\therefore$ 15 is not a perfect number

SOLVED EXAMPLES

Example 1 :

Is all even numbers are perfect numbers? Justify your answer.

Solution:

Only some even numbers like 6, 28 are perfect.

Not all even numbers are perfect.

Example 2 :

Is 12 a perfect number? Why or why not?

Solution:

Proper factors = 1, 2, 3, 4, 6

Sum = $1 + 2 + 3 + 4 + 6 = 16 \neq 12$

So, 12 is not a perfect number.

Example 3 :

Is 10 a perfect number? Show your steps.

Solution:

Proper factors = 1, 2, 5

Sum = 1 + 2 + 5 = 8 $\neq$ 10

So, 10 is not a perfect number.

Example 4 :

Show that 28 is a perfect number.

Solution:

Proper factors = 1, 2, 4, 7, 14

Sum = 1 + 2 + 4 + 7 + 14 = 28 $\Rightarrow$ So, 28 is a perfect number.

CDF POINTS

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1. The product of a number and counting numbers are known as the mutliples of the number.
2. Every multiple of a number is greater than or equal to that number
3. For every number there are infinite mulitples.
4. Greatest multiple of a number doesnot exist.
5. Smallest multiple of a number is the number itself.
6. When we multiply two or more numbers we get a product each number multiplied is a factor of that product.
7. Every factor of a number is an exact divisior of the number. i.e a number is exactly divisible by all of its factors.
8. Every factor of a number is less than or equal to that number.
   Factors of 6 are 1,2,3,6 i.e 1<6, 2<6 , 3 < 6 and 6=6
9. Number of factors of a given number are finite.
10. '1' is the least factor of any number.
11. Greatest factor for any number is the number itself.
12. A number in which sum of all factors is equal to twice the number is called perfect number.
13. If 'N" is a composite number such that $a^p \times b^q \times c^r \times$ ..... where a,b,c .....prime numbers of N p,q,r.... are positive integers,then the number of factors of N is given by the expression (p+1)(q+1)(r+1).....

TEACHING TASK

JEE MAINS LEVEL QUESTIONS

Multiple Choice Type:

1. If a,b and c are three natural numbers and a x b = c, then which of the following statement is false

   A) 'c' is the factor of a and b B) 'c' is the product of a and b

C) 'c' is the multiple of a and b D) a and b are the factors of 'c'

2. What is the greatest odd integer less than 2000 that is multiple of 19
   A) 1996 B) 1995 C) 1999 D) 1998
3. What is the smallest even integer gareater than 1000
   A) 1002 B) 1020 C) 1026 D) 1033
4. If a is a factor of b, then the number of common factors of a and b is
   A) number of factors of b B) number of factors of a
   C) number of factors of ab D) number of factors of a^b
5. Which of the following option represents, "all the factors of 192"
   A)1,2,3,4,8,16,96,192,32,64
   B)1,2,6,8,16,96,192,32,64,3
   C)1,2,,4,6,8,12,16,24,32,64,96,4192
   D)1,2,3,4,6,8,12,16,24,64,192,32,48,96

JEE ADVANCED LEVEL QUESTIONS

Multiple Correct type:

1. If a is a natural number, then the multiples of 'a' are
   A) 4a B) 5a C) 3a D) 100a

Statement Type:

A) Both Statements are True.
B) Both Statements are False.
C) Statement - I is True, Statement - II is False.
D) Statement - I is False, Statement - IIis True.

2. **Statement - I :** The number of multiples of a given number is in finite
   Statement - II : The number of factors of a given number is finite

Comprehension Type :

When we multiply two or more numbers, we get a product. Each number is called a factor of the product. The product is called multiple of each number.

3. Every number is a multiple of
   A) 1 B) 0 C) 3 D) 2
4. The largest multiple of a number is
   A) 1 B) 0 C)3 D) doesn't exist
5. _____is a factor of every number
   A) 1 B) 0 C) 3 D) 2

Integer Type :

6. Sum of the prime factors of 143 is ____

Matrix Matching Type :

7.

Column - I	Column - II
a) odd prime factors of 99	p) 11
b) even prime factors 100	q) 2
c) single digit perfect number	r) 9
d) double digit perfect number	s) 6

t) 28

LEARNERS TASK

CONCEPTUAL UNDERSTANDING QUESTIONS (CUQ's)

Multiple Choice Type :

1. Which of the following are perfect numbers
   A) 6 B) 12 C) 28 D) A and C
2. What is the greatest multiple of 10
   A) 10^{10} B) 10^{99} C) 10^{100} D) Can't say
3. 32 is not a multiple of
   A) 2 B) 4 C) 6 D) 8
4. Sum of the factors of 100
   A) 214 B) 213 C) 312 D) None of these
5. Sum of the multiples of 9
   A) finite B) infinite C) 999 D) 9999

JEE MAINS LEVEL QUESTIONS

Multiple Choice Type :

1. If a > b and c is common factor of a and b then
   A) ac is multiple of bc B) ac is factor of bc
   C) bc is multiple of ac D) None of these

2. If $\frac{x}{y}$ = z (x,y,z are Natural numbers) then
   A) x is not a multiple of yz B) x is not a factor of y
   C) x is a multiple of y and z D) None of these
3. x = ab, y = bc, z = ca, then the factors of $\frac{xyz}{abc}$ (x,y,z, a,b and c are Natural numbers)
   A) ab, bc and ca B) a+b, b+c and c+a
   C) a-b, b-c and c-a D) a,b and c
4. The product of least and greatest common factors of x is
   A) x^2 B) x C) $\frac{x}{2}$ D) None of these
5. If x,y,z,w,r are the consecutive multiples of a Natural number then the sum of x,y,w and r is how many times of z
   A) 5 B) 3 C) 4 D)6
6. a,b,c,d and e are the consecutive multiples of a number and their sum is 45, then the next multiple is
   A)12 B) 14 C) 18 D)16
7. a is a factor of b, b is a factor of c, c is a factor d, then 'd' is a factor of
   A) ab+bc+ca B) abc C) a+b+c D) None of these

JEE ADVANCED LEVEL QUESTIONS

Multiple Correct Type:

1. Let 'x' be a composite number and sum of its factors is multiple of '3', then the number is
   A) 16 B) 28 C) 18 D)10
2. If a,b and c,d are '4' consecutive multiples of a number and b^2 = a x d then the multiples are
   A)2,4,6,8 B)3,6,9,12 C) 5,10,15,20 d) both B and C

Statement Type:

A) Both Statements are True.
B) Both Statements are False.
C) Statement - I is True, Statement - II is False.
D) Statement - I is False, Statement - IIis True.

3. **Statement I :** If 2x, 2y, 2z are the factors 8 then x,y,z values 2,3 and 4
   Statement II : If a,b, and c are the factors 6 and $(a \neq 1,\ b \neq 1,\ c \neq 1)$, then a value 3.
4. **Statement I :** If sum of the factors of a number except itself '6' then the number is 12
   Statement II : If sum of the factors of a number is double to itself then the number is called perfect number.

Comprehension Type :

If N is a composite number such the $N = a^p \times b^q \times c^r \times \ldots$ where a,b,c .... prime numbers and p,q,r..... are positive integers. then the number of factors of N is given by (p+1) (q+1) (r+1) .....

5. Number of factors of 18 is
   A) 7 B) 8 C) 6 D) 9
6. Number of factors of 180 is
   A) 18 B) 19 C) 20 D) 21
7. Which of the following is false.
   A) number of factors of 16 is 5 B) number of factors of 68 is 6
   C) number of factors of 102 is 10 D) number of factors of 127 is 2

Integer Type :

8. If $X = a^2 \times b^p$ then the number factors of x are 24, then p =

Matrix Matching Type :

9.

Column - I	Column - II
a) greatest '2' digits multiple of 3	p) 996
b) least '2' digit multiple of 10	q) 10
c) greatest '3' digits multiple of 4	r) 100
d) least '3' digits multiple of 2	s) doesn't exist
	t) 99

KEY

TEACHING TASK				
JEE MAINS LEVEL QUESTIONS				
1	**2**	**3**	**4**	**5**
A	B	A	C	D
JEE ADVANCED LEVEL QUESTIONS				
1	**2**	**3**	**4**	**5**
ABCD	A	A	A	A
6	**7**			
24	p,q,s,t			
LEARNERS TASK				
CUQ'S				
1	**2**	**3**	**4**	**5**
C	D	C	D	B
JEE MAINS LEVEL QUESTIONS				
1	**2**	**3**	**4**	**5**
D	C	D	B	C
6	**7**			
C	A			
JEE ADVANCED LEVEL QUESTIONS				
1	**2**	**3**	**4**	**5**
C	ABC	D	A	C
6	**7**	**8**	**9**	
A	A	7	t,q,p,r	

6. PRIME AND COMPOSITE NUMBERS

INTRODUCTION

1. Observe the number of factors of some numbers arranged in the following table

Number	Factors	Number of factors
1	1	1
2	1, 2	2
3	1, 3	2
4	1, 2, 4	3
5	1, 5	2
6	1, 2, 3, 6	4
7	1, 7	2
8	1, 2, 4, 8	4
9	1, 3, 9	3
10	1, 2, 5, 10	4
11	1, 11	2
12	1, 2, 3, 4, 6, 12	6

We can see that

i) The number '1' has one and only one factor (i.e., itself)

ii) There are numbers having exactly two factors 1 and the number itself. we can see that such numbers are 2, 3, 5, 7, 11 etc.

These numbers are said to be prime numbers.

Definition:

The number which has only factors 1 and itself is called prime number.

Note:

'2' is only even prime number

There are numbers which have more than two factors like 4, 6, 8, 9, 10 etc and so on are called composite numbers.

Definition:

Numbers having more than two factors are called composite numbers.

Note:

'1' is neither prime nor composite number.

By using the method of sieve of eratosthenese easily we can verify the whether the given number is prime or not

SOLVED EXAMPLES

Example 1 :

Is 2 a prime or composite number?

Solution:

Factors of 2 are 1 and 2.

Only two factors.

$\therefore$ 2 is a Prime number

Example 2 :

Is all even numbers are composite numbers?

Solution:

All even numbers are not composite numbers.
Since, 2 is even but also a prime number.

Example 3 :

Write the number 10 and list its factors. Then say if it's prime or composite.

Solution:

The factors of 10 are 1, 2, 5, 10.
More than two factors.
$\therefore$ 10 is Composite number.

Example 4 :

List all prime numbers between 1 and 10.

Solution:

Prime numbers between 1 and 10 are 2, 3, 5, 7.

SIEVE OF ERATOSTHENES

Sieve Of Eratosthenes:

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

Step -I : Cross out '1' because it is not a prime number

Step - II : Encircle 2, cross out all the multiples of 2, other than 2 itself i.e., 4, 6, 8 and so on .

Step III : We will find that the next uncrossed number is 3, encircle 3 and cross out all the multiples of 3, other than 3 itself .

Step IV : The next uncrossed number is 5 encircle 5 and cross all the multiples of 5 other than 5 itself.

Step V : Continue this process till all the numbers in the list are either encircled or crossedout.

Now, if we listout all the encircled numbers are prime numbers. All the crossed out numbers. other then '1' are composite numbers. This method is called the sieve of eratosthenes.

Twin Primes:

If the difference of two prime numbers is '2' then they are called Twin primes.

Ex:- (3, 5), (5, 7), (11, 13).....etc

Co-primes or relative primes:

Two numbers are said to be co-primes or relatively prime numbers if their H.C.F is '1'

Ex:- (3, 5), (10, 11), (15, 16)..... etc are co-primes.

Note:

1) The co-primes need not necessarily be prime themselves.
2) A pair of co-primes may consist of
   a) both primes eg :3, 5
   b) one prime and one composite eg: 7, 6
   c) both composite eg:-8, 15
   d) The co-primes need not necessarily be prime themselves
   e) If two numbers are not co-primes then they must have a common factors other than '1'

Some More Important Points:

1. There are only two primes which are consecutive integers.Those are 2 and 3.
2. The primes 3, 5 and 7 are called prime triplet
3. If a and b are prime numbers, then their product ab will have only a, b and ab as factors
   Ex : a = 3, b= 5, ab = 15
   factors of 15 are 1, 3, 5, 15
4. Set of prime numbers is infinite

SOLVED EXAMPLES

Example 1 :

Why do we cross out multiples of each prime in the sieve?

Solution:

Because multiples of a prime number are not prime (they have more than two factors).

Example 2 :

List all numbers between 40 and 50. Use the sieve to pick the primes.

Solution:

Numbers: 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50

Primes: 41, 43, 47

Example 3 :

Use the sieve to list prime numbers up to 20."

Solution:

Cross 1

Circle 2 $\Rightarrow$ cross 4, 6, 8, 10, 12, 14, 16, 18, 20

Circle 3 $\Rightarrow$ cross 6, 9, 12, 15, 18

Circle 5 $\Rightarrow$ cross 10, 15, 20

Circle 7

Answer: 2, 3, 5, 7, 11, 13, 17, 19

Example 4 :

Why is the sieve method useful for kids?

Solution:

Simple

Visual

Helps quickly find prime numbers

Builds number sense

EVEN NUMBERS AND ODD NUMBERS

Even Numbers:

All numbers divisible by '2' are called even numbers 2, 4, 6, 8 .....

Odd Numbers:

Numbers which are not divisible by '2' are called odd numbers 1, 3, 5.....

General form of even and odd numbers

1. General form of even number can be written as $2n,(n \in w, n \in I)$

   General form of odd numbers can be written as $2n \pm 1(n \in w, n \in I)$

2. $E = \{0, 2, 4, ...\}$, $O = \{1, 3, 5, ...\}$

Some Facts About Even And Odd Numbers:

1. The sum or product of any number of even numbers is even

   Ex:- 4 + 2 = 6 and $4 \times 6 = 24$

2. The difference of two even numbers is even

   Ex:- $4 - 2 = 2$

3. The sum of odd numbers depends on the number of numbers

   a) If the number of numbers is odd sum of the numbers is odd

      Ex:- 3 + 5 + 9 = 17(odd)

   b) If the number of numbers is even the sum is even

      Ex:- 3 + 5 + 7 + 9 =24(even)

4. If the product of a certain number of numbers is odd, then none of the

numbers is even

$3 \times 5 \times 7 = 105(odd)$

i.e the product of any number of odd numbers is odd.

5. If the product of certain number of numbers is even, then atleast one of them is even.
   7 x 5 x 10 = 750
6. If $2n(n \in I)$ is even number, then odd number is $(2n \pm 1)(n \in z)$ i.e., the difference of even and odd number is '1'
   i.e. 2n- (2n -1) = 2n - 2n +1 =1

SOLVED EXAMPLES

Example 1 :

Can zero (0) be called an even number?

Solution:

Yes, because 0 ÷ 2 = 0 (no remainder)
So, 0 is an even number.

Example 2 :

Which of the following numbers are odd?
Numbers: 13, 24, 18, 27, 32

Solution:

Odd numbers are those not divisible by 2
13 and 27 are odd numbers

Example 3 :

Write the first 5 odd numbers.

Solution:

1, 3, 5, 7, 9

Example 4 :

What is the product of two even numbers? (e.g. 2 × 6)

Solution:

2 × 6 = 12 $\Rightarrow$ divisible by 2
The product is an even number.

CDF POINTS

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1. The number which has only two factors 1 and itself are called prime numbers..
2. Numbers having more than '2' facors are called composite numbers
3. '1' is neither prime nor composite because it has only one factor
4. If the difference of two numbers is '2' then they are called twin primes
5. Two numbers are said to be co-prime or relatively prime numbers if their HCF is '1'.
6. A pair of co-primes may consist

7. The only two primes which are consecutive integers are 2 and 3
8 The primes 3,5 and 7 are called prime triplet
9. Set of prime numbers are infinite
10. The general form of even number can be put in the form $2n(n \in N)$
11. The general form of odd number can be put inthe form $2n \pm 1(n \in w, n \in N)$.
12. Only the difference between even number and odd number is '1'.

TEACHING TASK

JEE MAINS LEVEL QUESTIONS

Multiple Choice Type:

1. Is the prime number that can be written sum of two prime numbers
   A) 2 B) 3 C) 5 D) 11
2. Which of the following statement is false
   A) 2 is only even prime
   B) All prime are odd
   C)The product of two even numbers is even.
   D) The product of three odd numbers is odd.
3. The number of pairs of twin primes between 1 to 100 is
   A) 7 B) 8 C) 9 D) 10
4. Which of the following is not a pair of twin primes
   A) (11,13) B) (17,19) C) (23,29) D)(41,43)
5. If two numbers do not have a common factor other then "1", then they are known as
   A) Twin Primes B) Primes
   C) Perfect Primes D) Co-primes (or) relatively Primes

JEE ADVANCED LEVEL QUESTIONS

Multiple Correct type:

1. Prime numbers between 50 and 60
   A) 53 B) 57 C) 59 D) 55

Statement Type:

A) Both Statements are True.
B) Both Statements are False.
C) Statement - I is True, Statement - II is False.
D) Statement - I is False, Statement - IIis True.

2. **Statement -I :** 29 is a Prime number and an odd number
   Statement -II : All Prime numbers are odd numbers

Comprehension Type :

A natural numbers having factors 1 and itself is known as a Prime number

3. Number of even prime numbers is
   A) 1 B) 2 C) 0 D) infinite

4. Which of the following is not a Prime number
   A) 67 B) 69 C) 89 D) 71
5. Split 100 as the sum of two Primes
   A) 59,41 B) 57,43, C) 61,39 D) 73,27

Integer Type :

6. Sum of least prime and least composite

Matrix Matching Type :

7.

Column - I	**Column - II**
a) number of Primes below 100	p) 23
b) number of composite number below 100	q) 48
c) number of odd prime below 100	r) 24
d) number of even composite number below 100	s) 25
	t) 73

LEARNERS TASK

CONCEPTUAL UNDERSTANDING QUESTIONS (CUQ's)

Multiple Choice Type :

1. General form of sum of any number of even number
   A) 2n B) 3n C) 4n D) 5n
2. Sum of 'n' number of even number is
   A) even number B) odd number
   C) composite number D) none of these
3. A pair of co-primes may consits of
   A) both primes B) one prime and one composite
   C) both may be composite D) All
4. '2' is a number of kind
   A) even prime B) even
   C) least multiple of 2 D) All
5. The sum of least odd number and the greatest odd number below 100
   A) 100 B) 99 C) 101 D) A and B

JEE MAINS LEVEL QUESTIONS

Multiple Choice Type :

1. The value of 2367+3592+4572 is
   A) Even B) Odd
   C) Even and odd D)Neither even nor odd
2. The value of $7868\times78,963\times4578$ is
   A) odd B) even
   C) even and odd D) neither even nor odd
3. The number of Prime numbers between 100 and 200 is
   A) 20 B)21 C) 22 D)23
4. Sum of Prime numbers between 30 and 4
   A) 67 B) 69 B) 68 D)107

5. If $a^2 - b^2$ is a Prime number, then $a - b$ =
   A) 2 B) 1 C) 3 D) 7
6. If $a^2 + b^2 + 2ab$ is a two digit Prime number then $a + b$ value
   A) 6 B) 5 C) 7 D) does not exist
7. If sum of the digits of Prime number is 8 and product 15 then the number
   A) 35 B) 16 C) 53 D) 15
8. For which values of k, $2^k + 1$ is a Prime number
   A) 1,2 B) 2,3 C) 1,3 D)4,5

JEE ADVANCED LEVEL QUESTIONS

Multiple Correct Type:

1. Which of the following are odd and Prime
   A) 9 B) 13 C) 15 D) 19
2. The Prime factors of 63
   A) 3 B) 7 C) 3^2 D) 21

Statement Type:

A) Both Statements are True.
B) Both Statements are False.
C) Statement - I is True, Statement - II is False.
D) Statement - I is False, Statement - IIis True.

3. **Statement -I :** 15 can be written as the sum of 3 Prime numbers
   Statement -II : Sum of 3 times of a Prime number and 2 times of another prime number is 59

Comprehension Type :

The number which has more than 2 factors is said to the composite number

4. Which of the following has even number of factors
   A) 20 B) 6 C) 15 D)1 and 3
5. What are the Prime factors of composite number 84
   A) 2,3,7 B) 2^2 ,3,7 C) 12,7 D) 4,21
6. 4, 6, 8 are three consecutive composite numbers to make a prime triplet what should be subtracted from each number
   A) -1 B) 1 C) 2 D) 2 and 3

Integer Type :

7. If the sum of a prime number and another prime number which is obtained by reversing the 1st prime number will be 110 then the numbers are

Matrix Matching Type :

8.

Column-I	**Column-II**
a) Greatest Prime less than 42	p) 6
b) Number if twin prime pairs below 50	q) 41
c) Sum of prime numbers below 15 is	r) between 9 and 100
d) Two digit composite number lies between	s) 5
	t) between 10 and 100

KEY

TEACHING TASK				
JEE MAINS LEVEL QUESTIONS				
1	**2**	**3**	**4**	**5**
C	B	A	C	D
JEE ADVANCED LEVEL QUESTIONS				
1	**2**	**3**	**4**	**5**
AC	C	A	B	A
6	**7**			
6	r,t,p,t			
LEARNERS TASK				
CUQ'S				
1	**2**	**3**	**4**	**5**
A	A	D	D	A
JEE MAINS LEVEL QUESTIONS				
1	**2**	**3**	**4**	**5**
B	B	B	B	B
6	**7**	**8**		
D	A	A		
JEE ADVANCED LEVEL QUESTIONS				
1	**2**	**3**	**4**	**5**
BD	AB	A	D	A
6	**7**	**8**		
B	73&37	t,s,q,r		

7. DIVISIBILITY RULES

Divisibility by 2:

A natural number is divisible by '2' if and only if the digit in its units place is either 0 (or) 2 (or) 4 (or) 6 (or)8

Ex:

1) 3750 is divisible by 2
2) 4758 is divisible by 2

Note:

If a number contains any odd number (1 or 3 or 5 or 7 or 9) in its units place then it is not divisible by '2' any odd number is divided by 2 we get remainder '1'.

Divisibility by 3:

A nuatural number is divisible by 3 if and only if the sum of the digits is divisible by '3'.

Ex:

1) Consider 10038
   1 + 0 + 0 + 3 + 8 = 12 is divisible by 3.
2) Consider 13725
   1 + 3 +7 + 2 + 5 = 18 is divisible by 3
   $\therefore$ 13725 is also divisible by '3'.

Divisibility by 4:

A natural number is divisible by 4 if and only if the number formed by the last two digits is divisible by 4 (or) last two digits in the given numbers should contain zeroes.

Ex:

1) consider 7295824, clearly 24 is divisible by '4' then 7295824 is also divisible by 4
2) Consider 1700 = 17 $\times$ 100
   clearly 100 is divisible by 4
   $\therefore$ 1700 is also divisible by 4

Divisibility by 5:

A natural number is divisible by 5, if and only if,the last digit is either '0' (or) 5

Ex:

1) Consider 7580 = 758 $\times$ 10
   $\therefore$ 10 is divisible by 5
   $\therefore$ 7580 is also divisible by '5'
2) Consider 9575 = 9575 $\times$ 5.
   $\therefore$ 5 is divisible by 5, then 9575 is also divisible by 5.

Divisibility by 6:

A natural number is divisible by 6, if it is divisible by 2 and 3 .

Ex: 30702

$\because$ unit place contains '2' then it is divisible by 2

3 + 0 + 7 + 0 + 2 = 12 is divisible by 3 then 30702 is divisible by 3

$\therefore$ The given number is divisible by '6'

Note:

2139 is not divisible by 6

$\because$ 9 is an odd number it is not divisible 2 $\therefore$ 2139 is not divisibel by 2139.

2 + 1 + 3 + 9 = 15 is divisible by '3'

$\therefore$ 2139 is not divisible by 6

Divisibility by 7:

Double the last digit (digit in even place) and subtract it from the remaining original number and continue doing until only digit remains , if the result is 0 (or) 7, then the given number is divisible by 0 (or) 7

Ex : Consider $\frac{5613}{b}\frac{3}{a}$

$b-2a=5613-6=5607$

$\frac{560}{b}\frac{7}{a}$

b - 2a = 560-14 = 546

$\frac{54}{b}\frac{6}{a}$

b - 2a = 54 - 12 = 42

$\frac{4}{b}\frac{2}{a}$

b - 2a = 4 - 4 = 0

$\therefore$ 56133 is divisible by '7'.

Divisibility by 8:

A natural number is divisible by '8' if the number formed by last three digit of the given number is divisible 8 (or) last 3 digit in the given number should contain zeros.

Ex:

1) 136976 is divisible by 8 because 976 is divisible by 8

$\therefore$ 136976 is also divisible by 8

2) 437000 = 437 $\times$ 1000

$\because$ 1000 is divisible by '8'

$\therefore$ 4,37,000 is divisible by '8'

Divisibility by 9:

A natural number is divisible by '9', if and only if sum of the digit is divisible by '9'.

Ex: 1) 306019 = 2 + 0 + 6 + 0 + 1 + 9 = 18 is divisible by 9, then 206019 is also divisible by '9' (Division try yourself)

Note:

872645 is not divisible by ' 9' as 8 + 7 + 2 + 6 + 4 + 5 = 32 is not divisible by '9'

$\therefore$ 8,72,645 is also not divisible by '9'.

Divisibility by 10:

A natural number is divisible by 10, if and only if the last digit is zero.

Ex: 2070 is divisible by 10 as 2070 = 207 $\times$ 10

$\because$ 10 is divisible by 10

$\therefore$ 2070 is also divisible by 10

Divisibility by 11:

A natural number is divisibile by '11', if and only if, the difference (D) of the sum of the numbers obtained on adding the alternate digits of the numbers seperately (S_1 and S_2) is divisible by '11' (or) zero.

1) If $D = S_1 - S_2 = 0$, then the given number is divisible by 11

2) If $D = S_1 - S_2$ = multiple of '11' then also 'D' is divisible by '11

Ex: 1) 4334

$4+3= 7 = S_1$, $3+4=7 = S_2$

$\therefore S_1 - S_2 = 7-7 = 0$.

$\therefore$ 4334 is divisible by '11'

2) 66311 is not divisible by 11 as

$S_1 = 6+3+1 = 10$, $S_2 = 6+1 = 7$

$D = S_1 - S_2 = 10 - 7 = 3$

clearly '3' is not multiple of 3

SOLVED EXAMPLES

Example 1 :

Is 346 divisible by 2?

Solution:

Rule: A number is divisible by 2 if its last digit is even (0, 2, 4, 6, 8).

The last digit of 346 is 6 (which is even).

$\therefore$ 346 is divisible by 2.

Example 2 :

Is 831 divisible by 3?

Solution:

Rule: A number is divisible by 3 if the sum of its digits is divisible by 3.

Step 1: Sum the digits $\Rightarrow$ 8 + 3 + 1 = 12.

Step 2: Check if 12 is divisible by 3 $\Rightarrow$ 12 ÷ 3 = 4 (no remainder).

$\therefore$ 831 is divisible by 3.

Example 3 :

Is 724 divisible by 4?

Solution:

Rule: A number is divisible by 4 if the last two digits form a number divisible by 4.

Step 1: Last two digits of 724 $\Rightarrow$ 24.

Step 2: Check if 24 ÷ 4 = 6 (no remainder).

$\therefore$ 724 is divisible by 4.

Example 4 :

Is 560 divisible by 5?

Solution:

Rule: A number is divisible by 5 if the last digit is 0 or 5.
The last digit of 560 is 0.
$\therefore$ 560 is divisible by 5.

Example 5 :

Is 918 divisible by 6?

Solution:

Rule: A number is divisible by 6 if it is divisible by both 2 and 3.
Step 1 : Last digit is 8 $\Rightarrow$ divisible by 2.
Step 2 : Sum digits $\Rightarrow$ 9 + 1 + 8 = 18 $\Rightarrow$ 18 ÷ 3 = 6 $\Rightarrow$ divisible by 3.
$\therefore$ 918 is divisible by 6.

Example 6 :

Is 343 divisible by 7?

Solution:

Rule: Double the last digit, subtract from the rest, check if result is divisible by 7.
Step 1: Last digit = 3 $\Rightarrow$ 3 × 2 = 6.
Step 2: Subtract from remaining part $\Rightarrow$ 34 – 6 = 28.
Step 3: Check if 28 ÷ 7 = 4 $\Rightarrow$ divisible.
$\therefore$ 343 is divisible by 7.

Example 7 :

Is 1,024 divisible by 8?

Solution:

Rule: A number is divisible by 8 if the last three digits form a number divisible by 8.
Step 1: Last three digits $\Rightarrow$ 024 (which is 24).
Step 2: 24 ÷ 8 = 3 $\Rightarrow$ divisible.
$\therefore$ 1,024 is divisible by 8.

Example 8 :

Is 2,655 divisible by 9?

Solution:

Rule: A number is divisible by 9 if the sum of its digits is divisible by 9.
Step 1: Sum digits $\Rightarrow$ 2 + 6 + 5 + 5 = 18.
Step 2: 18 ÷ 9 = 2 $\Rightarrow$ divisible.
$\therefore$ 2,655 is divisible by 9.

Example 9 :

Is 4,390 divisible by 10?

Solution:

Rule: A number is divisible by 10 if it ends with 0.
Check: The last digit is 0.
$\therefore$ 4,390 is divisible by 10.

Example 10 :

Is 2,915 divisible by 11?

Solution:

Rule: Subtract and add digits alternately, check if the result is divisible by 11.
Step 1: Alternating sum $\Rightarrow$ (2 + 1) – (9 + 5) = 3 – 14 = –11.
Step 2: –11 is divisible by 11 (since 11 ÷ 11 = 1).
$\therefore$ 2,915 is divisible by 11.

CDF POINTS

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1. A natural number is divisible by '2' if and only if the digit in its units place is either 0 (or) 2 (or) 4 (or) 6 (or)8.
2. A nuatural number is divisible by 3 if and only if the sum of the digits is divisible by '3'.
3. A natural number is divisible by 4 if and only if the number formed by the last two digits is divisible by 4 (or) last two digits in the given numbers should contain zeroes.
4. A natural number is divisible by 5, if and only if,the last digit is either '0' (or) 5
5. A natural number is divisible by 6, if it is divisible by 2 and 3
6. A natural number is divisible by '8' if the number formed by last three digit of the given number is divisible 8 (or) last 3 digit in the given number should contain zeros.
7. Double the last digit (digit in even place) and subtract it from the remaining original number and continue doing until only digit remains , if the result is 0 (or) 7, then the given number is divisible by 0 (or) 7
8. A natural number is divisible by '9', if and only if sum of the digit is divisible by '9'.
9. A natural number is divisible by 10, if and only if the last digit is zero.
10. A natural number is divisibile by '11', if and only if, the difference (D) of the sum of the numbers obtained on adding the alternate digits of the numbers seperately (S_1 and S_2) is divisible by '11' (or) zero.

TEACHING TASK

JEE MAINS LEVEL QUESTIONS

Multiple Choice Type:

1. 23A57 is divisible by 3, then what is the least value of A
   A) 2 B) 1 C) 3 D) 0
2. If 35x7y1 is divisible by '9' then least sum of x + y
   A) 2 B) 3 C) 4 D) none of these
3. 476a is divisible by 4 then the value of a
   A) 4 B) 8 C) 5 D) 7
4. If 57a68 is divisible by 4, then value of a
   A) any single digit number B) 2
   C) 6 D) All

5. If 3A57 is divisible by 3 and 4578B is divisible by 9, then the least sum of A+B
A) 2 B) 0 C) 4 D)none of these

JEE ADVANCED LEVEL QUESTIONS

Multiple Correct type:

1. Which of the following numbers is divisible by '3'
A) 12345 B) 453 C) 3690 D) 1235

Statement Type:

A) Both Statements are True.
B) Both Statements are False.
C) Statement - I is True, Statement - II is False.
D) Statement - I is False, Statement - IIis True.

2. **Statement I :** The number abcdefghijkl is divisible by 4 if K-1, *l*=6
Statement -II : A number is divisible by 4 if the number formed by last two digits is divisible by 4

Comprehension Type :

A Number is divisible by '2' if the units digit of the number is divisible by 2. a number is divisible by 3 and 9 of the sum of the digits of the number is divisible by 3 and 9 respectively.

3. Which of the following number is divisible by '9'
A) 200409 B) 124678 C) 32197 D) 320418
4. The number which is divisible by both 2 and 3 is
A) 120360 B) 12031 C) 20709 D) 5632
5. The number which is divisible by 3 but not by '9' is
A) 1080 B) 46782 C)112233 D) 356850

Integer Type :

6. If abc is a number divisible by '8' then the least value of abc =

Matrix Matching Type :

7.

Column-I	Column-II
a) 428	p) Divisible by 5
b) 540	q) Divisible by 3
c) 135	r) Divisible by 10
d) 27	s) Divisible by 2

LEARNERS TASK

CONCEPTUAL UNDERSTANDING QUESTIONS (CUQ's)

Multiple Choice Type :

1. which of the following is divisible by '9'
A) 204009 B) 246817 C) 31297 D) 340218
2. 78,436 is divisible by
A) 2 B) 3 C) 5 D) 7

3. If a number is divisible '9' then it is divisible by
   A) 2 B) 3 C) 9 D) 2 and 3
4. Which of the following number is divisible by '11'
   A) 3116365 B) 901351 C) 8790322 D) 8790321
5. Which of the following number is divisible by '7'
   A) 508157 B) 508158 C) 508159 D) 508260

JEE MAINS LEVEL QUESTIONS

Multiple Choice Type :

1. abcdef is divisible by 11 then which of the following is correct
   A) a+b+c = d+c+f B) a+c+e = b+d+f
   C) (a+c+e)-(b+d+f)=11 D) 1 and 3
2. In a given number last digit (units digit) is represented by y and the remaining part is denoted by x, and if the number is divisible by '7', then
   A) y = 2x B) x = 2y C) x = y D) $y = \frac{3}{x}$
3. Number divisible by 4 but not by '8' in the following is...
   A) 4664 B) 4464 C) 3940 D) 2848
4. Which of the following number is divisible by '11' if a single digit number is subtracted from the number?
   A) 8449 B) 8490 C)4875 D) 7028
5. A number when divided by 6 leaves the remainder '3' when the square of the number is divided by '6', then remainder is
   A) 0 B)1 C)2 D) 3

JEE ADVANCED LEVEL QUESTIONS

Multiple Correct Type:

1. A number which is divisible by 99 then it is divisible by
   A) 9 B) 11 C) 9 and 11 D) 3
2. A number which is divisible by 15 then it must be divisible by
   A) 5 B) 11 C) 3 D) 13

Statement Type:

A) Both Statements are True.
B) Both Statements are False.
C) Statement - I is True, Statement - II is False.
D) Statement - I is False, Statement - IIis True.

3. **Statement -I :** A number is divisible by '11' if and only if, the difference of the sum of the numbers obtained on adding the alternate digits is divisible by 11 or zero.
   Statement -II : If (a+c+e) -(b+d+f), then the number abcdef is divisible by '11'

Comprehension Type :

A number is divisible by '6', if it is divisble by both 2 and 3. A number is divisible by '8' if the number formed by last three digits is divisible by 8

4. The number 2358134 is divisible by
   A) 6 B) 3 C) 2 D)8
5. Which of the following is divisible by '8'
   A) 41384 B) 236124 C) 56018 D) 31562
6. The number which is divisible by 2 but not by '6' is
   A) 35610 B) 124672 C) 52183 D) 369276

Integer Type :

7. If the sum (lm1+11m) is divisible by '2' then the least sum of l and m

Matrix Matching Type :

8. If a = 5, b = 7, c = 8, d = 9, then

Column-I	**Column-II**
a) abc is divisible by	p) 3
b) bcd is divisible by	q) 5
c) cda is divisible by	r) 6
d) dab is divisible by	s) 2

KEY

TEACHING TASK				
JEE MAINS LEVEL QUESTIONS				
1	**2**	**3**	**4**	**5**
B	A	A	A	D
JEE ADVANCED LEVEL QUESTIONS				
1	**2**	**3**	**4**	**5**
ABC	A	B	A	C
6	**7**			
104	s,r,(pq),q			
LEARNERS TASK				
CUQ'S				
1	**2**	**3**	**4**	**5**
D	A	B	B	B
JEE MAINS LEVEL QUESTIONS				
1	**2**	**3**	**4**	**5**
D	D	C	A	D
JEE ADVANCED LEVEL QUESTIONS				
1	**2**	**3**	**4**	**5**
ABCD	AC	A	D	A
6	**7**	**8**		
C	2	s,p,q,p		

8. LCM AND HCF

FACTORS AND MULTIPLES

Prime factorisation :

When a number is expressed as a product of prime numbers,we call it as the prime factorisation of that number.

(OR)

A factorisation in which every factor is prime, is called the prime factorization of the number.

Factor :

A factor of a number is an exact divisor of the number.

Ex: 1, 2, 3, 6 divides '6' exactly

$\therefore$ 1, 2, 3, 6 are called factors or divisors of the number '6'

Multiple :

The products we get when a number is multiplied by the numbers 1, 2, 3, 4,..... are called the multiples of the given number.

Ex: The numbers 3, 6, 9, 12, 15, 18,..... are called the multiples of '3'.

Common Factor:

A natural number is said to be a common factor of two or more numbers, if it is a factor of each of them.

Common Multiple :

A natural number is said to be a common multiple of two or more numbers, if it is a multiple of each of them.

SOLVED EXAMPLES

Example 1:

Find all factors of 15.

Solution:

Factors are numbers that divide 15 exactly:1, 3, 5, 15

Factors of 15 = {1, 3, 5, 15}

Example 2:

Write 4 multiples of 9.

Solution:

$9 \times 1 = 9$

$9 \times 2 = 18$

$9 \times 3 = 27$

$9 \times 4 = 36$

Multiples = {9, 18, 27, 36}

Example 3:

Find common factors of 12 and 18.

Solution:

Factors of 12 = {1, 2, 3, 4, 6, 12}
Factors of 18 = {1, 2, 3, 6, 9, 18}
Common = {1, 2, 3, 6}
Common factors = {1, 2, 3, 6}

Example 4:

Find the smallest common multiple of 4 and 6.

Solution:

Multiples of 4 = {4, 8, 12, 16, ...}
Multiples of 6 = {6, 12, 18, 24, ...}
Common = {12, 24, ...}
Least common multiple (LCM) = 12

HCF

HCF and LCM Definition:

The full form of LCM in Maths is Least Common Multiple, whereas the full form of HCF is the Highest Common Factor. The H.C.F. defines the greatest factor present in between given two or more numbers, whereas L.C.M. defines the least number which is exactly divisible by two or more numbers. H.C.F. is also called the greatest common factor (GCF) and LCM is also called the Least Common Divisor.

We know that the factors of a number are exact divisors of that particular number.

HCF Definition:

The greatest number which is the common factor of two or more given numbers is called H.C.F (or) G.C.D can be determined by three methods.

i) by writing all factors
ii) by prime factorisation method
iii) by division method

H.C.F By Using Factors:

Example- I:

Find H.C.F of 8, 12
Factors of 8 are 1,2,4 and 8
Factors of 12 are 1,2,4,3,6,12
Common factors of 8,12 are 1, 2, 4
H.C.F of 8 and 12 is 4

Example - II:

Find H.C.F of 36, 48, 52
Factors of 36 are 1,2,3,4,6,9,12,18,36
Factors of 52 are 1,2,4,13,26,52
Common factors are 2,4, = H.C.F = 4

H.C.F By Using Prime Factorisation

Express each of the given number as the product of their prime factors. The product of the least powers of the common factors gives the H.C.F of the given numbers

Example - I:

Find the H.C.F of 360 and 756 by using prime factorisation method

2	360
2	180
2	90
3	45
3	15
5	5
	1

2	756
2	378
3	189
3	63
3	21
7	7
	1

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

$756 = 2^2 \times 3^3 \times 7$

clearley the common factors are 2 and 3

H.C.f =least power of 2 x least power of 3

$= 2^2 \times 3^2 = 4 \times 9 = 36$

Hence, H.C.F of 360 and 756 is 36.

Division Method :

We find the H.C.F two given numbers using the steps given below

Step I : Divide the larger number by the smaller number.

Step II : Divide the divisor by the remainder

Step III : Repeat the process of dividing the preceding divisor by the remainder last obtained, till remainder '0' is obtained. Then, the last divisor is the required H.C.F

Example I : Find the H.C.F of 1965 and 2096.

Solution : Using division method, we have

Hence, the H.C.F of 1965 and 2096 is 131

Note :

H.C.F of three numebers

H.C.F of 3 numbers = H.C.F of (any two and 3rd number)

```
1965)2096(1
  1965
  ----
   131)1965(15
     131
     ---
      655
      655
      ---
        0
```

Co-primes :

Two numbers are said to be co-primes if their H.C.F is '1'

Example:

HCF of 161 and 192 by division method

Solution :

Let us find the H.C.F of 161 and 192 by division method.

We have, H.C.F of 161 and 192 is '1'

Hence 161 and 192 are co-primes

```
161)192(1
  161
  ---
   31)161(5
     155
     ---
      6) 31(5
        30
        --
         1)6(6
           6
           -
           0
```

Note :

1) H.C.F of two distinct prime numbers is one
2) H.C.F of two co-primes is one
3) H.C.F of an even number and an odd number is one
4) H.C.F of two consecutive even numbers is '2'.
5) If a and b are co-primes then write (a,b) =1
   [H.C.F of a and b is 1]

some examples :

(15, 16) =1, (20, 22) =2

SOLVED EXAMPLES

Example 1:

Find the HCF of 10 and 15.

Solution:

Factors of 10 = 1, 2, 5, 10
Factors of 15 = 1, 3, 5, 15
Common Factors = 1, 5
$\therefore$ HCF of 10 and 15 = 5

Example 2:

Find the HCF of 6, 8, and 12.

Solution:

Factors of 6 = 1, 2, 3, 6
Factors of 8 = 1, 2, 4, 8
Factors of 12 = 1, 2, 3, 4, 6, 12
Common Factors = 1, 2
$\therefore$ HCF of 6, 8, and 12 = 2

Example 3:

Find the HCF of 11 and 22.

Solution:

Factors of 11 = 1, 11
Factors of 22 = 1, 2, 11, 22
Common Factors = 1, 11
HCF of 11 and 22 = 11

Example 4:

Find the HCF of 17 and 19.

Solution:

Factors of 17 = 1, 17
Factors of 19 = 1, 19
Common Factor = 1
HCF = 1 (These are co-prime numbers)

LCM

Definition :

The least common multiple of two or more numbers is the least natural number that is a multiple of the given numbers.

L.C.M Can Be Determined By Three Methods:

1) By writing the multiples of the given numbers.
2) By prime factorisation method
3) By division method.

L.C.M By Writing The Multiples Of Given Numbers:

In order to find L.C.M of two or more numbers the steps given below are fol

lowed.

1) Write the numbers
2) Write the multiples of the given numbers.
3) Round off all common multiples.
4) Compute the least multiple from them.

Example- I :

Find L.C.M of 2 and 3

Solution :

Now multiples of '2' are 2, 4, 6, 8, 10, 12, 14, 16, 18 .....
multiples of '3' are 3, 6, 9, 12, 15, 18 .....
common multiples of '2' and '3' are 6, 12, 18....
Here the least common multiple of 2 and 3 is 6

L.C.M By Prime Factorisation Method:

To find L.C.M of 2 or more given numbers by prime factorisation method follow the given steps

Steps :

1) Resolve each of the given numbers into its prime factors and keep them in exponential form
2) Find the product of the numbers having the highest powers of all factors that occur in any one of the given number.
3) The product will be L.C.M.

Example I :

Find the L.C.M of 15 and 21

Solution :

$15 = 3^1 \times 5^1$, $24 = 2 \times 2 \times 2 \times 3 = 2^3 \times 3^1$

$\therefore$ The product of numbers with highest powers

i.e $3 \times 5 \times 2 \times 2 \times 2 = 120$

LCM = The product of numbers with highest powers

$= 3 \times 5 \times 2^3 = 120$

L.C.M By Synthetic Division Method:

In order to find the L.C.M of two or more numbers by division method the steps given below are followed.

1) Write all the given numbers in a line seperating them with a comma.
2) Find the prime number which divides at least two of the given numbers
3) And write the Quotient below each of them. carry forward the numbers which are not divisible.
4) Repeat step 2 and 3 until the quotient are coprime to each other.
5) Find the product of all prime divisors along with co-primes in the last column, this product is the L.C.M of the given numbers.

Example I :

Find the L.C.M of 24, 36 and 40 by division method.

2	24, 36, 40
2	12, 18, 20
3	6, 9, 10
2	2, 3 10
	1, 3, 5

L.C.M = $2 \times 2 \times 3 \times 2 \times 1 \times 3 \times 5 = 360$

Note :

i) If two numbers are relatively primes, then their L.C.M is equal to their product,
Ex : (3,4) =1,
$\therefore$ L.C.M = 3 x 4 = 12

ii) In the given numbers if the first number is a multiple of second number then their L.C.M is equal to first number.
Ex : 50 and 25
50 is the multiple of 25
$\therefore$ 50 is the L.C.M of 50 and 25

iii) The least common multiple of two prime numbers is their product
Ex : LCM of 3 and 5 = 3 x 5= 15

iv) The LCM of two numbers is never less than either of the two numbers.
Ex : LCM of 5 and 6 = 5 x 6 = 30
5 < 30 and 6 < 30

Note :

1. The greatest number that will divide x,y and z leaving remainders a,b,c respectively is given by H.C.F of x-a, y -b, z-c
2. The greatest number that will divide x,y and z leaving the same remainder 'a' in each case is given by H.C.F of x-a, y-a, z-a

---

SOLVED EXAMPLES

Example 1:

Find the LCM of 6 and 9.

Solution:

Multiples of 6 = 6, 12, 18, 24, 30, 36, ...
Multiples of 9 = 9, 18, 27, 36, ...
Common Multiples = 18, 36, ...
LCM of 6 and 9 = 18

Example 2:

Find the LCM of 7 and 14.

Solution:

Multiples of 7 = 7, 14, 21, 28, 35, ...
Multiples of 14 = 14, 28, 42, ...
Common Multiples = 14, 28, ...

LCM of 7 and 14 = 14

Example 3:

Find the LCM of 4 and 6.

Solution:

Multiples of 4 = 4, 8, 12, 16, 20, 24, ...
Multiples of 6 = 6, 12, 18, 24, 30, ...
Common Multiples = 12, 24, ...
LCM of 4 and 6 = 12

Example 4:

Find the LCM of 11 and 22.

Solution:

Multiples of 11 = 11, 22, 33, 44, ...
Multiples of 22 = 22, 44, 66, ...
Common Multiples = 22, 44, ...
LCM of 11 and 22 = 22

HCF AND LCM OF FRACTIONS

HCF And LCM Of Fractions :

$$\text{HCF of given fractions} = \frac{\text{HCF of numerators}}{\text{LCM of denominators}}$$

Ex : HCF of $\frac{3}{2}, \frac{2}{3}, \frac{7}{5}$

$$= \frac{2^0 \times 3^0 \times 7^0}{30} = \frac{1}{30}$$

$$\text{LCM of given fractions} = \frac{\text{LCM of numerators}}{\text{HCF of demoninators}}$$

Ex : Find LCM of $\frac{2}{3}, \frac{3}{2}, \frac{5}{7}$

$$= \frac{30}{1} = 30$$

HCF And LCM Of Fractions :

To find the HCF and LCM of decimals we convert the given decimals into fractions and then find HCF and LCM

Ex :

0.6, 0.84, 0.12

$$= \frac{6}{10}, \frac{84}{100}, \frac{12}{100}$$

$$= \frac{3}{5}, \frac{21}{25}, \frac{3}{25}$$

by using above formulas find HCF and LCM

SOLVED EXAMPLES

Example 1:

Find the HCF of $\frac{5}{6}$ and $\frac{10}{8}$.

Solution:

HCF of numerators = HCF(5, 10) = 5
LCM of denominators = LCM(6, 8) = 24

HCF of $\frac{5}{6}$ and $\frac{10}{8} = \frac{5}{24}$

Example 2:

Find the LCM of $\frac{5}{6}$ and $\frac{10}{8}$

Solution:

LCM of numerators = LCM(5, 10) = 10
HCF of denominators = HCF(6, 8) = 2

LCM $\frac{5}{6}$ and $\frac{10}{8} = \frac{10}{2} = 5$

Example 3:

Find the HCF of $\frac{9}{10}, \frac{6}{15}$

Solution:

HCF of numerators = HCF(9, 6) = 3
LCM of denominators = LCM(10, 15) = 30

HCF of $\frac{9}{10}, \frac{6}{15} = \frac{3}{30} = \frac{1}{10}$

Example 4:

Find the LCM of $\frac{9}{10}, \frac{6}{15}$

Solution:

LCM of numerators = LCM(9, 6) = 18
HCF of denominators = HCF(10, 15) = 5

LCM of $\frac{9}{10}, \frac{6}{15} = \frac{18}{5}$

CDF POINTS

1. A natural number is said to be a common factor of two or more numbers, if it is a factor of each of them.
2. A natural number is said to be a common multiple of two or more numbers, if it is a multiple of each of them.

3. The greatest common divisor or the GCD of two or more positive integers happens to be the largest positive integer that divides the numbers without leaving a remainder.
4. The full form of LCM in Maths is Least Common Multiple.
   In arithmetic, the least common multiple or LCM of two numbers say a and b, is denoted as LCM (a,b). And the LCM is the smallest or least positive integer that is divisible by both a and b.
5. Product of two numbers = HCF of the two numbers x LCM of the two numbers
6. If A and B are two numbers
   $A \times B = HCF \times LCM$
7. HCF of two numbers = $\frac{\text{Product of two numbers}}{\text{LCM of two numbers}}$
8. LCM of two numbers = $\frac{\text{Product of two numbers}}{\text{HCF of two numbers}}$
9. HCF of given fractions = $\frac{\text{HCF of numerators}}{\text{LCM of denominators}}$
10. LCM of given fractions = $\frac{\text{LCM of numerators}}{\text{HCF of denominators}}$
11. To find the HCF & LCM of decimals we convert the given decimals into fractions and then find HCF & LCM.

TEACHING TASK

JEE MAINS LEVEL QUESTIONS

Multiple Choice Type:

1. 252 can be expressed as a product of primes as
   A) $2 \times 2 \times 3 \times 3 \times 7$ B) $2 \times 2 \times 2 \times 3 \times 7$
   C) $3 \times 3 \times 3 \times 3 \times 7$ D) $2 \times 3 \times 3 \times 3 \times 7$
2. Which is the highest common factor of 36 and 84.
   A) 4 B) 6 C) 12 D) 18
3. How many times is the HCF of 48, 36, 72 and 24 contained in their LCM?
   A) 12 B) 3 C) 24 D) 4
4. The number which is nearest to 457 and is exactly divisible by 11 is
   A) 459 B) 460 C) 462 D) 455
5. If the LCM of two numbers and their product is 12, 24 respectively. Find HCF of that numbers.
   A) 12 B) 2 C) 3 D) 4

JEE ADVANCED LEVEL QUESTIONS

Multiple Correct type:

1. Relation between LCM adn HCF of two numbers a & b is
   A) a x b = LCM x HCF B) $\frac{a}{b} = LCM \times HCF$

C) Product of numbers = product of LCM & HCF D) $\frac{a}{b}=\frac{LCM}{HCF}$

Statement Type:

A) Both Statements are True.
B) Both Statements are False.
C) Statement - I is True, Statement - II is False.
D) Statement - I is False, Statement - IIis True.

2. **Statement I :** LCM of 3, 5 is 15.
Statement II : LCM of two primes is their product.

Comprehension Type :

HCF of two or more numbers is the number which is the greatest coomon factor of them

3. The HCF of 45 and 60 is.
A) 5 B) 15 C) 45 D) 35

4. If $P=a\times b\times c\times d$ and $Q=b\times c\times d\times 4$ then HCF of P,Q is
A) bcd B) bc C) abc D) 4abcd

Integer Type :

5. The number that should be subtracted from 510 and 270 to get 24 as the GCD is .

Matrix Matching Type :

6.

Column I	**Column II**
a) The product of 2 numbers	p) $\frac{HCF}{LCM}$
b) The two prime numbers differ by 2 are	q) co-prime
c) The numbers having HCF as 1 are	r) HCF x LCM
d) (1, 3), (5, 7), (11, 13) are examples are	s) twin primes

LEARNERS TASK

CONCEPTUAL UNDERSTANDING QUESTIONS (CUQ's)

Multiple Choice Type :

1. Prime factorisation of 100 is
A) 10^2 B) $5^2\times 4$ C) $2^2\times 5^2$ D) 25×4

2. If two numbers are relatively prime their LCM is
A) 1 B) their product C) greater of two D) smaller of two

3. If A and B are two positive numbers, then relation between LCM and HCF
A) HCF x LCM = product of A and B
B) HCF x LCM = $\frac{A}{B}$

C) $A \times B = \frac{HCF}{LCM}$

D) $\frac{LCM}{HCF} = \frac{A}{B}$

4. HCF of given fractions =

A) HCF of numerators $\times$ LCM of denominators

B) $\frac{\text{HCF of numerators}}{\text{LCM of denominators}}$

C) $\frac{\text{LCM of denominators}}{\text{HCF of numerators}}$

D) $\frac{\text{LCM of numerators}}{\text{HCF of denominators}}$

5. LCM of given fractions =

A) LCM of numerators $\times$ HCF of denominators

B) $\frac{\text{LCM of numerators}}{\text{HCF of denominators}}$

C) $\frac{\text{HCF of denominators}}{\text{LCM of numerators}}$

D) $\frac{\text{LCM of denominators}}{\text{HCF of numerators}}$

JEE MAINS LEVEL QUESTIONS

Multiple Choice Type :

1. The length and breadth of a room is 325 cm and 2.25m respectively. Find the largest size of the square tile in meters which can cover the floor of the room exactly.
   A) 0.25m B) 0.30m C) 0.20m D) 0.35m
2. Write the greatest 6-digited number having atleast three different digits.
   A) 888897 B) 999978 C) 999987 D) 999897
3. A milk man has 20 litres of milk in one container and 30000 millilitres of milk in another container. Determine the capacity of the biggest container which the milk man can use to measure milk from either container an exact number of times.
   A) 10l B) 20l C) 15l D) 25l
4. Find the greatest number which divides 171 and 251 leaving remainder 3 and 6 respectively.
   A) 9 B) 10 C) 7 D) 5
5. Find the LCM of $\frac{36}{225}, \frac{48}{150}, \frac{72}{65}$

   A) $\frac{72}{225}$ B) $\frac{36}{65}$ C) $\frac{144}{5}$ D) $\frac{288}{5}$

JEE ADVANCED LEVEL QUESTIONS

Multiple Correct Type:

1. Which of the following is true
   A) the LCM of two even numbers is their product
   B) the LCM of two numbers is always greather than either of the numbers
   C) the LCM of two prime numbers is always their product
   D) if 'a' is a factor of 'b' then LCM of a and b is equal to b

Statement Type:

A) Both Statements are True.
B) Both Statements are False.
C) Statement - I is True, Statement - II is False.
D) Statement - I is False, Statement - IIis True.

2. **Statement I :** Product of two numbers = product of their HCF and LCM
Statement II : If the product and HCF of two numbers are 4107 and 37 respectively, then the greater number is 111.

Comprehension Type :

$$\text{HCF of fractions} = \frac{\text{HCF of numerators}}{\text{LCM of denominators}}$$

3. The HCF of $\frac{9}{10}, \frac{12}{25}, \frac{18}{35}$ and $\frac{21}{40}$ is

A) $\frac{3}{5}$ B) $\frac{252}{5}$ C) $\frac{3}{1400}$ D) $\frac{63}{700}$

4. The HCF of $\frac{8}{9}$ and $\frac{12}{27}$

A) $\frac{4}{27}$ B) $\frac{5}{27}$ C) $\frac{5}{28}$ D) $\frac{3}{28}$

Integer Type :

5. HCF of 36 and 84 is.

Matrix Matching Type :

6.

Column I	**Column II**
a) Common factors of 18 and 24.	p) 3
b) HCF of 55 and 121 is	q) 6
c) LCM of 12, 24 is	r) 19
d) Common factors of 38 and 57 is	s) 11
	t) 24

KEY

TEACHING TASK				
JEE MAINS LEVEL QUESTIONS				
1	**2**	**3**	**4**	**5**
A	C	A	C	B
JEE ADVANCED LEVEL QUESTIONS				
1	**2**	**3**	**4**	**5**
AC	A	B	A	6
6				
r,s,q,s				
LEARNERS TASK				
CUQ'S				
1	**2**	**3**	**4**	**5**
C	B	A	B	B
JEE MAINS LEVEL QUESTIONS				
1	**2**	**3**	**4**	**5**
A	C	A	C	C
JEE ADVANCED LEVEL QUESTIONS				
1	**2**	**3**	**4**	**5**
CD	A	C	A	12
6				
(pq), s,t,r				

9. FUNDAMENTALS OF FRACTIONS

INTRODUCTION

In Mathematics, fractions are defined as the parts of a whole. The whole can be an object or a group of objects. In real life, when we cut a piece of cake from the whole of it, then the portion is the fraction of the cake. A fraction is a word that is originated from Latin. In Latin, "Fractus" means "broken". In ancient times, the fraction was represented using words. Later, it was introduced in numerical form.

The fraction is also termed as a portion or section of any quantity. It is denoted by using '/' symbol, such as $\frac{a}{b}$. For example, in $\frac{2}{4}$ is a fraction where the upper part denotes the numerator and the lower part is the denominator.

FRACTIONS

Fraction :

A fraction represents a numerical value, which defines the parts of a whole. Generally, the fraction can be a portion of any quantity out of the whole thing and the whole can be any specific things or value.

The basics of fractions explain the top and bottom numbers of a fraction. The top number represents the number of selected or shaded parts of a whole whereas the bottom number represents the total number of parts.

Suppose a number has to be divided into four parts, then it is represented as $\frac{x}{4}$. So the fraction here, $\frac{x}{4}$, defines $\frac{1}{4}$th of the number x. Hence, $\frac{1}{4}$ is the fraction here. It means one in four equal parts. It can be read as one-fourth or $\frac{1}{4}$. This is known as fraction.

Types Of Fractions:

Based on the properties of numerator and denominator, fractions are sub-divided into different types. They are:

Proper Fractions :

The proper fractions are those where the numerator is less than the denominator.

For example, $\frac{8}{9}$ will be a proper fraction since

"numerator < denominator".

Improper Fraction:

The improper fraction is a fraction where the numerator happens to be greater than the denominator.

For example, $\frac{9}{8}$ will be an improper fraction since "numerator > denominator".

Mixed Fraction:

A mixed fraction is a combination of the integer part and a proper fraction. These are also called mixed numbers or mixed numerals.

Like Fractions :

Fractions that have same denominators are called like fractions.

Ex :

1) $\frac{4}{5}$ and $\frac{2}{5}$ are called like fractions

2) $\frac{2}{7},\frac{3}{7},\frac{11}{7}$ etc are called like fractions

Unlike Fractions:

Fractions that have different denominators are called unlike fractions.

Ex : $\frac{1}{4}$ and $\frac{2}{3}$ are unlike fractions.

Equivalent Fractions :

Two fractions are equivalent to each other if after simplification either of two fractions is equal to the other one.

For example, $\frac{2}{3}$ and $\frac{4}{6}$ are equivalent fractions.

Since, $\frac{4}{6} = \frac{(2\times 2)}{(2\times 3)} = \frac{2}{3}$

Unit Fraction :

A fraction is known as a unit fraction when the numerator is equal to 1.

One half of whole = $\frac{1}{2}$

One-third of whole = $\frac{1}{3}$

One-fourth of whole = $\frac{1}{4}$

One-fifth of whole = $\frac{1}{5}$

Decimal Fraction :

A fraction whose denominator is 10, 100, 1000,.....etc is called decimal fraction.

Ex: $\frac{3}{10},\frac{9}{100}$ etc

Vulgar Fraction :

A fraction whose denominator is a whole number other than 10,100,1000.....etc are called vulgar fractions.

Ex:- $\frac{2}{3}, \frac{4}{5}, \frac{7}{8}, \frac{13}{9}$..... etc

Complex Fraction :

A fraction whose numerator and denominator are fractions those are called complex fractions.

Ex:- $\frac{\left(\frac{1}{2}\right)}{\left(\frac{3}{4}\right)}, \frac{\left(\frac{7}{8}\right)}{\left(\frac{11}{9}\right)}, \frac{\left(\frac{9}{8}\right)}{\left(\frac{13}{14}\right)}$ etc

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SOLVED EXAMPLES

Example 1 :

Identify the type of fraction: $\frac{9}{4}$

Solution:

$\frac{9}{4}$ is an improper fraction because the numerator is greater than the denominator.

Example 2 :

Convert the improper fraction $\frac{11}{4}$ to a mixed fraction.

Solution:

$\frac{11}{4} = 2\frac{3}{4}$

Example 3 :

Are these fractions equivalent?

$\frac{1}{2}$ and $\frac{2}{4}$

Solution:

Yes, because

$\frac{1\times 2}{2\times 2} = \frac{2}{4}$

Example 4 :

Convert $\frac{17}{5}$ to a mixed number.

Solution:

$\frac{17}{5} = 3\frac{2}{5}$

Example 5 :

Which is a proper fraction?

$\frac{6}{10}$ or $\frac{10}{6}$

Solution:

$\frac{6}{10}$ is a proper fraction since 6 < 10

FRACTION ON A NUMBER LINE

Fraction On A Number Line:

We have already learned to represent the integers, such as 0, 1, 2, -1, -2, on a number line. In the same way, we can represent fractions on a number line.

For example, if we have to represent $\frac{1}{5}$ and $\frac{3}{5}$ parts of a whole, then it can be represented as shown in the below figure.

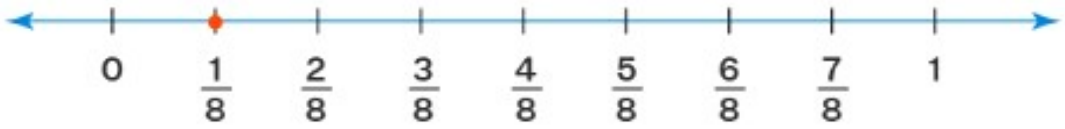
Since the denominator is equal to 5, thus 1 is divided into 5 equal parts, on the number line. Now the first section is 1/5 and the third section is 3/5.

SOLVED EXAMPLES

Example 1 :

Represent the fraction $\frac{1}{8}$ on the number line.

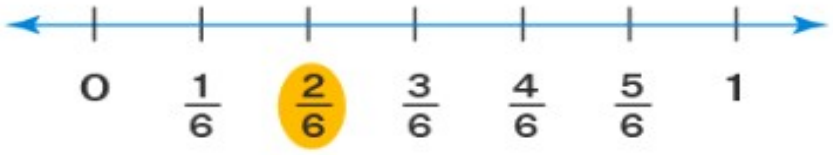
Solution:



Example 2 :

Represent the fraction $\frac{2}{6}$ on the number line.

Solution:



Example 3 :

Represent the fractions $\frac{2}{10}, \frac{4}{10}, \frac{5}{10}, \frac{6}{10}$ and $\frac{8}{10}$ on the number line.

Solution:

COMPARISON OF FRACTION

Comparison Of Fraction By Cross-Multiplication Method:

If two fractions $\frac{a}{b}$ and $\frac{c}{d}$ are to be compared, we cross multiply

i) If $a \times d > b \times c$, then $\frac{a}{b} > \frac{c}{d}$ ii) If $a \times d < b \times c$, then $\frac{a}{b} < \frac{c}{d}$

iii) If $a \times d = b \times c$, then $\frac{a}{b} = \frac{c}{d}$

Ex:- Compare the $\frac{2}{3}$ and $\frac{5}{6}$

Solution:

On cross mutiplication we get $2 \times 6 = 12$ and $3 \times 5 = 15$ clearly, then 12 < 15

$\therefore \frac{2}{3} < \frac{5}{6}$

Note :

1) Every fraction is an irrational number, every irrational number may not be a fraction
2) Fraction is always positive, where as rational number may be positive or negative.

Reducing A Fraction:

Reducing is what we do when we want to make a smaller version of a fraction that still has the same mathematical value as the original.

Ex: $\frac{4}{8}=\frac{4\div 4}{8\div 4}=\frac{1}{2}$

In this numerator and denominator both are divided by 4, we get 1 over 2.

Comparison Of Fractions :

1) Converting fractions to decimals.

Example :

$\frac{3}{8} or \frac{5}{12}$ which is greater?

Solution:

$\frac{3}{8}=0.375 \& \frac{5}{12}=0.4166...$

$\therefore \frac{5}{12}>\frac{3}{8} \Rightarrow \frac{5}{12}$ is greater.

2) Making fractions as like fractions.

Example 1:

i) $\frac{2}{3} or \frac{4}{15}$ which is smaller?

Solution:

Given $\frac{2}{3} and \frac{4}{15}$, Here LCM of 3 & 15 is 15.

Make the denominators = LCM of denominators

$\frac{2}{3}=\frac{2\times 5}{3\times 5}=\frac{10}{15}$ and $\frac{4}{15}$

$\therefore \frac{4}{15}<\frac{10}{15} \Rightarrow \frac{4}{15}<\frac{2}{3}$

$\therefore \frac{4}{15}$ is smaller.

Example 2:

$\frac{3}{8} or \frac{5}{12}$ which is greater?

Solution:

8 x 3 = 24, 12 x 2 = 24

Make the denominator equal to LCM of denominators.

$\therefore \frac{3\times 3}{8\times 3}=\frac{9}{24} and \frac{5\times 2}{12\times 2}=\frac{10}{24}$

$\therefore \frac{9}{24}<\frac{10}{24}\left(\because 9<10\right)$

So $\frac{5}{12}$ is greater.

i.e., to compare fractions we convert unlike fractions into like fractions by making denominator equal to LCM of denominators.

SOLVED EXAMPLES

Example 1 :

Compare: $\frac{2}{3}$ and $\frac{3}{5}$

Solution:

Find LCM of 3 and 5 = 15

$\frac{2}{3} = \frac{10}{15}, \quad \frac{3}{5} = \frac{9}{15}$

$\frac{2}{3} > \frac{3}{5}$

Example 2:

Which is greater: $\frac{4}{5}$ or $\frac{3}{4}$?

Solution:

$\frac{4}{5} = 0.8, \quad \frac{3}{4} = 0.75$

$\frac{4}{5}$ is greater

Example 3:

Compare: $\frac{5}{6}$ and $\frac{7}{9}$

Solution (Cross multiply):

$5 \times 9 = 45, 7 \times 6 = 42$

$\frac{5}{6} > \frac{7}{9}$

Example 4:

Compare: $1\frac{2}{3}$ or $\frac{5}{3}$?

Solution:

$1\frac{2}{3} = \frac{5}{3}$

Both are equal

ASCENDING AND DESCENDING ORDER

How To Arrange Fractions In Ascending And Descending Order:

1. Check the denominators of all the given fractions. If all the denomiantors are equal then simply compare the numerators and arrange fractions according to

it.

2. If the denominators are not same then take the LCM of all the denominators and make all the denominators equal to LCM, i.e., we convert fractions into like fractions. Then check the numerators arrange them in ascending order (from smaller to bigger) or descending order (from bigger to smaller fractions).

Example :

Arrange the fractions $\frac{2}{3},\frac{1}{2},\frac{5}{6}$ in ascending oder.

Solution:

Given fractions $\frac{2}{3},\frac{1}{2},\frac{5}{6}$ denominators are not equal.

$\therefore$ LCM of 3, 2, 6 = 6

$\therefore \frac{2\times2}{3\times2},\frac{1\times3}{2\times3},\frac{5\times1}{6\times1}$

$\Rightarrow \frac{4}{6},\frac{3}{6},\frac{5}{6}$

$\therefore$ Ascending oder is $\frac{1}{2}<\frac{2}{3}<\frac{5}{6}$

or Ascending order is $\frac{1}{2},\frac{2}{3},\frac{5}{6}$

SOLVED EXAMPLES

Example 1 :

Arrange in ascending order: $\frac{3}{8},\frac{5}{8},\frac{1}{8},\frac{7}{8}$

Solution:

All have the same denominator (8), so compare numerators.

1 < 3 < 5 < 7

Ascending order: $\frac{1}{8},\frac{3}{8},\frac{5}{8},\frac{7}{8}$

Example 2 :

Arrange in ascending order: $\frac{2}{5},\frac{1}{2},\frac{3}{10}$

Solution:

Find LCM of 5, 2, 10 = 10

Convert all to denominator 10: $\frac{2}{5}=\frac{4}{10},\ \frac{1}{2}=\frac{5}{10},\ \frac{3}{10}=\frac{3}{10}$

Compare: 3 < 4 < 5

Ascending order: $\frac{3}{10},\frac{2}{5},\frac{1}{2}$

Example 3 :

Arrange in descending order: $\frac{5}{12}, \frac{2}{3}, \frac{3}{4}$

Solution:

LCM of 12, 3, 4 = 12

$\frac{5}{12} = \frac{5}{12}, \quad \frac{2}{3} = \frac{8}{12}, \quad \frac{3}{4} = \frac{9}{12}$

Compare: 9 > 8 > 5

Descending order:

$\frac{3}{4}, \frac{2}{3}, \frac{5}{12}$

Example 4 :

Arrange in ascending order: $\frac{5}{6}, \frac{9}{8}, \frac{3}{4}$

Solution:

Convert to common denominator (LCM = 24):

$\frac{5}{6} = \frac{20}{24}, \quad \frac{9}{8} = \frac{27}{24}, \quad \frac{3}{4} = \frac{18}{24}$

Compare: 18 < 20 < 27

Ascending order:

$\frac{3}{4}, \frac{5}{6}, \frac{9}{8}$

CDF POINTS

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1. A part of whole is called fraction. The fraction is of the form $\frac{a}{b}$ where a,b are whole numbers $c(b \neq 0)$ and H.C.F of (a.b) is 1
2. A fraction whose denominator is a whole numbers like 10,100,1000.....etc are called decimal fractions.
3. A fraction whose denominator is a whole number other than 10,100,1000..... .etc are called vulgar fractions.
4. A fraction in which the numerator is less than denominator is called proper fraction .
5. A fraction in which the numerator is greater than denominator is called improper fraction.
6. The combination of natural numbers and a proper fraction is called mixed fraction.
7. Fractions that represent the same part is called equivalent fractions.
8. Fractions that have same denominators are called like fractions.
9. Fractions that have different denominators are called unlike fractions.
10. Which have '1' as numerator are called unit fractions.
11. A fraction whose both numerator and denominator are fractions those is called complex fraction.

12. To arrange fractions in ascending and descending order, if the denominators are not same then take the LCM of all the denominators and make all the denominators equal to LCM, i.e., we convert fractions into like fractions. Then check the numerators arrange them in ascending order (from smaller to bigger) or descending order (from bigger to smaller fractions).

TEACHING TASK

JEE MAINS LEVEL QUESTIONS

Multiple Choice Type:

1. Which of the following is a proper fraction?

   A) $\frac{21}{5}$ B) $\frac{13}{4}$ C) $\frac{3}{4}$ D) $\frac{4}{3}$

2. Compare $\frac{4}{5} and \frac{5}{9}$

   A) $\frac{4}{5} > \frac{5}{9}$ B) $\frac{4}{5} < \frac{5}{9}$ C) $\frac{4}{5} = \frac{5}{9}$ D) Both A and B

3. Which of the following is an improper fraction?

   A) $\frac{3}{15}$ B) $\frac{7}{3}$ C) $\frac{3}{7}$ D) $\frac{1}{2}$

4. If $\frac{45}{60}$ is equivalent to $\frac{3}{x}$, then x =

   A) 20 B) 10 C) 5 D) 4

5. Which of the following is in descending order?

   A) $\frac{11}{17}, \frac{9}{13}, \frac{5}{8}$ B) $\frac{9}{13}, \frac{11}{17}, \frac{5}{8}$ C) $\frac{5}{8}, \frac{11}{17}, \frac{9}{13}$ D) $\frac{5}{8}, \frac{9}{13}, \frac{11}{17}$

JEE ADVANCED LEVEL QUESTIONS

Multiple Correct Type:

1. Which of the following pairs of fractions are equivalent?

   A) $\frac{1}{2}, \frac{2}{4}$ B) $\frac{1}{3}, \frac{3}{9}$ C) $\frac{2}{5}, \frac{4}{9}$ D) $\frac{4}{7}, \frac{8}{13}$

Statement Type:

A) Both Statements are True.
B) Both Statements are False.
C) Statement - I is True, Statement - II is False.
D) Statement - I is False, Statement - IIis True.

2. **Statement I :** $\frac{3}{4} and \frac{2}{4}$ are like fractions.

   Statement II : Denominators are same in the like fractions.

Comprehension Type :

We convert unlike fractions to like fractions and we find LCM of denominators

in comparing fractions with different denominators

3. Which of the following fraction is less than $\frac{7}{8}$ and greater than $\frac{1}{3}$?

A) $\frac{1}{4}$ B) $\frac{23}{24}$ C) $\frac{11}{12}$ D) $\frac{17}{24}$

4. Which of the following shows the correct ascending order of the fractions $:\frac{2}{3},\frac{3}{5},\frac{4}{15}$ after converting them to like fractions?

A) $\frac{3}{5}<\frac{2}{3}<\frac{4}{15}$ B) $\frac{4}{15}<\frac{3}{5}<\frac{2}{3}$ C) $\frac{2}{3}<\frac{3}{5}<\frac{4}{15}$ D) $\frac{4}{15}<\frac{2}{3}<\frac{3}{5}$

Integer Type :

5. If $\frac{11}{4}=\frac{77}{x}$, then x =

Matrix Matching Type :

6.

Column - I	**Column-II**
a) 80p as a fraction of Rs.5	p) $\frac{7}{20}$
b) 8 hours as a fraction of 2 days	q) $\frac{9}{20}$
c) 450gms as fraction of 1kg	r) $\frac{4}{25}$
d) 350ml as a fraction of 1 litre	s) $\frac{1}{6}$
	t) 48

LEARNERS TASK

CONCEPTUAL UNDERSTANDING QUESTIONS (CUQ's)

Multiple Choice Type :

1. If $\frac{4}{9}=\frac{a}{18}$, then value of a is

A) 6 B) 8 C) 72 D) 9

2.. While converting unlike fractions to like fractions we find

A) H.C.F denominators B) Sum of denominator
C) L.C.M of numerator D) L.C.M of denominator

3. Convert $\frac{10}{3}$ to a mixed fraction

A) $3\frac{1}{3}$ B) $2\frac{1}{3}$ C) $5\frac{1}{2}$ D) $5\frac{1}{3}$

4. Convert $3\frac{2}{5}$ to an improper fraction.

A) $\frac{6}{5}$ B) 1 C) $\frac{17}{5}$ D) $\frac{5}{17}$

5. What fraction of an hour is 30 minutes?

A) $\frac{1}{4}$ B) $\frac{1}{2}$ C) $\frac{1}{3}$ D) $\frac{1}{5}$

JEE MAINS LEVEL QUESTIONS

Multiple Choice Type :

1. Which one of the following fraction is the smallest?

A) $\frac{1}{2}$ B) $\frac{4}{9}$ C) $\frac{14}{27}$ D) $\frac{2}{3}$

2. Which one of the following fractions is the greatest?

A) $\frac{1}{3}$ B) $\frac{5}{12}$ C) $\frac{2}{5}$ D) $\frac{13}{30}$

3. Reduce the fraction $\frac{315}{405}$ into lowest form.

A) $\frac{6}{9}$ B) $\frac{35}{45}$ C) $\frac{7}{9}$ D) $\frac{3}{4}$

4. If the fractions $\frac{7}{13},\frac{2}{3},\frac{4}{11},\frac{5}{9}$ are arranged in ascending order, the correct order is

A) $\frac{2}{3},\frac{7}{13},\frac{4}{11},\frac{5}{9}$ B) $\frac{7}{13},\frac{4}{11},\frac{5}{9},\frac{2}{3}$ C) $\frac{4}{11},\frac{7}{13},\frac{5}{9},\frac{2}{3}$ D) $\frac{5}{9},\frac{4}{11},\frac{7}{13},\frac{2}{3}$

5. Which of the following fractions is not equivalent to $\frac{1}{3}$?

A) $\frac{5}{15}$ B) $\frac{6}{18}$ C) $\frac{4}{12}$ D) $\frac{7}{20}$

JEE ADVANCED LEVEL QUESTIONS

Multiple Correct Type:

1. Which of the following pairs of fractions are like fractions?

A) $\frac{1}{5},\frac{4}{5}$ B) $\frac{2}{3},\frac{3}{4}$ C) $\frac{1}{6},\frac{5}{6}$ D) $\frac{5}{6},\frac{6}{7}$

Statement Type:

A) Both Statements are True.
B) Both Statements are False.
C) Statement - I is True, Statement - II is False.
D) Statement - I is False, Statement - IIis True.

2. **Statement I :** Ascending order of $\frac{2}{3},\frac{2}{7},\frac{2}{11},\frac{2}{5}$ and $\frac{2}{9}$ is $\frac{2}{3},\frac{2}{5},\frac{2}{7},\frac{2}{9},\frac{2}{11}$

Statement II : Ascending order of given numbers is to write the given numbers from smallest to greatest.

Comprehension Type :

Rani typed 50 pages of a book containing 100 pages. Meena typed $\frac{1}{4}$th pages of same book.

3. Who typed more?
   A) Rani B) Meena C) Both are equal D) None of these
4. The number of pages typed by Meena is.
   A) 25 B) 30 C)50 D)75

Integer Type :

4. If $\frac{5}{10}=\frac{x-2}{30}$, then the value of x = _____

Matrix Matching Type :

5.

Column I	**Column II**
a) Simplest form of $\frac{24}{78}$	p) <
b) Fraction equivalent to $\frac{3}{5}$ is	q) $\frac{4}{13}$
c) $\frac{3}{5}$ ___ $\frac{8}{5}$	r) $\frac{12}{20}$
d) $\frac{5}{3}$ ___ $\frac{7}{10}$	s) >

KEY

TEACHING TASK				
JEE MAINS LEVEL QUESTIONS				
1	**2**	**3**	**4**	**5**
C	A	B	D	B
JEE ADVANCED LEVEL QUESTIONS				
1	**2**	**3**	**4**	**5**
AB	A	D	B	28
6				
r,s,q,p				
LEARNERS TASK				
CUQ'S				
1	**2**	**3**	**4**	**5**
B	D	A	C	B
JEE MAINS LEVEL QUESTIONS				
1	**2**	**3**	**4**	**5**
B	D	C	C	D
JEE ADVANCED LEVEL QUESTIONS				
1	**2**	**3**	**4**	**5**
AC	D	A	A	17
6				
q,r,p,s				

10. DECIMALS

INTRODUCTION

Decimals :

Decimals are one of the types of numbers, which has a whole number and the fractional part separated by a decimal point. The dot present between the whole number and fractions part is called the decimal point.

For example: 34.5 is a decimal number.

Here, 34 is a whole number part and 5 is the fractional part.

"**.**" is the decimal point.

34.5 can be read as "thirty four and five-tenths".

In 34.5 decimal point is between ones and tenths.

34.5 has 3 tens, 4 ones and 5 tenths

$$\therefore 34.5 = 30 + 4 + \frac{5}{10}$$

Types of Decimal Numbers:

Decimal Numbers may be of different kinds, namely

Recurring Decimal Numbers (Repeating or Non-Terminating Decimals):

A decimal in which a figure or set of figures is repeated continuously is called a recurring or periodic or circulating decimal. The repeated figures or set of figures is called the period of the decimal.

Example:

(i) 3.125125 (Finite)

(ii)3.121212121212..... (Infinite)

Non-Recurring Decimal Numbers (Non Repeating or Terminating Decimals):

In non-recurring decimal numbers, digits never repeat after a fixed interval.

Example:

(i) 3.2376 (Finite)

(ii) 3.137654....(Infinite)

Mixed Recurring Decimal :

A decimal fraction in which some figures do not recur, is called a mixed recurring decimal.

Example:

(i) 12.14323232.....

(ii) 0.14325252525.....

Decimal Fraction:

It represents the fraction whose denominator in powers of ten.

Example:

(i) $81.75 = \frac{8175}{100}$

(ii) $32.425 = \frac{32425}{1000}$

Converting the Decimal Number into Decimal Fraction:

For the decimal point place "1" in the denominator and remove the decimal point.

"1" is followed by a number of zeros equal to the number of digits following the decimal point.

For Example:

$81.75 = \frac{8175}{100}$

8 represents the power 1 of 10 that is tens position.

1 represents the power 0 of 10 that is units position.

7 represents the power -1 of 10 that is one-tenths position.

5 represents the power -2 of 10 that is one-hundredths position

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SOLVED EXAMPLES

Example 1 :

Write the decimal form of 7 ones and 3 tenths.

Solution:

7 ones = 7

3 tenths = 0.3

Decimal form = 7.3

Example 2 :

What type of decimal is 0.75?

Solution:

0.75 ends after two digits.

It is a terminating decimal.

Example 3 :

Is 0.666... (with 6 repeating) a terminating or non-terminating decimal?

Solution:

It never ends and 6 repeats.

It is a non-terminating recurring decimal.

Example 4 :

What type of decimal is 3.141592653...?

Solution:

This decimal neither ends nor repeats.

It is a non-terminating non-recurring decimal (like π).

PLACE VALUE IN DECIMALS

The place value system is used to define the position of a digit in a number which helps to determine its value. When we write specific numbers, the position of each digit is important.

Example:

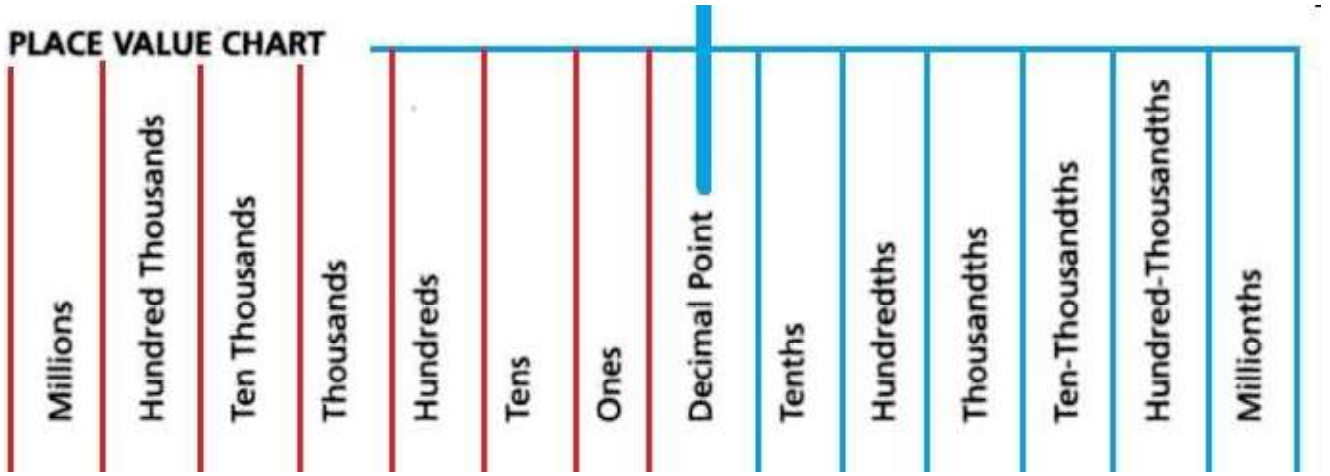
For instance, let's consider the number 456.
The position of "6" is in One's place, which means 6 ones (i.e. 6).
The position of "5" is in the Ten's place, which means 5 tens (i.e. fifty).
The position of "4" is in the Hundred's place, which means 4 hundred.
As we go left, each position becomes ten times greater.
Hence, we read it as "Four hundred fifty-six".

As we move left, each position is 10 times bigger!
Tens are 10 times bigger than Ones.
Hundreds are 10 times bigger than Tens.
And Each time we move right every position becomes 10 times smaller from Hundred's to Ten's, to Ones.

Now, 10 times smaller than ones means $\frac{1}{10}$(tenths)

Before that we should first put a decimal point.
The power of 10 can be found using the following Place Value Chart:

Place Value Chart:



The digits to the left of the decimal point are multiplied with the positive powers of ten in increasing order from right to left.
The digits to the right of the decimal point are multiplied with the negative powers of 10 in increasing order from left to right.

Ex :

Decimal expansion of 81.75 is

$(8\times10)+(1\times1)+(7\times0.1)+(5\times0.01)$

i.e., $(8\times10)+(1\times1)+\left(7\times\frac{1}{10}\right)+\left(5\times\frac{1}{100}\right)$

SOLVED EXAMPLES

Example 1 :

What is the place value of 6 in 43.625?

Solution:

6 is in the tenths place.

So, its place value is: $6\times\frac{1}{10}=0.6$

Example 2 :

Write 7.42 in expanded form.

Solution:

7.42 =7+0.4+0.02

Example 3 :

Expanded form of 23.758 is

Solution:

Given the number 23.758.

$23.578=20+3+0.7+0.05+0.008$

$\text{Decimal expansion}=(2\times10)+(3\times1)+\left(5\times\frac{1}{10}\right)+\left(7\times\frac{1}{100}\right)+\left(8\times\frac{1}{1000}\right)$

Example 4:

Decimal Expansion of 1023.0045:

Solution:

Given the number = 1023.0045

Start by breaking down the number:

1023.0045

$=1\times10^3+0\times10^2+2\times10^1+3\times10^0+0\times10^{-1}+0\times10^{-2}+4\times10^{-3}+5\times10^{-4}$

PROPERTIES OF DECIMALS

The important properties of decimal numbers under multiplication and division operations are as follows:

1. If any two decimal numbers are multiplied in any order, the product remains the same.
2. If a whole number and a decimal number are multiplied in any order, the product remains the same.
3. If a decimal fraction is multiplied by 1, the product is the decimal fraction itself.
4. If a decimal fraction is multiplied by 0, the product is zero (0).
5. If a decimal number is divided by 1, the quotient is the decimal number.
6. If a decimal number is divided by the same number, the quotient is 1.
7. If 0 is divided by any decimal, the quotient is 0.
8. The division of a decimal number by 0 is not possible, as the reciprocal of 0 does not exist.

Ex:

Expanded form of 23.758 is

$$23.578 = (2\times 10)+(3\times 1)+\left(5\times\frac{1}{10}\right)+\left(7\times\frac{1}{100}\right)+\left(8\times\frac{1}{1000}\right)$$

$$= 20+3+0.7+0.05+0.008$$

Rounding of decimals to the nearest tenths:

It can be done by taking the digit at the hundredth place.
If that digit in hundredth place is 4 and less, just remove all the digits to the right of the tenths place digit and the remaining is the result.
If the digit at the hundredth place is 5 or greater, increase the tenths place digit by 1, and remove all the digits on the right of the tenths place digit.
Ex : Rounding 765.27446 to the tenths place .
Hundredths place digit is 7 > 5

Add 1 to the tenths place digit and ignore the rest. $(\because 2+1=3)$

We will get 765.3

Like Decimals :

The decimals which have the same no. of digits after the decimal point.
Ex : 4.65 and 3.21 are like decimals.

Unlike Decimals :

The decimals which do not have the same number of digits after the decimal point.
Ex : 7.3 and 4. 76 are unlike decimals.

Conversion of unlike decimals to like decimals.

Steps to follow are :

1. Find the decimal number having the maximum no. of decimal places say (n)
2. Convert each of the decimal numbers to 'n' places of decimals.
   If we put a number of zeroes to the extreme right of decimal, the value of

decimal remains the same.

0.8 = 0.80 = 0.800

Ex : Convert decimal no.s 5.42, 11.6 and 212.075 into like decimals.

Solution: 212.075 has maximum no. of decimal places i.e., 3.

5.42 = 5.420

11.6 = 11.600

5.420, 11.600, 212.075 are unlike decimals.

Rouding of decimal to the nearest whole number:

If the tenths place value is 5 or greater than 5, the digit at the ones place increases by 1 and the digits at the tenths place & thereafter becomes '0'.

Ex : In 9.63 6 > 5

It is rounded to the nearest whole number. 10.

If the tenths place value is less than 5 then the digit at the ones place remains the same but the digits at the tenths place and thereafter becomes '0'.

Ex : 7.21 is rounded to 7.

since 2 < 5

SOLVED EXAMPLES

Example 1 :

Are 5.23 and 8.91 like decimals?

Solution:

5.23 and 8.91 have 2 digits after the decimal. They are Like Decimals.

Example 2 :

Are 3.1 and 6.25 unlike decimals?

Solution:

3.1 and 6.25 one has 1 digit and the other has 2 digits after decimal

They are Unlike Decimals.

Example 3 :

Round 3.68 to the nearest tenth

Solution:

Look at hundredths digit $\Rightarrow$ 8 ($\geq$5)

Round tenths up: 3.6 $\Rightarrow$ 3.7

Example 4 :

Round "seven and fifty-nine hundredths" to the nearest tenth

Solution:

Decimal: 7.59 $\Rightarrow$ Hundredths = 9

$\Rightarrow$Round up: 7.6

OPERATIONS ON DECIMALS

Addition Of Decimals:

Adding decimals is just same like adding as usual.

How to add decimal number?

To add decimal follow the below steps:

1. Write down the decimal numbers, one number under the other number and line up the decimal points.
2. Convert the given decimals to like decimals.
3. Arrange the addends in such a way that the digits of the same place are in the same column.
4. Add the numbers from right as we carry addition usually.

Subtracting decimals :

Subtracting decimals is just same like subtracting as usual.

How to subtract decimal number ?

To subtract decimal follow the below steps :

1. Write down the two decimal numbers, one number under the other number and line up the decimal points.
2. Convert the given decimals to like decimals.
3. Write the smaller decimal number under the larger decimal number in the column.
4. Arrange the decimal numbers in the column in such a way that the digits of the same place are in the same column.
5. Subtract the numbers in the column from the right.

Multiplication Of Decimals:

Steps to follow:

1. Multiply the decimal numbers as usual without decimal point.
2. Count the number of decimal places in the multiplicand and the multiplier.
3. Mark the decimal point in the product obtained from the right such that the no. of decimal places in the product is equal to the sum of decimal places in the two decimal number.

Example:

Multiply 0.03 by 1.1

0.03 x 1.1

Multiply without decimal points = 3 x 11 = 33

0.03 has 2 decimals places, and 1.1 has 1 decimal place, so the answer has 3 decimal places = 0.033

How to multiply a decimal by a whole number:

1. Multiply the decimal with the decimal point by the whole number.
2. Mark the decimal point in the product from right to left according to the number of decimal places in the given decimal number.

Example: Multiply 0.03 by 1.1

0.03 x 1.1

Multiply without decimal points = 3 x 11 = 33

0.03 has 2 decimals places, and 1.1 has 1 decimal place, so the answer has 3 decimal places = 0.033

Division of Decimals:

How to divide a decimal by a whole number?

1. Divide the decimal number (dividend) by considering it as a whole number by the given whole number.
2. Mark the decimal point in the quotient such that it has the same number of

decimal places as in the decimal number (dividend) .

Example:

A car travels 234.40 km in 4 hours. How much distance will it travel in 1 hour?

Solution :

Number of hours = 4

Distance covered by a car in 4 hours = 234.40 km

Therefore, a car can travel 1 hour = $(234.40 \div 4)km = 58.6km$

How to divide a decimal by a decimal number?

1. Convert the divisor into a whole number by multiplying the dividend and divisible by the suitable power of 10.
2. Now, divide the new dividend by the whole number as discussed before.

SOLVED EXAMPLES

Example 1:

Add: 10.567 + 2.783 + 4.679

Solution:

Given 10.567 + 2.783 + 4.679

$$\begin{array}{r} 10.567 \\ 2.783 \\ +\ 4.679 \\ \hline 18.019 \end{array}$$

Example 2:

Subtract: 3.045 - 1.79

Solution:

Given 3.045 - 1.79

$$\begin{array}{r} 3.045 \\ -\ 1.790 \\ \hline 1.255 \end{array}$$

Example 3 :

Multiply: 0.75 × 0.06

Solution:

Step 1: Multiply the numbers as if they are whole numbers.

75×6=450

Step 2: Count the total number of decimal places in both numbers (2 decimal places in 0.75 and 2 decimal places in 0.06, so 4 decimal places in total).

Step 3: Place the decimal point 4 places from the right.
0.0450 or 0.045

Example 4 :

Divide 0.0072 ÷ 0.004

Solution :

Step 1: Remove decimals by multiplying both numbers by 10000:

$$\frac{0.0072}{0.004} = \frac{72}{40}$$

Step 2: Simplify:

$$\frac{72}{40} = \frac{9}{5} = 1.8$$

POWERS OF 10

"Powers of 10" is a very useful way of writing down large or small numbers. Instead of having lots of zeros, you show how many powers of 10 will make that many zeros.

Example :

5,000 = 5 x 1,000 = 5 x 10^3

5 thousand is 5 times a thousand. And a thousand is 10^3,

So 5 times 10^3 = 5,000

Can you see that 10^3 is a handy way of making 3 zeros

Example :

What is 1.35 x 10^4 ?

You can calculate it as : $1.35 \times (10 \times 10 \times 10 \times 10) = 1.35 \times 10,000 = 13,500$

But it is easier to think "move the decimal point 4 places to the right" like this:

$1.35 \rightarrow 13.5 \rightarrow 135. \rightarrow 1350. \rightarrow 13500.$

Negative powers of 10:

Example :

5 x $10^{-3} = 5 \times \frac{1}{10^3} = \frac{5}{1000} = 0.005$

Just remember for negative powers of 10,move the decimal point to the left.

Example :

What is 7.1 x 10^{-3} ?

Well, It is really $7.1 \times \left(\frac{1}{10} \times \frac{1}{10} \times \frac{1}{10}\right) = 7.1 \times 0.001 = 0.0071$

But it is easier to think "move the decimal point 3 places to the left" like this.

$7.1 \rightarrow 0.71 \rightarrow 0.071 \rightarrow 0.0071$

SOLVED EXAMPLES

Example 1:

Express 0.000000000345 in scientific notation.

Solution:

Given 0.000000000345

First, move the decimal point 10 places to the right:

$0.000000000345 = 3.45 \times 10^{-10}$

So, the result is:

$\boxed{3.45 \times 10^{-10}}$

Example 2:

Express 0.0000045 as a power of 10.

Solution:

Given 0.0000045

First, express 0.0000045 in scientific notation.

Move the decimal point 6 places to the right:

$0.0000045 = 4.5 \times 10^{-6}$

So, the result is:

$\boxed{4.5 \times 10^{-6}}$

CDF POINTS

1. Decimals are one of the types of numbers, which has a whole number and the fractional part separated by a decimal point. The dot present between the whole number and fractions part is called the decimal point.
2. A decimal in which a figure or set of figures is repeated continuously is called a recurring or periodic or circulating decimal. The repeated figures or set of figures is called the period of the decimal.
3. In non-recurring decimal numbers, digits never repeat after a fixed interval.
4. A decimal fraction in which some figures do not recur, is called a mixed recurring decimal.
5. It represents the fraction whose denominator in powers of ten.
6. If any two decimal numbers are multiplied in any order, the product remains the same.
7. If a whole number and a decimal number are multiplied in any order, the product remains the same.
8. If a decimal fraction is multiplied by 1, the product is the decimal fraction itself.
9. If a decimal fraction is multiplied by 0, the product is zero (0).
10. If a decimal number is divided by 1, the quotient is the decimal number.

11. If a decimal number is divided by the same number, the quotient is 1.
12. If 0 is divided by any decimal, the quotient is 0.
13. The division of a decimal number by 0 is not possible, as the reciprocal of 0 does not exist.
14. Adding and Subtracting decimals is just like adding as usual.
15. Divide the decimal number (dividend) by considering it as a whole number by the given whole number.
16. "Powers of 10" is a very useful way of writing down large or small numbers.

TEACHING TASK

JEE MAINS LEVEL QUESTIONS

Multiple Choice Questions Type:

1. What decimal of an hour will be a second?
   A) 0.00027 B) 0.00256 C) 0.00081 D) 0.00216
2. If 0.36 is written in simplest fractions form, then the difference between its numerator and the denominator will be
   A) 25 B) 18 C) 16 D) 15
3. The value of 3 x 0.3 x 0.03 x 0.003 x 30 is equal to
   A) 0.0243 B) 243 C) 0.00243 D) 0.000243
4. A train travels 45.8 km in one hour.The distance travelled by the train in 6 hours is ?
   A) 264.6 km B) 474.8km C) 274.8km D) 384.8km
5. 0.3 x 0.008 =
   A) 0.054 B) 0.0440 C) 0.0024 D) 0.0034

JEE ADVANCED LEVEL QUESTIONS

Multi correct answer type:

1. Which of the following numbers has a 4 in the hundreadths place?
   A) 413.26 B) 9.546 C) 765.047 D) 87.349

Statement Type:

A) Both Statements are True.
B) Both Statements are False.
C) Statement I is True and II is False.
D) Statement I is False and II is True.

2. **Statement I** : When the given numbers are different in their length, we convert them to unlike decimals.
   Statement II : Like decimals have an equal number of digits after the decimal, 0.34 and 2.63 are like decimals.

Comprehension Type:

When we add decimals, we convert them into like decimals. Like decimals have an equal number of digits after the decimal.

3. Which of the following are like decimals?
   A) 2.342 and 4.37 B) 89.43 and 8.2

C) 63.694 and 43.492 D) 7.29 and 3.4932

4. Which of the following are unlike decimals?
   A) 22.789 and 8.9 B) 7.659 and 7.654
   C) 52.329 and 48.432 D) 8.32 and 4.99

Integer type:

5. What is the result of integer value of multiplying 0.7 by 0.25?

Matrix matching Type :

6.

Column I	**Column II**
a. 20+3+0.7+0.05+0.008=	p. 827.7973.....
b. Nonterminating decimal no	q. 2.3758
c. Recurring decimal number	r. 2
d. 14.62 + 12.63 - 25.25=	s. 573.636363....
	t. 23.758

LEARNERS TASK

CONCEPTUAL UNDERSTANDING QUESTIONS (CUQ's)

Multiple Choice Questions Type:

1. Convert 32.35 into fraction.
   A) $\frac{3235}{100}$ B) $\frac{3235}{10}$ C) $\frac{3235}{10000}$ D) $\frac{3235}{1000}$

2. $400+20+1+\frac{2}{10}+\frac{3}{100}+\frac{5}{1000}$ is equal to
   A) 421.235 B) 42.1235 C) 4.21235 D) 421.325

3. $102 \times 0.22 =$
   A) 102.44 B) 22.44 C) 224.4 D) 22.444

4. Divide 0.0098 by 0.28
   A) 0.000035 B) 0.00035 C) 0.0035 D) 0.035

5. Which of the following is terminating decimal?
   A) 0.8666..... B) 0.15 C) 0.878787 D) 0.8333

JEE MAINS LEVEL QUESTIONS

Multiple Choice Questions Type:

1. Cost of one kg salt increases from Rs. 28.47 to 39.45.The increase in cost in rupees is ?
   A) 9.25 B) 10.98 C) 1.98 D) 25.45

2. Simplify to the nearests hundreadth 18.35 x 1.2 =
   A) 2.202 B) 220.2 C) 22.02 D) 2.200

3. If $2.4x-0.6=1.8$, what is the value of x?
   A) 0.5 B) 0.6 C) 1.0 D) 0.7

4. What is the product of 0.3 and 0.4?
   A) 0.12 B) 0.15 C) 0.08 D) 0.24

5. If 0.2 is added to three times a certain decimal, the result is 1.1. What is the decimal?
   A) 0.3 B) 0.4 C) 0.2 D) 0.1

JEE ADVANCED LEVEL QUESTIONS

Multiple correct answer type:

1. Which of the following are in scientific notation?
   A) 5.3242×10^{2} B) 53.4252×10^{3} C) 6.4932×10^{-2} D) 423×10^{-4}

Statement Type:

A) Both statements I and II are true.
B) Both statements I and II are false.
C) Statement I is true and II is false.
D) Statement I is false and II is true.

2. **Statement I** : If Jack travels by bus 1.2 miles and he ran 0.75 mile, then he travelled the distance in total is 1.95 miles.
   Statement II : When we add decimals we convert them into like decimals.

Comprehension Type:

Riya is planning a school event. She allocates Rs.5,000 to snacks. She estimates that each student snack will cost Rs.12.75. If there are 300 students, she calculates the total cost using multiplication of decimals. Later, she checks whether the budget can cover the cost or not.

3. What is the estimated total cost for 300 students?
   A) Rs.13,825 B) Rs.14,250 C) Rs.13,675 D) Rs.13,975
4. Will Riya's budget be sufficient for the expense?
   A) Yes, Rs.5,000 > Rs.3,825 B) No, Rs.3,825 is more than the budget
   C) No, budget is less than total D) Not enough information

Integer Type :

5. A tin contains 18.5 lit of oil, how many such tins required for 129.5 litres of oil?

Matrix Matching Type:

6.

Column I	Column II
a. 367.80 x 6 =	p. 277.772
b. 234.28 + 43.492=	q. 543.73
c. 81.2 ÷32 =	r. 2206.8
d. (823.32 - 321.29)+41.7=	s. 2.5375

KEY

TEACHING TASK				
JEE MAINS LEVEL QUESTIONS				
1	**2**	**3**	**4**	**5**
A	C	C	C	C
JEE ADVANCED LEVEL QUESTIONS				
1	**2**	**3**	**4**	**5**
BCD	D	C	A	0
6				
t,p,s,r				
LEARNERS TASK				
CUQ'S				
1	**2**	**3**	**4**	**5**
C	A	B	D	B
JEE MAINS LEVEL QUESTIONS				
1	**2**	**3**	**4**	**5**
B	C	C	A	A
JEE ADVANCED LEVEL QUESTIONS				
1	**2**	**3**	**4**	**5**
ABCD	A	C	A	7
6				
r,p,sq				