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ARITHMETIC TEST

CHAPTER 01

NUMBER AND NUMERIC SYSTEM

Number

In Hindu Arabic system, there are ten digits (i.e. 0, 1, 2, 3, 4, 5, 6, 7, 8, 9). A number is formed by considering these digit as a group, which is called as numeral.

Systems

A numeric system is a set of characters and mathematical rules that are used to represent a number.

1. Indian system,

2. International system

Indian/Hindu Arabic System

Periods	Crores		Lakhs		Thousands		Ones	
Values	Ten Crore 10,00,00,000	Crore 1,00,00,000	Ten Lakh 10,00,000	Lakh 1,00,000	Ten Thousand 10,000	Thousand 1,000	Hundred 100	Ten 10
Numeral	4	3	2	5	2	3	7	1

According to the Indian system, the above numeral is written as 43, 25, 23, 716. It is read as forty three crore twenty five lakh twenty three thousand seven hundred sixteen.

International System

Periods	Millions			Thousands			Ones		
Values	Hundred Million 100,000,000	Ten Million 10,000,000	Million 1,000,000	Hundred Thousand 100,000	Ten Thousand 10,000	Thousand 1,000	Hundred 100	Ten 10	One 1
Numeral	4	3	2	5	2	3	7	1	6

It is most commonly used system in the world. In this system above numeral is written as 432, 523, 716. It is read as four hundred thirty two million five hundred twenty three thousand seven hundred sixteen.

Example 1. Write the following in words

- (i) 8275 (ii) 76901 (iii) 1234578

Sol. (i) 8275 = Eight thousand two hundred seventy five.

(ii) 76901 = Seventy six thousand nine hundred one.

(iii) 1234578 = Twelve lakh thirty four thousand five hundred seventy eight.

Example 2. Write the following in figures

- (i) Seventy thousand three hundred sixty four.
 (ii) One lakh twenty five thousand four hundred twenty.
 (iii) Five crore fifty lakh five thousand five hundred five.

Sol. (1) 70364 (2) 125420 (3) 55005505

Face Value

The face value of a digit in a numeral is equal to the digit number itself, irrespective of the place occupied.

e.g., In 364, face value of '6' is 6.

Place Value

The place value of a digit in a numeral depends on the place it occupies.

Place value of a digit = Face value of the digit
 × Value of the place occupied

e.g., In 3548 the place value of 5 is $5 \times 100 = 500$

Example 3. Find the difference between face value and place value of 8 in 35829.

- (1) 834
 (2) 729
 (3) 792
 (4) None of the above

Sol. (3) In 35829

$$\text{Face value} = 8 \quad \text{and} \quad \text{place value} = 8 \times 100 = 800$$

$$\therefore \text{Difference} = 800 - 8 = 792$$

Least and Greatest Numbers

We know that, 1 is the least one digit number and 9 is the greatest one digit number. For finding the least number of n digit, we write $(n - 1)$ zeros in the right

side of 1 and for greatest number of n digit, we write the number 9 n times.

e.g., Least 4 digit number = 1000

Greatest 4 digit number = 9999

Successor and Predecessor of a Number

Successor is the number just after the given number and predecessor is the number just before the given number. To get successor or predecessor of a number we add or subtract 1 from it.

e.g., Successor of 856979 is 856980 and predecessor is 856978.

Roman Numbers

The numbers which we use are called 'Arabic Numbers' but sometimes we use the another system for writing numbers called roman system.

Mostly, roman numbers are used to denote the class standard and position (Rank) of a candidate, in faces of clocks, in page numbering etc.

The letters used in roman numbers are

I = 1, V = 5, X = 10, L = 50, C = 100, D = 500, M = 1000

Roman Numerals Chart

Roman	Arabic	Roman	Arabic
I	1	XVII	17
II	2	XVIII	18
III	3	XIX	19
IV	4	XX	20
V	5	XXX	30
VI	6	XL	40
VII	7	L	50
VIII	8	XC	90
IX	9	C	100
X	10	D	500
XI	11	DI	501
XII	12	DL	550
XIII	13	CM	9000
XIV	14	MD	1500
XV	15	MM	2000
XVI	16		

Types of Numbers

There are following types of number

Natural Numbers

The counting numbers such as 1, 2, 3, 4, ... are called as natural numbers.

The set of natural numbers is denoted by N .

$$N = \{1, 2, 3, 4, \dots\}$$

- (i) 1 is the smallest natural number.
- (ii) 0 is not a natural number.

Whole Numbers

All natural numbers together with 0 (zero) are called whole numbers.

The set of whole numbers is denoted by W .

$$W = \{0, 1, 2, 3, 4, \dots\}$$

Here, 0 is the smallest whole number.

Integer Numbers

All natural numbers together with 0 and negative numbers are called integer numbers.

The set of integer numbers is denoted by I .

$$I = \{\dots, -5, -4, -3, -2, -1, 0, 1, 2, 3, 4, 5, 6, \dots\}$$

- (i) I^+ = 1, 2, 3, 4, ... are positive integers.
- (ii) I^- = -1, -2, -3, -4, ... are negative integers.
- (iii) 0 (zero) is neither positive integer nor negative integer.

Even Numbers

The natural numbers which are divisible by 2 are called as even numbers. e.g., 2, 4, 6, 8, 10, ...

Here, 2 is the smallest even number.

Odd Numbers

The natural numbers which are not divisible by 2 are called as odd numbers. e.g., 1, 3, 5, 7, 9, ...

Here, 1 is the smallest odd number.

Rational Numbers

Numbers which can be written in the form $\frac{p}{q}$ ($q \neq 0$), where p and q are integers, are called rational numbers.
e.g., $\frac{5}{4}, \frac{1}{7}, \frac{3}{8}$.

Irrational Numbers

Numbers which cannot be written in the form $\frac{p}{q}$ ($q \neq 0$), where p and q are integers, are called irrational numbers. e.g., $\sqrt{2}, \sqrt{5}$.

Prime Numbers

The natural numbers greater than 1 which are not divisible by any number except 1 and itself are called prime numbers. e.g., 2, 3, 5, 7, ...

- (i) 2 is the smallest prime number and again it is the only even prime number.
- (ii) The prime numbers upto 100 are 2, 3, 5, 7, 11, 13, 17, 19, 23, 29, 31, 37, 41, 43, 47, 53, 59, 61, 67, 71, 73, 79, 83, 89 and 97.
- (iii) The elements in the set of natural numbers, prime numbers and whole numbers are infinite.

Composite Numbers

Numbers other than 1 which are not prime are called composite numbers. As 4, 6, 8, 9 are all composite numbers.

- (i) 4 is the smallest composite number.
- (ii) 1 is neither prime nor composite.

Entrance Corner

1. Which of the following statement is correct? [JNV 2019]
 - (1) Zero is an odd number
 - (2) Zero is an even number
 - (3) Zero is a prime number
 - (4) Zero is neither odd nor even number
2. What is the sum of the place value of 5 in the number 584356? [JNV 2019]
 - (1) 10
 - (2) 50050
 - (3) 5050
 - (4) 500050
3. The difference between the greatest and the smallest 5-digit numbers, formed by the digits 0, 3, 6, 7 and 9 without repetition, is [JNV 2019]
 - (1) 93951
 - (2) 67061
 - (3) 66951
 - (4) 60840
4. Find the differences between 5 digits greater and 5 digits smaller number with different digits. [JNV 2018]
 - (1) 41976
 - (2) 88531
 - (3) 98531
 - (4) 108999
5. Using the different digits, find the smallest number of 4 digits in which 9 is in tens place. [JNV 2018]
 - (1) 1290
 - (2) 1092
 - (3) 2091
 - (4) 2190
6. Which is the smallest 5 digit number formed by digits 5, 1, 6 when two digits can be used twice? [JNV 2018]
 - (1) 11565
 - (2) 51156
 - (3) 11556
 - (4) 11655

- 7.** In which of the following numbers only one prime number lie? [JNV 2018]
 (1) 40 and 50 (2) 60 and 70
 (3) 80 and 90 (4) 90 and 100
- 8.** What is quotient when 76076 is divided by 13? [JNV 2018]
 (1) 5652 (2) 5852 (3) 5762 (4) 5662
- 9.** Which one is the smallest number? [JNV 2016]
 (1) 7413 (2) 7130 (3) 7985 (4) 7545
- 10.** The difference between the smallest number of six-digits and the largest number of four-digits is [JNV 2016]
 (1) 90001 (2) 91000 (3) 90100 (4) 90010
- 11.** Which one of the following is the correct statement for the numbers 56 and 84? [JNV 2016]
 (1) Both the numbers are prime
 (2) Both the numbers are co-prime
 (3) Both the numbers are multiple of 14
 (4) Both the numbers are odd
- 12.** Five digits greatest number to be formed with the help of 7, 2, 4, 8 and 0 is (each digit using once time) [JNV 2015]
 (1) 80742 (2) 87042 (3) 87420 (4) 87402
- 13.** Which statement is true for 11 and 21? [JNV 2015]
 (1) Both are divisible numbers
 (2) Both are even numbers
 (3) Both are co-prime numbers
 (4) Both are multiple of 3
- 14.** Five digits greatest odd number to be formed with the help of 3, 5, 7, 9 and 0 is [JNV 2014]
 (1) 90573 (2) 97530 (3) 97503 (4) 97053
- 15.** Highest two digits prime number is [JNV 2013]
 (1) 93 (2) 97 (3) 91 (4) 99
- 16.** Find the greatest five digit even number using the 3, 0, 5, 7 and 8 digits. [JNV 2013]
 (1) 83570 (2) 85703 (3) 87530 (4) 87350
- 17.** Find the greatest five digit number using the 9, 6, 3 and 0 digits (Any one digit repeated twice.) [JNV 2012]
 (1) 96630 (2) 96300 (3) 99630 (4) 90963
- 18.** The difference between the place values of two 7s in 27307 is [JNV 2011]
 (1) 6993 (2) 7300 (3) 307 (4) 40
- 19.** Which one of the following is a prime number? [JNV 2011]
 (1) 81 (2) 83 (3) 85 (4) 87
- 20.** Eighty thousand nine hundred and five is represented in number form as [JNV 2011]
 (1) 8095 (2) 80905 (3) 809005 (4) 8009005
- 21.** Sixteen lakh eight hundred and thirteen may be written in digit as [JNV 2010]
 (1) 16813 (2) 160830 (3) 1600813 (4) 160813
- 22.** The place value of 5 in 214.56 [JNV 2010]
 (1) 5×1 (2) 5×10
 (3) 5×0.1 (4) 5×0.01
- 23.** Find a prime even number out of the following numbers. [JNV 2008]
 (1) 4 (2) 6
 (3) 2 (4) 13
- 24.** In a question of division if divisor is 51, quotient 16 and remainder 27, then the dividend will be [JNV 2004, 1994]
 (1) 843 (2) 483
 (3) 94 (4) 1393

Answers

1. (4)	2. (4)	3. (3)	4. (2)	5. (2)	6. (3)	7. (4)	8. (2)	9. (2)	10. (1)
11. (3)	12. (3)	13. (3)	14. (3)	15. (2)	16. (3)	17. (3)	18. (1)	19. (2)	20. (2)
21. (3)	22. (3)	23. (3)	24. (1)						

Hints and Solutions

1. Zero is neither odd nor even number.

2. Given, 5 84 356

Place values of 5 \rightarrow [5] 84 3 [5] 6

i.e. 500000 and 50

$$\begin{aligned}\text{Sum of place values of 5} &= 500000 + 50 \\ &= 500000\end{aligned}$$

3. Given digits = 0, 3, 6, 7, 9

Greatest 5-digit number = 97630

Smallest 5-digit number = 30679

\therefore The difference between the greatest and the smallest numbers = $97630 - 30679 = 66951$

4. 5-digit largest number = 98765

5-digit smaller number = 10234

Required difference = $98765 - 10234 = 88531$

5. The smallest number of four digits by using different digit = 1092

6. The 5-digit smallest number using digit 5, 1, 6 by using two digits twice = 11556

7. Between 90 and 100 only one prime number '97' exist.

8. $13 \overline{)76076} \quad 5852$ quotient

$$\begin{array}{r} 65 \\ 110 \\ 104 \\ \hline 67 \\ 65 \\ \hline 26 \\ 26 \\ \hline 0 \end{array}$$

0 Remainder.

9. The smallest number is 7130.

10. Smallest number of 6-digits = 100000

Largest number of 4-digits = 9999

$$\begin{aligned}\text{Then, the required difference} &= 100000 - 9999 \\ &= 90001\end{aligned}$$

11. $56 = 14 \times 4$ and $84 = 14 \times 6$

It is clear from the above factors both numbers are multiple of 14.

12. Five digits greatest number to be formed with the help of 7, 2, 4, 8 and 0 digit = 87420

13. Both 11 and 21 are co-prime numbers.

14. Required odd number

Ten	Th	Hun	Ten	Unit
9	7	50	0	3

15. In the given number 97 is the two digits largest prime number.

16. Required largest five digits even number = 87530

17. Required largest five digits (any one digit repeated twice) number = 99630

18. \therefore Place values of two 7s in 27307 are = 7000 and 7

$$\therefore \text{Difference} = (7000 - 7) = 6993$$

19. 83 is a prime number.

20. Eighty thousand nine hundred and five represented in number form as 80905

23. Prime number = 2, 3, 5, 7, 11, 13, 17 etc.

\therefore Prime even number = 2

24. As we know,

$$\text{Dividend} = \text{Divisor} + \text{Quotient} + \text{Remainder}$$

$$\text{Dividend} = 51 \times 16 + 27 = 816 + 27 = 843$$

Practice Exercise

1. 12 thousands + 13 hundreds + 2 tens is equal to

- (1) 12132 (2) 13320
(3) 130132 (4) 121320

2. The difference between the greatest number of four digits and the smallest number of five digits is

- (1) 1 (2) 11
(3) 1111 (4) 8999

3. The place value of 5 in 64532981 is

- (1) five thousand (2) fifty thousand
(3) five lakh (4) fifty lakh

4. Ninety thousand and ninety nine may be written in digit as

- (1) 90000909 (2) 9000099 (3) 90909 (4) 90099

5. The difference between the largest and the smallest numbers of three digits is

- (1) 999 (2) 998 (3) 899 (4) 888

6. In number 36490, when the digits 6 and 9 are interchanged, then the difference between the original and the new number is
 (1) 2870 (2) 2960 (3) 2970 (4) 3970
7. Find the sum of the face values of 9 and 6 in 907364.
 (1) 15 (2) 20 (3) 9 (4) 18
8. Find the smallest number, which by adding or subtracting to or from an even number will be an odd number.
 (1) 0 (2) 1 (3) 2 (4) 3
9. Using digits 1, 0, 5 and 7, the greatest 4 digit number formed is
 (1) 1075 (2) 1057 (3) 5017 (4) 7510
10. The smallest 4-digits even number formed by the digits 0, 1, 2 and 3 is
 (1) 1023 (2) 1032 (3) 3201 (4) 3210
11. The sum of the greatest and the smallest number of four digits is
- (1) 8999 (2) 10999 (3) 11110 (4) 11111
12. Find the difference between largest and smallest 5 digit number, which are formed from digits 0, 2, 5, 6 and 8.
 (1) 65925 (2) 69552 (3) 65952 (4) 65592
13. The smallest odd number formed by using the digits 1, 0, 3, 4 and 5 is
 (1) 10345 (2) 10453 (3) 10543 (4) 10534
14. How many prime numbers are there between 80 and 100?
 (1) 6 (2) 7 (3) 8 (4) 3
15. The number which when multiplied by 13 is increased by 180 is
 (1) 15 (2) 5 (3) 12 (4) 25
16. The smallest number of four digits is
 (1) 1001 (2) 0001 (3) 0010 (4) 1000
17. Sum of all prime numbers between 1 and 10 is
 (1) 15 (2) 17 (3) 18 (4) 16

Answers

1. (2)	2. (1)	3. (3)	4. (4)	5. (3)	6. (3)	7. (1)	8. (2)	9. (4)	10. (2)
11. (2)	12. (3)	13. (1)	14. (4)	15. (1)	16. (4)	17. (2)			

Hints and Solutions

1. 12 thousands + 13 hundreds + 2 tens
 $= 12000 + 1300 + 20 = 13320$
2. \therefore Smallest number of five digits = 10000
 Greatest number of four digits = 9999
 \therefore Difference = $(10000 - 9999) = 1$
3. The place value of 5 in 64532981 is
 $= 500000$ or 5 lakh
4. Ninety thousand and ninety nine = 90099
5. \therefore Difference = $999 - 100 = 899$
6. \therefore Original number = 36490
 New number = 39460
 \therefore Difference = $(39460 - 36490) = 2970$
7. The face value is the value of digit itself.
 So, required sum = $9 + 6 = 15$
8. 8 is an even number by adding or subtracting 1 to or from it, the result will be 9 and 7 respectively which are odd numbers.
9. 7510
10. 1032
11. Greatest number of four digit = 9999
 Smallest number of four digit = 1000
 $\text{Sum} = 9999 + 1000 = 10999$
12. Given, digits = 0, 2, 5, 6 and 8
 Largest 5-digit number = 86520
 Smallest 5-digit number = 20568
 \therefore Required difference = $86520 - 20568$
 $= 65952$
13. The required odd number formed is 10345.
14. 3 prime numbers are between 80 and 100.
15. $13 \times 15 - 15 = 180$
17. Prime number between 1 and 10
 $= 2 + 3 + 5 + 7 = 17$

Self Practice

1. One lakh, thirty five thousand, four hundred and twenty six is written in figures as
(1) 133256 (2) 135426 (3) 153263 (4) 153353
2. The difference between the place value and face value of 4 in 45689, is
(1) 40000 (2) 39999 (3) 39996 (4) 39000
3. The predecessor of 8000 is
(1) 7999 (2) 8001 (3) 7989 (4) 7988
4. The greatest number of 5 digits which starts from 8 and ends with 7 is
(1) 89997 (2) 88997 (3) 88887 (4) 87987
5. The least number formed with the digit 0, 4, 2, 6 is
(1) 0462 (2) 4026 (3) 0246 (4) 2046
6. What is the greatest number that forms from the digits 3, 5, 0, 6?
(1) 6503 (2) 6530 (3) 6350 (4) 6053
7. How many numbers are of 4 digits?
(1) 9000 (2) 1000 (3) 900 (4) None of these
8. Find the least number formed by the digits 7, 0, 0 and 2.
(1) 7200 (2) 2007 (3) 2070 (4) 7020
9. In the given number 890436, if you write 0 in place of 4, by how much the resulting number be less than this given number?
(1) 40 (2) 400 (3) 436 (4) 36
10. The sum of all odd numbers less than 10 is
(1) 15 (2) 25 (3) 23 (4) 24
11. The sum of all prime numbers less than 15 is
(1) 39 (2) 42 (3) 41 (4) 45
12. How many prime numbers are there in between 1 and 10?
(1) 2 (2) 3 (3) 4 (4) 5
13. Which one of the following statements is true?
(1) All even numbers are composite numbers
(2) All odd numbers are prime numbers
(3) There are infinitely prime numbers
(4) A prime number can be written as the product of more than two natural numbers
14. The sum of 3 even numbers will be
(1) always even (2) always odd
(3) sometimes even and sometimes odd (4) None of these
15. What will remain after subtracting 11 ten times from 121?
(1) 0 (2) 11 (3) 22 (4) 10

Answers

1. (2)	2. (3)	3. (1)	4. (1)	5. (2)	6. (2)	7. (1)	8. (2)	9. (2)	10. (2)
11. (3)	12. (3)	13. (3)	14. (1)	15. (2)					

CHAPTER 02

FOUR FUNDAMENTAL OPERATIONS ON WHOLE NUMBERS

Whole Numbers

All natural numbers together with 0 (zero) are called whole numbers. Addition as well as multiplication of two whole numbers must be a whole number but same is not true while having the operation like subtraction and division on whole number.

Fundamental Operations

Closure Law

For addition

$$1 + 2 = 3$$

$$4 + 5 = 9$$

For multiplication

$$2 \times 3 = 6$$

$$4 \times 5 = 20$$

Commutative Law

For addition

$$2 + 3 = 3 + 2$$

$$11 + 7 = 7 + 11$$

For multiplication

$$2 \times 3 = 3 \times 2$$

$$11 \times 7 = 7 \times 11$$

Associative Law

For addition

$$1 + (2 + 3) = (1 + 2) + 3$$

$$5 + (9 + 11) = (5 + 9) + 11$$

For multiplication

$$1 \times (2 \times 3) = (1 \times 2) \times 3$$

$$5 \times (9 \times 11) = (5 \times 9) \times 11$$

Distributive Law

$$2 \times (4 + 5) = 2 \times 4 + 2 \times 5$$

$$(11 + 7) \times 5 = 11 \times 5 + 7 \times 5$$

Identity Elements

Zero is the identity element for addition and 1 is the identity element for multiplication.

Properties of Zero

- When zero is added or subtracted from any number, the result is the number itself.
e.g., $4 + 0 = 4, 18 - 0 = 18$
 $6 - 0 = 6, 24 - 0 = 24$
- Product of any whole number and zero is zero.
e.g., $4 \times 0 = 0$
- If we divide zero by any whole number, the result is zero.
e.g., $0 \div 10 = 0, 0 \div 4 = 0$
- If power of any number is zero, then the value of that number will be 1.
e.g., $1^0 = 1, 4^0 = 1$

Properties of One

The product of any whole number and 1 is the whole number itself.

$$\text{i.e., } 18 \times 1 = 18, 5 \times 1 = 5$$

Tests of Divisibility

Test of divisibility may be derived from the properties of multiples of specific divisors.

Divisibility by 2

Any number, having last digit is either 2, 4, 6, 8 or zero is divisible by 2.

e.g., 12, 86, 130, 242 and 306 are divisible by 2.

Divisibility by 3

If the sum of the digits of a number is divisible by 3, the number is also divisible by 3.

e.g., 426

$4 + 2 + 6 = 12$ which is divisible by 3. Hence, 426 is divisible by 3.

Divisibility by 4

If the last two digits of a number are divisible by 4, the number is divisible by 4. The number having two or more zeros at the end is also divisible by 4.

e.g., 324, 824, 5632, 3500, 4320, are divisible by 4.

Divisibility by 5

If a number ends in 5 or 0, the number is divisible by 5.

e.g., 1345

As its last digit is 5, it is divisible by 5.

Divisibility by 6

A number is divisible by 6, when it is divisible by 2 as well as 3. This rule can be obtained from the fact that 2 and 3 are the two factors or submultiples of 6.

- (i) The number should end with an even digit or 0.
- (ii) The sum of its digits should be divisible by 3.

e.g., 4554

Here, as the number is even, so it is divisible by 2.

Also, the sum of digits = $4 + 5 + 5 + 4 = 18$,

which is divisible by 3.

So, the number 4554 is divisible by 6.

Divisibility by 8

If the last three digits of a number is divisible by 8, the number is also divisible by 8. Also, if the last three digits of a number are zeros, the number is divisible by 8.

e.g., 3648

Since, 648 is divisible by 8, 3648 is divisible by 8.

Divisibility by 9

If the sum of all the digits, of a number is divisible by 9, the number is also divisible by 9.

e.g., $39681 : 3 + 9 + 6 + 8 + 1 = 27$ is divisible by 9, hence the number is also divisible by 9.

Divisibility by 10

Any number which ends with zero is divisible by 10.

e.g., The numbers 150, 540, 1860, 2210 etc. are divisible by 10.

Divisibility by 11

If the sums of digits at odd and even places are equal by a number divisible by 11, then the number is also divisible by 11.

e.g., $3245682 : \text{Odd place value} = 3 + 4 + 6 + 2 = 15$ and even place value = $2 + 5 + 8 = 15$

As, odd place value = even place value, the number is divisible by 11.

Important Facts

- If a number is made by writing a digit 6 times, then the number is divisible by 7, 11 and 13.
e.g., 888888 is divisible by 7, 11 and 13.
- If a number is made by writing a 2 digit number 3 times, then the number is divisible by 7 and 13.
e.g., 939393 is divisible by both 7 and 13.
- If a number is made by repeating a 3 digit number 2 times, then the number is divisible by 7, 11 and 13. e.g., 973973 is divisible by 7, 11 and 13.

Example 1. 85536 is divisible by which number, without actual division?

- | | |
|-------|--------|
| (1) 5 | (2) 3 |
| (3) 7 | (4) 13 |

Sol. (2) Sum of the digits = $8 + 5 + 5 + 3 + 6 = 27$

As 27 is divisible by 3, so the given number 85536 is divisible by 3.

Other Important Formulae

- $\text{Dividend} = \text{Divisor} \times \text{Quotient} + \text{Remainder}$
- $\text{Divisor} = \frac{\text{Dividend} - \text{Remainder}}{\text{Quotient}}$

Example 2. On dividing 18270 by a certain number, the quotient is 186 and the remainder is 42. Find the divisor.

- | | |
|--------|---------|
| (1) 48 | (2) 79 |
| (3) 98 | (4) 108 |

$$\begin{aligned}\text{Sol. (3)} \quad \text{Divisor} &= \frac{\text{Dividend} - \text{Remainder}}{\text{Quotient}} \\ &= \frac{18270 - 42}{186} \\ &= \frac{18228}{186} = 98\end{aligned}$$

So, divisor is 98.

Example 3. What least number should be added to the least number of four digits, so that the resulting number is exactly divisible by 89?

Sol. (1) Least number of four digits = 1000

$$89) \begin{array}{r} 1000 \\ - 89 \\ \hline 110 \\ - 89 \\ \hline 21 \end{array}$$

$$\therefore \text{Required number} = 89 - 21 = 68$$

Unit Digit

Extreme right digit of a number is known as unit digit of that number.

Unit Digit in the Multiplication of Numbers

If we want to find the unit digit in the multiplication of some numbers, we can do so by multiplying only the unit digits of the given numbers.

$$\begin{aligned} \text{e.g., Unit digit in } & 786 \times 498 \times 189 \times 592 \\ & = \text{Unit digit in } 6 \times 8 \times 9 \times 2 \\ & \equiv \text{Unit digit in } 864 \equiv 4 \end{aligned}$$

Entrance Corner

1. When -1 is multiplied by itself 100 times, the product is
(1) 1 (2) -1 (3) 100 (4) -100

2. A store sells a packet of 5 apples in ₹25 and a single apple in ₹ 6, if a lady purchase 27 apples. How much money will she pay?
(1) ₹ 128 (2) ₹ 130 [JNV 2018]
(3) ₹ 137 (4) ₹ 150

3. Kaku got 7 marks less than Bakshi while Raman got 3 marks more than Kaku. If the total marks obtained by all three is 76. Find the marks obtained by Raman.
[JNV 2018]
(1) 22 (2) 25 (3) 29 (4) 31

4. Ram got 8 marks more than Shyam in an examination. Anil got 4 marks more than Ram in the same examination. If all three of them got 128 marks together as a total, Ram's marks would be
[JNV 2016]
(1) 36 (2) 44 (3) 48 (4) 54

5. Rajesh's weight is 5 kg less than Ram's weight and Neha's weight is 3 kg more than Ram's weight. If the weight of three is 103 kg, then the weight of Ram is
[JNV 2015]
(1) 34 kg (2) 38 kg (3) 33 kg (4) 35 kg

6. In an examination Karan got 10 marks more than Bhavna. Isha got 5 marks less than Bhavna. If Trio get a total of 170, then what is the marks obtained by Isha?
[JNV 2014]
(1) 65 (2) 55 (3) 50 (4) 45

7. 1000000 is obtained, when a number is subtracted from the sum of 893645 and 635489, find that number. [JNV 2014]
(1) 106355 (2) 364511
(3) 51329 (4) 529134

8. A shopkeeper charges ₹ 10 for every bottle of coke or ₹ 240 for every crate of 30 bottles. If Vandana wants to buy 185 bottle of coke, what amount she will have to pay?
[JNV 2014]
(1) ₹ 1480 (2) ₹ 1490
(3) ₹ 1600 (4) ₹ 1850

9. What is the maximum difference between the smallest number formed by 7 numerals and the largest number formed by 6 numerals?
[JNV 2014]
(1) 1 (2) 35802
(3) 38502 (4) 999998

10. Unit digit of product of first ten prime number is
[JNV 2014]
(1) 6 (2) 4 (3) 2 (4) 0

11. The difference between the highest and lowest five digits number using 0, 3, 6, 8 and 9 digit (each digits using once time).
[JNV 2013]
(1) 94941 (2) 61821 (3) 61740 (4) 67941

12. The sum of two numbers is 234560. If one number is more than other number by ten thousand ten. Find the greatest number.
[JNV 2013]
(1) 112272 (2) 112275 (3) 132285 (4) 117280

13. Find out the unit's digit in the product of $(3207 \times 12 \times 17 \times 13)$. [JNV 2013]
 (1) 0 (2) 3 (3) 4 (4) 7
14. Which of the following is the smallest four digits number? [JNV 2011]
 (1) 1000 (2) 1100 (3) 1300 (4) 1900
15. The multiple of 7 between 14 and 77 is [JNV 2011]
 (1) 10 (2) 9 (3) 8 (4) 7
16. What value must be given to *, so that the number $6912*$ is divisible by 25?
 [JNV 2011, 1997]
 (1) 3 (2) 5 (3) 4 (4) 7
17. The value of $20.91 \div 0.17$ is [JNV 2011]
 (1) 0.0123 (2) 1.230 (3) 12.30 (4) 123.0
18. 14 rows in a park 420 cars stand in every row. Then, how many cars will stand in the park? [JNV 2010]
 (1) 5880 (2) 434 (3) 406 (4) 30
19. A number
 - is less than 50 - multiple of 7
 - have 3 factors
 Then, the number is [JNV 2010]
 (1) 14 (2) 42 (3) 49 (4) 70
20. What should be added to 65° to make it a right angle? [JNV 2008]
 (1) 35° (2) 45° (3) 40° (4) 25°
21. In a well water level was 18 m below. Due to rains water level increased by 3.5 m. What is the water level in the well now?
 [JNV 2008]
 (1) 14.5 m (2) 15.6 m (3) 21.5 m (4) 3.5 m
22. What is the greatest four digits number in which all the digits are different? [JNV 2007]
 (1) 9876 (2) 9768 (3) 9867 (4) 9786
23. 2408×200 is equal to [JNV 2007]
 (1) 480160 (2) 480016
 (3) 481600 (4) 461600
24. The product of three numbers is 7980. In which the product of two numbers is 228, then what is the third number? [JNV 2007]
 (1) 25 (2) 15 (3) 16 (4) 35
25. The sum of the greatest and the smallest 4 digit numbers is [JNV 2004]
 (1) 8999 (2) 10999
 (3) 11110 (4) 111111
26. The product of two numbers is 8192. One of the number is two times the second number, the smaller number is [JNV 2004]
 (1) 8 (2) 16 (3) 32 (4) 64
27. The smallest odd number formed by the digits 1, 0, 3, 4 and 5 will be [JNV 2004]
 (1) 10345 (2) 10453
 (3) 10543 (4) 10534
28. The number 13013 is divisible by 13. The smallest 5 digit number beginning with 14 and exactly divisible by 13 is [JNV 2003, 1995]
 (1) 14040 (2) 14001
 (3) 14014 (4) 14027
29. In a question of division if divisor is 51, quotient 16 and remainder 27, then the dividend will be [JNV 2003, 1995]
 (1) 843 (2) 483
 (3) 9 (4) 1393

Answers

1. (2)	2. (3)	3. (2)	4. (2)	5. (4)	6. (3)	7. (4)	8. (2)	9. (1)	10. (4)
11. (4)	12. (2)	13. (3)	14. (1)	15. (3)	16. (2)	17. (4)	18. (1)	19. (2)	20. (4)
21. (1)	22. (1)	23. (3)	24. (4)	25. (2)	26. (4)	27. (1)	28. (2)	29. (1)	

Hints and Solutions

1. According to the question,
 \therefore Required answer $= (-1) \times (1)^{100} = (-1)^{101} = -1$
2. Price of packet of 5 apples is ₹ 25.
 Price of a single apple = ₹ 6
 Now, 27 apples $= 5 \times 5$ packet + 2 apple
 $= 5 \times 25 + 2 \times 6 = 125 + 12 = ₹ 137$

1. Price of 27 apples = ₹ 137
3. \therefore Let marks obtained by Kaku = x
 Marks obtained by Raman = $x + 3$
 Marks obtained by Bakshi = $x + 7$
 According to the question
 $x + x + 3 + x + 7 = 76$

- $3x + 10 = 76 \Rightarrow 3x = 66 = 22$
 \therefore Marks obtained by Raman = $x + 3 = 22 + 3 = 25$
4. Let the marks obtained by Shyam be x .
Then, marks obtained by Ram = $x + 8$
and marks obtained by Anil = $x + 8 + 4$
= $x + 12$
According to the question,
 $x + x + 8 + x + 12 = 128$, $3x + 20 = 128$
 $3x = 108$, $x = 36$
So, marks obtained by Ram = $x + 8 = 36 + 8 = 44$
5. Suppose Ram's weight = x kg
Then, Rajesh's weight = $(x - 5)$ kg
and Neha's weight = $(x + 3)$ kg
Then, $x + (x - 5) + (x + 3) = 103$
 $\Rightarrow 3x - 2 = 103 \Rightarrow 3x = 105$
 $\therefore x = \frac{105}{3} = 35$ kg
6. Let the score of Bhavna be x , then
Score of Karan = $x + 10$
Score of Isha = $x - 5$
According to the question,
 $x + 10 + x - 5 + x = 170$
 $\Rightarrow 3x + 5 = 170 \Rightarrow 3x = 165$
 $\therefore x = 55$
Obtained mark of Isha = $55 - 5 = 50$
7. Sum = $893645 + 635489 = 1529134$
Let the number which is to be subtracted is x ,
then $1529134 - x = 1000000$
 $\Rightarrow x = 1529134 - 1000000 = 529134$
8. Given, 1 crate = 30 bottles
185 bottles = 6 crates + 5 bottles
= $6 \times 240 + 5 \times 10 = 1440 + 50 = ₹ 1490$
9. Smallest number of seven digit = 1000000
Greatest number of six digit = 999999
Required difference = $1000000 - 999999 = 1$
10. First ten prime numbers
2, 3, 5, 7, 11, 13, 17, 19, 23, 29
Product of first ten prime numbers
 $2 \times 3 \times 5 \times 7 \times 11 \times 13 \times 17 \times 19 \times 23 \times 29$
 \therefore Unit digit of product of $2 \times 3 \times 5 = 0$
Hence, the unit digit of first ten prime number
= 0 (0 multiplied by any number gives always 0).
11. Largest number of 5 digits = 98630
Smallest number of 5 digits = 30689
Hence, required difference
= $98630 - 30689 = 67941$

12. Suppose, first number = x
and second number = $x + 10010$
Then, $x + x + 10010 = 234560$
 $\Rightarrow 2x = 234560 - 10010$
 $\Rightarrow 2x = 224550 \Rightarrow x = 112275$
Hence, greatest number = $x + 10010$
= $112275 + 10010 = 122285$
13.
$$\begin{array}{cccccc} 3 & 2 & 0 & 7 & \times & 1 & 2 & \times & 1 & 7 & \times & 1 & 3 \\ & \uparrow & & \uparrow & & & \uparrow & & \uparrow & & & \uparrow & & \uparrow \\ & 7 & & 2 & & & 7 & & 3 & & & & & \end{array}$$

 \therefore Unit's digits are 7, 2, 7 and 3.
Hence, required product = $7 \times 2 \times 7 \times 3 = 294$
 \therefore Unit's digit = 4
14. Smallest four digits number = 1000
15. Multiples of 7 between 14 and 77
= 21, 28, 35, 42, 49, 56, 63, 70
So, total numbers of multiples are = 8
16. The numbers divisible by 25 are only the numbers with last digits 25, 50, 75 and 100. So, 5 is required number.
17. $\because 20.91 + 0.17 = \frac{2091}{100} \times \frac{100}{17} = 123.0$
18. Required number of cars = $14 \times 420 = 5880$
19. Required number = 42
 \therefore Factors of 42 = $2 \times 3 \times 7$
20. Right angle is 90° .
 $\therefore 90^\circ - 65^\circ = 25^\circ$
21. Required level = $18 - 3.5 = 14.5$ m
22. Arrange it in descending order starting from 9.
Hence, required number = 9876
23. $2408 \times 200 = 481600$
24. Third number = $\frac{7980}{228} = 35$
25. The greatest 4 digit number = 9999
The smallest 4 digit number = 1000
Total = 10999
26. Let the number be x and $2x$.
 $\therefore x \times 2x = 8192$
 $x \times x = \frac{8192}{2} = 4096$
 $\Rightarrow x^2 = 4096$
 $\Rightarrow x = \sqrt{4096}$
 $\Rightarrow x = 64$
28. The smallest five digit number beginning with 14 is 14000.

$$\begin{array}{r}
 13 \\
 \times 100 \\
 \hline
 91 \\
 \hline
 90 \\
 \hline
 78 \\
 \hline
 12
 \end{array}$$

∴ The required number will be

$$\begin{aligned}
 &= 14000 + (13 - 12) \\
 &= 14000 + 1 \\
 &= 14001
 \end{aligned}$$

- 29.** As we know,
 Dividend = Divisor + Quotient + Remainder
 Dividend = $51 \times 16 + 27$
 $= 816 + 27 = 843$

Practice Exercise

- 1.** On dividing a number by 9, the quotient is 12 and remainder is 7. The number is
 (1) 114 (2) 93 (3) 115 (4) 108
- 2.** What least number must be subtracted from 543 to get a number exactly divisible by 8?
 (1) 9 (2) 1 (3) 5 (4) 7
- 3.** The number 4318 should be divided by which number, so that the quotient is 17.
 (1) 253 (2) 254 (3) 244 (4) 354
- 4.** What must be added to 2910, so that the quotient is 243 on dividing by 12?
 (1) 7 (2) 4 (3) 5 (4) 6
- 5.** Which of the greatest four digits number, is exactly divisible by 88?
 (1) 9944 (2) 9988 (3) 9996 (4) 9966
- 6.** Which one of the following numbers is exactly divisible by 11?
 (1) 1552 (2) 1331 (3) 1882 (4) 1902
- 7.** If $10 * 4$ divisible by 3, the number at * is
 (1) 4 (2) 1 (3) 2 (4) 3
- 8.** If the number $325 * 6$ is exactly divisible by 3, the number which comes at the place of * is
 (1) 4 (2) 2 (3) 3 (4) 1
- 9.** If $34 * 24$ is divisible by 9, the number at * is
 (1) 5 (2) 9 (3) 2 (4) 3
- 10.** Find the unit's digit in the product of (4326×5321) .
 (1) 6 (2) 8
 (3) 1 (4) 3
- 11.** The unit's digit in the product $(2467)^{153} \times (341)^{72}$ is
 (1) 9 (2) 3 (3) 1 (4) 7
- 12.** A man's monthly salary is ₹ 25000. He spent ₹ 2500 on clothes, ₹ 4000 on food, ₹ 3000 on house rent and ₹ 3500 on education monthly. His monthly saving is
 (1) ₹ 1200 (2) ₹ 1800
 (3) ₹ 12000 (4) None of these
- 13.** The unit digit in the product of $163 \times 87 * \times 239$ be 1, then the digit that the place of * will be
 (1) 1 (2) 3 (3) 7 (4) 9
- 14.** On dividing 55055 by 11, the quotient obtained is
 (1) 550 (2) 5005 (3) 505 (4) 50005
- 15.** If the number $9708 * 3$ is divisible by 9 and 3, the number which comes at the place of * is
 (1) 0 (2) 1 (3) 3 (4) 6
- 16.** Find the greatest number of 4 digits which is exactly divisible by 75
 (1) 9975 (2) 9927 (3) 7799 (4) 9978

Answers

1. (3)	2. (4)	3. (2)	4. (4)	5. (1)	6. (2)	7. (2)	8. (2)	9. (1)	10. (1)
11. (4)	12. (3)	13. (2)	14. (2)	15. (1)	16. (1)				

Hints and Solutions

1. Dividend = Quotient \times Divisor + Remainder
 $= 12 \times 9 + 7 = 108 + 7 = 115$

2. 8) 543 (67
 $\underline{48}$
 63
 $\underline{56}$
 7 Remainder

\therefore 7 is the required least number.

3. The required number $= \frac{4318}{17} = 254$

4. The required number $= (243 \times 12) - 2910$
 $= 2916 - 2910 = 6$

5. The greatest number of four digits is 9999.

88) 9999 (113
 $\underline{88}$
 119
 $\underline{88}$
 319
 $\underline{264}$
 55

\therefore Required number $= 9999 - 55 = 9944$

6. \because In 1331; $(1+3) - (3+1) = 0$

[The difference between the sum of digits at even places and sum of the digits at odd places is 0].

7. For divisibility by 3, the sum of digits of a number must be divisible by 3, sum of the digits of the number $10 * 4 = 1 + 0 + 4 = 5$, which must be 6, so the digit at * place must be $(6 - 5) = 1$.

8. For divisibility by 3, the sum of digits of a number must be divisible by 3.

The sum of digits of the number $325 * 6$

$= 3 + 2 + 5 + 6 = 16$, which must be 18.

So, the digit at * place must be $(18 - 16) = 2$.

9. For divisibility by 9, the sum of digits of a number must be divisible by 9.

The sum of digits of the number $34 * 24$
 $= 3 + 4 + 2 + 4 = 13$, which must be 18.

So, the digit at * place must be $(18 - 13) = 5$.

10. Product of unit's digit $= 6 \times 1 = 6$
 \therefore Required digit = 6

11. Unit's digit of $(2467) \times (341)$
 $= 7 \times 1 = 7$

12. Total spent $= 2500 + 4000 + 3000 + 3500$
 $= ₹ 13000$,
Salary $= ₹ 25000$
 \therefore His monthly saving $= 25000 - 13000$
 $= ₹ 12000$

13. $163 \times 87 * \times 239$
The unit digit in product of 3, *, 9 should be 1.
 \therefore The required number of * should be 3.
 $\because 3 \times 3 \times 9 = 81$

14. 11) 55055 (5005
 $\underline{55}$
 055
 $\underline{55}$
 x

15. If the sum of digits of a number is divisible by both 9 and 3, that number will also be divisible by 9 and 3. Here, sum of digits $= 9 + 7 + 0 + 8 + * + 3 = 27 + *$, 27 is divisible by both 9 and 3.
 \therefore The number, which comes at the place of * is 0.

16. $9999 \div 75$, remainder = 24
 \therefore The required number
 $= 9999 - 24$
 $= 9975$

Self Practice

1. The greatest number of five digits exactly divisible by 8 is
(1) 99992 (2) 99984 (3) 90000 (4) 10000
2. In the election, a candidate 'A' gets 252130 votes while, candidate 'B' gets 113717 votes. Then, the number of votes with which candidate 'A' wins are
(1) 148413 (2) 138413 (3) 365847 (4) None of these
3. Which one of the numbers is exactly divisible by 3?
(1) 2572 (2) 3411 (3) 2732 (4) 3521
4. Which of the following numbers is exactly divisible by 9?
(1) 20756 (2) 10836 (3) 31525 (4) 53162
5. Which of the numbers is exactly divisible by 8?
(1) 444 (2) 8442 (3) 8096 (4) 8844
6. If 2^*345 is divisible by 9 what will come at *?
(1) 4 (2) 1 (3) 9 (4) 8
7. What least number should be subtracted from 413, so that the resulting number is exactly divisible by 13?
(1) 12 (2) 10 (3) 11 (4) 17
8. ₹ 125000 is to be distributed among 5 persons. Then, the share of each person is
(1) ₹ 2500 (2) ₹ 20000 (3) ₹ 25000 (4) ₹ 20005
9. The greatest number of three digits divisible by 5 is
(1) 9990 (2) 990 (3) 995 (4) 105
10. What least number should be added to 64 to make it divisible by 7?
(1) 4 (2) 6 (3) 12 (4) 3
11. The number 7254*38 is divisible by 9, then the number which comes at the place of * is
(1) 4 (2) 7 (3) 6 (4) 5
12. 57244 is divisible by
(1) 11, 4 (2) 4, 7 (3) 7, 11 (4) 7, 9
13. The number between 800 and 900 divisible completely by 13 and 17 is
(1) 878 (2) 884 (3) 888 (4) 868
14. What is the unit digit in $(44 \times 88 \times 11)$?
(1) 1 (2) 3 (3) 2 (4) 5

Answers

1. (1)	2. (2)	3. (2)	4. (2)	5. (3)	6. (1)	7. (2)	8. (3)	9. (3)	10. (2)
11. (2)	12. (1)	13. (2)	14. (3)						

CHAPTER 03

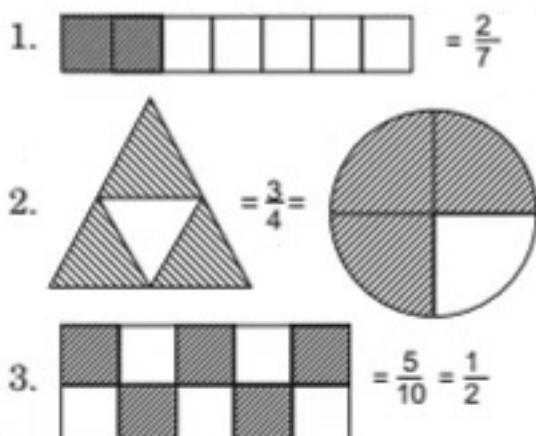
FRACTIONAL NUMBER AND FUNDAMENTAL OPERATIONS

Fraction

When a number quantity or an object is divided into equal parts, one or more of such equal parts is known as fraction. It is formed as $\frac{x}{y}$, where $y \neq 0$,

which represents x number of parts out of y number of equal parts of an object. Every fraction has a numerator and a denominator.

Here, x is called numerator and y is called denominator. Some figures are given below to understand the fraction in better way.



Types of Fraction

Proper Fraction

If numerator is less than the denominator of a fraction, then fraction is called proper fraction.

e.g. $\frac{8}{11}, \frac{4}{9}, \frac{19}{27}$ etc.

☞ The value of proper fraction is always less than 1.

Improper Fraction

A fraction whose numerator is equal to or greater than the denominator is called an improper fraction.

e.g. $\frac{17}{12}, \frac{12}{7}, \frac{18}{5}$ etc.

☞ The value of an improper fraction is always more than or equal to 1.

Mixed Fraction

A fraction combined with whole number part and a fractional part is called mixed fraction.

e.g. $1\frac{7}{16}, 2\frac{9}{4}, 3\frac{4}{11}$ etc.

Equivalent Fractions

Equivalent fractions can be defined as fractions with different numerators and denominators that represent the same value or proportion of the whole.

e.g. $\frac{3}{5}, \frac{6}{10}, \frac{30}{50}$ etc are equal

☞ The representation of the same ratio as multiplying or dividing numerator and denominator by common factor does not alter the value of the fraction.

Reciprocal Fraction

If numerator and denominator of a fraction are interchanged to each other, then the new fraction is called a reciprocal fraction.

e.g. Reciprocal fraction of $\frac{4}{5}$ is $\frac{5}{4}$.

Addition of Fractions

When Denominators are Equal Here, we simply add the numerators and keep the denominators same as all the denominators of the fraction are given same.

e.g. $\frac{1}{9} + \frac{8}{9} + \frac{5}{9} = \frac{1+8+5}{9} = \frac{14}{9}$

When Fractions are Mixed with Equal Denominators

Here, firstly we add all the whole part and simply add the numerator and keep denominator same as all the denominators of the fraction are given same. And lastly we sum up these two parts and get the final result.

$$\text{e.g. } 7\frac{2}{8} + 4\frac{1}{8} + 3\frac{3}{8} = (7+4+3) + \frac{2+1+3}{8} \\ = 14 + \frac{6}{8} = 14\frac{6}{8}$$

When Denominators are Unequal

If denominators are unequal, then we take the LCM of denominators and make equivalent fraction having same denominator further sum up numerator.

$$\text{e.g. } \frac{5}{3} + \frac{2}{5} + \frac{3}{10}$$

Here, LCM (3, 5, 10) = 30

$$\therefore \frac{5}{3} = \frac{5}{3} \times \frac{10}{10} = \frac{50}{30}, \frac{2}{5} = \frac{2}{5} \times \frac{6}{6} = \frac{12}{30}$$

$$\text{and } \frac{3}{10} = \frac{3}{10} \times \frac{3}{3} = \frac{9}{30}$$

$$\therefore \frac{5}{3} + \frac{2}{5} + \frac{3}{10} = \frac{50+12+9}{30} = \frac{71}{30}$$

When Fractions are Mixed with Unequal Denominators

Here, firstly we add all the whole part and fraction part make equivalent fraction having same denominator and further sum up numerator.

$$\text{e.g., } 5\frac{2}{3} + 4\frac{1}{2} + 3\frac{1}{6} = (5+4+3) + \left(\frac{2}{3} + \frac{1}{2} + \frac{1}{6} \right) \\ = 12 + \left(\frac{2 \times 2 + 3 \times 1 + 1 \times 1}{6} \right) \\ = 12 + \frac{8}{6} = 12 + \frac{4}{3} = 12 + 1\frac{1}{3} \\ = 12 + 1 + \frac{1}{3} = 13\frac{1}{3}$$

Subtraction of Fractions

The method of subtraction of fraction is same as that of their addition. Here, we have to take care regarding signs.

When Denominators are Equal

Here, we simply subtract the numerator and keep the denominators same as all the denominators of the fraction are given same.

$$\text{e.g. } \frac{8}{9} - \frac{4}{9} - \frac{2}{9} = \frac{8-4-2}{9} = \frac{2}{9}$$

When Fractions are Mixed with Equal Denominators

Here, firstly we subtract all the whole part and simply subtract the numerator and keep the denominators same as all the denominators of the fraction are given same as. And lastly we sum up there two parts and get the final result.

$$\text{e.g. } 8\frac{7}{4} - 4\frac{5}{4} = (8-4) + \frac{7-5}{4} = 4 + \frac{2}{4} = 4\frac{2}{4}$$

When Denominators are Unequal

If denominator are unequal, then we take the LCM of denominators and make equivalent fraction having same denominator. Further subtract the numerator

$$\text{e.g. } \frac{2}{3} - \frac{1}{2} = \frac{2 \times 2 - 1 \times 3}{6} = \frac{4-3}{6} = \frac{1}{6}$$

When Fractions are Mixed with Unequal Denominators

Here, firstly we subtract all the whole part and fraction part make equivalent fraction having same denominators and further subtract the numerator.

$$\text{e.g. } 9\frac{1}{3} - 8\frac{1}{4} = (9-8) + \frac{1}{3} - \frac{1}{4} = 1 + \frac{1 \times 4 - 1 \times 3}{3 \times 4} \\ = 1 + \frac{1}{12} = 1\frac{1}{12}$$

Multiplication of Fractions

- Convert the mixed fraction, if any into improper fraction.
- Multiply the numerators which gives the numerator of the product and multiply the denominators to get the denominator of the product.

$$(i) \frac{1}{3} \times \frac{2}{3} = \frac{1 \times 2}{3 \times 3} = \frac{2}{9}$$

$$(ii) 1\frac{2}{3} \times 2\frac{3}{1} = \frac{5}{3} \times \frac{5}{1} = \frac{5 \times 5}{3 \times 1} = \frac{25}{3}$$

Division of Fractions

- First convert mixed fraction into improper fraction, if any is given.
- In division of fraction first of all interchange the position of numerator and denominator of the second fraction.

Now, multiply of first fraction and interchange second fraction.

$$\text{e.g. } \frac{1}{4} \div \frac{1}{2} = \frac{1}{4} \times \frac{2}{1} = \frac{2}{4} = \frac{1}{2}$$

LCM and HCF of Fractions

Suppose we have fractional number of the form $\frac{a}{b}$, $\frac{c}{d}$ and $\frac{e}{f}$, then

$$\text{LCM of fractions} = \frac{\text{LCM of numerators } (a, c, e)}{\text{HCF of denominators } (b, d, f)}$$

and HCF of fractions = $\frac{\text{HCF of numerators } (a, c, e)}{\text{LCM of denominators } (b, d, f)}$

Example Find the LCM and HCF of $\frac{3}{8}$, $\frac{5}{12}$ and $\frac{9}{16}$.

- (1) $\frac{45}{4}, \frac{1}{48}$ (2) $\frac{35}{4}, \frac{1}{24}$ (3) $\frac{25}{4}, \frac{1}{12}$ (4) $\frac{1}{12}, \frac{25}{4}$

Sol. (1) LCM of $\frac{3}{8}, \frac{5}{12}$ and $\frac{9}{16}$

$$= \frac{\text{LCM of } 3, 5, 9}{\text{HCF of } 8, 12, 16} = \frac{45}{4}$$

HCF of $\frac{3}{8}, \frac{5}{12}$ and $\frac{9}{16}$

$$= \frac{\text{HCF of } 3, 5, 9}{\text{LCM of } 8, 12, 16} = \frac{1}{48}$$

Comparison of Fraction

Firstly, we change the given fraction in decimal fraction and compare them from compare, we can write of fractions in ascending and descending orders.

e.g.

- (i) greater fraction in $\frac{1}{2}$, $\frac{3}{4}$ and $\frac{5}{6}$

$$\frac{1}{2} = 0.5; \frac{3}{4} = 0.75; \frac{5}{6} = 0.833\dots$$

So, $\frac{5}{6}$ is greater fraction.

- (ii) Descending order of $\frac{7}{12}, \frac{5}{8}$ and $\frac{11}{15}$ can be determined as the following way.

$$\frac{7}{12} = 0.59, \frac{5}{8} = 0.63, \frac{11}{15} = 0.74$$

Clearly, $0.74 > 0.63 > 0.59$

$$\therefore \frac{11}{15} > \frac{5}{8} > \frac{7}{12}$$

Important Facts

- In two or more fractions, if denominators are same, then fraction with greater numerator is greater and fraction with lesser numerator is lesser.
 - In two or more fractions, if numerators are same, then fraction with greater denominator is lesser and fraction with lesser denominator is greater.
 - If difference between numerator and denominator of given fractions are same then the fraction having the greatest numerator is greatest and the fraction having the lowest numerator is lowest.

Entrance Corner

7. $\frac{1}{3}$ rd of a property is worth ₹ 1500. Find $\frac{1}{5}$ th of the property. [JNV 2012]
 (1) ₹ 600 (2) ₹ 900 (3) ₹ 1200 (4) ₹ 1000
8. The sum of the fraction $\frac{2}{9}$, $\frac{4}{3}$ and $\frac{6}{18}$ is [JNV 2011]
 (1) $\frac{17}{9}$ (2) $\frac{16}{9}$
 (3) $\frac{2}{5}$ (4) $\frac{11}{18}$
9. The value of $5 - \left(2\frac{1}{2} - \frac{3}{4}\right) + \left(3\frac{1}{2} - 1\frac{1}{4}\right)$ is [JNV 2007]
 (1) $4\frac{1}{2}$ (2) $5\frac{1}{2}$
 (3) $5\frac{1}{4}$ (4) $3\frac{1}{2}$
10. Which of the following numbers are in ascending order? [JNV 2004]
 (1) $\frac{1}{3}, \frac{1}{2}, 0.25$ (2) $0.25, \frac{1}{2}, \frac{1}{3}$
 (3) $0.25, \frac{1}{3}, \frac{1}{2}$ (4) $\frac{1}{2}, \frac{1}{3}, 0.25$
11. The sum of the fractions $\frac{4}{3}$, $\frac{5}{9}$ and $\frac{6}{18}$ is [JNV 2003]
 (1) $\frac{2}{5}$ (2) $\frac{11}{18}$
 (3) $\frac{19}{9}$ (4) $\frac{20}{9}$
12. The product of two numbers is $\frac{5}{4}$. If one number is $\frac{5}{6}$, what is the other number? [JNV 2002]
 (1) 2 (2) $\frac{1}{2}$ (3) $\frac{3}{2}$ (4) $\frac{2}{3}$
13. The correct arrangement of the fractional numbers $\frac{17}{25}$, $\frac{17}{13}$, $\frac{17}{19}$ and $\frac{17}{27}$ in ascending order is [JNV 2001]
 (1) $\frac{17}{19}, \frac{17}{13}, \frac{17}{27}, \frac{17}{25}$ (2) $\frac{17}{27}, \frac{17}{25}, \frac{17}{19}, \frac{17}{13}$
 (3) $\frac{17}{27}, \frac{17}{19}, \frac{17}{13}, \frac{17}{25}$ (4) $\frac{17}{13}, \frac{17}{25}, \frac{17}{19}, \frac{17}{27}$
14. Which of the following is the largest fraction? [JNV 2000]
 (1) $\frac{5}{6}$ (2) $\frac{9}{10}$ (3) $\frac{7}{9}$ (4) $\frac{10}{11}$
15. Which of the following is the smallest fraction? [JNV 1999]
 (1) $\frac{1}{10}$ (2) $\frac{2}{15}$ (3) $\frac{3}{8}$ (4) $\frac{4}{9}$
16. $\frac{5}{6}$ of an hour is equal to [JNV 1999]
 (1) $\frac{1}{2}$ h (2) 40 min
 (3) 50 min (4) 55 min
17. $\frac{4}{5}$ of 0.025 is equal to [JNV 1999]
 (1) 0.0002 (2) 0.002 (3) 0.02 (4) 0.2
18. Find the product of $0.4 \times 0.04 \times 0.004$. [JNV 1998]
 (1) 0.00064 (2) 0.0064
 (3) 64 (4) 0.000064
19. $\frac{1}{3}$ rd part of a certain amount was given to Sita and rest to Gita. If Gita got ₹ 524, what did Sita get? [JNV 1998]
 (1) ₹ 262 (2) ₹ 412 (3) ₹ 200 (4) ₹ 400
20. Simplify $\frac{8 \times 21 \times 24}{48 \times 7 \times 15}$. [JNV 1998]
 (1) $\frac{3}{5}$ (2) $\frac{4}{5}$ (3) $\frac{1}{7}$ (4) $\frac{1}{2}$
21. Which fraction should be added to the sum of $5\frac{3}{4}$, $4\frac{4}{5}$ and $7\frac{3}{8}$ to make the result a whole number? [JNV 1998]
 (1) $\frac{1}{40}$ (2) $\frac{2}{40}$ (3) $\frac{3}{40}$ (4) $\frac{4}{40}$
22. $2.205 \div 0.15$ is equal to [JNV 1997]
 (1) 1.47 (2) 14.7
 (3) 147 (4) 0.147
23. Which is the smallest fraction? [JNV 1997]
 (1) $\frac{2}{5}$ (2) $\frac{7}{5}$ (3) $\frac{6}{5}$ (4) $\frac{7}{8}$
24. The product of two fractions is 6. If one fraction is $\frac{5}{3}$. Find the other. [JNV 1997]
 (1) $\frac{3}{5}$ (2) $\frac{4}{5}$ (3) $\frac{18}{5}$ (4) $\frac{12}{5}$
25. In a class of 30 students the number of girls is $\frac{1}{5}$ th of the number of the boys. How many boys are there in the class? [JNV 1997]
 (1) 25 (2) 18 (3) 20 (4) 19

26. $\frac{1}{3}$ rd of a number is 15. Find $\frac{1}{5}$ th of the number. [JNV 1997]

- (1) 9 (2) 6 (3) 4 (4) 5

27. If $\frac{4}{5}$ of an estate be worth ₹ 1680, find the value of half of the estate. [JNV 1996]

- (1) ₹ 1080 (2) ₹ 1200 (3) ₹ 1000 (4) ₹ 1050

28. By how much does $\frac{6}{7}/\frac{8}{8}$ exceed $\frac{6}{7}$? [JNV 1996]

- (1) $6\frac{2}{3}$ (2) $6\frac{3}{4}$ (3) $7\frac{1}{2}$ (4) $8\frac{3}{4}$

29. Arrange these fractions in ascending order $\frac{3}{4}, \frac{1}{6}, \frac{9}{8}, \frac{10}{13}$. [JNV 1995]

- (1) $\frac{9}{8}, \frac{1}{6}, \frac{3}{4}, \frac{10}{13}$
 (2) $\frac{10}{13}, \frac{9}{8}, \frac{1}{6}, \frac{3}{4}$
 (3) $\frac{3}{4}, \frac{9}{8}, \frac{1}{6}, \frac{10}{13}$
 (4) $\frac{1}{6}, \frac{3}{4}, \frac{10}{13}, \frac{9}{8}$

30. Arrange these fractions in descending order $\frac{5}{6}, \frac{7}{8}, \frac{2}{3}, \frac{1}{7}$. [JNV 1995]

- (1) $\frac{7}{8}, \frac{5}{6}, \frac{2}{3}, \frac{1}{7}$
 (2) $\frac{5}{6}, \frac{1}{7}, \frac{2}{3}, \frac{7}{8}$
 (3) $\frac{5}{6}, \frac{7}{8}, \frac{2}{3}, \frac{1}{7}$
 (4) $\frac{1}{7}, \frac{2}{3}, \frac{5}{6}, \frac{7}{8}$

Answers

1. (2)	2. (1)	3. (2)	4. (3)	5. (2)	6. (3)	7. (2)	8. (1)	9. (2)	10. (3)
11. (4)	12. (3)	13. (2)	14. (4)	15. (1)	16. (3)	17. (3)	18. (4)	19. (1)	20. (2)
21. (3)	22. (2)	23. (1)	24. (3)	25. (1)	26. (1)	27. (4)	28. (2)	29. (4)	30. (1)

Hints and Solutions

1. According to the question,

$$\text{Total eggs} = 500$$

$$\frac{3}{25} \text{ got broken i.e. broken eggs} = \frac{3}{25} \times 500 = 60$$

$$\therefore \text{Remaining eggs} = 500 - 60 = 440$$

Now, $\frac{4}{5}$ of the remaining eggs were sold i.e.

$$= \frac{4}{5} \times 440 = 88 \times 4 = 352$$

$$\begin{aligned} \text{Hence, number of eggs left} &= 500 - (60 + 352) \\ &= 500 - 412 = 88 \end{aligned}$$

2. ∵ Empty part of the drum = $1 - \frac{2}{3} = \frac{1}{3}$

If $\frac{1}{3}$ part requires = 50 L

$$\text{Then, 1 part requires} = 50 \div \frac{1}{3} = 50 \times 3 = 150 \text{ L}$$

3. According to the question, $\frac{3}{4}$ th of 144

$$= 144 \times \frac{3}{4} = 108 \text{ and } \frac{2}{3}\text{rd of 96} = 96 \times \frac{2}{3} = 64$$

$$\therefore \text{Required difference} = 108 - 64 = 44$$

4. Fraction of drum filled with = $\frac{1}{5}$

$$\text{Remaining part} = 1 - \frac{1}{5} = \frac{4}{5}$$

According to the question, $\frac{4}{5}$ part = 28 L

$$4 \text{ part} = 28 \times 5 = 140 \text{ L}$$

$$1 \text{ part} = \frac{140}{4} = 35 \text{ L}$$

5. Suppose capacity of the drum = x L

$$\text{Water in drum} = \frac{x}{3} \text{ L}$$

$$\text{Then, } x - \frac{x}{3} = 60 \Rightarrow \frac{3x - x}{3} = 60$$

$$\Rightarrow \frac{2x}{3} = 60 \Rightarrow 2x = 180$$

$$\therefore x = 90 \text{ L}$$

6. Let x be taken out.

$$\text{Then, } \frac{3}{7} - x = \frac{2}{7} \Rightarrow x = \frac{3}{7} - \frac{2}{7} \Rightarrow x = \frac{1}{7}$$

7. Suppose total property = ₹ x

$$\text{Then, } x \times \frac{1}{3} = 1500 \Rightarrow x = 1500 \times 3$$

$$\Rightarrow x = ₹ 4500$$

$$\therefore \frac{1}{5} \text{ th of the property} = 4500 \times \frac{1}{5} = ₹ 900$$

8. Sum of the fraction

$$= \frac{2}{9} + \frac{4}{3} + \frac{6}{18} = \frac{4 + 24 + 6}{18} = \frac{34}{18} = \frac{17}{9}$$

9. $5 - \left[\frac{5}{2} - \frac{3}{4} \right] + \left[\frac{7}{2} - \frac{5}{4} \right] = 5 - \left[\frac{10-3}{4} \right] + \left[\frac{14-5}{4} \right]$
 $= 5 - \frac{7}{4} + \frac{9}{4} = \frac{20-7+9}{4} = \frac{22}{4} = \frac{11}{2} = 5\frac{1}{2}$

10. $\because \frac{1}{3} = 0.33, \frac{1}{2} = 0.50$

\therefore In ascending order the numbers will be written as $0.25 < 0.33 < 0.50$ or $0.25, \frac{1}{3}, \frac{1}{2}$

11. $\frac{4}{3} + \frac{5}{9} + \frac{6}{18} = \frac{6 \times 4 + 2 \times 5 + 1 \times 6}{18}$
 $= \frac{24 + 10 + 6}{18} = \frac{40}{18} = \frac{20}{9}$

12. \because Product of two numbers = $\frac{5}{4}$

One number = $\frac{5}{6}$

Other number = $\frac{5}{4} + \frac{5}{6} = \frac{5}{4} \times \frac{6}{5} = \frac{3}{2}$

13. $\frac{17}{27}, \frac{17}{25}, \frac{17}{19}, \frac{17}{13}$ are in ascending order.

(In like fractions with equal numerators, the fraction with greatest denominators is the smallest.)

14. $\frac{5}{6} = 0.833, \frac{9}{10} = 0.900, \frac{7}{9} = 0.777, \frac{10}{11} = 0.090$

\therefore Largest fraction = $\frac{10}{11}$

15. $\frac{1}{10} = 0.1, \frac{2}{15} = 0.13, \frac{3}{8} = 0.375, \frac{4}{9} = 0.444$

\therefore Smallest fraction = $\frac{1}{10}$

16. $\frac{5}{6}$ of 1 h = $\frac{5}{6} \times 60$ min = 50 min

17. $\frac{4}{5} \times 0.025 = \frac{4}{5} \times \frac{25}{1000} = \frac{1}{50} = 0.02$

18. $0.4 \times 0.04 \times 0.004 = 0.000064$

19. Let the total amount be ₹ x.

\therefore Gita get = $x - \frac{x}{3} = \frac{3x-x}{3} = ₹ \frac{2x}{3}$

According to the question,

$\frac{2x}{3} = 524 \Rightarrow 2x = 3 \times 524 \Rightarrow x = \frac{3 \times 524}{2} = ₹ 786$

Sita get = $786 \times \frac{1}{3} = ₹ 262$

20. $\frac{8 \times 21 \times 24}{48 \times 7 \times 15} = \frac{4032}{5040} = \frac{4}{5}$

21. $5\frac{3}{4} + 4\frac{4}{5} + 7\frac{3}{8} = \frac{23}{4} + \frac{24}{5} + \frac{59}{8} = \frac{717}{40}$

$\frac{717}{40}$ becomes whole number when $\frac{3}{40}$ is added to it.

$$\frac{717}{40} + \frac{3}{40} = \frac{720}{40} = 18$$

Which is a whole number.

22. $2205 \div 0.15 = \frac{2205}{0.15} = \frac{2205}{1000} \times \frac{100}{15} = \frac{2205}{150}$
 $= 14.7$

23. $\frac{2}{5} = 0.4, \frac{7}{5} = 1.4, \frac{6}{5} = 1.2, \frac{7}{8} = 0.875$

$\therefore \frac{2}{5}$ is the smallest fraction.

24. Let the other fraction be x.

Then, $x \times \frac{5}{3} = 6 \Rightarrow \frac{5x}{3} = 6$

$\therefore x = \frac{6 \times 3}{5} = \frac{18}{5}$

25. Let the number of boys be x.

Then, number of girls is $\frac{x}{5}$.

According to the question, $x + \frac{x}{5} = 30$

$\Rightarrow \frac{6x}{5} = 30 \Rightarrow 6x = 5 \times 30 \Rightarrow x = \frac{5 \times 30}{6} = 25$

\therefore Number of boys = 25

26. Let the number be x. Then, $\frac{1}{3}x = 15 \Rightarrow x = 45$

Then, $\frac{x}{5}$ of 45 = $45 \times \frac{1}{5} = 9$

27. Let the value of estate be ₹ x.

According to the question, $\frac{4x}{5} = 1680$

$\therefore x = \frac{1680 \times 5}{4} = ₹ 2100$

Value of half of the estate = $\frac{1}{2} \times 2100 = ₹ 1050$

28. $6 \div \frac{7}{8} = 6 \times \frac{8}{7} = \frac{48}{7}, \frac{6}{7} \div 8 = \frac{6}{7} \times \frac{1}{8} = \frac{3}{28}$

$$\frac{48}{7} - \frac{3}{28} = \frac{192-3}{28} = \frac{189}{28} = 6\frac{21}{28} = 6\frac{3}{4}$$

29. $\frac{3}{4} = 0.75, \frac{1}{6} = 0.166, \frac{9}{8} = 1.125, \frac{10}{13} = 0.769$

Ascending order, 0.16, 0.75, 0.76, 1.125

i.e., $\frac{1}{6}, \frac{3}{4}, \frac{10}{13}, \frac{9}{8}$

30. $\frac{5}{6} = 0.833, \frac{7}{8} = 0.875, \frac{2}{3} = 0.66, \frac{1}{7} = 0.142$

Descending order, 0.875, 0.833, 0.66, 0.142

i.e., $\frac{7}{8}, \frac{5}{6}, \frac{2}{3}, \frac{1}{7}$

Practice Exercise

1. $12 + \frac{\square}{6} = 13\frac{1}{6}$, which number should be written \square to prove statement true?

- (1) 1 (2) 7 (3) 13 (4) 25

2. Which of the following fractions is not equal to the other three?

- (1) $\frac{4}{5}$ (2) $\frac{9}{15}$ (3) $\frac{3}{5}$ (4) $\frac{6}{10}$

3. Which of the following numbers are in ascending order?

- (1) $\frac{12}{19}, \frac{12}{25}, \frac{12}{29}, \frac{12}{37}$ (2) $\frac{12}{29}, \frac{12}{37}, \frac{12}{19}, \frac{12}{25}$
 (3) $\frac{12}{37}, \frac{12}{29}, \frac{12}{19}, \frac{12}{25}$ (4) $\frac{12}{37}, \frac{12}{29}, \frac{12}{25}, \frac{12}{19}$

4. $\frac{2}{3} + \frac{5}{7}$ is equal to

- (1) $\frac{2+5}{3+7}$ (2) $\frac{2+5}{3\times 7}$
 (3) $\frac{2\times 7 + 3\times 5}{3+7}$ (4) $\frac{2\times 7 + 3\times 5}{3\times 7}$

5. The product of $3\frac{1}{2}$ and $3\frac{1}{2}$ is

- (1) 7 (2) $9\frac{1}{2}$ (3) $9\frac{1}{4}$ (4) $12\frac{1}{4}$

6. $1\frac{2}{3} \times 1\frac{3}{5}$ is equal to

- (1) $2\frac{2}{3}$ (2) $1\frac{2}{5}$ (3) $2\frac{2}{5}$ (4) $1\frac{5}{8}$

7. Find the value of



- (1) $\frac{1}{2}$ (2) $\frac{1}{3}$ (3) $\frac{1}{6}$ (4) $\frac{5}{6}$

8. $2\frac{1}{2} \times 3\frac{1}{3} \times 4\frac{1}{4}$ is equal to

- (1) $9\frac{1}{24}$ (2) $24\frac{1}{24}$ (3) $29\frac{1}{24}$ (4) $35\frac{5}{12}$

9. Write in ascending order of the following fractional numbers $\frac{5}{17}, \frac{9}{17}, \frac{8}{17}$ and $\frac{10}{17}$.

- (1) $\frac{10}{17}, \frac{9}{17}, \frac{8}{17}, \frac{5}{17}$ (2) $\frac{8}{17}, \frac{5}{17}, \frac{10}{17}, \frac{9}{17}$
 (3) $\frac{5}{17}, \frac{9}{17}, \frac{10}{17}, \frac{8}{17}$ (4) $\frac{5}{17}, \frac{8}{17}, \frac{9}{17}, \frac{10}{17}$

10. Which one of the following fractions are expressed in descending order?

- (1) $\frac{17}{25}, \frac{17}{27}, \frac{17}{13}, \frac{17}{19}$ (2) $\frac{17}{13}, \frac{17}{19}, \frac{17}{25}, \frac{17}{27}$
 (3) $\frac{17}{27}, \frac{17}{19}, \frac{17}{13}, \frac{17}{25}$ (4) $\frac{17}{27}, \frac{17}{19}, \frac{17}{25}, \frac{17}{13}$

11. The product of two numbers is $\frac{5}{4}$. If one number is $\frac{5}{6}$, what is the other number?

- (1) 2 (2) $\frac{1}{2}$ (3) $\frac{3}{2}$ (4) $\frac{2}{3}$

12. There is 500 eggs in a box. $\frac{4}{25}$ eggs were broken, $\frac{2}{5}$ of remaining eggs were sold. The number of eggs left is

- (1) 80 (2) 252 (3) 100 (4) 120

13. Mohan Lal gives $\frac{1}{4}$ th part of his total money to his son, $\frac{1}{3}$ rd part to his wife and $\frac{1}{8}$ th part to his daughter. Then, remaining part of his money is

- (1) $\frac{7}{24}$ (2) $\frac{5}{24}$ (3) $\frac{11}{24}$ (4) $\frac{1}{8}$

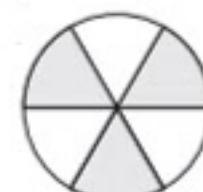
14. Which of the following fractions is greatest?

- $\frac{7}{12}, \frac{11}{16}, \frac{12}{17}, \frac{13}{18}, \frac{31}{36}$
 (1) $\frac{13}{18}$ (2) $\frac{12}{17}$ (3) $\frac{31}{36}$ (4) $\frac{7}{12}$

15. If one-fifth of one-fourth of a number is $\frac{5}{80}$, find the number.

- (1) $\frac{4}{5}$ (2) $\frac{5}{4}$ (3) $\frac{2}{3}$ (4) $\frac{3}{2}$

16. What is the $\frac{3}{4}$ th of $\frac{1}{5}$ of given figure?



- (1) $\frac{1}{30}$ (2) $\frac{3}{40}$ (3) $\frac{3}{20}$ (4) $\frac{5}{24}$

17. If $\frac{2}{3}, \frac{23}{30}, \frac{9}{10}, \frac{11}{15}$ and $\frac{4}{5}$ are written in ascending order, then the fraction in the middle most will be

- (1) $\frac{23}{30}$ (2) $\frac{4}{5}$ (3) $\frac{2}{3}$ (4) $\frac{11}{15}$

Answers

1. (2)	2. (1)	3. (4)	4. (4)	5. (4)	6. (1)	7. (4)	8. (4)	9. (4)	10. (2)
11. (3)	12. (2)	13. (1)	14. (3)	15. (2)	16. (2)	17. (1)			

Hints and Solutions

1. $12 + \frac{\square}{6} = 13\frac{1}{6} \Rightarrow \frac{72 + \square}{6} = \frac{79}{6}$
 $\square = 79 - 72 = 7$

2. (1) $\frac{4}{5} = \frac{4}{5}$ (2) $\frac{9}{15} = \frac{3}{5}$ (in its lowest term)
(3) $\frac{3}{5} = \frac{3}{5}$ (4) $\frac{6}{10} = \frac{3}{5}$ (in its lowest term)

As, (2), (3) and (4) are equal.

Hence, only $\frac{4}{5}$, i.e., (1) is not equal to other three fractions.

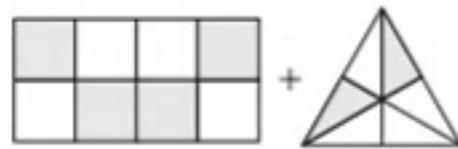
3. When the numerators are the same, the ascending order is determined by the descending order of the denominators.

4. $\because \frac{2}{3} + \frac{5}{7} = \frac{2 \times 7 + 3 \times 5}{3 \times 7}$

5. $3\frac{1}{2} \times 3\frac{1}{2} = \frac{7}{2} \times \frac{7}{2} = \frac{49}{4} = 12\frac{1}{4}$

6. $1\frac{2}{3} \times 1\frac{3}{5} = \frac{5}{3} \times \frac{8}{5} = \frac{8}{3} = 2\frac{2}{3}$

7.



$$= \frac{4}{8} + \frac{2}{6} = \frac{1}{2} + \frac{1}{3} = \frac{3+2}{6} = \frac{5}{6}$$

8. $2\frac{1}{2} \times 3\frac{1}{3} \times 4\frac{1}{4} = \frac{5}{2} \times \frac{10}{3} \times \frac{17}{4}$
 $= \frac{850}{24} = \frac{425}{12} = 35\frac{5}{12}$

9. When the denominators are the same, the ascending order is determined by the ascending order of numerators.

i.e. $\frac{5}{17}, \frac{8}{17}, \frac{9}{17}, \frac{10}{17}$

10. Since, numerators are same.
So, descending order,

$$\frac{17}{13}, \frac{17}{19}, \frac{17}{25}, \frac{17}{27}$$

11. The product of two numbers = $\frac{5}{4}$

One number = $\frac{5}{6}$
Other number = $\frac{5}{4} \div \frac{5}{6} = \frac{5}{4} \times \frac{6}{5} = \frac{3}{2}$

12. Total eggs = 500

Number of broken eggs = $500 \times \frac{4}{25} = 80$

∴ Remaining eggs = $500 - 80 = 420$

Number of sold eggs = $420 \times \frac{2}{5} = 168$

Hence, required remaining eggs = $420 - 168 = 252$

13. Remaining part of money = $1 - \left(\frac{1}{4} + \frac{1}{3} + \frac{1}{8} \right)$
 $= 1 - \left(\frac{6+8+3}{24} \right) = 1 - \frac{17}{24} = \frac{24-17}{24} = \frac{7}{24}$

14. Here, difference between numerator and denominator of all the fractions is 5. Therefore, the fraction with greatest numerator is the greatest.

Hence, $\frac{31}{36}$ is the greatest amongst the given fractions.

15. Let the required number be x .

Then, $\frac{1}{5} \times \frac{1}{4} \times x = \frac{5}{80}$, $x = \frac{5}{80} \times 5 \times 4 = \frac{5}{4}$

Hence, the required number is $\frac{5}{4}$.

16. It is clear from the figure that the fraction is

$$\frac{3}{6} = \frac{1}{2}$$

∴ Required value

$$= \frac{3}{4} \times \frac{1}{5} \times \frac{1}{2} = \frac{3}{40}$$



17. $\frac{2}{3}, \frac{23}{30}, \frac{9}{10}, \frac{11}{15}, \frac{4}{5} = \frac{20}{30}, \frac{23}{30}, \frac{27}{30}, \frac{22}{30}, \frac{24}{30}$

In ascending order, $\frac{20}{30}, \frac{22}{30}, \frac{23}{30}, \frac{24}{30}, \frac{27}{30}$

∴ Required fraction = $\frac{23}{30}$

Self Practice

1. Which is the greatest fraction in $\frac{2}{3}, \frac{2}{5}, \frac{1}{2}, \frac{1}{3}$?

(1) $\frac{1}{2}$ (2) $\frac{1}{3}$ (3) $\frac{2}{5}$ (4) $\frac{2}{3}$

2. $\frac{1}{8} - \frac{1}{9}$ is equal to

(1) $\frac{1}{72}$ (2) $\frac{1}{36}$ (3) $\frac{3}{72}$ (4) $\frac{7}{72}$

3. $\frac{1}{4} \times \frac{4}{5} \times \frac{5}{7} \times \frac{14}{25}$ is equal to

(1) $\frac{2}{25}$ (2) $\frac{1}{25}$ (3) $\frac{3}{25}$ (4) $\frac{4}{25}$

4. $\frac{2}{7}$ th part of a certain sum was donated and $\frac{1}{4}$ th was spent on education. The balance amount will be

(1) $\frac{13}{28}$ (2) $\frac{11}{28}$ (3) $\frac{5}{28}$ (4) $\frac{14}{28}$

5. If $\frac{3}{4}x = 48$, the value of x is

(1) 16 (2) 64 (3) 40 (4) 72

6. What is subtracted from $\frac{3}{4}$ to get remainder $\frac{2}{3}$?

(1) $\frac{1}{2}$ (2) $\frac{2}{12}$ (3) $\frac{1}{3}$ (4) $\frac{1}{12}$

7. Which is the smallest fraction?

(1) $\frac{3}{5}$ (2) $\frac{1}{2}$ (3) $\frac{2}{3}$ (4) $\frac{3}{4}$

8. $\frac{7 \times 7 \times 7}{21 \times 21 \times 21}$ is equal to

(1) $\frac{21}{63}$ (2) $\frac{1}{27}$ (3) $\frac{21}{42}$ (4) $\frac{1}{9}$

9. $3\frac{1}{5} \div 1\frac{2}{3}$ is equal to

(1) $\frac{46}{25}$ (2) $\frac{48}{25}$ (3) $\frac{44}{25}$ (4) $\frac{42}{25}$

10. On subtracting $\frac{1}{3}$ from 2, what will remain?

(1) $1\frac{1}{3}$ (2) $1\frac{2}{3}$ (3) $\frac{4}{3}$ (4) $1\frac{1}{2}$

11. $\frac{45 \times 36}{9}$ is equal to

(1) 160 (2) 170 (3) 180 (4) 190

Answers

CHAPTER 04

FACTORS AND MULTIPLES INCLUDING THEIR PROPERTIES

Factors

If a number is exactly divisible by the another number, without leaving any remainder, then the second number is said to be a factor of first number. In other words, an exact divisor of a number is called a factor of the number.

- 1 is the factor of every number.
- Every number is a factor of itself.
- Factors of a number are less than or equal to that number.
- Number of factors of that number are finite.

Example 1. Find number of factors of 250.

- (1) 7 (2) 8 (3) 9 (4) 6

Sol. (2) $250 = 2 \times 125 = 5 \times 50 = 10 \times 25 = 250 \times 1$

So, 1, 2, 5, 10, 25, 50, 125 and 250 are all factors of 250.
Hence, number of factors of 250 is 8.

Common Factors

When we find the factors of two or more numbers and then find some factors are the same ("Common") then they are the "Common Factors".

Example 2. What are the common factors of 20 and 25?

- (1) 4 (2) 5 (3) 6 (4) 7

Sol. (2) The factors of 20 = 1, 2, 4, 5, 10, 20

The factors of 25 = 1, 5, 25
and the common factors of 20 and 25 are 1 and 5.

Multiples

A multiple of a number is the number obtained by multiplying it with other (or same) number. In other words, the product of two or more numbers is said to be a multiple of each of those numbers.

e.g. $5 \times 1 = 5, 5 \times 2 = 10, 5 \times 3 = 15, 5 \times 4 = 20$; Hence, 5, 10, 15 and 20 all are multiples of 5.

- Multiple of a number is greater than or equal to that number.
- Every number is a multiple of itself.
- Every multiple of a number is exactly divisible by the number. Number of multiples of a number are infinite.

Example 3. Find the first five multiples of 20 between 100 and 300.

- (1) 125, 130, 145, 165, 180
(2) 115, 130, 145, 165, 180
(3) 125, 135, 145, 165, 180
(4) 120, 140, 160, 180, 200

Sol. (4) Multiples of 20 between 100 and 300 are 120 (20×6), 140 (20×7), 160 (20×8), 180 (20×9), 200 (20×10).

Common Multiples

A number that can be divided exactly by two or more different numbers.

e.g. common multiple of 24 and 36 is 4, because

$$4 \times 6 = 24, 4 \times 9 = 36$$

Prime Factor

The prime factors of a quantity are all of the prime quantities that will exactly divide the given quantity.

e.g. $28 = 2 \times 2 \times 7$ etc.

Example 4. Find the prime factors of 96.

- (1) 4 (2) 5 (3) 6 (4) 7

Sol. (3) $96 = 2 \times 48 = 2 \times 2 \times 24$
 $= 2 \times 2 \times 2 \times 12 = 2 \times 2 \times 2 \times 2 \times 6 = 2 \times 2 \times 2 \times 2 \times 2 \times 3$
Thus, the prime factors of 96 are 2, 2, 2, 2, 2 and 3.

Entrance Corner

1. Which of the following numbers is divisible by 3, 4, 5 and 6? [JNV 2019]
 (1) 36 (2) 60 (3) 80 (4) 90
2. A common multiple of both 9 and 7 is A. This number is in between 1200 and 1300. What is number A? [JNV 2018]
 (1) 1197 (2) 1260 (3) 1206 (4) 1266
3. The sum of the first four multiples of 6, is [JNV 2016]
 (1) 66 (2) 56 (3) 72 (4) 60
4. The sum of first five multiple of 6 is [JNV 2015]
 (1) 90 (2) 54 (3) 30 (4) 84
5. The difference between ten's digit and unit's digit of the sum of the first five multiple of 6 is [JNV 2015]
 (1) 6 (2) 7 (3) 8 (4) 9
6. Which of the following is not a factor of 316? [JNV 2011, 2002]
 (1) 1 (2) 8 (3) 79 (4) 158
7. What is the prime factorization of 37800?
 (1) $2 \times 2 \times 3 \times 3 \times 5 \times 5 \times 7 \times 7$ [JNV 2005]
 (2) $2 \times 2 \times 2 \times 3 \times 3 \times 3 \times 5 \times 5 \times 7$
 (3) $8 \times 27 \times 25 \times 7$
 (4) $2 \times 4 \times 25 \times 27 \times 7$
8. Factors of 30 are [JNV 2004]
 (1) 2, 3, 5 (2) 1, 2, 3, 5, 110
 (3) 1, 2, 3, 10, 15 (4) 1, 2, 3, 5, 6, 10, 15, 30
9. How many times does 9 come in writing the number from 1 to 100? [JNV 2004]
 (1) 9 (2) 100 (3) 20 (4) 21
10. The number of prime factors of 105 is [JNV 2001]
 (1) 2 (2) 3 (3) 4 (4) 5
11. The total number of the factors of 24 is [JNV 2000]
 (1) 8 (2) 7 (3) 4 (4) 9
12. The factor of each odd number is [JNV 1999]
 (1) 0 (2) 1
 (3) 3 (4) 5

Answers

1. (2)	2. (2)	3. (4)	4. (1)	5. (4)	6. (2)	7. (2)	8. (4)	9. (3)	10. (2)
11. (1)	12. (2)								

Hints and Solutions

1. From the options,
 Multiples of 60 = $2 \times 2 \times 3 \times 5$ or $4 \times 3 \times 5$ or 6×10
 Hence, number 60 is divisible by 3, 4, 5 and 6.
2. A common multiple of 9 and 7 both is A.
 Then number will completely divide both 9 and 7. We observed that only two numbers 1197 and 1260 is in between 1200 and 1300 is completely divide by 9 and 7. But only number 1260.
 Thus, the number A is 1260.
3. First four multiple of 6 = 6, 12, 18 and 24
 Then, require sum = $6 + 12 + 18 + 24$
 $= 60$
4. First five multiple of 6 is as follows $6 \times 1, 6 \times 2, 6 \times 3, 6 \times 4, 6 \times 5$ or $6, 12, 18, 24, 30$
 \therefore Required sum = $6 + 12 + 18 + 24 + 30 = 90$
5. First five multiple of 6 is as follows $6 \times 1, 6 \times 2, 6 \times 3, 6 \times 4, 6 \times 5$ or $6, 12, 18, 24, 30$
 \therefore Sum of first five multiple of 6
 $= 6 + 12 + 18 + 24 + 30 = 90$
 \therefore Required difference of ten's and unit's digits
 $= 9 - 0 = 9$
6. \therefore Factors of 316 are $1 \times 316, 2 \times 158$ and 4×79
 $(1, 2, 4, 79, 158, 316)$
 $\therefore 8$ is not a factor of 316.

2	37800
2	18900
2	9450
3	4725
3	1575
3	525
5	175
5	35
	7

∴ Prime factorization

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

8. Factors of 30 are

$$1 \times 30, 2 \times 15, 3 \times 10 \text{ and } 5 \times 6$$

∴ Factors of 30 are

$$1, 2, 3, 5, 6, 10, 15, 30$$

$$9. 9, 19, 29, 39, 49, 59, 69, 79, 89 = 9$$

$$90, 91, 92, 93, 94, 95, 96, 97, 98 = 9$$

$$99 = 2$$

$$\text{Total} = 20$$

- 10.

3	105
5	35
	7

Prime factors of 105 are 3, 5 and 7.

∴ Number of factors of 105 = 3

11. All the factors of 24 are 1×24 ,

$$2 \times 12, 3 \times 8 \text{ and } 4 \times 6$$

So, number of factors are

$$(1, 2, 3, 4, 6, 8, 12, 24) = 8$$

12. 1 is the factor of each odd number.

Practice Exercise

1. The total number of the factors of 81 is
 (1) 6 (2) 5 (3) 4 (4) 7

2. The total number of the factors of 54 is
 (1) 6 (2) 8 (3) 7 (4) 5

3. The prime factors of 120 are
 (1) $2 \times 2 \times 3 \times 8$ (2) $2 \times 9 \times 5$
 (3) $2 \times 2 \times 2 \times 6$ (4) $2 \times 2 \times 2 \times 3 \times 5$

4. The prime factors of 48 are
 (1) $2 \times 2 \times 12$ (2) 2×24
 (3) $2 \times 2 \times 2 \times 6$ (4) $2 \times 2 \times 2 \times 2 \times 3$

5. What are the numbers of multiples of 5 which are less than 45?
 (1) 9 (2) 8 (3) 7 (4) 10

6. Which of the following is not a factor of 144?
 (1) 2 (2) 3 (3) 5 (4) 1

7. Which of the following is not a factor of 128?
 (1) 8 (2) 2 (3) 3 (4) 4

8. Total number of the factors of 210 is
 (1) 16 (2) 8 (3) 10 (4) 14

9. All prime factors of 150 are
 (1) 2, 3, 5 (2) 3, 5, 10
 (3) 2, 3, 5, 5 (4) None of these

10. Which one of the following is true?
 (1) 1 is a factor of every number

- (2) The factors of a number are uncountable
 (3) The multiples of a number are countable
 (4) 1 is a multiple of every number

11. The sum of first five even multiples of 2 is
 (1) 28 (2) 32 (3) 40 (4) 30

12. The sum of first 8 multiple of 3 is
 (1) 108 (2) 110 (3) 107 (4) 105

13. The numbers $x, x + 2, x + 4$ are all prime so x is
 (1) 3 (2) 2
 (3) 11 (4) 17

14. Which of the following is a prime factor?
 (1) $84 = 2 \times 2 \times 3 \times 7$
 (2) $112 = 2 \times 2 \times 14 \times 2$
 (3) $70 = 14 \times 5$
 (4) $45 = 5 \times 9$

15. Which of the following is a prime factor?
 (1) $48 = 2 \times 2 \times 2 \times 6$ (2) $63 = 3 \times 3 \times 7$
 (3) $81 = 3 \times 3 \times 9$ (4) $54 = 2 \times 3 \times 9$

16. Common multiple number for 18 and 54 is
 (1) 8 (2) 9
 (3) 7 (4) 4

- 17.** The number x , $x - 2$ and $x - 6$ are all prime numbers, so find the value of x .
 (1) 15 (2) 17 (3) 19 (4) 21
- 18.** Common multiple for the numbers 4, 8 and 10, within the first 10 multiples is
 (1) 40 (2) 20 (3) 50 (4) 48
- 19.** Which of the following is not a prime factor?
 (1) $81 = 3 \times 3 \times 3 \times 3$
 (2) $102 = 2 \times 3 \times 17$
 (3) $64 = 2 \times 2 \times 2 \times 2 \times 2 \times 2$
 (4) $98 = 7 \times 14$

- 20.** Which of the following is a prime factor of 168?
 (1) $2 \times 2 \times 6 \times 7$ (2) $2 \times 4 \times 3 \times 7$
 (3) $2 \times 2 \times 2 \times 21$ (4) $2 \times 2 \times 2 \times 3 \times 7$
- 21.** Which of the following is always a factor of prime number?
 (1) 1 (2) 2 (3) 4 (4) 7
- 22.** Common multiple of numbers 6, 8 and 12, within the first 10 multiples are
 (1) 24, 40 (2) 24, 48 (3) 40, 60 (4) 36, 40
- 23.** The sum of first four multiple of 7 is
 (1) 60 (2) 68 (3) 70 (4) 74

Answers

1. (2)	2. (2)	3. (4)	4. (4)	5. (2)	6. (3)	7. (3)	8. (1)	9. (3)	10. (1)
11. (4)	12. (1)	13. (1)	14. (1)	15. (2)	16. (2)	17. (3)	18. (1)	19. (4)	20. (4)
21. (1)	22. (2)	23. (3)							

Hints and Solutions

1. ∵ Factors of 81 are $1 \times 81, 3 \times 27$ and 9×9

∴ Number of factors = $(1, 3, 9, 27, 81) = 5$

2. ∵ Factors of 54 are $1 \times 54, 2 \times 27$

3×18 and 6×9 .

∴ Number of factors = $(1, 2, 3, 6, 9, 18, 27, 54) = 8$

3.	2	120
	2	60
	2	30
	3	15
	5	5
		1

∴ Prime factors of 120 = $2 \times 2 \times 2 \times 3 \times 5$

4.	2	48
	2	24
	2	12
	3	6
	3	3
		1

∴ Prime factors of 120 = $2 \times 2 \times 2 \times 2 \times 3$

5. Multiples of 5 less than 45

= 5, 10, 15, 20, 25, 30, 35, 40

Hence, required number of multiples is 8.

6. Factors of $144 = 2 \times 2 \times 2 \times 2 \times 3 \times 3 \times 1$

So, 5 is not a factor of 144.

7. Factors 128

$= 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 1$

$= 2 \times 2 \times 2 \times 2 \times 2 \times 4 \times 1 = 2 \times 2 \times 2 \times 2 \times 8 \times 1$

So, 3 is not the factor of 128.

8. Factors of 210 are $1 \times 210, 2 \times 105$

$3 \times 70, 5 \times 42, 6 \times 35, 7 \times 30$ and $10 \times 21, 14 \times 15$

Number of factors = 1, 2, 3, 5, 6, 7, 10, 14, 15,

21, 30, 35, 42, 70, 105, 210

Hence, number of factor is 16.

9.

2	150
3	75
5	25
5	5
	1

Prime factors of 150 = 2, 3, 5, 5

10. 1 is a factor of every number.

11. ∵ First 5 even multiples of 2 = 2, 4, 6, 8, 10

$$\begin{aligned}\text{Sum of these multiples} &= 2 + 4 + 6 + 8 + 10 \\ &= 30\end{aligned}$$

12. ∵ First 8 multiple of 3 are 3, 6, 9, 12, 15, 18, 21 and 24.

$$\begin{aligned}\therefore \text{Sum of these multiples} \\ &= 3 + 6 + 9 + 12 + 15 + 18 + 21 + 24 = 108\end{aligned}$$

13. 3 ($\because x = 3$, $x + 2 = 3 + 2 = 5$ and $x + 4 = 3 + 4 = 7$)

14. Prime factors of 84 = $2 \times 2 \times 3 \times 7$

Prime factors of 112 = $2 \times 2 \times 2 \times 2 \times 2 \times 7$

Prime factor of 70 = $2 \times 5 \times 7$

Prime factors of 45 = $3 \times 3 \times 5$

So, factors of 84 are prime factors.

15. Prime factors of 48 = $2 \times 2 \times 2 \times 2 \times 3$

Prime factors of 63 = $3 \times 3 \times 7$

Prime factors of 81 = $3 \times 3 \times 3 \times 3$

Prime factors of 54 = $2 \times 3 \times 3 \times 3$

So, factors of 63 are prime factors.

16. Factors of 18 = $2 \times 3 \times 3$

Factors of 54 = $2 \times 3 \times 3 \times 3$

\therefore Common multiple = $3 \times 3 = 9$

17. From option (3), $x = 19$,

$$x - 2 = 19 - 2 = 17$$

$$x - 6 = 19 - 6 = 13$$

18. First 10 multiples of 4 = 4, 8, 12, 16, 20, 24, 28, 32, 36, (40)

$$8 = 8, 16, 24, 32, (40) 48, 56, 64, 72, 80$$

$$10 = 10, 20, 30, (40) 50, 60, 70, 80, 90, 100$$

Hence, common multiple = 40

19. Prime factors of 81 = $3 \times 3 \times 3 \times 3$

Prime factors of 102 = $2 \times 3 \times 17$

Prime factors of 64 = $2 \times 2 \times 2 \times 2 \times 2 \times 2$

Prime factors of 98 = $2 \times 7 \times 7$

So, factor of 98 are not prime factors.

20. Prime factors of 168 = $2 \times 2 \times 2 \times 3 \times 7$

21. 1 is the factor of prime number.

22. First 10 multiple of

$$6 = 6, 12, 18, (24) 30, 36, 42, (48) 54, 60$$

$$8 = 8, 16, (24) 32, 40, (48) 56, 64, 72, 80$$

$$12 = 12, (24) 36, (48) 60, 72, 84, 96, 108, 120$$

So, common multiples are 24 and 48.

23. First 4 multiples of 7 = 7, 14, 21, 28

$$\begin{aligned}\text{Sum of these multiples} &= 7 + 14 + 21 + 28 \\ &= 70\end{aligned}$$

Self Practice

1. Sum of first five odd multiples of 3 are
(1) 45 (2) 75 (3) 90 (4) 60
2. The number of multiples of 3 between 18 and 54
(1) 11 (2) 12 (3) 10 (4) 14
3. Sum of first five multiples of 6 are
(1) 90 (2) 30 (3) 60 (4) 120
4. The prime factors of 75 are
(1) $3 \times 5 \times 3$ (2) 3×25 (3) 5×15 (4) $3 \times 5 \times 5$
5. All prime factors of 182 are
(1) 2 and 13 (2) 2 and 7 (3) 2, 7 and 13 (4) None of these
6. The prime factors of 210 are
(1) 5 (2) 4 (3) 3 (4) 2
7. The prime factors of 2310 are
(1) 2, 3, 5, 7, 11 (2) 2, 3, 4, 7 (3) 2, 4, 6, 7, 11 (4) None of these
8. Prime factors of 240 are
(1) $2 \times 2 \times 4 \times 3 \times 5$ (2) $2 \times 2 \times 2 \times 2 \times 3 \times 5$ (3) $4 \times 4 \times 3 \times 5$ (4) $4 \times 4 \times 15$
9. Multiple of first three multiple of 4
(1) 380 (2) 384 (3) 390 (4) 400
10. The number of multiple of 7 between 21 and 77
(1) 6 (2) 7 (3) 8 (4) 9
11. Prime factors of 68 are
(1) 2×34 (2) $2 \times 2 \times 17$ (3) 4×17 (4) 1×68
12. Prime factors of 88 are
(1) 3 (2) 4 (3) 6 (4) 8
13. Common multile of number 7 and 17 within 5 multiple
(1) 14, 42 (2) 14, 30 (3) 14, 28 (4) 21, 56
14. Which of the following is true?
(1) Every number is a factor of itself
(2) Number of multiples of a number are infinite
(3) A number is exactly divisible by its factors
(4) All are true
15. Which of the following is not true?
(1) Every number is a multiple of itself
(2) 1 is not the factor of all numbers
(3) Exact divisor of a number is a factor of that number
(4) All are true

Answers

1. (2)	2. (1)	3. (1)	4. (4)	5. (3)	6. (2)	7. (1)	8. (2)	9. (2)	10. (2)
11. (2)	12. (2)	13. (3)	14. (4)	15. (2)					

CHAPTER

05

LCM AND HCF OF NUMBERS

LCM

LCM (Least Common Multiple) of two or more numbers is a number which is smallest common multiple of the numbers, e.g., Multiple of 5 are 5, 10, 15, 20, 25, 30, 35, 40.

Multiple of 6 are 6, 12, 18, 24, 30, 36, 42.

e.g. Among the multiple of 5 and 6; 30 is the smallest multiple, which is common to both.

So, 30 is LCM of 5 and 6.

Similarly, 28 is the LCM of 4 and 7.

Methods for Finding LCM

There are two methods for finding LCM

1. Prime factorisation method
2. Division method

Prime Factorisation Method

Step I Write each of the given numbers as product of prime factors.

Step II Find the product of the highest powers of the prime factors, which will be the LCM.

Example 1. Find the LCM of 54 and 21.

- (1) 350 (2) 256
(3) 378 (4) 415

Sol. (3) Prime factors of,

$$54 = 2 \times 3 \times 3 \times 3$$

In both numbers, $21 = 3 \times 7$

Factor '2' appears maximum 'one' time.

Factor '3' appears maximum 'three' times.

Factor '7' appears maximum 'one' time.

\therefore Product $= 2 \times 3 \times 3 \times 3 \times 7 = 378$,
which is the required LCM.

Division Method

- Step I** Write the given numbers in a row
Step II Write the factor on the left hand side, which can divide maximum of the numbers.
Step III Write down the quotients and the undivided numbers in the row below the first row.
Step IV Repeat steps II and III until we get a row, where all the numbers are prime to each other.
Step V The product of all the factors/divisors and the numbers left in the last row is the required LCM.

Example 2. Find the LCM of 36, 56, 105 and 108.

- (1) 6730 (2) 7577 (3) 6578 (4) 7560

Sol. (4)	2	36, 56, 105, 108
	2	18, 28, 105, 54
	3	9, 14, 105, 27
	7	3, 14, 35, 9
		3, 2, 5, 9

36 is a factor/submultiple of 108 ($36 \times 3 = 108$). 56 and 108 are divisible by 2. So, we write 2 on the left side and perform Step III.

Next factors are 2, 3 and 7.

Thereafter, we find that 2, 5 and 9 left in the last row have no common divisor i.e., 2, 5, 9 are co-prime to each other, though 9 itself is not a prime number.

So, we find the product of 2, 2, 3, 7, 2, 5 and 9 to get the required LCM. $LCM = 2 \times 2 \times 3 \times 7 \times 2 \times 5 \times 9 = 7560$

Entrance Corner

1. The number of numbers which are multiples of both 3 and 5 in the first 100 natural numbers is [JNV 2019]
(1) 10 (2) 9 (3) 7 (4) 6
2. The HCF of two numbers 14 and 28 is 14. Find the LCM. [JNV 2018]
(1) 28 (2) 196 (3) 298 (4) 98
3. What is the four digit smallest number which is completely divided by 2,3,8,10?
[JNV 2019]
(1) 1020 (2) 1060 (3) 1080 (4) 1120
4. The HCF of two numbers is 38 and their LCM is 98154. If one of the number is 1558. The other number is [JNV 2017, 2009]
(1) 1197 (2) 2394 (3) 4932 (4) 2384
5. HCF of 128, 288 and 160 is [JNV 2016]
(1) 16 (2) 24 (3) 32 (4) 48
6. If the product of two co-prime numbers is 117, their LCM will be [JNV 2016]
(1) 9 (2) 13 (3) 39 (4) 117
7. The greatest number which will divide 1277 and 1368 leaving 3 as the remainder in each case is [JNV 2015]
(1) 68 (2) 77 (3) 91 (4) 97
8. LCM of 114 and 95 is [JNV 2015]
(1) 570 (2) 950 (3) 1140 (4) 5700
9. Three bells ring at intervals of 12, 15 and 18 min, respectively. They started ringing simultaneously at 9 : 00 am. What will be the next time when they all ring simultaneously? [JNV 2014]
(1) 10 : 00 am (2) 11 : 00 am
(3) 12 : 00 pm (4) 1 : 00 pm
10. Greatest number, which is to be divided by 280 and 1245 leaves the remainder 4 and 3 respectively, is [JNV 2014]
(1) 138 (2) 148 (3) 145 (4) 178
11. Find the HCF of 45, 75 and 165. [JNV 2013]
(1) 15 (2) 45 (3) 75 (4) 2475
12. Find the smallest number divided by 42, 98 and 70. [JNV 2013]
(1) 1470 (2) 1740 (3) 1070 (4) 980
13. Find the LCM of 12, 18 and 24. [JNV 2012]
(1) 72 (2) 48 (3) 60 (4) 84
14. LCM of 42, 70, 98 and 126 is [JNV 2011]
(1) 126 (2) 2205 (3) 4410 (4) 8820
15. Find the common factor of 12 and 15.
[JNV 2010]
(1) 1, 2, 4 (2) 1, 3, 5 (3) 1, 12 (4) 1, 3
16. What is the greatest number that divides both 16 and 20 exactly? [JNV 2008]
(1) 40 (2) 32 (3) 80 (4) 4
17. Find the least number which is divisible by 15 and 18. [JNV 2008]
(1) 60 (2) 54 (3) 90 (4) 100
18. Find the LCM of 30, 40 and 60. [JNV 2008]
(1) 300 (2) 120 (3) 180 (4) 500
19. What will be the HCF of 48, 144 and 576?
[JNV 2007]
(1) 576 (2) 144 (3) 48 (4) 1
20. What is the LCM of 16, 80 and 48?
[JNV 2005]
(1) 8 (2) 16 (3) 240 (4) 480
21. The difference between the LCM and HCF of the numbers 30, 36 and 90 is [JNV 2004]
(1) 366 (2) 354 (3) 186 (4) 174
22. Three bells start ringing together at 8 : 35 am, if they ring after 12s, 15s and 18 s respectively each time, the next time they will ring together at [JNV 2004]
(1) 8 : 38 am (2) 8 : 40 am
(3) 8 : 41 am (4) 8 : 45 am
23. The LCM of 8, 12, 20 and 36 is [JNV 2003]
(1) 120 (2) 180 (3) 360 (4) 720
24. The HCF of two co-prime numbers is [JNV 2003]
(1) 1
(2) 0
(3) sum of the numbers
(4) difference of the numbers
25. Three bells start ringing together at 8 : 30 am. If they ring after 4 min, 5 min and 6 min respectively each time, the next time they will ring together at [JNV 2003]
(1) 8 : 45 am (2) 9 : 30 am
(3) 9 : 45 am (4) 10 : 15 am
26. The LCM of 12, 24 and 30 is [JNV 2002]
(1) 2 (2) 30 (3) 60 (4) 120

- 27.** LCM of 3, 5 and 9 is [JNV 2000]
 (1) 25 (2) 45 (3) 65 (4) 85
- 28.** HCF of 8, 18, 24 is [JNV 2000]
 (1) 2 (2) 4
 (3) 6 (4) 8
- 29.** Six bells begin tolling together and toll at interval of 2 s, 4 s, 6 s, 8 s, 10 s, 12 s, respectively. The time after which they will toll together is [JNV 1999]
 (1) 2 min (2) 103 s
 (3) 150 s (4) 1 min
- 30.** Find the greatest number which divides 18 and 30 completely. [JNV 1999]
 (1) 6 (2) 8
 (3) 10 (4) 12

- 31.** The greatest number which will divide 2112 and 2792 leaving 4 as the remainder in each case is [JNV 1999]
 (1) 68 (2) 58 (3) 78 (4) 188
- 32.** Find the LCM of 18, 24 and 60. [JNV 1999]
 (1) 120 (2) 360
 (3) 480 (4) 520
- 33.** Find the HCF of 84 and 105. [JNV 1998]
 (1) 19 (2) 20 (3) 21 (4) 22
- 34.** Find the LCM of 20, 40, 60 is [JNV 1997]
 (1) 100 (2) 120 (3) 140 (4) 240
- 35.** Find the measure of the greatest length which can measure 24 m, 32 m and 44 m completely. [JNV 1997]
 (1) 2 m (2) 3 m (3) 4 m (4) 5 m

Answers

1. (4)	2. (1)	3. (3)	4. (2)	5. (3)	6. (4)	7. (3)	8. (1)	9. (3)	10. (1)
11. (1)	12. (1)	13. (1)	14. (3)	15. (4)	16. (4)	17. (3)	18. (2)	19. (3)	20. (3)
21. (4)	22. (1)	23. (3)	24. (1)	25. (2)	26. (4)	27. (2)	28. (1)	29. (1)	30. (1)
31. (1)	32. (2)	33. (3)	34. (2)	35. (3)					

Hints and Solutions

1. $\therefore \text{LCM of } 3 \text{ and } 5 = 15$

The numbers which are multiples of both 3 and 5
 $= 15 \times 1, 15 \times 2, 15 \times 3, 15 \times 4, 15 \times 5, 15 \times 6$
 $= 15, 30, 45, 60, 75, 90$

Total numbers = 6

2. We know that,

Product of two numbers = HCF \times LCM
 $14 \times 28 = 14 \times \text{LCM} \Rightarrow \text{LCM} = \frac{14 \times 28}{14} = 28$

3. LCM of 2, 3, 8, 10

2	2, 3, 8, 10
3	1, 3, 4, 5
4	1, 1, 4, 5
5	1, 1, 1, 5
	1, 1, 1, 1

$$= 2 \times 3 \times 4 \times 5 = 120$$

\therefore The four digit smallest number is multiple of
 $120 = 120 \times 9 = 1080$

$$\begin{aligned} \text{4. Other number} &= \frac{\text{HCF} \times \text{LCM}}{\text{First number}} \\ &= \frac{38 \times 98154}{1558} \\ &= 2394 \end{aligned}$$

$$\text{5. } 128 = 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2$$

$$288 = 2 \times 2 \times 2 \times 2 \times 2 \times 3 \times 3$$

$$160 = 2 \times 2 \times 2 \times 2 \times 2 \times 5$$

So, the required HCF = Common factor between given numbers

$$= 2 \times 2 \times 2 \times 2 \times 2 = 32$$

6. $\therefore 117 = 3 \times 3 \times 13$

Here, 9 and 13 are co-prime, so the required LCM = $9 \times 13 = 117$

7. Required greatest number

$$= \text{HCF of } (1277 - 3) \text{ and } (1368 - 3)$$

$$= \text{HCF of } 1274 \text{ and } 1365$$

$$1274)1365(1 \quad \text{and} \quad 91)1365(15$$

$$\begin{array}{r} \underline{1274} \\ 91)1274(14 \\ \underline{\times} \\ \underline{1274} \\ \times \end{array}$$

$$\therefore \text{Greatest number} = 91$$

8.

2	114, 95
3	57, 95
19	19, 95
5	1, 5
	1, 1

$$\therefore \text{Required LCM} = 2 \times 3 \times 19 \times 5 = 570$$

9. The LCM of 12, 15 and 18

$$\Rightarrow 2 \times 2 \times 3 \times 5 \times 3 = 180$$

Here, 60 min = 1 h; 180 min = 3 h

Hence, bells would ring after 3 h at 12:00 pm.

10. Required HCF = (280 - 4) and (1245 - 3)

$$= 276 \text{ and } 1242$$

$$276)1242(4$$

$$\begin{array}{r} \underline{1104} \\ 138)276(2 \\ \underline{276} \\ \times \end{array}$$

$$\therefore \text{Required greatest number} = 138$$

11. HCF of 45, 75 and 165

$$45)75(1$$

$$\begin{array}{r} \underline{45} \\ 30)45(1 \\ \underline{30} \end{array}$$

$$\begin{array}{r} 15)30(2 \\ \underline{30} \\ \times \end{array}$$

$$\therefore \text{HCF} = 15$$

12. Required smallest number = LCM of 42, 98 and 70

2	42, 98, 70
7	21, 49, 35
3	3, 7, 5
5	1, 7, 5
7	1, 7, 1
	1, 1, 1

$$\therefore \text{Required number} = 2 \times 7 \times 3 \times 5 \times 7 = 1470$$

13.

2	12, 18, 24
2	6, 9, 12
2	3, 9, 6
3	3, 9, 3
3	1, 3, 1
	1, 1, 1

$$\text{LCM of } 12, 18 \text{ and } 24 = 2 \times 2 \times 2 \times 3 \times 3 \\ = 72$$

14.

2	42, 70, 98, 126
3	21, 35, 49, 63
7	7, 35, 49, 21
	1, 5, 7, 3,

$$\therefore \text{LCM} = 2 \times 3 \times 7 \times 5 \times 7 \times 3 = 4410$$

15. $12 = 1 \times 2 \times 2 \times 3$;

$15 = 1 \times 3 \times 5$

$\therefore \text{Common factor} = 1, 3$

16. 16) 20 (1

$$\begin{array}{r} \underline{16} \\ 4)16(4 \\ \underline{\times} \\ \underline{16} \\ \times \end{array}$$

So, 4 is the greatest number.

17. LCM of 15 and 18

2	15, 18
3	15, 9
3	5, 3
5	5, 1
	1, 1

$$\therefore \text{Required number} = 2 \times 3 \times 3 \times 5 \\ = 90$$

18.

2	30, 40, 60
2	15, 20, 30
3	15, 10, 15
5	5, 10, 5
	1, 2, 1

$$\therefore \text{Required LCM} = 2 \times 2 \times 3 \times 5 \times 2 = 120$$

19. 48) 144 (3

$$\begin{array}{r} \underline{144} \\ \times \end{array}$$

Again, 48) 576 (12

$$\begin{array}{r} \underline{48} \\ 96 \\ \underline{96} \\ \times \end{array}$$

$$\therefore \text{HCF} = 48$$

20. LCM of 16, 80 and 48

2	16, 80, 48
2	8, 40, 24
2	4, 20, 12
2	2, 10, 6
	1, 5, 3

$$\therefore \text{LCM} = 2 \times 2 \times 2 \times 2 \times 5 \times 3 = 16 \times 15 = 240$$

- 21.

2	30, 36, 90
2	15, 18, 45
3	15, 9, 45
3	5, 3, 15
5	5, 1, 5
	1, 1, 1

$$\therefore \text{LCM} = 2 \times 2 \times 3 \times 3 \times 5 = 180$$

- 36) 90 (2

$$\begin{array}{r} 72 \\ 18) 36 (2 \\ \underline{-} \\ 36 \end{array}$$

$$\begin{array}{r} \underline{\times} \\ 18) 30 (1 \\ \underline{-} \\ 18 \end{array}$$

$$12) 18 (1$$

$$\begin{array}{r} 12 \\ - \\ 12 \end{array}$$

$$6) 12 (2$$

$$\begin{array}{r} 12 \\ - \\ \times \end{array}$$

$$\text{HCF} = 6$$

$$\therefore \text{Difference} = 180 - 6 = 174$$

- 22.

2	12, 15, 18
3	6, 15, 9
	2, 5, 3

$$\text{LCM} = 2 \times 3 \times 2 \times 5 \times 3 = 180 \text{ s or } 3 \text{ min}$$

After 3 min the bells will toll together

i.e. 8:35 + 3min = 8:38 am

- 23.

2	8, 12, 20, 36
2	4, 6, 10, 18
3	2, 3, 5, 9
	2, 1, 5, 3

$$\text{LCM} = 2 \times 2 \times 3 \times 2 \times 5 \times 3 = 360$$

24. The HCF of two co-prime number is always 1.

25. The LCM of 4, 5 and 6 = 60

Hence, after 60 min i.e., after 1 h.

They will ring together i.e., at 9 : 30 am.

- 26.

2	12, 24, 30
2	6, 12, 15
3	3, 6, 15
	1, 2, 5

$$\therefore \text{LCM} = 2 \times 2 \times 3 \times 2 \times 5 = 120$$

- 27.

3	3, 5, 9
	1, 5, 3

$$\therefore \text{LCM} = 3 \times 5 \times 3 = 45$$

28. 8) 18 (2

$$\begin{array}{r} 16 \\ 2) 8 (4 \\ \underline{-} \\ 8 \\ \underline{\times} \\ 2) 24 (12 \\ \underline{-} \\ 24 \\ \underline{\times} \end{array}$$

$$\therefore \text{Required HCF} = 2$$

- 29.

2	2, 4, 6, 8, 10, 12
2	1, 2, 3, 4, 5, 6
3	1, 1, 3, 2, 5, 3
	1, 1, 1, 2, 5, 1

$$\therefore \text{Required time} = 2 \times 2 \times 3 \times 2 \times 5 = 120 \text{ s} \\ = 2 \text{ min}$$

30. 18) 30 (1

$$\begin{array}{r} 18 \\ 12) 18 (1 \\ \underline{-} \\ 12 \\ \underline{\times} \\ 6) 12 (2 \\ \underline{-} \\ 12 \end{array}$$

The greatest number is 6.

31. $2112 - 4 = 2108$

$$2792 - 4 = 2788$$

$$2108) 2788 (1$$

$$\begin{array}{r} 2108 \\ 680) 2108 (3 \\ \underline{-} \\ 2040 \\ \underline{\times} \\ 68) 680 (10 \\ \underline{-} \\ 680 \\ \underline{\times} \end{array}$$

Hence, the required greatest number is 68.

- 32.

2	18, 24, 60
2	9, 12, 30
3	9, 6, 15
	3, 2, 5

$$\therefore \text{LCM} = 2 \times 2 \times 3 \times 2 \times 5 = 360$$

- 33, 84) 105 (1

$$\begin{array}{r} \underline{84} \\ 21) 84 (4 \\ \underline{84} \\ \times \end{array}$$

$$\therefore \text{HCF} = 21$$

- | | | |
|------------|---|------------|
| 34. | 2 | 20, 40, 60 |
| | 2 | 10, 20, 30 |
| | 5 | 5, 10, 15 |
| | | 1. 2. 3 |

$$\therefore \text{LCM} = 2 \times 2 \times 5 \times 2 \times 3 = 120$$

- 35, 24) 32 (1

$$\begin{array}{r} \underline{24} \\ 8) 24 (3 \\ \underline{24} \\ \times \end{array}$$

8) 44 (5)

$$\begin{array}{r} \underline{-40} \\ 4) 8(2 \\ \underline{8} \\ x \end{array}$$

Hence, the greatest measure is 4 m.

Practice Exercise

Answers

1. (3)	2. (3)	3. (1)	4. (1)	5. (1)	6. (4)	7. (4)	8. (1)	9. (3)	10. (2)
11. (3)	12. (1)	13. (3)	14. (1)	15. (2)	16. (1)	17. (4)	18. (1)	19. (2)	20. (3)
21. (3)	22. (3)								

Hints and Solutions

1. LCM of $2 \times 3 \times 5$

and $3 \times 5 \times 7 = 2 \times 3 \times 5 \times 7$.

- 2

2	8, 12, 15
2	4, 6, 15
3	2, 3, 15
	2, 1, 5

$$\therefore \text{LCM} = 2 \times 2 \times 3 \times 2 \times 5 = 120$$

∴ To get remainder 3 in each case, the required number = $120 + 3 = 123$.

- 3

2	2, 3, 4, 5, 6, 7
3	1, 3, 2, 5, 3, 7
	1, 1, 2, 5, 1, 7

$$\therefore \text{LCM} = 2 \times 3 \times 2 \times 5 \times 7 = 420$$

Now, smallest number of four digit, which is divisible by 2, 3, 4, 5, 6 and 7 is the multiple of 420.

$\therefore 420 \times 3 = 1260$ is the required number.

- 4

2	8,	14,	26
2	4,	7,	13
2	2,	7,	13
7	1,	7,	13
13	1,	1,	13
	1.	1.	1

Hence, required LCM = $2 \times 2 \times 2 \times 7 \times 13 = 728$

5. First number = $2 \times 3 \times 5 \times 7$

$$\text{Second number} = 3 \times 5 \times 7 \times 11$$

$$\therefore \text{LCM} = 2 \times 3 \times 5 \times 7 \times 11$$

- #### **6. Required time to meet again**

\equiv LCM of 24, 6 and 14

$$\text{Now, } 24 = 2 \times 2 \times 2 \times 3$$

$$6 = 2 \times 3; 14 = 2 \times 7$$

$$\therefore \text{LCM} = 2 \times 2 \times 2 \times 3 \times 7 = 168 \text{ s}$$

= 2 min 48s

Clearly, they will meet again after 2 min 48 s.

7. Required time to meet again = LCM of 27, 9 and 36

$$\text{Now, } 27 = 3 \times 3 \times 3$$

$$9 = 3 \times 3$$

$$36 = 2 \times 2 \times 3 \times 3$$

$$\therefore \text{LCM} = 3 \times 3 \times 3 \times 2 \times 2$$

$$= 108 \text{ s} = 1 \text{ min } 48 \text{ s}$$

Clearly, they will meet again 1 min 48 s.

8. Required time to ring again = LCM of 15, 21 and 16

$$\text{Now, } 15 = 3 \times 5; 21 = 3 \times 7$$

$$16 = 2 \times 2 \times 2 \times 2$$

$$\therefore \text{LCM} = 3 \times 5 \times 7 \times 2 \times 2 \times 2 \times 2$$

$$= 1680 \text{ s} = 28 \text{ min}$$

Clearly, all the bell will ring at 28 min past 12.

9. Required time to ring again = LCM of 12, 9 and 24

$$\text{Now, } 12 = 2 \times 2 \times 3$$

$$9 = 3 \times 3$$

$$24 = 2 \times 2 \times 2 \times 3$$

$$\therefore \text{LCM} = 2 \times 2 \times 2 \times 3 \times 3 = 72 \text{ s}$$

$$= 1 \text{ min } 12 \text{ s}$$

Clearly, all the bell will ring after 1 min 12 s.

10. Required time to meet again = LCM of 24, 18 and 10

$$\text{Now, } 24 = 2 \times 2 \times 2 \times 3$$

$$18 = 2 \times 3 \times 3$$

$$10 = 2 \times 5$$

$$\therefore \text{LCM} = 2 \times 2 \times 2 \times 3 \times 3 \times 5 = 360 \text{ s} = 6 \text{ min}$$

Clearly, they will meet again after 6 min.

- 11.

2	12, 30, 60
2	6, 15, 30
3	3, 15, 15
5	1, 5, 5
	1, 1, 1

$$\therefore \text{LCM} = 2 \times 2 \times 3 \times 5 = 60$$

12. LCM of 16 and 18

2	16, 18,
8	8, 9,
9	1, 9,
	1, 1,

$$= 2 \times 8 \times 9 = 144$$

On dividing 1500 by 144, then the remainder is 60.

$$\text{Hence, required number} = 1500 - 60 = 1440$$

13. HCF of $5 \times 7 \times 9 \times 11 \times 13$ and $9 \times 11 \times 13 \times 17$.

The common factors = $9 \times 11 \times 13$

$$14. \because \text{Other number} = \frac{\text{HCF} \times \text{LCM}}{\text{First number}}$$

$$= \frac{4 \times 48}{12} = 16$$

15. The other number is

$$= \frac{\text{HCF} \times \text{LCM}}{\text{First number}}$$

$$= \frac{96 \times 8}{32} = 24$$

$$16. \text{Other number} = \frac{\text{LCM} \times \text{HCF}}{\text{First number}}$$

$$= \frac{180 \times 3}{45} = 12$$

$$17. \text{LCM} = \frac{\text{Product of two numbers}}{\text{HCF}}$$

$$= \frac{216}{3} = 72$$

$$18. \text{Other number} = \frac{20 \times 120}{60} = 40$$

19. 15) 30 (2

$$\begin{array}{r} 30 \\ \times \\ 15) 45 (3 \\ \underline{45} \\ \times \end{array}$$

$$\therefore \text{HCF} = 15$$

20. 36) 48 (1

$$\begin{array}{r} 36 \\ \underline{12}) 36 (3 \\ \underline{36} \\ \times \end{array}$$

∴ Greatest number is 12.

21. Let the numbers be $3x$ and $4x$ respectively.

Then, their HCF = x and their LCM = $12x$

$$\therefore 12x \times x = 10800 \text{ or } x^2 = 900 \text{ or } x = 30$$

So, the numbers are 90 and 120.

The sum of the numbers = 210

22. One of the numbers is 130.

$$\therefore \text{Other number} = \frac{1820 \times 26}{130} = 364$$

Self Practice

Answers

1. (1)	2. (3)	3. (3)	4. (4)	5. (1)	6. (2)	7. (1)	8. (3)	9. (4)	10. (1)
11. (2)	12. (1)	13. (3)							

CHAPTER 06

DECIMAL AND FUNDAMENTAL OPERATIONS ON THEM

Decimal Numbers

The numbers expressed in decimal form are called decimal numbers e.g. 0.71, 3.2, 0.10

A decimal has two parts, namely

These parts are separated by a dot (.) called the decimal point.

The part on the left side of the decimal point is the whole number part and that on its right side is the decimal part, e.g. In 62.64, whole number part = 62 and decimal part = 64.

Decimal Places The number of digits contained in the decimal part of a decimal gives the number of decimal places, e.g. 4.24 has two decimal places and 9.126 has three decimal places.

Decimal Fraction

A fraction in which the denominator is 10 or the power of 10 called decimal fraction. It may be represented as $\frac{1}{10}$, $\frac{3}{100}$, $\frac{6}{1000}$ etc. Hence, $\frac{3}{100}$ is the hundredth part of 3 and must be written as 0.03.

Thus every decimal fraction represents a fraction number.

Table for Decimal Place Value

Thousands	Hundreds	Tens	Ones	Tenth	Hundredth	Thousandth
1000	100	0	1	$\left(\frac{1}{10}\right) = 0.1$	$\left(\frac{1}{100}\right) = 0.01$	$\left(\frac{1}{1000}\right) = 0.001$

Operations on Decimal Numbers (or Fractions)

1. Addition and Subtraction of Decimal Numbers

To add or subtract decimal numbers, the numbers are placed under each in such a way that the decimal point lie in a line. Then, the numbers can be added or subtracted as in usual manner.

e.g. Find the addition of 51.3, 7.078, 1.38 and 0.9.

$$\begin{array}{r}
 \text{Now,} \\
 & 51.300 \\
 & 7.078 \\
 & 1.380 \\
 + & 0.900 \\
 \hline
 & 60.658
 \end{array}$$

Example 1. Find the addition of $9 + 2.42 + 4.067 + 16.89$.

- (1) 32.737 (2) 32.377 (3) 32.773 (4) 32.320

Sol. (2) 9.000
 2.420
 4.067
 $\begin{array}{r} + 16.890 \\ \hline 32.377 \end{array}$

Example 2. Subtract $27.85 - 14.34$.

(1) 12.51 (2) 11.13 (3) 13.51 (4) 13.71
 Sol. (3) 27.85
 $\begin{array}{r} - 14.34 \\ \hline 13.51 \end{array}$

2. Multiplication of Two or More Decimal Numbers

To multiply two decimal numbers, we follow the given steps:

- Step I* Multiply the two decimal numbers without the decimal point just like whole numbers.
Step II Now, count the number of digits starting from the rightmost digit and move towards left. Then, put the decimal there. Mark the decimal point in the product in such a way that the number of decimal places in the product is equal to the sum of the decimal places in the given decimal numbers.

☞ To multiply a decimal number by 10 is equivalent to moving the decimal point one place to the right. To multiply by 100 is equivalent to moving the decimal point two places to the right and so on.

Example 3. Find the product of 3.5413×2.1 .

- (1) 7.67343 (2) 7.14654 (3) 6.67345 (4) 7.43673

Sol. (4) For the product of 3.5413×2.1 .

Consider them without decimal,
 i.e., $35413 \times 21 = 743673$

Total number of digits after decimal = $4 + 1 = 5$
 So, put decimal point at 5th place from right hand side in product.

∴ $3.5413 \times 2.1 = 7.43673$

3. Division of Decimal Numbers

To divide a decimal number by another decimal number, remove the decimal point in the divisor by multiplying both the dividend and divisor by the appropriate multiple of 10, then use the procedure of dividing a decimal number by a whole number.

e.g. $7.103 \div 2.01 = \frac{7.103}{2.01} = \frac{7.103 \times 100}{2.01 \times 100} = \frac{710.3}{201} = 3.53$

Example 4. Divide 1.562 by 0.25.

- (1) 6.248 (2) 6.240 (3) 5.284 (4) 6.482

Sol. (1) $\frac{1.562}{0.25} = \frac{1.562 \times 100}{0.25 \times 100} = \frac{156.2}{25}$

Now, $\frac{6.248}{25}$
 $\begin{array}{r} 156.200 \\ 150 \\ \hline 62 \\ 50 \\ \hline 120 \\ 100 \\ \hline 200 \\ 200 \\ \hline \times \end{array}$

∴ The quotient is 6.248.

4. Conversion of Simple Fraction into Decimal Number

To convert a fraction into a decimal, given steps are to be followed:

Step I Divide the numerator by the denominator till a non-zero remainder is obtained.

Step II Put a decimal point in the dividend as well as in the quotient.

Step III Put a zero on the right of the decimal point in the dividend as well as on the right of the remainder.

Step IV Divide again just as we do in wholenumbers.

Step V Repeat steps III and IV, till the remainder is zero.

Example 5. Convert $\frac{11}{16}$ into decimal number.

- (1) 0.6875 (2) 0.6785 (3) 0.6587 (4) 0.5687

Sol. (1) $\frac{0.6875}{16}$
 $\begin{array}{r} 11.0000 \\ 96 \\ \hline 140 \\ 128 \\ \hline 120 \\ 112 \\ \hline 80 \\ 80 \\ \hline \times \end{array}$

∴ $\frac{11}{16} = 0.6875$

5. Conversion of Decimal Number into Simple Fraction

To convert a decimal into a fraction, given steps are to be followed:

Step I Write the given decimal without decimal point as the numerator of the fraction.

Step II In the denominator, write 1 followed by as many zeroes as there are decimal places in the given decimal.

Step III Change the fraction obtained to the simplest form.

$$e.g., \quad 0.025 = \frac{25}{1000}$$

[\therefore 3 digits after decimal, so we put 3 zeros]

Some Important Decimal Conversion			
$\frac{1}{10} = 0.1$	$\frac{1}{9} = 0.\bar{1}$	$\frac{1}{12} = 0.08\bar{3}$	$\frac{1}{8} = 0.125$
$\frac{1}{15} = 0.06$	$\frac{1}{6} = 0.1\bar{6}$	$\frac{1}{16} = 0.0625$	$\frac{1}{5} = 0.2$
$\frac{1}{20} = 0.05$	$\frac{1}{4} = 0.25$	$\frac{1}{25} = 0.04$	$\frac{1}{3} = 0.\bar{3}$
$\frac{1}{40} = 0.025$	$\frac{1}{2} = 0.5$	$\frac{1}{50} = 0.02$	$\frac{3}{4} = 0.75$
$\frac{1}{100} = 0.01$	$\frac{2}{3} = 0.\bar{6}$	$\frac{2}{5} = 0.4$	$\frac{3}{2} = 1.5$
$\frac{5}{8} = 0.625$	$\frac{7}{8} = 0.875$	$\frac{3}{5} = 0.6$	$\frac{9}{11} = 0.\overline{81}$

Entrance Corner

1. Simplification of $2.75 - 1.25 + 4.75 - 3.80$ in fractional form is [JNV 2019]

(1) $2\frac{9}{20}$ (2) $2\frac{9}{10}$
 (3) $1\frac{9}{10}$ (4) $5\frac{9}{20}$

2. Find the value of $3 \times 0.3 \times 0.003 \times 0 \times 30$. [JNV 2018]

(1) 81 (2) 8.1
 (3) 0.81 (4) 0

3. If $23200 \div 145 = 160$, then $23.2 \div 1.45$ is equal to [JNV 2018]

(1) 160 (2) 16 (3) 1.60 (4) 0.16

4. Find the sum of $7.7 + 7.77 + 7.7777 + 7.777$. [JNV 2018]

(1) 28.2828 (2) 28.2847 (3) 30.0247 (4) 31.0247

5. The product of two decimals is 20.7326. If one decimal is 4.13, what is the other decimal? [JNV 2017]

(1) 5.12 (2) 4.82 (3) 5.23 (4) 5.02

6. If $4.75 \times 0.7 = 3.325$, then 475×0.7 is equal to [JNV 2016]

(1) 332.5 (2) 33.25 (3) 3.325 (4) 0

7. If $4854.3 \div 3.3 = 1471$, then $48.543 \div 33$ is equal to [JNV 2016]

(1) 1.471 (2) 14.71 (3) 147.1 (4) 0.1471

8. Ram bought a book for ₹ 178.50, some medicines for ₹ 248.25 and gave a ₹ 500 note to the shopkeeper. The remaining amount is [JNV 2016]

(1) ₹ 126.50 (2) ₹ 70.50 (3) ₹ 75.50 (4) ₹ 73.25

9. The decimal equivalent to $\left[\frac{3}{4} + \frac{4}{5} + \frac{8}{25} \right]$ is [JNV 2015]

(1) 1.870 (2) 18.70
 (3) 187 (4) 1870

10. If $3.65 \times 0.5 = 1.825$, then the value of 365×0.5 is [JNV 2015]

(1) 182.5 (2) 18.25
 (3) 1.825 (4) 365

11. $\frac{0.1}{0.01} + \frac{0.01}{0.1}$ is equals to [JNV 2014]

(1) $\frac{101}{10}$ (2) $\frac{1101}{100}$
 (3) $\frac{11}{10}$ (4) $\frac{1001}{100}$

12. 00.0675 is divided by 15, quotient is [JNV 2014]

(1) 0.0045 (2) 0.0450
 (3) 0.0450 (4) 0.6045

13. Which of the following is equivalent to 1.01? [JNV 2014]

(1) 101% (2) 10.1%
 (3) 1.01% (4) 1010%

- 14.** If $4015 \div 11 = 365$, $40.15 \div 11$ is equal to [JNV 2014]
 (1) 36.5 (2) 3.65 (3) 0.365 (4) 0.0365
- 15.** $17\frac{1}{16}$ decimal equivalent as [JNV 2013]
 (1) 17.625 (2) 17.6025
 (3) 17.0625 (4) 17.0525
- 16.** Which number divided by 5.029 to obtain 50.29? [JNV 2013]
 (1) 0.01 (2) 0.1
 (3) 1.0 (4) 10.0
- 17.** The sum of 7.7, 7.07, 7.007 and 77.0077 is [JNV 2013]
 (1) 98.7777 (2) 98.7877
 (3) 98.7807 (4) 98.7847
- 18.** What is the decimal equivalent of $(₹2200 \text{ of } 4\%) \text{ of } 7.5\%$? [JNV 2013]
 (1) ₹13.2 (2) ₹6.6 (3) ₹3.3 (4) ₹26.4
- 19.** What fraction of ₹4 is ₹1.50? [JNV 2012]
 (1) $\frac{1}{8}$ (2) $\frac{3}{8}$ (3) $\frac{1}{4}$ (4) $\frac{2}{5}$
- 20.** $\frac{61}{10000}$ can be changed into decimal as [JNV 2010]
 (1) 610000 (2) 0.61000
 (3) 0.000061 (4) 0.0061
- 21.** The product of two decimals is 14.837. If one decimal is 4.01, what is the other decimal? [JNV 2010]
 (1) 37 (2) 3.7 (3) 3.07 (4) 3.007
- 22.** A drum is two-third full, if 50 L more required to fill it up, how much is the capacity of the drum? [JNV 2009]
 (1) 150 L (2) 120 L (3) 100 L (4) 90 L
- 23.** The value of $\frac{1}{125}$ is [JNV 2007]
 (1) 0.8 (2) 0.08 (3) 0.008 (4) 0.0008
- 24.** The value of 0.05% is [JNV 2007]
 (1) 0.0005 (2) 0.005 (3) 0.05 (4) 0.5
- 25.** What is the decimal equivalent of $1\frac{5}{8}$? [JNV 2005]
 (1) 1.58 (2) 1.62
 (3) 1.622 (4) 1.625
- 26.** 4.4% is equivalent to which of the following? [JNV 2005]
 (1) $\frac{4.4}{10}$ (2) $\frac{4.4}{100}$ (3) $\frac{44}{10}$ (4) $\frac{44}{100}$
- 27.** In decimal 80% can be expressed as [JNV 2004]
 (1) $\frac{8}{10}$ (2) $\frac{8}{100}$ (3) $\frac{100}{8}$ (4) $\frac{10}{8}$
- 28.** 5.125 when changed into fraction, becomes [JNV 2003]
 (1) $5\frac{1}{125}$ (2) $5\frac{1}{25}$ (3) $5\frac{1}{8}$ (4) $51\frac{1}{4}$
- 29.** The fraction equivalent to 1.25 is [JNV 2002]
 (1) $1\frac{1}{4}$ (2) $12\frac{1}{2}$ (3) $1\frac{1}{8}$ (4) $12\frac{1}{4}$
- 30.** A bus left Delhi for Dehradun at 10 : 15 am. It took 6 h 30 min in journey. At what time did the bus reach at Dehradun? [JNV 2002]
 (1) 4 : 15 pm (2) 4 : 30 pm
 (3) 4 : 45 pm (4) 5 : 00 pm
- 31.** The product of 2, 0.2, 0.02 and 0.002 is equal to [JNV 2000]
 (1) 0.016 (2) 0.0016
 (3) 0.00016 (4) 0.000016
- 32.** Which of the following is equal to 1? [JNV 2000]
 (1) $\frac{0.7 \times 6}{10 \times 42}$ (2) $\frac{0.7 \times 6}{1.0 \times 4.2}$
 (3) $\frac{0.7 \times 0.6}{10 \times 4.2}$ (4) $\frac{7.0 \times 6.0}{1.0 \times 4.2}$
- 33.** Which one of the following is equal to 9? [JNV 1999]
 (1) 15×0.006 (2) 15×0.060
 (3) 150×0.600 (4) 15×0.600
- 34.** $0.231 - 0.02$ is equal to [JNV 1999]
 (1) 0.233 (2) 0.229
 (3) 0.211 (4) 0.031
- 35.** $\frac{3 \times 12}{10}$ can be written as [JNV 1998]
 (1) 0.36 (2) 3.12 (3) 3.60 (4) 31.2
- 36.** $\frac{77}{5}$ may be written as [JNV 1998]
 (1) 15.4 (2) 15.24 (3) 15.04 (4) 1.54
- 37.** $0.3636 \div 0.06$ is equal to [JNV 1997]
 (1) 6.600 (2) 6.060
 (3) 0.660 (4) 0.606
- 38.** How will you express fraction $\frac{2}{25}$ in decimal fraction? [JNV 1997]
 (1) 0.008 (2) 0.080
 (3) 0.800 (4) 8.000

Answers

1. (1)	2. (4)	3. (2)	4. (4)	5. (4)	6. (1)	7. (1)	8. (4)	9. (1)	10. (1)
11. (1)	12. (1)	13. (3)	14. (1)	15. (3)	16. (2)	17. (4)	18. (2)	19. (2)	20. (4)
21. (2)	22. (1)	23. (3)	24. (1)	25. (4)	26. (2)	27. (1)	28. (3)	29. (1)	30. (3)
31. (4)	32. (2)	33. (4)	34. (3)	35. (3)	36. (1)	37. (2)	38. (2)		

Hints and Solutions

1. According to the question

$$\begin{aligned}\text{Given expression} &= 2.75 - 1.25 + 4.75 - 3.80 \\ &= 2.75 + 4.75 - 1.25 - 3.80 \\ &= 7.5 - 5.05 = 2.45 = \frac{245}{100} = \frac{49}{20} = 2\frac{9}{20}\end{aligned}$$

2. Any number multiplied by zero we get zero as resultant.

$$\therefore 3 \times 0.3 \times 0.003 \times 0 \times 30 = 0$$

3. $23200 \div 145 = 160$

$$\therefore 23.2 \div 1.45 = \frac{2320}{145} = 16$$

4. 7.7000

7.7700

7.7770

$\underline{+ 7.7777}$

$\underline{31.0247}$

[given]

5. Suppose second decimal = x

$$\text{Then, } x \times 4.13 = 20.7326$$

$$\Rightarrow x = \frac{20.7326}{4.13} = 5.02$$

6. Since, $4.75 \times 0.7 = 3.325$

$$\text{So, } 475 \times 0.7 = 332.5$$

7. Since, $48543 \div 33 = 1471$

$$\text{So, } 48543 \div 33 = 1471$$

8. Here, Ram expenses for book and medicine

$$= 178.50 + 248.25 = ₹ 426.75$$

Then, amount returned to Ram by shopkeeper

$$= 500 - 426.75 = ₹ 73.25$$

9. Required decimal value $= \frac{3}{4} + \frac{4}{5} + \frac{8}{25}$
 $= 0.75 + 0.80 + 0.32 = 1.87$

10. Given, $365 \times 0.5 = 182.5$

$$\therefore 365 \times 0.5 = 182.5 \times 100 = 18250$$

11. $\frac{0.1}{0.01} + \frac{0.01}{0.1} = 10 + \frac{1}{10} = \frac{100 + 1}{10} = \frac{101}{10}$

12. $0.0675 \div 15$

$$= \frac{0.0675}{15} = \frac{675}{1000 \times 15} = \frac{45}{1000} = 0.0045$$

13. $101\% = \frac{101}{100} = 1.01$

14. As, $\frac{4015}{11} = 365$ then $\frac{40.15}{1.1} = 36.5$

15. Required decimal equivalent of $17\frac{1}{16}$
 $= \frac{16 \times 17 + 1}{16} = \frac{272 + 1}{16} = \frac{273}{16} = 17.0625$

16. Suppose number = x

$$\text{Then, } \frac{5.029}{x} = 50.29 \Rightarrow x = \frac{5.029}{50.29}$$

$$\therefore x = 0.1$$

17. Required sum = 7.7

$$\begin{array}{r} 7.07 \\ 7.007 \\ \hline 77.0077 \\ 98.7847 \end{array}$$

18. Required decimal equivalent

$$= 2200 \times \frac{4}{100} \times \frac{75}{100} = ₹ 6.6$$

19. $\frac{₹ 150}{₹ 4} = \frac{150}{400} = \frac{3}{8}$

20. $\frac{61}{10000} = 0.0061$

21. Suppose second decimal = x

$$\text{Then, } x \times 4.01 = 14.837 \Rightarrow x = \frac{14.837}{4.01} = 3.7$$

22. ∵ Empty part of the drum = $1 - \frac{2}{3} = \frac{1}{3}$

If $\frac{1}{3}$ part requires = 50 L

Then, 1 part requires = $50 \div \frac{1}{3} = 50 \times 3 = 150$ L

- 23.** Required value of $\frac{1}{125} = 0.008$

24. $0.05\% = \frac{0.05}{100} = 0.0005$

$$25. \quad 1\frac{5}{8} = \frac{1 \times 8 + 5}{8} = \frac{13}{8} = 1.625$$

$$26. \quad 4.4\% = \frac{4.4}{100}$$

27. $80\% = \frac{80}{100}$ or $\frac{8}{10}$

$$28. \quad 5.125 = \frac{5125}{1000} = \frac{41}{8} \text{ or } 5\frac{1}{8}$$

$$29. \because 125 = \frac{125}{100} = \frac{5}{4} \text{ or } 1\frac{1}{4}$$

30. Departure of bus from Delhi = 10:15 am

Time taken in the journey = 6 h 30 min

∴ Reach the bus at Dehradun.

$\equiv 10:15 \pm 6:30 \equiv 16:45$ or $4:45$ pm

$$32. \because \frac{0.7 \times 6}{10 \times 42} = \frac{7 \times 6 \times 10}{10 \times 42} = 1$$

- $$33. \because 15 \times 0.600 = 9.000 = 9$$

$$\begin{array}{r}
 34. \\
 -0.020 \\
 \hline
 0.211
 \end{array}$$

$$35. \frac{3 \times 12}{10} = \frac{36}{10} = 3.6 \text{ or } 3.60$$

Quotient = 15.4

$$37. \quad 0.3636 \div 0.06 = \frac{3636 \times 100}{10000 \times 6} = \frac{606}{100} = 6.06$$

38. 25) 2.00×0.08
 2.00
 \times

Practice Exercise

- 13.** By multiplying a number by 0.6, result is 657.24. What is the result, if the number is multiplied by 0.06?
 (1) 6.5724 (2) 6
 (3) 65.724 (4) 657.24
- 14.** The value of $\frac{0.5 + 0.7 + 0.3}{5}$ is equal to
 (1) 0.3 (2) 3.1 (3) 0.03 (4) 1.3
- 15.** The value of $\frac{0.037 - 0.028}{0.03}$ is equal to
 (1) 3.0 (2) 0.3
 (3) 0.03 (4) 0.003
- 16.** In fraction 3.125 can be written as
 (1) $3\frac{1}{25}$ (2) $3\frac{1}{8}$
 (3) $3\frac{1}{125}$ (4) $31\frac{1}{4}$
- 17.** $6 + \frac{9}{100} + \frac{1}{1000} + \frac{2}{10}$ is equal to
 (1) 6.291 (2) 6.921 (3) 8.81 (4) 6.129
- 18.** $\frac{8}{1000} + \frac{7}{100} + \frac{5}{10}$ is equal to
 (1) 0.0578 (2) 0.875
 (3) 0.578 (4) 0.0875

Answers

1. (3)	2. (2)	3. (2)	4. (1)	5. (2)	6. (3)	7. (1)	8. (3)	9. (1)	10. (2)
11. (4)	12. (2)	13. (3)	14. (1)	15. (2)	16. (2)	17. (1)	18. (3)		

Hints and Solutions

- 1.** $4.44 - 0.330 = 4.11$
- 2.**
$$\begin{array}{r} 1.10 \\ - 1.01 \\ \hline 0.09 \end{array}$$
- 3.** $2.30 + 0.62 - 1.39 = 2.92 - 1.39 = 1.53$
- 4.** $1.2 \times 0.6 \times 3.12 \times 0.03 = 0.067392$
- 5.** $0.5 \times 0.05 \times 0.005 = 0.000125$
- 6.** $2.5 \times 0.01 = 0.025$
- 7.** $\because 4.5 \times 0.2 = 0.90$
- 8.** $0.2 \times 0.3 \times 0.7 = 0.042$
- 9.** $0.3 \times 0.4 \times 0.7 = 0.084$
- 10.** $\frac{6.75}{0.05} = 135$
- 11.**
$$\begin{aligned} \frac{1.298 - 0.1298}{0.04} &= \frac{1.1682}{0.04} \\ &= \frac{11682}{10000} \times \frac{100}{4} = 29.205 \end{aligned}$$
- 12.** Let the number be x .
 Then, $x \times 4.3 = 0.43$
 $\Rightarrow x = \frac{0.43}{4.3} = \frac{43}{100} \times \frac{10}{43} = \frac{1}{10} = 0.1$
- 13.** Let $x \times 0.6 = 657.24$
 $\Rightarrow x = \frac{65724}{0.6}$
 Hence, $\frac{65724}{0.6} \times 0.06 = \frac{65724}{100} \times \frac{6}{100} \times \frac{10}{6}$
 $= \frac{65724}{1000} = 65.724$
- 14.** $\because \frac{0.5 + 0.7 + 0.3}{5} = \frac{1.5}{5} = 0.3$
- 15.**
$$\begin{aligned} \frac{0.037 - 0.028}{0.03} &= \frac{0.009}{0.03} \\ &= \frac{9}{1000} \times \frac{100}{3} \\ &= \frac{3}{10} = 0.3 \end{aligned}$$
- 16.** $3.125 = \frac{3125}{1000} = \frac{125}{40} = \frac{25}{8} = 3\frac{1}{8}$
- 17.** $6 + 0.09 + 0.001 + 0.2 = 6.291$
- 18.**
$$\begin{aligned} \frac{8}{1000} + \frac{7}{100} + \frac{5}{10} &= 0.008 + 0.07 + 0.5 \\ &= 0.578 \end{aligned}$$

Self Practice

1. The value of (6.97×0.093) will be
(1) 0.7 (2) 0.8 (3) 7.0 (4) 8.0
2. The product of 0.2, 0.02 and 0.002 is
(1) 0.016 (2) 0.0016 (3) 0.00016 (4) 0.000008
3. Which of the following simplification is equal to 1?
(1) $\frac{0.304 \times 20}{304 \times 2}$ (2) $\frac{0.304 \times 20}{3.04 \times 2}$ (3) $\frac{0.304 \times 20}{30.4 \times 2}$ (4) $\frac{0.304 \times 20}{304 \times 0.2}$
4. Subtract 82.68 from 97.836.
(1) 12.24 (2) 15.156 (3) 19.75 (4) 14.21
5. The addition of 4.23, 31.79, 5.006 and 7.5 is
(1) 49.5 (2) 35.27 (3) 48.341 (4) 48.526
6. Convert 8.125 into fraction.
(1) $\frac{5}{10}$ (2) $2\frac{3}{4}$ (3) $1\frac{1}{2}$ (4) $8\frac{1}{8}$
7. Raju deposited ₹ 23.25 in first week, ₹ 27.50 in second week and ₹ 30.75 in the third. He had deposited ₹ 250.60 earlier. Now, what is his total amount in that bank?
(1) ₹ 350 (2) ₹ 332.10 (3) ₹ 325.75 (4) ₹ 275.25
8. $132 \div 0.4$ is equal to
(1) 0.33 (2) 0.033 (3) 3.3 (4) 33
9. $0.5 \times 0.5 \times 0.5$ is equal to
(1) 0.125 (2) 0.0125 (3) 0.00125 (4) 1.25
10. $0.220 - 0.202$ is equal to
(1) 0.082 (2) 0.018 (3) 0.180 (4) 0.982
11. 2.05 when changed into a fraction becomes
(1) $2\frac{1}{20}$ (2) $3\frac{1}{8}$ (3) $3\frac{1}{25}$ (4) $3\frac{1}{20}$
12. The expression $\frac{72 + 4.8}{5.6 - 3.2}$ is equal to
(1) 8.0 (2) 5.0 (3) 2.8 (4) 1.4
13. If $187 \times 98 = 18326$, the value of $183.26 \div 18.7$ is
(1) 0.098 (2) 98 (3) 9.8 (4) 9.08

Answers

1. (1)	2. (4)	3. (2)	4. (2)	5. (4)	6. (4)	7. (2)	8. (3)	9. (1)	10. (2)
11. (1)	12. (2)	13. (3)							

CHAPTER 08

MEASUREMENT

Measurement

A measurement is a result usually expressed in numbers, that can be obtain by measuring quantity, length, weight, etc. of an object.

Measures of Articles

$$12 \text{ articles} = 1 \text{ dozen}$$

$$12 \text{ dozen} = 1 \text{ gross}$$

$$1 \text{ gross} = 144 \text{ articles}$$

Measures of Length

$$10 \text{ millimetres (mm)} = 1 \text{ centimetre (cm)}$$

$$1 \text{ inch} = 2.54 \text{ centimetre (cm)}$$

$$10 \text{ centimetres} = 1 \text{ decimetre (dm)}$$

$$10 \text{ decimetres} = 1 \text{ metre (m)}$$

$$10 \text{ metres} = 1 \text{ decametre (dam)}$$

$$10 \text{ decametres} = 1 \text{ hectometre (hm)}$$

$$10 \text{ hectometres} = 1 \text{ kilometre (km)}$$

Example 1. Convert 10 inches into centimetre.

(1) 24.4 cm

(2) 23.2 cm

(3) 25.4 cm

(4) 27.7 cm

Sol. (3) $\because 1 \text{ inch} = 2.54 \text{ cm}$

$$\therefore 10 \text{ inch} = 2.54 \times 10 = 25.4 \text{ cm}$$

Example 2. Convert 6825 m into kilometres and millimetres.

(1) 6.825 km, 6825000 mm

(2) 7.601 km, 2765000 mm

(3) 5.625 km, 135700 mm

(4) 4.625 km, 372140 mm

Sol. (1) Arrange the given number of metres in the place value chart as given below

Kilometres	1000	6
Hectometres	100	8
Deca metres	10	2
Metres	1	5
Decimetres	$1/10 (0.1)$	0
Centimetres	$1/100 (0.01)$	0
Millimetres	$1/1000 (0.001)$	0

From the chart it is clear that

$$6825 \text{ m} = \frac{6825}{1000} = 6.825 \text{ km}$$

$$6825 \text{ m} = 6825 \times 1000 = 6825000 \text{ mm}$$

Measures of Weight

$$10 \text{ milligrams (mg)} = 1 \text{ centigram (cg)}$$

$$10 \text{ centigrams} = 1 \text{ decigram (dg)}$$

$$10 \text{ decigrams} = 1 \text{ gram (g)}$$

$$10 \text{ grams} = 1 \text{ decagram (dag)}$$

$$10 \text{ decagrams} = 1 \text{ hectogram (hg)}$$

$$10 \text{ hectograms} = 1 \text{ kilogram (kg)}$$

$$100 \text{ kg} = 1 \text{ quintal}$$

$$10 \text{ quintals} = 1 \text{ tonne}$$

$$1000 \text{ kilograms} = 1 \text{ tonne}$$

Example 3. Convert 7 quintals into kilograms.

(1) 600 kg

(2) 700 kg

(3) 800 kg

(4) 750 kg

Sol. (2) $1 \text{ quintal} = 100 \text{ kg}$

$$\therefore 7 \text{ quintals} = 100 \times 7 = 700 \text{ kg}$$

Measures of Area

- 100 sq millimetres = 1 sq cm
 100 sq centimetres = 1 sq dm
 100 sq decimetres = 1 sq m
 100 sq metres = 1 sq dam
 100 sq decametres = 1 sq hm
 100 sq hectometres = 1 sq km

Example 4. Convert 10 sq cm into square millimetres.

- (1) 900 sq mm (2) 920 sq mm
 (3) 100 sq mm (4) 1000 s

$$\text{Sol. (4)} \quad 1 \text{ sq cm} = 100 \text{ sq mm}$$

$$\therefore \quad 10 \text{ sq cm} = 10 \times 100 = 1000 \text{ sq mm}$$

Measures of Volume

- 1000 cube cm = 1 litre
 10 millilitres = 1 centilitre
 10 centilitres = 1 decilitre
 10 decilitres = 1 litre
 10 litres = 1 decalitre
 10 decalitres = 1 hectolitre
 10 hectolitres = 1 kilolitre

Example 5. Convert 5 L into decalitres.

$$\text{Sol. (3)} \quad \begin{aligned} (1) & 45 \text{ dL} \quad (2) 51 \text{ dL} \quad (3) 50 \text{ dL} \quad (4) 60 \text{ dL} \\ \therefore & 1 \text{ L} = 10 \text{ dL} \\ \therefore & 5 \text{ L} = 5 \times 10 = 50 \text{ dL} \end{aligned}$$

Measures of Time

- 60 seconds = 1 minute
 60 minutes = 1 hour
 24 hours = 1 day
 7 days = 1 week
 30 days = 1 month
 12 months = 1 year
 365 days = 1 year
 366 days = 1 leap year

Example 6. How many days are there in 8 months, 3 weeks?

$$\text{Sol. (3)} \quad \begin{aligned} (1) & 165 \quad (2) 240 \quad (3) 261 \quad (4) 321 \\ 8 \text{ months} & = 8 \times 30 = 240 \text{ days} \\ 3 \text{ weeks} & = 3 \times 7 = 21 \text{ days} \\ \therefore & \text{Required days} = 261 \text{ days} \end{aligned}$$

Example 7. A train started from Dehradun at 5 : 40 in the morning and reached Mumbai next day at 10 : 55. How much time was taken by the train in this journey?

- (1) 15 h 16 min (2) 6 h 10 min
 (3) 7 h 5 min (4) 17 h 15 min

Sol. (4) Time of departure from Dehradun = 5 : 40

Time of arrival at Mumbai = 10 : 55 (next day)

Time taken from 5 : 40 to 12 : 00 (midnight)

= 6 h 20 min

Time taken from 12 : 00 (midnight) to 10 : 55

= 10 h 55 min

Total time = 6 h 20 min + 10 h 55 min

= 17 h 15 min

Anti Meridian (AM)

The time between 12 midnight and 12 noon is known as Anti Meridian (AM).

Post Meridian (PM)

The time between 12 noon and 12 midnight is known as Post Meridian (PM).

Measurement of Days

A year is a unit of time defined as 365 days. These 365 days are distributed in couple of months and a month is also distributed in 30 days. A group of 7 days refers to a week.

Months	Number of days	Month	Number of days
January	31 days	July	31 days
February	28 days (29 days in leap year)	August	31 days
March	31 days	September	30 days
April	30 days	October	31 days
May	31 days	November	30 days
June	30 days	December	31 days

Unitary Method

In this method, we find the value of one article for reference and then determine the value of group. This method is also known as 'Method of one'.

$$\text{Value of 1 article} = \frac{\text{Value of given number of article}}{\text{Number of articles}}$$

and value of required number of article =

$$(\text{Value of one article}) \times (\text{Required number of articles})$$

Example 8. If 8 books cost ₹ 680. What will be the cost of such 15 books?

- (1) ₹ 1275 (2) ₹ 1350 (3) ₹ 1005 (4) ₹ 905

$$\text{Sol. (1)} \quad \text{Cost of 8 books} = ₹ 680$$

$$\therefore \text{Cost of 1 book} = ₹ \frac{680}{8}$$

$$\therefore \text{Cost of 15 books} = ₹ \frac{680}{8} \times \frac{15}{1} = ₹ 1275$$

Work and Time

1. **Work and Person** Directly proportional (more work, more men and conversely more men, more work).
 2. **Time and Person** Inversely proportional (more men, less time and conversely more time, less men).
 3. **Work and Time** Directly proportional (more work, more time and conversely more time, more work).

While solving these types of problems the work done is always supposed to be equal to 1.

While solving these types of problems the work done is always supposed to be equal to 1.

Example 9. If the wages of 12 men for 30 days be ₹ 4200, the wages of 18 men for 24 days is

Sol. (1) Let the required wages = ₹ x

$$\begin{array}{l} \text{Men } 12:18 \\ \text{Days } 30:24 \end{array} :: 4200 : x (\text{Days})$$

$$12 \times 30 \times x = 18 \times 24 \times 4200$$

$$x = \frac{18 \times 24 \times 4200}{12 \times 30}$$

$$= \text{₹ } 5040$$

Entrance Corner

1. 5045 grams is equal to [JNV 2019]
(1) 50 kg 45 gm (2) 5 kg 45 gm
(3) 5 kg 450 gm (4) 50 kg 450 gm

2. 5 minutes past 3, in the afternoon, is written as [JNV 2019]
(1) 5 : 30 am (2) 5 : 30 pm
(3) 3 : 50 pm (4) 3 : 05 pm

3. Four pieces of 75 cm were cut from a piece of 14m 25cm of fabric. Find the length of remaining fabric. [JNV 2018]
(1) 13 m 50 cm (2) 11 m 25 cm
(3) 10 m 50 cm (4) 10 m 25 cm

4. 12 Men or 15 women can do a piece of work in 21 days. Find the number of days required to complete the same work by 6 men and 10 women. [JNV 2018]
(1) 15 (2) 18 (3) 21 (4) 24

5. A bus starts at 9 : 10 am from Delhi and reaches Chandigarh at 4 : 20 pm. The total time in this journey is [JNV 2017, 2009, 2007]
(1) 7 h 10 min (2) rightly 7 h
(3) 6 h 30 min (4) 7 h 20 min

6. A train leaves Delhi at 7 : 40 evening and reaches Mumbai next morning at 11:10. The total time taken by train during the journey is [JNV 2016]
(1) 15 h 26 min (2) 14 h 15 min
(3) 15 h 30 min (4) 16 h 20 min

7. 12 men or 15 women can finish a work in 10 days. How many days will 7 men and 10 women take to finish the same work together? [JNV 2016]
(1) 12 (2) 10
(3) 9 (4) 8

8. A man do a work in 12 days working 8 h/day. If he does 6 h/ day, what would be the number of days taken by him? [JNV 2014]
(1) 12 (2) 14 (3) 16 (4) 18

9. A work done by 12 men or 15 women in 20 days. What is the time taken by 4 men and 5 women to complete this work? [JNV 2013]
(1) 15 days (2) 25 days
(3) 30 days (4) 40 days

10. A can do a piece of work in 10 days and B can do the same work in 12 days. How long will they take to finish the work, if 60th work together? [JNV 2012]
(1) $5\frac{5}{11}$ days (2) $3\frac{1}{2}$ days
(3) 6 days (4) $4\frac{2}{3}$ days

11. Convert 4 m 2604 cm into centimetres.
(1) 3040 cm (2) 3400 cm [JNV 2011]
(3) 3004 cm (4) 6604 cm

12. How many days are there in 2 months, 5 weeks and 18 days? [JNV 2011]
(1) 113 (2) 115 (3) 116 (4) 114

13. Anita started a horse painting at 11:55 am and finished it at 12:05 pm. What time taken by him to complete the painting? [JNV 2010]
(1) 50 min (2) 1 h 50 min
(3) 10 min (4) 1 h 10 min

14. How many bottles filled 300 mL capacity from a pot which contains 2.85 m^3 oil?
(1) 950 (2) 9050 [JNV 2010]
(3) 9500 (4) 9550

15. The 31st May of a year is Thursday, then the day of the 30th June of the same year will be [JNV 2007]
 (1) Sunday (2) Friday
 (3) Saturday (4) Thursday

16. Sampurna Kranti Express departs from Patna at 5 : 50 pm and arrives New Delhi at 8:15 am of the next day. What is the total time of the journey? [JNV 2007]
 (1) 12 h 25 min (2) 14 h 35 min
 (3) 14 h 25 min (4) 12 h 35 min

17. If 1 cm = 10 mm, how much is 10 cu cm? [JNV 2005]
 (1) 100 cu mm (2) 1000 cu mm
 (3) 10000 cu mm (4) 100000 cu mm

18. At the start of a journey, the meter of a car reads 678.3 km. At the end of the journey, the meter reads 913.5 km. What was the distance covered by the car during the journey? [JNV 2005]
 (1) 687.3 km (2) 931.5 km
 (3) 1591.8 km (4) 235.2 km

19. A bus left Delhi for Amritsar at 5 : 30 pm and reached Amritsar at 7 : 36 am next day. How much time did it take to reach Amritsar? [JNV 2004, 1994]
 (1) 2 h 6 min (2) 14 h 6 min
 (3) 13 h 6 min (4) 12 h 6 min

20. 10 m is what per cent of 10 km? [JNV 2003]
 (1) 0.1 (2) 1.0 (3) 10.0 (4) 40.0

21. On 1st April of a year, it is Monday. What day will it be on 18th April in the same year? [JNV 2003]
 (1) Thursday (2) Friday
 (3) Saturday (4) Wednesday

22. A boy slept at 9 : 45 pm and woke up the next morning at 5 : 30 am. He slept for [JNV 2003, 1995]
 (1) 4 h 15 min (2) 7 h 15 min
 (3) 7 h 45 min (4) 8 h 15 min

23. A bus left Delhi for Dehradun at 10 : 15 am. It took 6 h 30 min in journey. At what time did the bus reach at Dehradun? [JNV 2002, 1996]
 (1) 4 : 15 pm (2) 4 : 30 pm
 (3) 4 : 45 pm (4) 5 : 00 pm

24. A student went to sleep at 9 : 30 pm and got up at 4 : 15 am. For how much time did the student sleep? [JNV 2001, 1996]

(1) 5 h 45 min (2) 6 h 15 min
 (3) 6 h 45 min (4) 7 h 45 min

25. A train leaves New Delhi railway station at 10 : 50 am. It travels at a speed of 80 km/h. The train covers a distance of 120 km by [JNV 2001]
 (1) 11 : 50 am (2) 12 : 10 pm
 (3) 12 : 20 pm (4) 12 : 50 pm

26. A train leaves Mumbai at 17:20 o'clock on Monday and reaches Hyderabad next day at 11:25 o'clock. What is the total time taken by the train during this journey? [JNV 2000]
 (1) 5 h 35 min (2) 5 h 55 min
 (3) 18 h 5 min (4) 28 h 45 min

27. A train leaves station A at 5:15 pm and reached station B next morning at 10:40 am, what is the total time taken by the train in the journey? [JNV 2000]
 (1) 5 h 25 min (2) 15 h 55 min
 (3) 17 h 25 min (4) 22 h 40 min

28. On a Sunday Ram slept at 9 : 30 pm at night and woke up the next morning at 5 : 50 am. For how many times did he sleep? [JNV 1999]
 (1) 8 h 20 min (2) 8 h 10 min
 (3) 7 h 40 min (4) 7 h 20 min

29. A train reached its destination at 9:00 pm after completing its 6 h 30 min journey. At what time the train had started its journey? [JNV 1999]
 (1) 2 : 30 pm (2) 2 : 30 am
 (3) 3 : 30 pm (4) 3 : 30 am

30. A train leaves Mumbai at 5:40 in the evening and reaches New Delhi next morning at 10:55. The total time taken by the train during the journey is [JNV 1998]
 (1) 5 h 15 min (2) 6 h 45 min
 (3) 17 h 15 min (4) 16 h 35 min

31. A fort had provisions for 1200 men for 20 days. If 400 men joined the fort on the first day, how long would the food last at the same rate? [JNV 1997]
 (1) 12 days (2) 13 days
 (3) 14 days (4) 15 days

32. 20 books are bought for ₹ 200. How much will 45 books cost? [JNV 1997]
 (1) ₹ 250 (2) ₹ 450
 (3) ₹ 400 (4) ₹ 350

Answers

1. (1)	2. (4)	3. (2)	4. (2)	5. (1)	6. (3)	7. (4)	8. (3)	9. (3)	10. (1)
11. (3)	12. (1)	13. (3)	14. (3)	15. (3)	16. (3)	17. (3)	18. (4)	19. (2)	20. (1)
21. (1)	22. (3)	23. (3)	24. (3)	25. (3)	26. (3)	27. (3)	28. (1)	29. (1)	30. (3)
31. (4)	32. (2)	33. (1)	34. (1)	35. (2)					

Hints and Solutions

- 1.** $1 \text{ kg} = 1000 \text{ gm}$
 Given, $5045 \text{ gm} = (5000 + 45) \text{ gm}$
 This can be written as $5 \times 1000 \times 45 \text{ gm}$
 i.e. $5 \text{ kg } 45 \text{ gm}$

2. According to the question,
 \Rightarrow 5 min past 3 in the afternoon is written as
 $3 : 05 \text{ pm.}$

3. Total length of fabric = $14\text{m } 25\text{cm}$
 $= 1400 + 25 = 1425\text{cm}$
 Length of 4 pieces of $75\text{cm} = 75 \times 4 = 300\text{cm}$
 Remaining length = $1425 \text{ cm} - 300\text{cm}$
 $= 1125\text{cm} = 11\text{m } 25\text{cm}$

4. $12 \text{ men} = 15 \text{ women}$
 $1 \text{ man} = \frac{15}{12} \text{ women}$
 $1 \text{ man} = \frac{5}{4} \text{ women}$
 $\therefore 6 \text{ men} + 10 \text{ women}$
 $= \left(6 \times \frac{5}{4} + 10\right) = \left(\frac{15}{2} + 10\right) = \frac{35}{2} \text{ women}$

$\therefore M_1 = 15, D_1 = 21, M_2 = \frac{35}{2}, D_2 = ?$
 $W_1 = W_2 = 1$
 Therefore by using formula
 $M_1 D_1 W_2 = M_2 D_2 W_1$
 $15 \times 21 \times 1 = \frac{35}{2} \times D_2 \times 1$
 $D_2 = \frac{15 \times 21 \times 2}{35} = 18 \text{ days}$

5. Time of start from Delhi = $9 : 10 \text{ am}$
 Reaching time at Chandigarh = $4 : 20 \text{ pm}$
 Time from $9 : 10$ to $12 : 00 = 2 \text{ h } 50 \text{ min}$
 From $12 : 00$ to $4 : 20 = 4 \text{ h } 20 \text{ min}$
 Total time taken = $7 \text{ h } 10 \text{ min}$

6. Time of departure from Dehli = $7 : 40 \text{ evening}$
 Time arrival at Mumbai = $11 : 40 \text{ (Next morning)}$
 \therefore Total time = $7 : 40 \text{ evening to } 12 : 00 \text{ am}$
 $+ 12 : 00 \text{ am} + 11 : 10 \text{ am}$
 $= 4 \text{ h } 20 \text{ min} + 11 \text{ h } 10 \text{ min} = 15 \text{ h } 30 \text{ min}$

7. Since, $12 \text{ males} = 15 \text{ females,}$
 $4 \text{ males} = 5 \text{ females}$
 $10 \text{ females} = 8 \text{ males}$
 Now, according to the question,
 Work done by $12 \text{ males} = 10 \text{ Days}$
 Work done by $1 \text{ males} = 120 \text{ Days}$
 So, work done by $(7 + 8) \text{ males}$
 $= \frac{120}{7+8} = \frac{120}{15} = 8 \text{ Days}$

8. Here, $H_1 = 8, D_1 = 12, M_1 = 1, W_1 = 1,$
 $H_2 = 6, D_2 = ?, M_2 = 1, W_2 = 1$
 Now, $\frac{M_1 D_1 H_1}{W_1} = \frac{M_2 D_2 H_2}{W_2}$
 $\therefore D_2 = \frac{96}{6}$
 $= 16 \text{ days}$

9. $\therefore 12 \text{ men} = 15 \text{ women}$

$$\therefore 1 \text{ Man} = \frac{15}{12} \text{ Women}$$

$$\therefore 4 \text{ Men} = \frac{15}{12} \times 4 = 5 \text{ Women}$$

Women	Days
15 ↑	20 ↓
10	x
⇒	$\frac{x}{20} = \frac{15}{10}$
⇒	$x = \frac{20 \times 15}{10}$
∴	$x = 30 \text{ days}$

10. A's 1 day's work = $\frac{1}{10}$

$$B's 1 \text{ day's work} = \frac{1}{12}$$

$$(A + B)'s 1 \text{ day's work} = \frac{1}{10} + \frac{1}{12} \\ = \frac{6+5}{60} = \frac{11}{60}$$

$$\therefore (A + B) \text{ complete the whole work in } \frac{60}{11} \text{ days} \\ \text{or } 5\frac{5}{11} \text{ days.}$$

11. $\because 1 \text{ m} = 100 \text{ cm}, 4 \text{ m} = 400 \text{ cm}$

$$\text{Now, } 400 \text{ cm} + 2604 \text{ cm} = 3004 \text{ cm}$$

12. 2 months, 5 weeks and 18 days

$$= (2 \times 30 + 5 \times 7 + 18) \\ = 60 + 35 + 18 = 113 \text{ days}$$

13. Required time = $12:05 - 11:55 = 10 \text{ min}$

14. Required bottles = $\frac{2.85 \times 100 \times 100 \times 100}{300}$
 $= \frac{285 \times 100}{3}$
 $= 9500$

15. 31st May to 30th June = 30 days

\therefore In 30 days, divided by 7, remainder is 2.
 \therefore Required day = Thursday + 2 = Saturday

16. Time taken in the journey

$$= 8:15 \text{ am of the next day} - 5:50 \text{ pm} \\ = 20:15 - 5:50 = 14:25 \\ = 14 \text{ h } 25 \text{ min}$$

17. $1 \text{ cm} = 10 \text{ mm}$

$$1 \text{ cu cm} = 10 \times 10 \times 10 \text{ cu mm} \\ 10 \text{ cu cm} = 10 \times 10 \times 10 \times 10 = 10000 \text{ cu mm}$$

18. Distance covered by car = $9135 - 6783$

$$= 2352 \text{ km}$$

19. \therefore Bus left from Delhi = 5:30 pm

$$\text{Reached Amritsar} = 7:36 \text{ am}$$

$$\text{Time from } 5:30 \text{ pm to } 12:00 \text{ pm (midnight)}$$

$$= 12:00 - 5:30 = 6 \text{ h } 30 \text{ min}$$

$$\text{Time from } 12:00 \text{ to } 7:36 \text{ am} = 7 \text{ h } 36 \text{ min}$$

$$\therefore \text{Total time} = 6 \text{ h } 30 \text{ min} + 7 \text{ h } 36 \text{ min}$$

$$= 14 \text{ h } 6 \text{ min}$$

20. $\therefore 10 \text{ km} = 10 \times 1000 \text{ m} = 10000 \text{ m}$

$$\text{Let } x\% \text{ of } 10 \text{ km} = 10 \text{ m}$$

$$\therefore \frac{x}{100} \times 10000 \text{ m} = 10 \text{ m}$$

$$x = \frac{10 \times 100}{10000} = \frac{1}{10} = 0.1\%$$

21. \therefore Monday is on 1st April.

$$\text{Monday will be on 8th April and 15th April.}$$

$$\therefore \text{On 16th April it is Tuesday.}$$

$$\text{On 17th April it is Wednesday and 18th April it will be Thursday.}$$

22. The boy slept at = 4:45 pm

$$\text{The boy woke up at} = 5:30 \text{ am (next morning)}$$

$$\text{Time taken in sleeping from } 9:45 \text{ to } 12:00 \text{ (midnight)}$$

$$= 2 \text{ h } 15 \text{ min}$$

$$\text{Time taken in sleeping from } 12:00 \text{ to } 5:30$$

$$= 5 \text{ h } 30 \text{ min}$$

$$\text{Total time he slept} = 2 \text{ h } 15 \text{ min} + 5 \text{ h } 30 \text{ min} \\ = 7 \text{ h } 45 \text{ min}$$

23. Departure of bus from Delhi = 10:15 am

$$\text{Time taken in the journey} = 6 \text{ h } 30 \text{ min}$$

$$\therefore \text{Arrival of bus at Dehradun} = 10:15 + 6:30 \\ = 16:45 = 4:45 \text{ pm}$$

24. The student went to sleep at = 9:30 pm

$$\text{The student got up at} = 4:15 \text{ am}$$

$$\text{Time from } 9:30 \text{ to } 12:00 \text{ (midnight)}$$

$$= 2 \text{ h } 30 \text{ min}$$

$$\text{Time from } 12:00 \text{ to } 4:15 = 4 \text{ h } 15 \text{ min}$$

$$\text{Total time} = 6 \text{ h } 45 \text{ min}$$

$$\therefore \text{The student sleep for } 6 \text{ h } 45 \text{ min.}$$

25. $\therefore \text{Time} = \frac{\text{Distance}}{\text{Speed}} = \frac{120}{80} = \frac{3}{2} \text{ h or } 1 \text{ h } 30 \text{ min}$

$$\text{The train will cover the distance by}$$

$$= 10:50 \text{ am} + 1 \text{ h } 30 \text{ min} = 12:20 \text{ pm}$$

26. Time of departure—Monday 17:20 pm

$$\text{Time of arrival—Tuesday 11:25 am}$$

$$\text{Time taken in the journey from}$$

$$17:20 \text{ to } 24:00 = 6 \text{ h } 40 \text{ min} \quad (\text{on Monday})$$

$$\begin{aligned} \text{From } 24 : 00 \text{ to } 11 : 25 \\ = + 11 \text{ h } 25 \text{ min} & \quad (\text{on Tuesday}) \\ \therefore \text{Total time} &= 6 \text{ h } 40 \text{ min} + 11 \text{ h } 25 \text{ min} \\ &= 18 \text{ h } 05 \text{ min} \end{aligned}$$

- 27.** Time of departure from station A, 5 : 15 pm
 Time of arrival at station B, 10 : 40 am
 (Next day)
 Time taken in the journey from
 5 : 15 to 12 : 00 = 6 h 45 min
 Next day from 12 : 00 to 10 : 40
 = + 10 h 40 min
 ∴ Total time = 17 h 25 min

- 28.** Ram slept on Sunday at 9 : 30 pm.
 He woke up on Monday at 5 : 50 am.
 Time from 9 : 30 to 12:00 = 2 h 30 min
 Time (Next day) = 12 : 00 to 5 : 50 = 5 h 50 min
 ∴ Total time = 8 h 20 min

- 29.** The train reached destination at 9:00 pm.
 Time taken during the journey = 6 h 30 min
 ∴ The time of departure = (9 : 00 – 6 : 30)
 = 2 : 30 pm

- 30.** Time of departure from Mumbai
 = 5 : 40 in the evening
 Time of arrival at New Delhi
 = 10 : 55 (Next morning)
 Total time = 5 : 40 evening to 5 : 40 next
 morning = 12 h
 Next morning 5 : 40 to 10 : 55 = 5 h 15 min
 ∴ Total time = 17 h 15 min

- 31.** $1200 + 400 = 1600$
 ∵ 1200 men can eat the food in 20 days.

$$\begin{aligned} \therefore 1 \text{ man can eat the food in } 20 \times 1200 \text{ days.} \\ \therefore 1600 \text{ men can eat the food} &= \frac{20 \times 1200}{1600} \\ &= 15 \text{ days} \end{aligned}$$

- 32.** 20 books are bought for ₹ 200.
 ∴ 1 book is bought for ₹ $\frac{200}{20}$.
 ∴ 45 books are bought for $\frac{200}{20} \times 45 = ₹ 450$
- 33.** Kumar Manglam's earning = ₹ 1500
 Total spends = $800 + 200 + 200 = ₹ 1200$
 Monthly savings = $1500 - 1200 = ₹ 300$
 Yearly savings = $300 \times 12 = ₹ 3600$
- 34.** Amit alone can do the whole work in
 $8 \times 2 = 16$ days
 ∴ Work done by Amit in 1 day = $\frac{1}{16}$
 Utpal alone can do the whole work in
 $8 \times 3 = 24$ days
 ∴ Work done by Utpal in 1 day = $\frac{1}{24}$
 Work done by Amit and Utpal in 1 day
 $= \frac{1}{16} + \frac{1}{24} = \frac{5}{48}$
 ∴ Amit and Utpal will finish the work in
 $\frac{48}{5} = 9.6$ days.
- 35.** Time from 8 : 30 pm to 12 : 00 = 3 h 30 min
 Time from 12 : 00 to 7 : 45 am = 7 h 45 min
 ∴ Total time = 3 h 30 min + 7 h 45 min
 = 10 h 75 min
 = 11 h 15 min

Practice Exercise

1. What is the weight of 1 cu cm of a metal in gram if weight of 1 cu m of the same metal is 4060 kg?
 (1) 406 g (2) 40.6 g (3) 4.06 g (4) 0.406 g

2. Value of 225 h in days.
 (1) $8\frac{9}{24}$ (2) 9 (3) $9\frac{3}{8}$ (4) $9\frac{5}{24}$

3. Convert ₹ 25 into paise.
 (1) 2450 paise (2) 2300 paise
 (3) 2500 paise (4) 2400 paise

4. What is the value of ₹ 50.75 into paise?
 (1) 5575 paise (2) 5750 paise
 (3) 5075 paise (4) 5800 paise

5. 70 paise is equivalent to
 (1) ₹ 0.70 (2) ₹ 0.90
 (3) ₹ 0.07 (4) None of these

6. What time is 4 h 59 min before 2:58 pm?
 (1) 9 : 59 am (2) 10: 01 am
 (3) 9 : 59 pm (4) 9 : 57 am

7. $500 \text{ cm} + 50 \text{ m} + 5 \text{ km}$ is equal to
 (1) 500 m (2) 555 m (3) 5055 m (4) 55 m

8. Convert 6.5 quintals into kilograms.
 (1) 65 kg (2) 6500 kg
 (3) 650 kg (4) 65000 kg

9. A car travelled for 5 h 20 min. It reached its destination at 7 : 00 pm. When did the car start its journey?
 (1) 1:40 pm (2) 1:40 am
 (3) 12:20 am (4) 10:20 am

10. Convert 16 kg 9 hg and 90 g into grams
 (1) 160990 g (2) 16909 g
 (3) 16990 g (4) 16099 g

11. How will be shown 4h 3 min in the afternoon?
 (1) 4:03 am (2) 4:03 pm (3) 4:03 am (4) 4:30 pm

12. A train was 1 h 45 min late by its time. It reached at a station at 12:30. What was its exact time of arrival at that station?
 (1) 11:15 (2) 10:45
 (3) 12:15 (4) 2:15

13. A school started at 7:40 in the morning and closed at 1:30 in the noon. For how long did the school open?
 (1) 4 h 50 min (2) 6 h 50 min
 (3) 6 h (4) 5 h 50 min

14. How many articles are there in 15 gross, 8 dozen and 10 units?
 (1) 2256 (2) 2266
 (3) 2276 (4) 2286

15. A girl slept at 8:45 pm and woke up the next morning at 6:30 am. She slept for
 (1) 9 h 15 min (2) 2 h 15 min
 (3) 9 h 45 min (4) 8 h 45 min

16. How many days are there in 6 months, 7 weeks and 16 days?
 (1) 255 (2) 257 (3) 235 (4) 245

17. A bus left Meerut for Lucknow at 7:45 pm and reached there at 7:15 am next day. How much time was taken by the bus in this journey?
 (1) 11 h 30 min (2) 10 h 15 min
 (3) 11 h 45 min (4) 12 h

18. The cost of 7 rings and 6 bangles is ₹ 148600. What is the cost of 21 rings and 18 bangles?
 (1) ₹ 325400 (2) ₹ 297200
 (3) ₹ 445800 (4) Cannot be determined

19. 20 persons can make 15 toys in 12h. How many toys can 10 persons make in 8 h?
 (1) 20 (2) 15 (3) 5 (4) 2

20. 28 men can complete a piece of work in 21 days. How many more men must be hired to complete the work in 14 days?
 (1) 18 (2) 10 (3) 8 (4) 14

21. A canteen requires 28 dozen bananas for a week. How many dozen bananas will it require for 47 days?
 (1) 2256 (2) 322
 (3) 196 (4) 2352

Answers

Hints and Solutions

1. We know that,

$$1 \text{ cu m} = 1000000 \text{ cu cm}$$

\therefore Weight of 1 cu m

$$= \text{Weight of } 1000000 \text{ cu cm}$$

$$= 4060 \text{ kg} = 4060 \times 1000 \text{ g}$$

$$\therefore \text{Weight of 1 cu cm} = \frac{4060 \times 1000}{1000000} = 4.06 \text{ g}$$

2. $\because 24 \text{ h} = 1 \text{ day}$

$$\therefore 1 \text{ h} = \frac{1}{24} \text{ day}$$

$$\therefore 225 \text{ h} = \frac{225}{24} = 9\frac{9}{24} = 9\frac{3}{8} \text{ days}$$

3. ₹ 25 = 258×100 paise = 2500 paise

4. ₹ 50 + 75 paise = $(50 \times 100 + 75)$ p

$$= 5000 + 75 = 5075 \text{ paise}$$

5. 70 paise = ₹ $\frac{70}{100}$ = ₹ 0.70

6. Required time = 2: 58 pm – 4 h 59 min
 $= 14:58 - 4:59 = 9:59 \text{ am}$

7. 500 cm + 50 m + 5 km

$$= 5 \text{ m} + 50 \text{ m} + 5000 \text{ m} = 5055 \text{ m}$$

8. 1 quintal = 100 kg

$$\therefore 6.5 \text{ quintals} = 6.5 \times 100 = 650 \text{ kg}$$

9. Car start its journey = 7:00 pm – 5 h 20 min
 $= 1:40 \text{ pm}$

10. $\because 1 \text{ kg} = 1000 \text{ g}$

$$\therefore 16 \text{ kg} = 16 \times 1000 = 16000 \text{ g}$$

$$9 \text{ hg} = 9 \times 100 \text{ g} = 900 \text{ g}$$

Now, 16 kg + 9 hg + 90 g

$$= 16000 \text{ g} + 900 \text{ g} + 90 \text{ g} = 16990 \text{ g}$$

11. \therefore Required answer = 4:03 pm

12. Exact time of arrival = 12 : 30 – 1 h 45 min
 $= 10:45$

13. Closing time = 1:30 pm or 13 h 30 min

Starting time = 7:40 am or 7 h 40 min

\therefore The school opened for

$$= 13 \text{ h } 30 \text{ min} - 7 \text{ h } 40 \text{ min}$$

$$= 5 \text{ h } 50 \text{ min}$$

14. 15 gross = 15×144 articles

$$= 2160 \text{ articles}$$

$$8 \text{ dozen} = 8 \times 12 = 96 \text{ articles}$$

$$10 \text{ units or articles} = 10 \times 1 = 10 \text{ articles}$$

$$\therefore \text{Total articles} = 2160 + 96 + 10 = 2266 \text{ articles}$$

15. Time from 8:45 pm to 12:00 = 3 h 15 min

$$\text{Time from 12:00 to 6:30 am} = 6 \text{ h } 30 \text{ min}$$

$$\therefore \text{Total time} = 3 \text{ h } 15 \text{ min} + 6 \text{ h } 30 \text{ min} \\ = 9 \text{ h } 45 \text{ min}$$

16. 6 months = $6 \times 30 = 180$ days

$$7 \text{ weeks} = 7 \times 7 = 49 \text{ days}$$

$$\therefore \text{Total days} = 180 + 49 + 16 = 245$$

17. Time from 7:45 pm to 12:00

$$= 4 \text{ h } 15 \text{ min}$$

$$\text{Time from 12:00 to 7:15 am}$$

$$= 7 \text{ h } 15 \text{ min}$$

$$\therefore \text{Total time} = 4 \text{ h } 15 \text{ min} + 7 \text{ h } 15 \text{ min} \\ = 11 \text{ h } 30 \text{ min}$$

18. Cost of 7 rings and 6 bangles = ₹ 148600

$$\therefore \text{Cost of 21 rings and 18 bangles} = 3 \times 148600 \\ = ₹ 445800$$

19. 20 persons can make in 12 h = 15 toys

$$\therefore 20 \text{ persons can make in 1 h} = \frac{15}{12} \text{ toys}$$

$$\therefore 1 \text{ person can make in 1 h} = \frac{15}{12 \times 20} \text{ toys}$$

$$\therefore 10 \text{ persons can make in 8 h}$$

$$= \frac{15 \times 10 \times 8}{12 \times 20} = 5 \text{ toys}$$

20. In 21 days, the work is completed by 28 men.

\therefore In 1 day, the work is completed by

$$= 28 \times 21 \text{ men}$$

\therefore In 14 days, the work is completed by

$$= \frac{28 \times 21}{14} = 42 \text{ men}$$

$\therefore (42 - 28) = 14$ more men must be hired.

21. A canteen required for 7 days = 28×12 bananas

\therefore The canteen requires for 1 day

$$= \frac{28 \times 12}{7} \text{ bananas}$$

\therefore The canteen requires for 47 days

$$= \frac{28 \times 12}{7} \times 47$$

$$= 2256 \text{ bananas}$$

Self Practice

- 1.** 1000 cm is equivalent of
(1) 100 m (2) 10 m (3) 110 m (4) 1 m

2. On a certain day, the Sun rises at 6:15 am and sets at 6:52 pm. What is the length of the day?
(1) 12 h (2) 12 h 17 min (3) 12 h 27 min (4) 12 h 37 min

3. A girl goes to sleep at 9:15 pm and gets up 6:10 next morning. For how much time she slept?
(1) 7 h 45 min (2) 8 h 45 min (3) 8 h 55 min (4) 9 h 15 min

4. How many days are there in 2 months, 5 weeks and 18 days?
(1) 113 days (2) 115 days (3) 116 days (4) 114 days

5. A train started from Howrah at 5:40 in the evening and reached Delhi next day at 9:55. For how much time was taken by the train in this journey?
(1) 17 h 15 min (2) 16 h 15 min (3) 15 h 15 min (4) 18 h 15 min

6. 182 cg can be expressed into milligram as
(1) 1820 mg (2) 182 mg (3) 18200 mg (4) 182000 mg

7. How many seconds are there in 3 min and 25 s?
(1) 28 (2) 325 (3) 205 (4) 175

8. An aeroplane takes off Delhi at 6:50 am and lands Mumbai airport at 9:30 am. For how much time it takes to reach Mumbai?
(1) 2 h 30 min (2) 2 h (3) 3 h (4) 2 h 40 min

9. A boy started for his school by a cycle at 7:30 am from his house and he returned at 3:50 pm from his school. For how much time he has been out from his house?
(1) 7 h 20 min (2) 8 h 20 min (3) 9 h 20 min (4) 7 h 30 min

10. Convert 100 cm^2 into metre square.
(1) 0.1 m^2 (2) 0.01 m^2 (3) 1 m^2 (4) 10 m^2

11. Convert 5000 paise into rupees.
(1) ₹ 500 (2) ₹ 5 (3) ₹ 50 (4) ₹ 05

Answers

CHAPTER 11

AVERAGE

Average

The average (or mean) of a given observation or data is a number which is found on dividing the sum of observations or data by the number of observations or data given.

$$\text{Average} = \frac{\text{Sum of observations}}{\text{Number of observations}}$$

If $x_1, x_2, x_3, \dots, x_n$ are n numbers, then the average of these numbers is $\bar{x} = \frac{x_1 + x_2 + x_3 + \dots + x_n}{n}$

Example 1. The marks obtained by a student are 40, 50, 60, 70, 80. Find his average marks.

- (1) 60 (2) 50
(3) 40 (4) 30

Sol. (1) Average marks

$$= \frac{40 + 50 + 60 + 70 + 80}{5}\\ = \frac{300}{5} = 60$$

Example 2. Rahul Dravid in his 12th inning makes a score of 63 runs and thereby increase his average score by 2. What is his average after the 12th inning?

- (1) 50 (2) 41 (3) 25 (4) 30

Sol. (2) Let the average of Dravid's 11 innings be x .

Then, the average of 12 innings = $x + 2$

$$\therefore \frac{11x + 63}{12} = x + 2 \Rightarrow 12x + 24 = 11x + 63 \Rightarrow x = 39$$

Hence, the average of 12 innings = $39 + 2 = 41$

Example 3. The average of 5 numbers is 496. If two of them are 117 and 140, find the average of remaining three numbers.

- (1) 239 (2) 717
(3) 741 (4) 637

Sol. (3) Sum of 5 numbers = $496 \times 5 = 2480$

Sum of two given numbers = $117 + 140 = 257$

Sum of remaining 3 numbers = $2480 - 257 = 2223$

$$\therefore \text{Average of these 3 numbers} = \frac{2223}{3} = 741$$

Entrance Corner

1. The mean of 20 observations was found to be 65 but later on it was found that 69 was misread as 96. Find the correct mean.

[JNV 2017]

- (1) 63.65 (2) 12.37
(3) 69.50 (4) 65.95

2. Find the average of the following set of scores 567, 434, 323, 290, 401 [JNV 2017]

- (1) 398 (2) 412
(3) 407 (4) 403

3. The average of 20 values is 18. If 3 is subtracted from each of the values, then the new average will be [JNV 2017]

- (1) 21 (2) 15
(3) 16 (4) 17

4. The average of 4 numbers is 7. If the sum of first 3 numbers is 20, find the fourth number. [JNV 2012]

- (1) 7 (2) 10
(3) 9 (4) 8

5. Find the average of the following numbers.
06, 0, 12, 14, 13 [JNV 2012]
(1) 9 (2) 7 (3) 12 (4) 11
6. The average of the height of 5 students having height 30, 40, 50, 60, 70 is [JNV 2011]
(1) 40 (2) 50 (3) 55 (4) 45
7. The average score of a cricketer in 2 matches is 27 and in 3 other matches is 32. Then, his average score in all the 5 matches is [JNV 2011]
(1) 28 (2) 29 (3) 30 (4) 31
8. The average of 20 values is 18. If 3 is subtracted from each of the values, then the new average will be [JNV 2009]
(1) 21 (2) 15 (3) 16 (4) 17
9. The average age of 4 children is 11 yr. If the ages of 3 children are 9 yr, 12 yr and 10 yr, find the age of the fourth child. [JNV 2001]
(1) 12 yr (2) 24 yr
(3) 13 yr (4) None of these
10. The average of the first 5 even-numbers is [JNV 2001]
(1) 4 (2) 5 (3) 6 (4) 7
11. Find the average of 3, 5, 7, 8, 9. [JNV 2000]
(1) 6 (2) 6.4 (3) 7.4 (4) 8.4
12. The average of 3 numbers is 10. If the average of first 2 numbers is 9, find the third number. [JNV 2000]
(1) 12 (2) 13 (3) 14 (4) 15
13. Find the average of 10, 9, 8, 7 and 6. [JNV 1999]
(1) 6 (2) 7 (3) 8 (4) 9
14. Average of 2 numbers is 17. If 1 number is 21, find the other number. [JNV 1999]
(1) 7 (2) 8 (3) 12 (4) 13
15. The average age of a group of 5 boys is 15 yr. If an other boy of 15 yr joins them, find the average of the whole group. [JNV 1998]
(1) 14 yr (2) 16 yr (3) 17 yr (4) 15 yr
16. The heights of 5 students are 140, 135, 142, 138, 140. Their average height is [JNV 1998]
(1) 136 (2) 138 (3) 139 (4) 140
17. The average of 4, 5, 3.5, 7.5, 9.5 and 6.5 is [JNV 1997]
(1) 6.0 (2) 5.2 (3) 5.5 (4) 5.0
18. The average of 3 numbers is 24. If one of the numbers is 18 and the other is 29, find the third number. [JNV 1996]
(1) 24 (2) 25 (3) 26 (4) 27
19. In a family consisting of 10 persons father, mother and the eldest son earn ₹ 4000, ₹ 3000 and ₹ 4400 per month. What is the average monthly income of a family member? [JNV 1996]
(1) ₹ 1260 (2) ₹ 1600
(3) ₹ 1140 (4) ₹ 3800
20. Average score in 10 matches of a cricket player was 45.6 runs. If the average score in first 6 matches was 48 runs, find the average score in last 4 matches. [JNV 1995]
(1) 42 runs (2) 44 runs
(3) 46 runs (4) 48 runs
21. The average of 5 consecutive even numbers, starting with 2 is [JNV 1995]
(1) 4 (2) 6 (3) 7 (4) 5
22. The lengths (in m) of 5 pieces of a string are 5, 5.2, 6.3, 7.2, 6.3. The average length (in m) of a piece is [JNV 1995]
(1) 5.8 (2) 6.0 (3) 6.1 (4) 6.2
23. The average expenditure of a man for first 7 months is ₹ 800 and for the next 5 months is ₹ 900. Find his average monthly expenditure. [JNV 1994]
(1) ₹ 600 (2) ₹ 700 (3) ₹ 800 (4) ₹ 841 $\frac{2}{3}$
24. Find the average of $\frac{1}{2}, \frac{1}{4}, \frac{1}{6}, \frac{1}{8}$. [JNV 1994]
(1) 0.26 (2) 4.17 (3) 4.18 (4) 4.19
25. Average of 8, 6, 0, 9 and 7 is [JNV 1994]
(1) 6 (2) 8 (3) 3 (4) 5
26. Average of class I to class V is 29. Average of class I to class III is 31. Average of class IV to class V is [JNV 1993]
(1) 25 (2) 26
(3) 27 (4) 28
27. Marks obtained by 10 students are 23, 25, 37, 36, 27, 28, 29, 34, 36, 38. The average marks are [JNV 1993]
(1) 30 (2) 30.3 (3) 31 (4) 31.3

Answers

1. (1)	2. (4)	3. (2)	4. (4)	5. (1)	6. (2)	7. (3)	8. (2)	9. (3)	10. (3)
11. (2)	12. (1)	13. (3)	14. (4)	15. (4)	16. (3)	17. (1)	18. (2)	19. (4)	20. (1)
21. (2)	22. (2)	23. (4)	24. (1)	25. (1)	26. (2)	27. (4)			

Hints and Solutions

1. Sum of 20 observation = $20 \times 65 = 1300$

after subtract 96 and add 69, we get
sum of correct 20 observation

$$= 1300 - 96 + 63 = 1273$$

Hence, mean of correct 20 observation

$$= \frac{1273}{20} = 63.65$$

2. Average = $\frac{567 + 434 + 323 + 290 + 401}{5}$

$$= \frac{2015}{5} = 403$$

3. Now, total values = $20 \times 18 = 360$

New total = $360 - 3 \times 20 = 360 - 60 = 300$

$$\therefore \text{New average} = \frac{300}{20} = 15$$

4. ∵ Average of 4 numbers = 7

$$\therefore \text{Sum of 4 numbers} = 4 \times 7 = 28$$

Sum of first 3 numbers = 20

Hence, fourth number = $28 - 20 = 8$

5. Required average

$$= \frac{6 + 0 + 12 + 14 + 13}{5} = \frac{45}{5} = 9$$

6. Average height of the students

$$= \frac{30 + 40 + 50 + 60 + 70}{5} = \frac{250}{5} = 50$$

7. Total score in first two matches = $2 \times 27 = 54$

Total score in other 3 matches = $3 \times 32 = 96$

$$\therefore \text{Average of 5 matches} = \frac{54 + 96}{5} = \frac{150}{5} = 30$$

8. Sum of 20 values = $18 \times 20 = 360$

after subtract 3 from each, value, we get

Sum of new 20 values = $360 - 3 \times 20$

$$= 360 - 60 = 300$$

Therefore, new average = $\frac{300}{20} = 15$

9. Total Ages of 3 children = $9 + 12 + 10 = 31$ yr

Total age of 4 children = $11 \times 4 = 44$ yr

$$\therefore \text{Age of 1 child} = 44 - 31 = 13 \text{ yr}$$

10. ∵ First five even numbers are = 2, 4, 6, 8, 10

$$\begin{aligned} \text{Their average} &= \frac{2 + 4 + 6 + 8 + 10}{5} \\ &= \frac{30}{5} = 6 \end{aligned}$$

11. Average = $\frac{3 + 5 + 7 + 8 + 9}{5} = \frac{32}{5} = 6.4$

12. Average of 3 numbers = 10

$$\therefore \text{Sum of 3 numbers} = 10 \times 3 = 30$$

$$\therefore \text{Average of first 2 numbers} = 9$$

$$\therefore \text{Sum of first 2 numbers} = 9 \times 2 = 18$$

$$\therefore \text{Third number} = 30 - 18 = 12$$

13. Average = $\frac{10 + 9 + 8 + 7 + 6}{5} = \frac{40}{5} = 8$

14. Average of two numbers = 17

$$\therefore \text{Sum of two numbers} = 17 \times 2 = 34$$

One number = 21

$$\text{Then, other number} = 34 - 21 = 13$$

15. Sum of the age of 5 boys = $15 \times 5 = 75$ yr

Other boy join, whose age = $75 + 15 = 90$ yr

$$\therefore \text{Average age of the whole group}$$

$$= \frac{90}{6} = 15 \text{ yr}$$

16. Required average

$$\frac{140 + 135 + 142 + 138 + 140}{5} = \frac{695}{5} = 139$$

17. Average = $\frac{4 + 5 + 3.5 + 7.5 + 9.5 + 6.5}{6}$

$$= \frac{36}{6} = 6$$

18. Average of 3 numbers = 24

$$\therefore \text{Sum of 3 numbers} = 24 \times 3 = 72$$

$$\therefore \text{Third number} = 72 - (18 + 29)$$

$$= 72 - 47 = 25$$

19. Average income of family member

$$\begin{aligned} &= \frac{4000 + 3000 + 4400}{3} = \frac{11400}{3} \\ &= ₹ 3800 \end{aligned}$$

20. ∵ Average score in 10 matches = 45.6 runs
 ∴ Total score in 10 matches
 = $45.6 \times 10 = 456$ runs
 ∴ Average score in 6 matches = 48 runs
 ∴ Total score in 6 matches = $48 \times 6 = 288$ runs
 ∴ Sum of the runs scored in last 4 matches
 = $456 - 288 = 168$ runs
 ∴ Average score in last 4 matches
 = $\frac{168}{4} = 42$ runs
21. Sum of 5 consecutive even numbers starting with 2
 = $2 + 4 + 6 + 8 + 10 = 30$
 Average = $\frac{30}{5} = 6$
22. Average length = $\frac{5 + 52 + 6.3 + 7.2 + 6.3}{5}$
 = $\frac{30}{5} = 6$
23. Total sum of 7 months expenditure
 = $7 \times 800 = ₹ 5600$
 Total sum of 5 months expenditure
 = $5 \times 900 = ₹ 4500$

- ∴ Average expenditure = $\frac{5600 + 4500}{12}$
 = $\frac{10100}{12} = \frac{2525}{3} = ₹ 841\frac{2}{3}$
24. Average = $\frac{\frac{1}{2} + \frac{1}{4} + \frac{1}{6} + \frac{1}{8}}{4} = \frac{12 + 6 + 4 + 3}{24}$
 = $\frac{25}{24} = \frac{25}{24 \times 4} = \frac{25}{96} = 0.26$
25. Average = $\frac{8 + 6 + 0 + 9 + 7}{5} = \frac{30}{5} = 6$
26. Total students in class I to V = $29 \times 5 = 145$
 Total students in class I to III = $31 \times 3 = 93$
 Total students in class IV to V = $145 - 93 = 52$
 ∴ Average of class IV and V = $\frac{52}{2} = 26$
27. Average marks
 = $\frac{[23 + 25 + 37 + 36 + 27 + 28 + 29 + 34 + 36 + 38]}{10}$
 = $\frac{313}{10} = 31.3$

Practice Exercise

- The average of all natural numbers from 521 and 525, is
 (1) 525 (2) 251 (3) 526 (4) 523
- The average of first 9 prime numbers is
 (1) 9 (2) 11 (3) $11\frac{2}{9}$ (4) $11\frac{1}{9}$
- The average of first 6 even numbers is
 (1) 7 (2) 6 (3) 8 (4) 5
- Find the average of first 10 natural numbers.
 (1) 5 (2) 5.5
 (3) 4.5 (4) 6
- Find the average of first 5 multiples of 3.
 (1) 45 (2) 9
 (3) 10 (4) 15
- The average age of 25 boys in a class decreases by 6 months when a new boy takes the place of a 20 yr old boy. Find the age of new boy.
 (1) 7 yr (2) 7.5 yr
 (3) 8 yr (4) 8.5 yr
- The average age of 30 boys of a class is equal to 14 yr. When the age of the class teacher is included the average becomes 15 yr. The age of the class teacher is
 (1) 40 yr (2) 42 yr
 (3) 48 yr (4) 45 yr
- The average marks of 4 men is increased by 3 when one of them whose marks are 120 is replaced by another man. What is the marks of new man?
 (1) 123 (2) 124
 (3) 132 (4) 133
- The average of 11 results is 30 that of the first 5 is 25 and that of the last 5 is 28. The value of the 6th number is
 (1) 64 (2) 65 (3) 66 (4) 45
- Sachin Tendulkar in his 17th inning makes a score of 85 and thereby increase his average by 3. What is his average after the 17th inning?
 (1) 37 (2) 35 (3) 33 (4) 39

Answers

1. (4)	2. (4)	3. (1)	4. (2)	5. (2)	6. (2)	7. (4)	8. (3)	9. (2)	10. (1)
11. (2)	12. (1)	13. (3)	14. (4)	15. (3)	16. (3)	17. (3)			

Hints and Solutions

1. \because Sum of all natural number from 521 to 525
 $= 521 + 522 + 523 + 524 + 525 = 2615$
 Therfore, average of all natural number from
 521 to 525 $= \frac{2615}{5} = 523$

2. The average of first 9 prime number
 $= \frac{2 + 3 + 5 + 7 + 11 + 13 + 17 + 19 + 23}{9}$
 $= \frac{100}{9} = 11\frac{1}{9}$

3. \because Sum of first 6 even number
 $= 2 + 4 + 6 + 8 + 10 + 12 = 42$
 Therefore, average of first 6 even number
 $= \frac{42}{6} = 7$

4. \because Sum of first 10 natural number
 $= 1 + 2 + 3 + 4 + 5 + 6 + 7 + 8 + 9 + 10 = 55$

Therefore, Average of first 10 natural number

$$= \frac{55}{10} = 5.5$$

$$5. \text{ Required average} = \frac{3 + 6 + 9 + 12 + 15}{5}$$

$$= \frac{45}{5} = 9$$

6. Total age decreased

$$= (\text{Average age} \times \text{Average decrement})$$

Thus, age of new boy = $20 - 12.5 = 7.5$ yr.

7. Total age of the boys of a class

$$= 14 \times 30 = 420 \text{ yr}$$

Total age when class teacher's age is included

$$= 15 \times 31 = 465 \text{ yr}$$

$$\therefore \text{Age of class teacher} = 465 - 420 = 45 \text{ yr}$$

8. Marks of new man = $120 + 3 \times 4$
 $= 120 + 12 = 132$

9. Total of 11 results = $11 \times 30 = 330$
 Total of first 5 results = $25 \times 5 = 125$
 Total of last 5 results = $28 \times 5 = 140$
 6th value = $330 - (125 + 140)$
 $= 330 - 265 = 65$

10. Let the average of Sachin's of the 16th inning be x .
 Then, the sum of 17 innings = $16x + 85$
 and $(16x + 85) = 17(x + 3)$
 $\therefore x = 85 - 51 = 34$
 \therefore Average after 17 innings = $34 + 3 = 37$

11. Total of 67 values = $67 \times 35 = 2345$
 Value to be added in all = $4 \times 67 = 268$
 \therefore Total value now = $2345 + 268 = 2613$
 \therefore Average = $\frac{2613}{67} = 39$

12. Previous total = $25 \times 78.4 = 1960$
 \therefore New total = $1960 + 96 - 69 = 1987$
 \therefore New average = $\frac{1987}{25} = 79.48$

13. Average temperature from Monday to Thursday
 $= 48^\circ$

\therefore Total temperature = $48^\circ \times 4 = 192^\circ$
 Temperature of Monday = 42°
 \therefore Temperature of Tuesday to Thursday
 $= 192^\circ - 42^\circ = 150^\circ$

Now, total temperature from Tuesday to Friday
 $= 52^\circ \times 4 = 208^\circ$

\therefore Temperature of Friday = $208^\circ - 150^\circ = 58^\circ$

14. Average weight = $\frac{42 + 72 + 85 + 64 + 54 + 73}{6}$
 $= \frac{390}{6} = 65 \text{ kg}$

15. Total age of 5 officers = $32 \times 5 = 160$
 Let the age of their supervisor be x . Then
 $160 + x = 6 \times 33 \Rightarrow x = 198 - 160 = 38 \text{ yr}$

16. In present situation, their average age
 $= (35 + 5) = 40 \text{ yr}$

17. Total age of 11 players + 1 coach
 $= 12 \times 18 = 216 \text{ yr}$
 Total age of 11 players = $11 \times 17 = 187 \text{ yr}$
 \therefore Age of coach = $216 - 187 = 29 \text{ yr}$

Self Practice

Answers

1. (3) **2.** (4) **3.** (1) **4.** (4) **5.** (4) **6.** (1) **7.** (4) **8.** (1) **9.** (3) **10.** (2)

CHAPTER**12**

PERCENTAGE AND ITS APPLICATIONS

Percentage

Percentage means per hundred or for every hundred.

Or

The value which is considered for every hundred is termed as percentage and the numerator of such fraction (having denominator 100) is called as the rate of percentage. Percentage is represented by % sign.

Basic Rules Related to Percentage

Per cent as a Fraction

To convert a per cent into a fraction, we divide it by 100 and remove the per cent sign %.

$$\text{e.g. } 5\% = \frac{5}{100} = \frac{1}{20}$$

$$0.3\% = \frac{0.3}{100} = \frac{3}{1000}$$

$$0.006\% = \frac{0.006}{100} = \frac{6}{100000} = \frac{3}{50000}$$

Fraction as a Per cent

To convert a fraction into a per cent, we multiply it by 100 and apply the per cent sign %.

$$\text{e.g. } \frac{3}{4} = \left[\frac{3}{4} \times 100 \right]\% = 75\%$$

$$0.4 = [0.4 \times 100]\% = 40\%$$

$$0.08 = [0.08 \times 100]\% = 8\%$$

Conversion of Per cent into Fraction

$$1\% = \frac{1}{100} \qquad 20\% = \frac{1}{5}$$

$$2\% = \frac{1}{50} \qquad 25\% = \frac{1}{4}$$

$$4\% = \frac{1}{25} \qquad 50\% = \frac{1}{2}$$

$$5\% = \frac{1}{20} \qquad 100\% = \frac{1}{1}$$

$$10\% = \frac{1}{10}$$

Finding a Percentage of a Number

To find a per cent of a given number, we proceed as follows

- Obtain the number, say x .
- Obtain the required per cent, say $p\%$.
- Multiply x by p and divide by 100 to obtain the required $p\%$ of x . i.e. $p\% \text{ of } x = \frac{p}{100} \times x$

Important Formulae

- Rate percentage = $\frac{\text{Result}}{\text{Original number}} \times 100$
- Increased percentage
$$= \left(\frac{\text{Increment}}{\text{Original number}} \times 100 \right)\%$$
- Decreased percentage
$$= \left(\frac{\text{Decrement}}{\text{Original number}} \times 100 \right)\%$$

Example 1. 25% is equal to

- (1) $\frac{1}{2}$ (2) $\frac{1}{4}$ (3) $\frac{1}{8}$ (4) $\frac{1}{16}$

$$\text{Sol. } (2) \quad 25\% = \frac{25}{100} = \frac{1}{4}$$

Example 2. Find the value of x , if 3% of x is 9.

- (1) 300 (2) 400 (3) 310 (4) 305

Sol. (1) As, 3% of x is 9

$$\Rightarrow \frac{3 \times x}{100} = 9 \Rightarrow x = \frac{9 \times 100}{3} \Rightarrow x = 300$$

Example 3. Reena deposits 60 per month in her post office saving bank account. If this is 10% of her monthly income, find her monthly income.

- (1) ₹ 600 (2) ₹ 650 (3) ₹ 630 (4) ₹ 720

Sol. (1) Let Reena's monthly salary = ₹ x

Now, 10% of x = ₹ 60

$$\Rightarrow \frac{10}{100} \times x = 60 \Rightarrow x = \frac{60 \times 100}{10} \Rightarrow x = ₹ 600$$

Example 4. Kareena went to school for 216 days in a full year. If her attendance is 90%. Find the number of days on which the school opened.

- (1) 220 (2) 200 (3) 240 (4) 260

Sol. (3) Let the number of days on which the school opened is x .

$$\text{Now, } 90\% \text{ of } x = 216 \Rightarrow \frac{90}{100} \times x = 216$$

$$\Rightarrow x = \frac{216 \times 100}{90}$$

$$\Rightarrow x = 240$$

Thus, the school opened for 240 days.

Example 5. 40% of (100 – 20% of 300) is equal to

- (1) 16 (2) 20 (3) 64 (4) 140

$$\text{Sol. (1)} \left(100 - 300 \times \frac{20}{100}\right) \times \frac{40}{100} = (100 - 60) \times \frac{40}{100}$$

$$= \frac{40 \times 40}{100} = 16$$

Entrance Corner

1. 150% is equal to [JNV 2019]

- (1) 1.5 (2) 5.1 (3) 0.15 (4) 15.0

2. 84% is equal to [JNV 2018]

- (1) $\frac{42}{100}$ (2) $\frac{42}{50}$ (3) $\frac{84}{225}$ (4) 8.4

3. A student scored 18 marks out of 25 marks in the first test of Math. In the second test he scored 22 marks in the second test exceeds his first test by [JNV 2017]

- (1) 4% (2) 8%
(3) 16% (4) 80%

4. 90% of 300 + 30% of 90 is equal to [JNV 2017]

- (1) 287 (2) 297 (3) 237 (4) 277

5. In an annual examination, Hardik got 500 marks out of 725. What is his approximate per cent in the examination? [JNV 2017]

- (1) 88 (2) 79 (3) 54 (4) 70

6. There are 3450 employees in an organisation. Out of which 42% got promoted. How many such employees are there who got promoted? [JNV 2017]

- (1) 1449 (2) 1518
(3) 1587 (4) 1656

7. 26.2% is equal to [JNV 2016]

- (1) 2.62 (2) 0.262 (3) 0.0262 (4) 262.0

8. $\frac{17}{25}$ can be expressed in percentage is [JNV 2015]

- (1) 34% (2) 68% (3) 17% (4) 25%

9. In a musical concert, 15% of the total is reserve for first class. If all the tickets were sold except 171 ticket of first class, then how many tickets were sold? [JNV 2014]

- (1) 1710 (2) 1600 (3) 1140 (4) 180

10. Which of the following is equivalent to 1.01? [JNV 2014]

- (1) 101% (2) 10.1% (3) 1.01% (4) 1010%

11. Weight of tomato comprises 90% of water. Weight of water in 25 kg of tomato is [JNV 2014]

- (1) 24 kg (2) 22.5 kg (3) 21 kg (4) 19.5 kg

12. What is the percentage of 500 g of 4 kg? [JNV 2013]

- (1) 12.5 (2) 25 (3) 50 (4) 125

13. A man bought a bicycle for ₹ 1200. He sold it for ₹ 1500. Find the profit per cent. [JNV 2012]

- (1) 30 (2) 20 (3) 25 (4) 28

Answers

1. (1)	2. (2)	3. (3)	4. (2)	5. (4)	6. (1)	7. (2)	8. (2)	9. (3)	10. (1)
11. (2)	12. (1)	13. (3)	14. (3)	15. (4)	16. (3)	17. (4)	18. (3)	19. (4)	20. (1)
21. (3)	22. (1)	23. (2)	24. (3)	25. (3)	26. (2)	27. (1)	28. (4)	29. (2)	30. (1)
31. (2)	32. (1)	33. (1)	34. (3)						

Hints and Solutions

1. Given, 150%

$$150\% \text{ is written as } \frac{150}{100} = \frac{15}{10} = 15$$

$$2. 84\% = \frac{84}{100} = \frac{42}{50}$$

$$3. \text{More marks} = 22 - 18 = 4$$

$$\text{Required percentage} = \frac{4 \times 100}{25} = 16\%$$

$$4. 90\% \text{ of } 300 + 30\% \text{ of } 90$$

$$= \frac{90 \times 300}{100} + \frac{30 \times 90}{100} \\ = 90 \times 3 + 3 \times 9 = 270 + 27 = 297$$

$$5. \text{Required percentage} = \frac{500}{725} \times 100 = 68.9 = 70$$

$$6. 3450 \times \frac{42}{100} = \frac{144900}{100} = 1449 \text{ got promotion}$$

$$7. 26.2\% = \frac{26.2}{100} = 0.262$$

$$8. \text{Percentage value of } \frac{17}{25} = \frac{17}{25} \times 100 = 68\%$$

9. According to the question,

$$15\% = 171$$

$$1\% = \frac{171}{15}$$

$$\therefore 100\% = \frac{171 \times 100}{15} = 1140$$

Hence, total number of ticket sold = 1140

$$10. 101\% = \frac{101}{100} = 101\%$$

$$11. \text{Weight of water in } 25 \text{ kg of tomato} = 90\% \text{ of } 25 \text{ kg} \\ = 22.5 \text{ kg}$$

$$12. \because 1 \text{ kg} = 1000 \text{ g}$$

$$\therefore 4 \text{ kg} = 4 \times 1000 \text{ g} = 4000 \text{ g}$$

$$\text{Hence, required percentage} = \frac{500}{4000} \times 100 \\ = 12.5\%$$

$$13. \text{Given, cost price of the bicycle} = ₹ 1200$$

$$\text{and selling price of the bicycle} = ₹ 1500$$

Hence, required profit percentage

$$= \frac{1500 - 1200}{1200} \times 100 = \frac{300}{1200} \times 100 = 25\%$$

$$14. \text{Monthly saving amount by the boy}$$

$$= 20 \times \frac{50}{100} = ₹ 10$$

$$\therefore \text{Annually saving amount} = 10 \times 12 = ₹ 120$$

$$15. \text{Required profit per cent} = \frac{330 - 300}{300} \times 100$$

$$= \frac{30}{300} \times 100 = 10\%$$

$$16. \text{New price of the car} = 500000 \times \frac{(100 - 10)}{100} \\ = 500000 \times \frac{90}{100} = ₹ 450000$$

$$17. \frac{6}{20} \text{ in percentage} = \frac{6}{20} \times \frac{100}{1} = 30\%$$

$$18. \text{Percentage of girls} = \frac{240}{600} \times 100 = 40\%$$

$$19. \text{District population after one year}$$

$$= 2000000 + 2000000 \times 1.1\%$$

$$= 2000000 + 2000000 \times \frac{1.1}{100}$$

$$= 2000000 + 22000$$

$$= 2022000$$

$$20. \text{Required number} = 200 \times \frac{75}{100} = 150$$

$$21. 10.01 = \frac{1001}{100} = 1001\%$$

$$22. 80\% \text{ of } ₹ 240 = \frac{240 \times 80}{100} = ₹ 192$$

$$35\% \text{ of } ₹ 400 = \frac{400 \times 35}{100} = ₹ 140$$

$$\therefore \text{Difference} = (192 - 140) = ₹ 52$$

$$23. 0.075 = 0.075 \times 100 = 7.5\% \text{ (To express number into per cent it is multiplied by 100)}$$

$$24. \because \text{Total marks} = 250$$

$$\text{Student got} = 30\%$$

$$\text{i.e., } 250 \times \frac{30}{100} = 75 \text{ marks}$$

$$\text{Failed by} = 25 \text{ marks}$$

$$\therefore \text{Pass marks} = 75 + 25 = 100$$

$$25. \because \text{Out of } 100 = 30$$

$$\therefore \text{Out of } 1 = \frac{30}{100}$$

$$\therefore \text{Out of } 40 = \frac{30}{100} \times 40 = ₹ 12$$

$$26. \frac{5}{8} = \frac{5}{8} \times 100\% = \frac{500}{8}\% = 62.5\%$$

$$27. 20\% \text{ of } ₹ 70 = \frac{20}{100} \times 70 = ₹ 14$$

$$28. 25\% \text{ of } 10 \text{ m} = 25\% \text{ of } 1000 \text{ cm}$$

$$= \frac{25}{100} \times 1000 = 250 \text{ cm}$$

29. Savings = $100\% - 50\% = 50\% = ₹ 200$

$$\therefore \text{Total salary} = \frac{100}{50} \times 200 = ₹ 400$$

30. $50\% = \frac{50}{100} = \frac{1}{2}$

31. Reduction at 15% on ₹ 200

$$= \frac{15}{100} \times 200 = ₹ 30$$

$$\therefore \text{Cash price} = \text{Catalogue price} - \text{Reduction}$$

$$= 200 - 30 = ₹ 170$$

32. 20% of ₹ 10 = $\frac{20}{100} \times 10 = ₹ 2$

33. Let the sum be ₹ x .

$$\text{Then, } 20\% \text{ of } x = ₹ 240$$

$$\Rightarrow x \times \frac{20}{100} = 240$$

$$\therefore x = \frac{240 \times 100}{20} = ₹ 1200$$

34. ∵ Out of ₹ 300 expenditure = ₹ 100

$$\therefore \text{Out of ₹ 1 expenditure} = ₹ \frac{100}{300}$$

$$\therefore ₹ 100 \text{ expenditure} = \frac{100}{300} \times 100 = 33\frac{1}{3}\%$$

Practice Exercise

1. Which one of the following is equal to 6.25%?
 (1) 0.00625 (2) 0.0625
 (3) 0.625 (4) 6.25
2. 40% of 20% is equal to
 (1) 16% (2) 20% (3) 8% (4) 80%
3. Express 45% in fraction.
 (1) $\frac{9}{20}$ (2) $\frac{9}{10}$
 (3) $\frac{3}{20}$ (4) $\frac{5}{20}$
4. Express $10\frac{1}{10}$ into percentage.
 (1) 1010% (2) 10.10%
 (3) 0.101% (4) 101%
5. 50 is what per cent of 75?
 (1) $\frac{100}{3}\%$ (2) $\frac{50}{3}\%$
 (3) $\frac{200}{3}\%$ (4) None of these
6. 25 g is what per cent of 1 kg?
 (1) 25% (2) 2.5%
 (3) 0.25% (4) 0.025%
7. 25% of 75 is equal to
 (1) 16 (2) 16.35 (3) 17.45 (4) 18.75
8. How many per cent of 72 is 18?
 (1) 25% (2) $33\frac{1}{3}\%$
 (3) 42% (4) 50%
9. (100% of 5) + (5% of 100) is equal to
 (1) 10 (2) 15
 (3) 55 (4) 105
10. 12% of 12 + 12 is equal to
 (1) 12.36 (2) 12.44 (3) 13.44 (4) 26.40
11. If 5% of X + 16% of 75 = 16. Find the value of X .
 (1) 75 (2) 80 (3) 90 (4) 100
12. After spending 30% of her money, a lady has ₹ 70 left. How much had she first?
 (1) ₹ 80 (2) ₹ 100
 (3) ₹ 120 (4) ₹ 140
13. Ram's monthly salary was ₹ 3000. Find his salary now after an increase of 20%.
 (1) ₹ 2400 (2) ₹ 3200
 (3) ₹ 3400 (4) ₹ 3600
14. In a class of 50 students, 40% are girls. How many boys are there?
 (1) 20 (2) 10 (3) 25 (4) 30
15. Out of 30 students 40% are boys and the remaining are girls. The number of girls in the class
 (1) 12 (2) 15 (3) 18 (4) 20
16. A person earns ₹ 1800 per month and saves 10% of it. How much does he save?
 (1) ₹ 180 (2) ₹ 1620
 (3) ₹ 1790 (4) ₹ 1810
17. A person saves 25% of his income. If he saves ₹ 3000 per month, his monthly income is
 (1) ₹ 15000 (2) ₹ 12000
 (3) ₹ 9000 (4) ₹ 7500

Answers

1. (2)	2. (3)	3. (1)	4. (1)	5. (3)	6. (2)	7. (4)	8. (1)	9. (1)	10. (3)
11. (2)	12. (2)	13. (4)	14. (4)	15. (3)	16. (1)	17. (2)	18. (4)	19. (4)	20. (1)
21. (3)	22. (1)	23. (3)	24. (4)	25. (4)					

Hints and Solutions

$$1. \quad 6.25\% = \frac{6.25}{100} = \frac{625}{10000} = 0.0625$$

$$2. \ 20\% = \frac{20}{100} \text{ and } 40\% = \frac{40}{100}$$

$$\therefore 40\% \text{ of } 20\% = \frac{40}{100} \times \frac{20}{100} = \frac{8}{100} \text{ or } 8\%$$

$$3. \quad 45\% = \frac{45}{100} = \frac{9}{20}$$

$$4. \quad 10\frac{1}{10} = \frac{101}{10} = \frac{101}{10} \times 100 = 1010\%$$

$$5. \text{ Required percentage} = \frac{50}{75} \times 100 = \frac{200}{3} \%$$

$$6. \text{ Required percentage} = \frac{25 \text{ g}}{1 \text{ kg}} \times 100$$

$$= \frac{25\text{ g}}{1000\text{ g}} \times 100 = 2.5\%$$

$$7. \text{ 25\% of } 75 = \frac{25}{100} \times 75 = \frac{75}{4} = 18.75$$

$$8. \text{ Required percentage} = \frac{18}{72} \times 100 = 25\%$$

$$9. \quad (100\% \text{ of } 5) + (5\% \text{ of } 100)$$

$$= \left(\frac{100}{100} \times 5 \right) + \left(\frac{5}{100} \times 100 \right) = 5 + 5 = 10$$

$$10. \quad 12\% \text{ of } 12 + 12 = \frac{12}{100} \times 12 + 12 \\ = 1.44 + 12 = 13.44$$

$$11. \therefore 5\% \text{ of } X + 16\% \text{ of } 75 = 16$$

$$\therefore 5\% \text{ of } X + \frac{16}{100} \times 75 = 16$$

$$\Rightarrow 5\% \text{ of } X + 12 = 16$$

$$\Rightarrow \frac{5}{100} \times X = 4 \Rightarrow X = \frac{4 \times 100}{5} = 80$$

- 12.** Let the total amount be ₹ x .

$$\text{Then, } x - 30\% \text{ of } x = ₹ 70$$

$$\Rightarrow x - \frac{30x}{100} = 70$$

$$\Rightarrow \frac{100x - 30x}{100} = 70 \Rightarrow 70x = 70 \times 100$$

$$\therefore x = \frac{70 \times 100}{70} = ₹ 100$$

- 13.** ∵ Required salary = 3000 + 20% of 3000

$$= 3000 + 3000 \times \frac{20}{100}$$

$$= 3000 + 600 = ₹ 3600$$

- 14.** Total students = 50

Percentage of girl = 40%

Number of boys = $50 \times 60\%$

$$= \frac{50 \times 60}{100} = 30$$

- 15.** Total students = 30

∴ Percentage of boys = 40%

∴ Percentage of girls = $100 - 40 = 60\%$

$$\therefore \text{Number of girls} = \frac{60}{100} \times \frac{30}{1} = 18$$

- 16.** His saving = $\frac{1800 \times 10}{100} = ₹ 180$

- 17.** Let the monthly income of man is ₹ x .

$$\therefore x \times \frac{25}{100} = 3000$$

$$\therefore x = \frac{3000 \times 100}{25}$$

$$= ₹ 12000$$

- 18.** 10% of 67000 = $\frac{10}{100} \times 67000 = ₹ 6700$

∴ Price of the car in April, 1994

$$= (67000 + 6700)$$

$$= ₹ 73700$$

$$\begin{aligned}\text{19. Required per cent} &= \left[\frac{700500 - 560400}{560400} \right] \times 100 \\ &= \left[\frac{140100}{560400} \times 100 \right] = 25\%\end{aligned}$$

- 20.** Number of boys = 60% of 5600

$$= \frac{60}{100} \times 5600 = 3360$$

Hence, number of girls = $5600 - 3360 = 2240$

- 21.** Savings of the man = $(100 - 85)\% = 15\%$

Let the monthly income = ₹ x

Then, 15% of x = 4560

$$\Rightarrow \frac{15}{100} \times x = 4560$$

$$\therefore x = \frac{4560 \times 100}{15} = ₹ 30400$$

Hence, monthly income of man = ₹ 30400

- 22.** Let the total number of mangoes = x

Then, 6% of x = 54

$$\Rightarrow \frac{6}{100} \times x = 54 \Rightarrow x = \frac{54}{6} \times 100 = 900$$

Hence, total number of mangoes = 900

- 23.** Total votes polled = 20000

The winning candidate got 60% of the total votes polled.

$$\therefore \frac{20000 \times 60}{100} = 12000 \text{ votes}$$

∴ The defeated candidate got
= $20000 - 12000 = 8000$ votes

- 24.** Pass marks = $25 + 15 = 40$

$$\text{Percentage of pass marks} = \frac{40}{80} \times 100 = 50\%$$

- 25.** Marks required to pass = $40\% = 20 + 20$

$$\therefore \text{Maximum marks} = \frac{100 \times 40}{40} = 100$$

Self Practice

1. Which one of the following is equivalent to $16\frac{2}{3}\%$?
(1) $\frac{50}{3}$ (2) $\frac{1}{6}$ (3) $\frac{16}{3}$ (4) $\frac{2}{3}$
2. Which one of the following equivalent to 28%?
(1) 2.8 (2) 0.28 (3) 28 (4) 280
3. Convert $1\frac{1}{4}$ into a percentage.
(1) 80% (2) 125% (3) 1.25% (4) 12.5%
4. What percentage is 40 paise of ₹ 2.50?
(1) 16% (2) 100% (3) 10% (4) 8%
5. If 36% of pupils in a school are girls and the number of boys in the school is 816, how many girls are there in the school?
(1) 459 (2) 357 (3) 457 (4) 359
6. A man get a 10% increase in his salary. His new salary is ₹ 10285, what was his original salary?
(1) ₹ 11313 (2) ₹ 9350 (3) ₹ 8350 (4) ₹ 10350
7. A football team won 40% of the total number of matches it played during a year. If it lost 6 matches in all and no match was drawn, find the total number of matches played by the team during the year.
(1) 20 (2) 8 (3) 12 (4) 10
8. Chalk contains 10% calcium, 3% carbon and 12% oxygen. The amount of each of these in 1 kg of chalk are
(1) 30 g, 20 g, 10 g (2) 30 g, 100 g, 120 g (3) 100 g, 30 g, 120 g (4) 120 g, 30 g, 100 g
9. $1/8$ is equal to
(1) 25% (2) 16% (3) $12\frac{1}{2}\%$ (4) 0.12%
10. 600% can be expressed in decimal as
(1) 60.0 (2) 6.0 (3) 6000 (4) 3/5
11. Sachin got 60% marks in Maths and 3 marks less than Maths in Science. If the total marks are 150, how many marks he scored in Science?
(1) 90 (2) 95 (3) 87 (4) 63
12. 20% of 60 is equal to
(1) 12 (2) 1200 (3) 3 (4) 30
13. What per cent of 90 is 27?
(1) 30% (2) 10% (3) 9% (4) 3%
14. What rate per cent is 1 min 12 s to 1h?
(1) 2% (2) 3% (3) 4% (4) 5%
15. A person spends 75% of his salary and saves ₹ 150 per month. His monthly salary is
(1) ₹ 750 (2) ₹ 600 (3) ₹ 400 (4) ₹ 300

Answers

1. (2)	2. (2)	3. (2)	4. (1)	5. (1)	6. (2)	7. (4)	8. (3)	9. (3)	10. (2)
11. (3)	12. (1)	13. (1)	14. (1)	15. (2)					

CHAPTER**18****PATTERN**

A **pattern** is a set of rule within the numeral and number series, hence refers to certain mathematical operations likewise addition, subtraction, division and multiplication from one term to another term. It can be classified in two ways :

Grid Pattern

It contains more than one numeral within the square rectangle applying certain rule.

e.g.,

6	11	16
9	14	19
13	18	23

Second and third term in each row is exceeding by 5 and 10 of the first term of each row

i.e. Ist row, $6 + 5 = 11$ and $6 + 10 = 16$

IInd row, $9 + 5 = 14$ and $9 + 10 = 19$

IIIrd row, $13 + 5 = 18$ and $13 + 10 = 23$

Example 1. Identify the value of question mark (?).

18	21	24
28	31	34
38	41	44
?	?	?

- (1) 48, 51, 53
- (2) 48, 51, 54
- (3) 46, 49, 52
- (4) 51, 54, 57

Sol. (2) Required pattern,

$$\begin{array}{ccc}
 18 & 18 + 3 = 21 & 21 + 3 = 24 \\
 \downarrow +10 & & \\
 28 & 28 + 3 = 31 & 31 + 3 = 34 \\
 \downarrow +10 & & \\
 38 & 38 + 3 = 41 & 41 + 3 = 44 \\
 \downarrow +10 & & \\
 48 & 48 + 3 = 51 & 51 + 3 = 54
 \end{array}$$

Example 2. If sum of each row, column and diagonals are equal, then the value of P, Q and R respectively is

P	15	22
21	19	Q
R	23	18

- (1) 20, 16, 17
- (2) 20, 17, 16
- (3) 17, 20, 16
- (4) 16, 20, 17

Sol. (2) ∵ Sum of all column are equal.

$$\therefore 15 + 19 + 23 = 22 + Q + 18$$

$$\Rightarrow 57 = 40 + Q \Rightarrow Q = 17$$

Again, sum of all row are equal.

$$\therefore P + 15 + 22 = 21 + 19 + Q = R + 23 + 18$$

$$\Rightarrow P + 37 = 40 + Q = R + 41$$

$$\Rightarrow P + 37 = 40 + 17 \Rightarrow P = 20$$

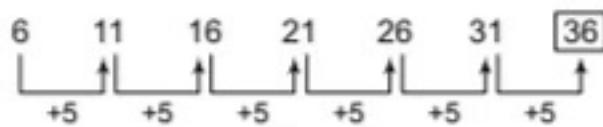
$$\text{and } R + 41 = 40 + 17 \Rightarrow R = 16$$

Series Based Pattern

Such type of questions mainly deals with the pattern of increasing or decreasing of numerals, hence may be operated by the mathematical operations such as addition, subtraction, multiplication and division.

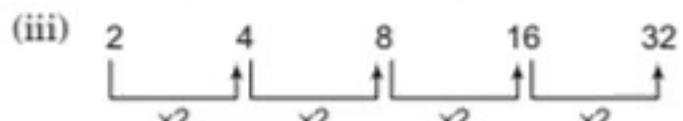
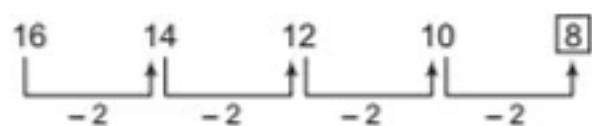
- If the next term is increasing in constant manner, then pattern of addition must take place.
- If the next term is decreasing in constant manner, then pattern of subtraction must take place.
- If the next term is increasing rapidly, then pattern of multiplication must take place.
- If the next term is decreasing rapidly, then pattern of division must take place.

e.g., (i)



Here, next term is increasing in constant manner.

(ii)



Here, next term is obtained by multiplying the previous number by 2.

(iv)



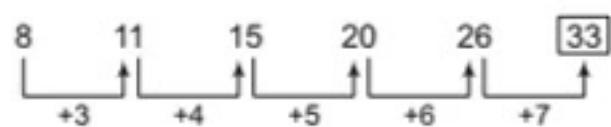
Here, next term is obtained by dividing the previous number by 3.

Example 3. Find the next term of the given series

8, 11, 15, 20, 26, ?

- 30
- 32
- 33
- 34

Sol. (3)



The series is increasing by ascending series by 1.

Example 4. Identify the pattern of the question and determine the next term.

$\begin{array}{r} 2 \\ \times 2 \\ \hline 4 \end{array}$	$\begin{array}{r} 5 \\ \times 5 \\ \hline 25 \end{array}$	$\begin{array}{r} 8 \\ \times 8 \\ \hline 64 \end{array}$	$\begin{array}{r} 11 \\ \times 11 \\ \hline 121 \end{array}$?
(1) $\begin{array}{r} 15 \\ \times 15 \\ \hline 225 \end{array}$		(2) $\begin{array}{r} 14 \\ \times 14 \\ \hline 196 \end{array}$		
(3) $\begin{array}{r} 16 \\ \times 16 \\ \hline 256 \end{array}$		(4) $\begin{array}{r} 18 \\ \times 18 \\ \hline 324 \end{array}$		

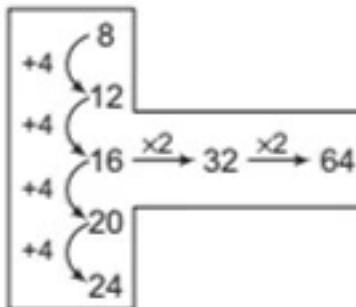
Sol. (2) Every next term is increasing by 3 from the previous one, so the next term will be $14(11 + 3)$.

$$\begin{array}{r} 14 \\ \times 14 \\ \hline 196 \end{array}$$

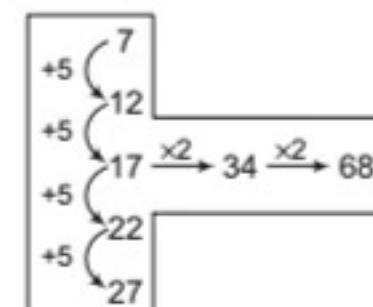
Example 5. Identify the pattern and find the value of question mark (?).

$\begin{array}{r} 8 \\ 12 \\ 16 \\ 20 \\ 24 \end{array}$	$\begin{array}{r} 7 \\ 12 \\ 17 \\ 22 \\ 27 \end{array}$
(1) 35 (2) 40 (3) 34 (4) 45	

Sol. (3) As,



Similarly,



$$\therefore ? = 34$$

Entrance Corner

1. What is the next term in the given series?
9, 13, 17, 21, 25, ? [JNV 2018]
(1) 26 (2) 27 (3) 29 (4) 33

2. Next term of 258, 130, 66, 34, 18, ... is [JNV 2017]
(1) 12 (2) 10 (3) 8 (4) 13

3. Find the next term of the series
3, 4, 6, 9, 13, ... [JNV 2016]
(1) 18 (2) 17 (3) 14 (4) 19

4. The next term of the series 1, 2, 4, 8, ... is [JNV 2015]
(1) 12 (2) 16 (3) 10 (4) 11

5. Next term of 80, 10, 70, 15, 60, ... is [JNV 2014]
(1) 20 (2) 25 (3) 30 (4) 50

6. If sum of each row, column and diagonals are equal, then the value of x , y , z and w respectively, is [JNV 2014]

8	x	z
y	5	w
4	9	2

(1) 4, 6, 8, 7 (2) 1, 3, 6, 7
(3) 1, 6, 3, 7 (4) 3, 6, 7, 1

7. Numbers in the next line is [JNV 2013]

40	45	50
55	60	65
70	75	80
-	-	-

(1) 75, 80, 85 (2) 85, 90, 95
(3) 90, 95, 100 (4) 70, 75, 85

8. If the sum of each row, column and diagonals are same, then the value of x , y , t and z is [JNV 2013]

x	1	y
3	5	z
t	9	2

(1) 8, 6, 4, 7 (2) 6, 8, 4, 7
(3) 7, 8, 6, 4 (4) 4, 6, 7, 8

9. The next number in the series 2, 5, 8, 11, is [JNV 2012]
(1) 12 (2) 10 (3) 14 (4) 15

10. 11, 13, 17, 19, 23, 29, 31, 37, 41,is [JNV 2011]
(1) 42 (2) 43 (3) 44 (4) 45

11. Study the following pattern find out the next term. [JNV 2010]

5	15	25	35	45
$\times 5$	$\times 15$	$\times 25$	$\times 35$	$\times 45$
<u>25</u>	<u>225</u>	<u>625</u>	<u>1225</u>	<u>2025</u>
$\frac{55}{2825}$				$\frac{55}{3225}$
$\frac{55}{3025}$				$\frac{55}{3225}$

(1) $\times \frac{55}{2825}$ (2) $\times \frac{55}{3225}$
(3) $\times \frac{55}{3025}$ (4) $\times \frac{55}{3225}$

12. Which group of number will come in the next row? [JNV 2007]

6	24	624
7	28	728
8	32	832
?	?	?

(1) 9, 36, 936, (2) 9, 36, 972
(3) 9, 81, 981, (4) 9, 63, 963

13. What will be the next row of numbers in the following pattern? [JNV 2005]

4	16	64
6	36	216
8	64	512
?	?	?

(1) 8, 68, 518 (2) 10, 100, 1000
(3) 10, 200, 2000 (4) 10, 500, 5000

14. The next two terms in the series 123, 234, 345, are [JNV 2004]
(1) 456, 457 (2) 346, 347
(3) 456, 567 (4) 456, 678

Answers

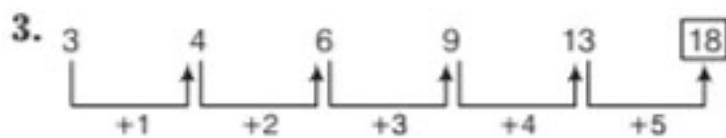
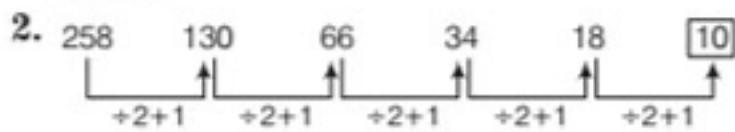
1. (3)	2. (2)	3. (1)	4. (2)	5. (1)	6. (2)	7. (2)	8. (1)	9. (3)	10. (2)
11. (3)	12. (1)	13. (2)	14. (3)						

Hints and Solutions

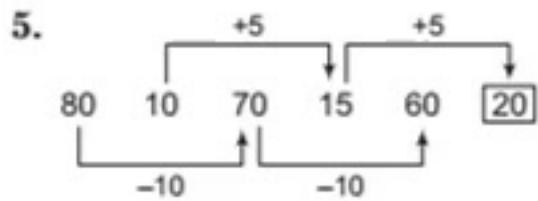
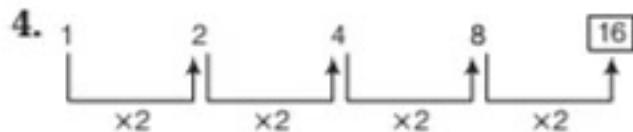
1. The series follows the pattern as

$$\begin{aligned} 9 + 4 &= 13 \\ 13 + 4 &= 17 \\ 17 + 4 &= 21 \\ 21 + 4 &= 25 \\ 25 + 4 &= \boxed{29} \end{aligned}$$

Therefore, 29 is the next term in the given series.



It is clear that next term of series is 18.



Hence, 20 is the missing term.

6. Since, the sum of last row

$$= 4 + 9 + 2 = 15$$

Now, sum of diagonal

$$\begin{aligned} 4 + 5 + z &= 15 \\ z &= 15 - 9 \\ &= 6 \end{aligned}$$

Now, sum of first column

$$\begin{aligned} 8 + y + 4 &= 15 \\ y &= 15 - 12 \\ &= 3 \end{aligned}$$

Also, $y + 5 + w = 15$

$$\begin{aligned} 3 + 5 + w &= 15 \\ w &= 15 - 8 \\ &= 7 \end{aligned}$$

Now, $8 + x + z = 15$

$$\begin{aligned} 8 + x + 6 &= 15 \\ x &= 15 - 14 = 1 \end{aligned}$$

Hence, x, y, z and w are 1, 3, 6 and 7.

7. 

(in first column)

- 

(in second column)

- 

(in third column)

- 8.

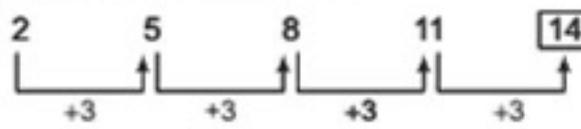
x	1	y
3	5	z
t	9	2

If we put $x = 8, y = 6, t = 4, z = 7$

Then,

8	1	6	= 15
3	5	7	= 15
4	9	2	= 15
15	15	15	

9. The pattern of series is



10. The series consists of prime numbers.
 \therefore The missing number is the next prime number which is 43.

11. $55 \times 55 = 3025$

12. 6 and 24 becomes 624.

Where, $6 \times 4 = 24$

Hence, 9 and $9 \times 4 = 36$ becomes 936

\therefore Next group will be 9, 36, 936.

13. Second and third columns are square and cube of the first column.

Hence, 10

$$(10)^2 = 100$$

$$(10)^3 = 1000$$

- 14.

1	2	3				
\times	2	3	4			
	\times	3	4	5		
		\times	4	5	6	
			\times	5	6	7

In the series, left most digit in each term is omitting and the succeeding of the right most digit is appearing.

Hints and Solutions

1.

$$\begin{array}{cccc}
 & +5 & +5 & +5 \\
 & \downarrow & \downarrow & \downarrow \\
 \begin{array}{c} 4 \\ +8 \end{array} & +4 & \begin{array}{c} 9 \\ +13 \end{array} & +4 & \begin{array}{c} 14 \\ +18 \end{array} & +4 & \begin{array}{c} 19 \\ +23 \end{array} & +4 \\
 \hline 12 & 22 & 32 & 42
 \end{array}$$

2. As, $18 + 12 + 2 = 32$

Same as, $16 + 19 + 2 = 37$

3. As, $6 \times 6 + 2 \Rightarrow 6 + 6 + 2 = 14 \xrightarrow{+1} 15$

and $8 \times 8 + 2 \Rightarrow 8 + 8 + 2 = 18 \xrightarrow{+1} 19$

Same as, $5 \times 5 + 2 \Rightarrow 5 + 5 + 2 = 12 \xrightarrow{+1} 13$

4. Now, sum of second column $= 7 + 11 + 15 = 33$
Then,

$$a = 33 - (7 + 14) = 12$$

$$b = 33 - (8 + a) = 33 - (8 + 12) = 13$$

$$c = 33 - (8 + 15) = 10$$

$$d = 33 - (14 + c)$$

$$\Rightarrow 33 - (14 + 10) = 9$$

$$\therefore a = 12, b = 13, c = 10 \text{ and } d = 9$$

5. Now, sum of diagonal $= 15 + 18 + 21 = 54$

then, $p = 54 - (18 + 16) = 20$

$$q = 54 - (19 + 21) = 14$$

$$r = 54 - (21 + 16) = 17$$

and $s = 54 - (15 + r) = 54 - (15 + 17) = 22$

6. Pattern of the series is as follow :

$$2 + 3 = 5$$

$$5 + 3 = 8$$

$$8 + 5 = 13$$

$$13 + 8 = 21$$

$$21 + 13 = \boxed{34}$$

7. Pattern of the series is as follow :

$$\begin{array}{cccccc}
 8 & 20 & 32 & 44 & 56 & \boxed{68} \\
 \uparrow & \uparrow & \uparrow & \uparrow & \uparrow & \uparrow \\
 +12 & +12 & +12 & +12 & +12 &
 \end{array}$$

8. Pattern of the series is as follow :

$$\begin{array}{cccccc}
 4 & 5 & 9 & 18 & 34 & \boxed{59} \\
 \uparrow & \uparrow & \uparrow & \uparrow & \uparrow & \uparrow \\
 +(1)^2 & +(2)^2 & +(3)^2 & +(4)^2 & +(5)^2 &
 \end{array}$$

9. Pattern of the series is as follow :

$$2, 3, 5, 7, \boxed{11}$$

Series is containing the prime numbers. Hence, next value after 7 is 11.

10. Pattern of the series is as follow :

As	$122 \Rightarrow 1 \times 2 = 2$
	$248 \Rightarrow 2 \times 4 = 8$
	$326 \Rightarrow 3 \times 2 = 6$
and	$414 \Rightarrow 4 \times 1 = 4$
Same as,	$177 \Rightarrow 1 \times 7 = 7$

11. Pattern of the series is as follow :

As,	$8 + (2 \times 3) = 14$
	$4 + (8 \times 7) = 60$

Similarly,

$$9 + (4 \times 8) = 41$$

12. Pattern of the series is as follow :

As,	$3 \times 6 \times 1 = 18$
	$7 \times 2 \times 4 = 56$
	$8 \times 4 \times 3 = 96$
Similarly,	$x \times 4 \times 3 = 48$
	$x = \frac{48}{4 \times 3} = 4$

Self Practice

1. If sum of each row, column and diagonals are equal, then the sum of A and B is

A	3	10
9	7	B
4	11	6

- (1) 12 (2) 13 (3) 14 (4) 18

2. Find the value of question mark (?).

8	11	6
15	10	13
12	15	10
19	14	?

- (1) 17 (2) 15 (3) 14 (4) 21

3. If the sum of each row, column and diagonal is 24, then find the multiple of x and y.

9	y	11
10	8	6
5	x	7

- (1) 32 (2) 40 (3) 44 (4) 48

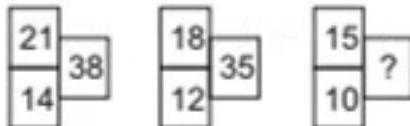
4. Next term of 69, 55, 26, 13, ... is

- (1) 5 (2) 4 (3) 6 (4) 8

5. Next term of 86, 48, 32, ... is

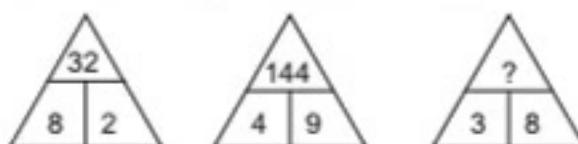
- (1) 12 (2) 10 (3) 6 (4) 27

6. Identify the pattern and find the value of question mark (?).



- (1) 40 (2) 30 (3) 32 (4) 36

7. Identify the pattern and find the value of question mark (?).



- (1) 72 (2) 68 (3) 65 (4) 81

Answers

- | | | | | | | |
|--------|--------|--------|--------|--------|--------|--------|
| 1. (2) | 2. (1) | 3. (4) | 4. (2) | 5. (3) | 6. (3) | 7. (1) |
|--------|--------|--------|--------|--------|--------|--------|

CHAPTER 19

DATA INTERPRETATION

Data

A collection of numbers (values) gathered to give some information is called data. There are two types of data : (i) Primary data (ii) Secondary data

Pictograph

Pictograph is the way of representing data using image/picture of objects. Each picture (image) stands for a certain number of objects. It helps us to answer the questions on the data at a glance.

e.g., Rajesh was asked to find the number of students playing different games in the school. The information collected by him is as follows : *Football 40, Cricket 30, Basketball 20, Badminton 10*

Represent the given information with a pictograph.

Given, information by Rajesh

Football \rightarrow 40, Cricket \rightarrow 30, Basketball \rightarrow 20, Badminton \rightarrow 10

The given data can be represented by a pictograph as shown below :

 = 10 students

Football	
Cricket	
Basketball	
Badminton	

Direction (Example 1) Read the given information carefully and answer the question given below.

Months	Sold Bananas
March	
April	
May	
June	
July	

[Here,  = 5 dozen]

Example 1. What is the number of sold bananas during all the given months?

- (1) 1380 (2) 1280 (3) 1180 (4) 1480

Sol. (1) \therefore 1 dozen = 12

$$\therefore \text{sun icon} = 5 \text{ dozen} = 5 \times 12$$

$$\begin{aligned}\text{Number of sold bananas in March} &= 6 \times 12 \times 5 \\ &= 360 \text{ bananas}\end{aligned}$$

$$\begin{aligned}\text{Number of sold bananas in April} &= 3 \times 12 \times 5 = 180 \text{ bananas}\end{aligned}$$

$$\begin{aligned}\text{Number of sold bananas in May} &= 5 \times 12 \times 5 = 300 \text{ bananas}\end{aligned}$$

$$\begin{aligned}\text{Number of sold bananas in June} &= 2 \times 12 \times 5 = 120 \text{ bananas}\end{aligned}$$

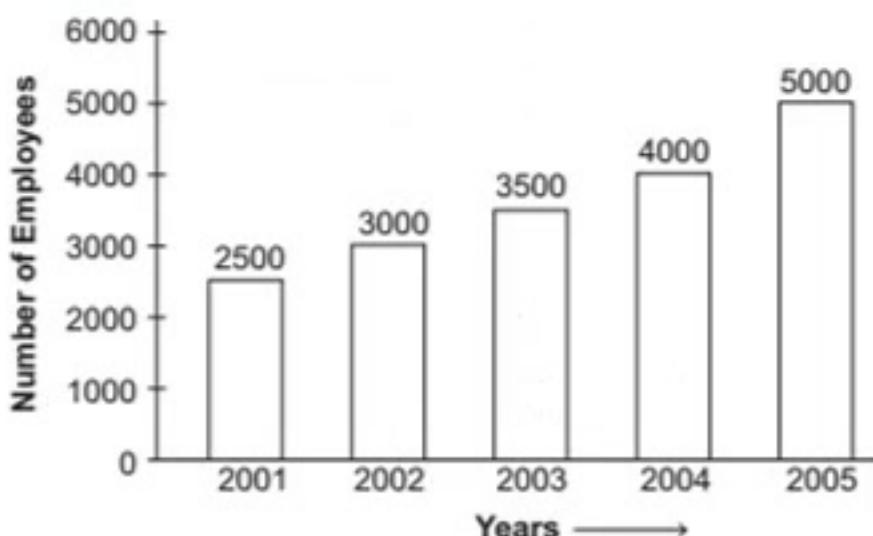
$$\begin{aligned}\text{Number of sold bananas in July} &= 7 \times 12 \times 5 = 420 \text{ bananas}\end{aligned}$$

$$\begin{aligned}\text{Hence, number of sold bananas} &= 360 + 180 + 300 + 120 + 420 = 1380 \text{ bananas}\end{aligned}$$

Bar Graph

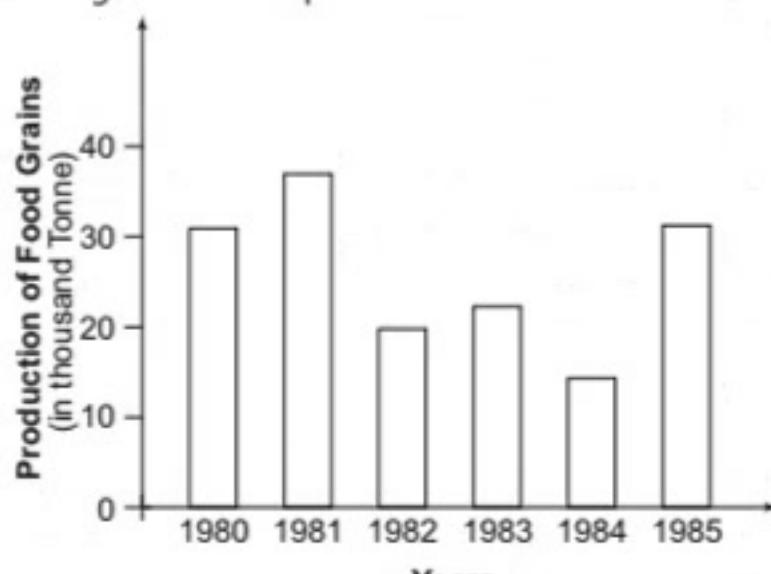
A bar graph is a pictorial representation of numerical data in the form of rectangles (or bars) of equal width and varying heights. Bars of uniform width can be drawn horizontally or vertically with equal spacing between them and the length of each bar represents the given number. Such method of representing data is called a **bar diagram** or a **bar graph**.

e.g., Number of Employees Over the Years
2001-2005 (in Thousands)



From the above graph it is clear that number of employees are increasing constantly by 500 and the number of employees in year 2002 are 3000 while as in year 2005 are 5000.

Example 2. The given graph here shows the production of food grains of a country in different years. Find the percentage increase in production from 1984 to 1985.



- (1) 50 (2) 100 (3) 75 (4) 150

Sol. (2) Production in 1984 = 15 (thousand Tonne)

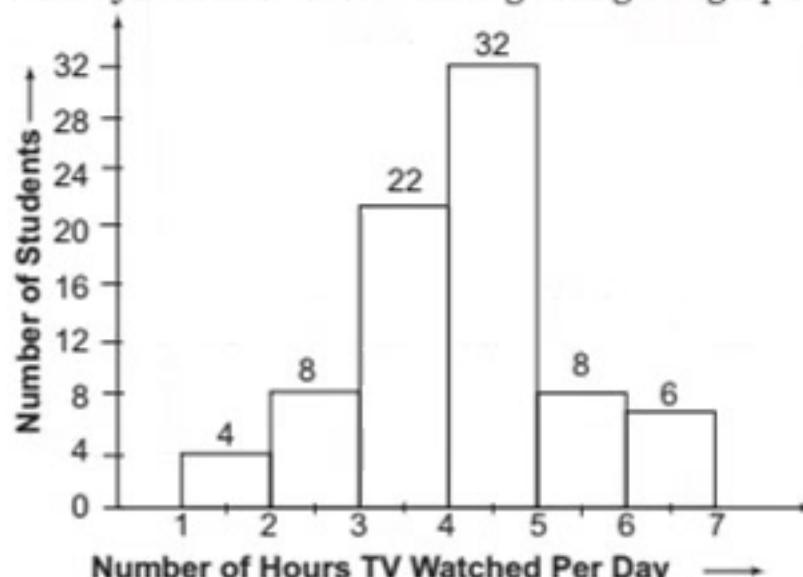
Production in 1985 = 30 (thousand Tonne)

$$\therefore \text{Percentage increase} = \frac{(30 - 15)}{15} \times 100 = 100\%$$

Histogram

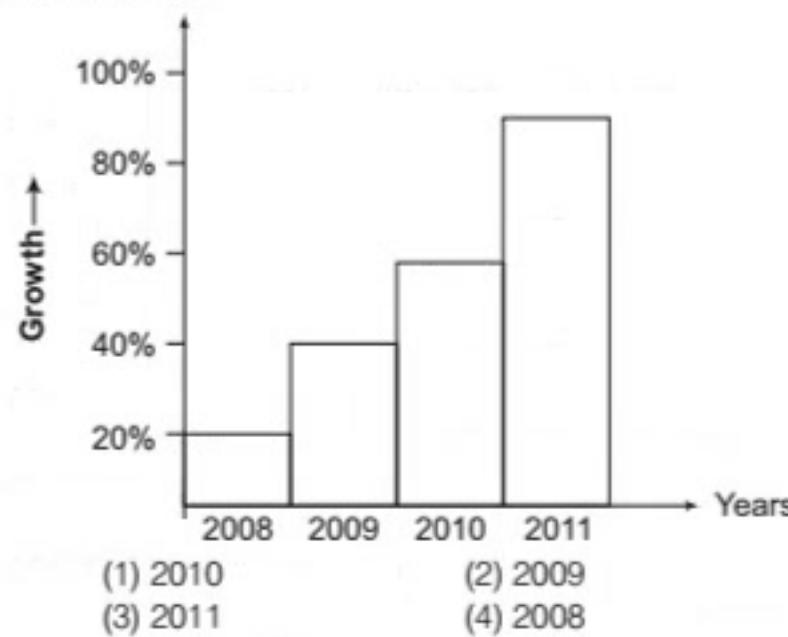
A histogram is a pictorial representation of numerical data in the form of rectangles (or bars) of equal width and varying height. Bars of uniform width can be drawn horizontally or vertically without space between them and the length of each bar represents the given number. Such method of representing data is called a histogram.

e.g., The number of hours for which students of a particular class watched television during holidays has been shown through the given graph.



From the above graph it is clear that number of maximum students (32) watching TV in hours 4 to 5, while minimum students (4) watching TV in hours 1 to 2.

Example 3. From the given figure determine that in which year right back from this year India had to face the maximum growth in price comparing both the years growth?



Sol. (3) Percentage growth in year 2008 = 20%

Percentage growth in year 2009 = 40%

Percentage growth in year 2010 = 60%

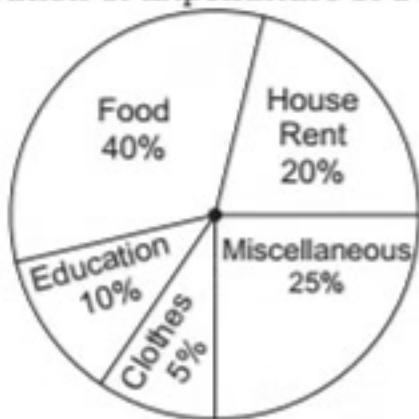
Percentage growth in year 2011 = 90%

Therefore, it is clear from the data that in year 2011 percentage growth in price is higher than the previous years.

Pie Chart (or Circle Graph)

A pie diagram is a pictorial representation of the numerical data by non-intersecting adjacent sectors of the circle such that area of each sector is proportional to the magnitude of the data represented by the sector.

e.g. Distribution of Expenditure of a Family



Directions (Examples 4 and 5) Study the given information carefully and answer the question based on it.

Adjoining pie chart gives the expenditure (in percentage) on various items and savings of a family during a month.



Example 4. Expenditure on which item is equal to the total savings of the family?

- (1) House rent
- (2) Education for children
- (3) Food
- (4) Others

Sol. (2) Expenditure on education of children is the same (i.e., 15%) as the savings of the family.

Example 5. If the monthly savings of the family is ₹ 3000, what is the monthly expenditure on clothes?

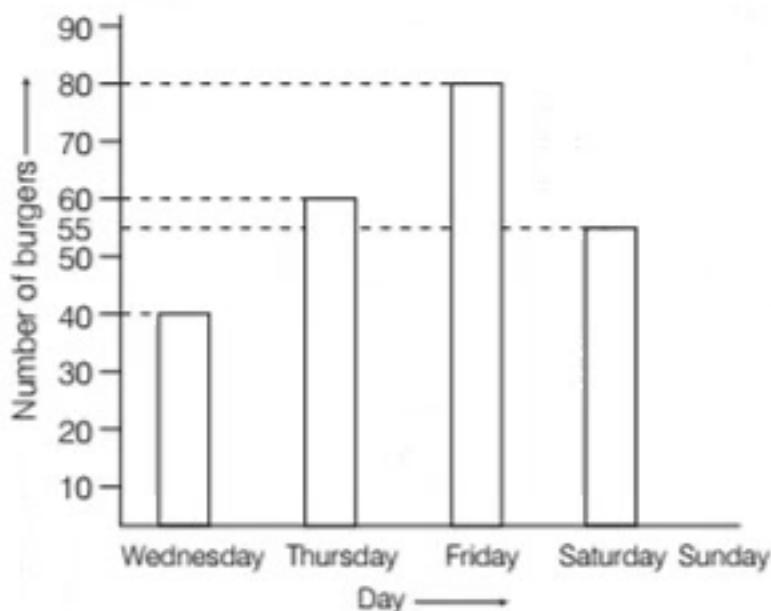
- (1) ₹ 1500
- (2) ₹ 3000
- (3) ₹ 2000
- (4) ₹ 1800

Sol. (3) ∵ 15% represents = ₹ 3000

$$\text{Therefore, } 10\% \text{ represents} = \frac{3000}{15} \times 10 \\ = ₹ 2000$$

Entrance Corner

1. The following bar diagram shows the sale (number of burgers) of a burger saler during 5 days.



If total sale of burger was 320. Then number of burger sold on Sunday? [JNV 2018]

- (1) 85 (2) 80 (3) 75 (4) 90

2. Pictograms shows the number of plants sold through a nursery from Monday to Friday

Days	Sold Plants
Monday	20
Tuesday	40
Wednesday	50
Thursday	30
Friday	40

= 20 plants

Find the number of plants sold from Monday to Friday. [JNV 2018]

- (1) 19 (2) 190 (3) 250 (4) 380

3. Read the given information carefully and answer the question.

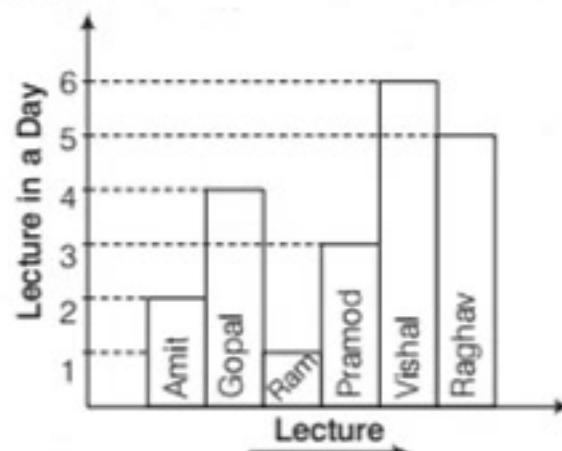
Months	Sold Bananas
March	6
April	4
May	5
June	2
July	7

[Here, = 5 dozen]

What is the number of sold bananas during the given months? [JNV 2017]

- (1) 1180 (2) 1380
(3) 1250 (4) 1450

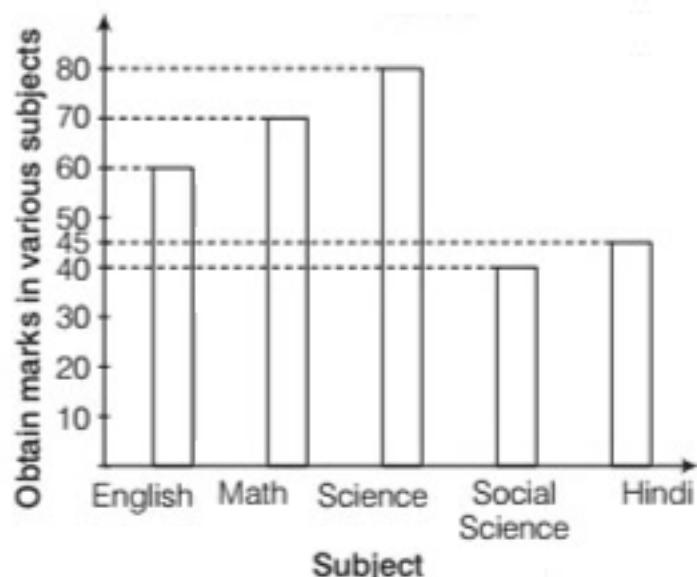
4. Study the graph and answer the questions



What is the difference between the lecture taken by Amit and Raghav to the Gopal and Pramod during a week? [JNV 2017]

- (1) 42 (2) 7
(3) 35 (4) 0

5. Study the bar chart given below which shows Shyam's marks in S₁ examination in different subjects out of 100 marks each.



The percentage of Shyam's marks in Science is [JNV 2016]

- (1) 50
(2) 80
(3) 70
(4) 60

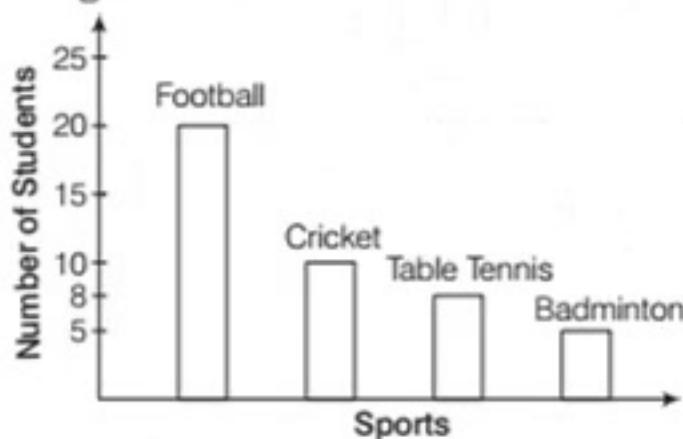
6. Following graph represents the number of shoes sold by a shopkeeper in last 4 months.

September			
October			
November			
December			

 = 112 pair shoes

What was the number of shoes sold by the shopkeeper in 4 months? [INV 2016]

7. Following bar chart represents the various sports play by students. Study the chart and give the answer.



How many students play table tennis?
[JNV 2015]

8. Following graph represents the various transport medium used by the students.

Transport	Number of students
Bicycle	2
Scooter	3
Car	4
School van	6

Here, ☺ = 50 students

How many percentage of students use school van? [JNV 2015]

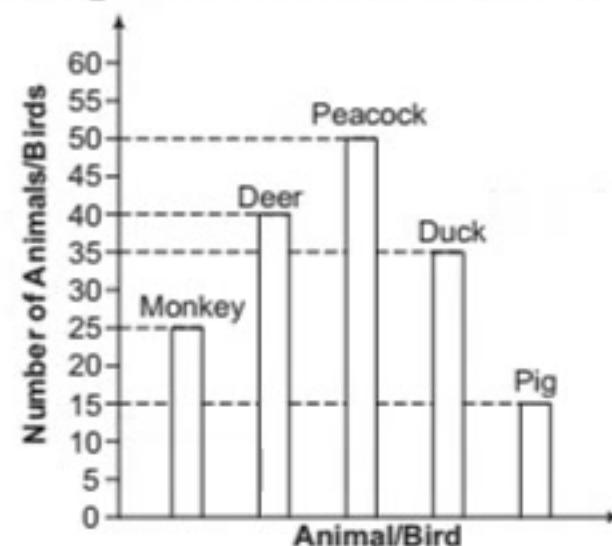
Direction (Q. No. 9) Following graph represents the number of carton filled with oranges in 4 days of a week sold by a vendor.

Day	Number of Oranges Sold
Monday	● ●
Wednesday	● ● ●
Friday	● ● ● ● ● ●
Sunday	● ● ● ●

- Represents 15 oranges

9. If vendor still remain with 25 oranges in a carton, then what was the number of oranges at the beginning? [JNV 2014]
(1) 200 (2) 225 (3) 250 (4) 300

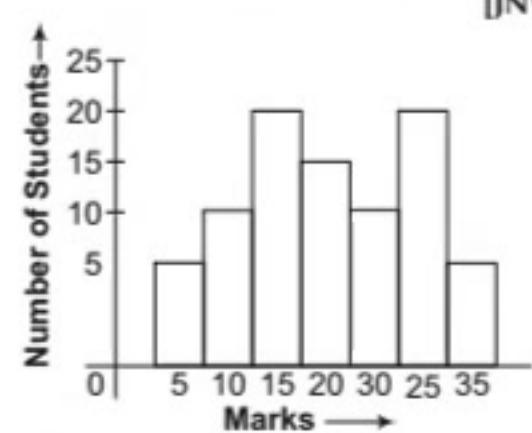
10. A class visit a park and they saw some animals and birds. They plot a graph by placing the number of animals and birds.



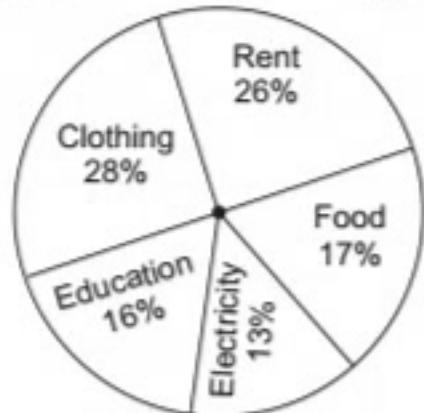
Sum of number of Deer and Monkey is more than the number of Peacock is

- [JNV 2014]

11. Study the diagram and find the number of students obtain less than 20 marks.



12. In the following pie chart if the expenditure on food is ₹ 6800 per month. Find out the expenditure on education. [JNV 2012]



- (1) ₹ 5000
 (2) ₹ 6400
 (3) ₹ 6000
 (4) ₹ 6260

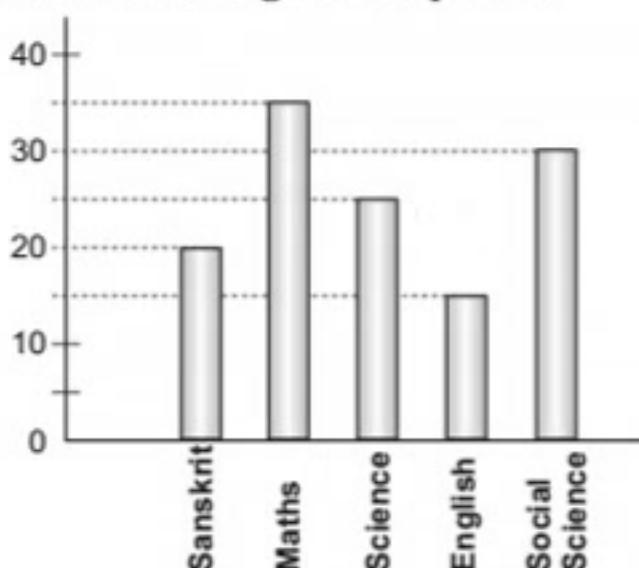
13. In a college library different subjectwise book pictures detail are given below.

Subject	<input type="checkbox"/>
Mathematics	<input type="checkbox"/>
Science	<input type="checkbox"/>
Hindi	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
English	<input type="checkbox"/>
History	<input type="checkbox"/> <input type="checkbox"/>

 = 10 Books

How many subjects have books more than 50? [INV 2010]

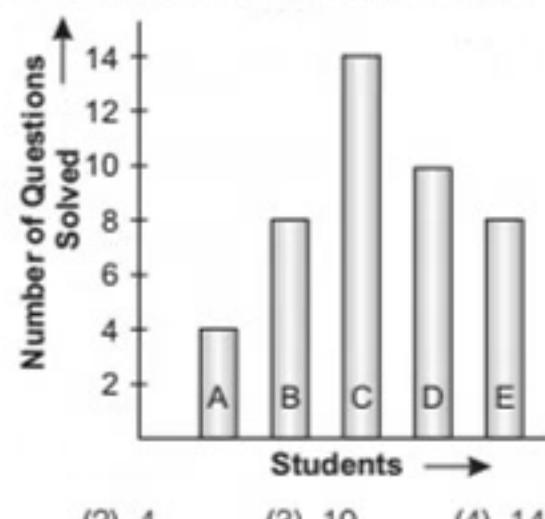
14. To study the graph say that, what per cent of the student in English has passed?



In different subjects, the number of passed students in a class of 40 students. [INV 2007]

- (1) 36.5 (2) 37.5 (3) 36 (4) 37

15. From the graph calculate how many questions do C and D solve more than A, B and E? [INV 2004]



- (1) 3 (2) 4 (3) 10 (4) 14

Answers

1. (1)	2. (4)	3. (2)	4. (4)	5. (2)	6. (4)	7. (2)	8. (3)	9. (3)	10. (3)
11. (2)	12. (2)	13. (2)	14. (2)	15. (2)					

Hints and Solutions

- Total sale of Burger = 320
 Burger sold on Wednesday = 40
 Burger sold on Thursday = 60
 Burger sold on Friday = 80
 Burger sold on Saturday = 55
 Now, burger sold on Sunday = Total sale - Sale on (Wed + Thu + Fri + Sat)

$$= 320 - (40 + 60 + 80 + 55)$$

$$= 320 - 235 = 85$$
- Number of plant sold from Monday to Friday

$$= 20 \times (2 + 4 + 5 + 3 + 5)$$

$$= 20 \times 19$$

$$= 380$$
- Number of sold bananas in March

$$= 6 \times 12 \times 5 = 360$$
 bananas
 Number of sold bananas in April

$$= 3 \times 12 \times 5 = 180$$
 bananas
 Number of sold bananas in May

$$= 5 \times 12 \times 5 = 300$$
 bananas
 Number of sold bananas in June

$$= 2 \times 12 \times 5 = 120$$
 bananas
 Number of sold bananas in July

$$= 7 \times 12 \times 5 = 420$$
 bananas
 Hence, number of sold bananas

$$= 360 + 180 + 300 + 120 + 420$$

$$= 1380$$
 bananas
- Lectures taken by Amit in a day = 2
 Lectures taken by Raghav in a day = 5
 Total number of Lectures by Amit and Raghav

$$= 2 + 5 = 7$$

 Total number of Lectures by Amit and Raghav in a week = $7 \times 6 = 42$
 Lectures taken by Gopal in a day = 4
 Lectures taken by Pramod in a day = 3
 Total number of Lectures by Gopal and Pramod

$$= 4 + 3 = 7$$

 Total number of Lectures by Gopal and Pramod in a week = $7 \times 6 = 42$
 \therefore Required difference = $42 - 42 = 0$
- It is clear from the bar chart Shyam gets 80 marks in Science.
 \therefore Required per cent marks

$$= \frac{\text{Obtained marks in Science}}{\text{Total marks in Science}} \times 100$$
- $$= \frac{80}{100} \times 100 = 80\%$$
- Shoes sold in September month = $3 \times 112 = 336$
 Shoes sold in October month = $4 \times 112 = 448$
 Shoes sold in November month = $3 \times 112 = 336$
 Shoes sold in December month = $1 \times 112 = 112$
 \therefore Total number of shoes sold by the shopkeeper in 4 months

$$= 336 + 448 + 336 + 112 = 1232$$
- From the given bar chart we clearly say that 8 students play table tennis.
- Total number of students

$$= 2 \times 50 + 3 \times 50 + 4 \times 50 + 6 \times 50$$

$$= 100 + 150 + 200 + 300 = 750$$

 Number of students use school van

$$= 6 \times 50 = 300$$

 \therefore Required percentage = $\frac{300}{750} \times 100 = 40\%$
- Given one $\bullet = 15$ oranges
 Number of oranges sold in four days = 15 (\bullet)
 Total oranges sold = $15 \times 15 = 225$
 Total oranges at beginning = $225 + 25 = 250$
- Sum of number of Deer and Monkey = $40 + 25$

$$= 65$$

 Number of Peacock = 50
 Required difference = $65 - 50 = 15$
- Number of students obtain less than 20 marks

$$= 5 + 10 + 15 + 10 + 5 = 45$$
- $\therefore 17\% = ₹ 6800$
 $\therefore 1\% = \frac{6800}{17} = ₹ 400$
 \therefore Expenditure on education (16%)

$$= ₹ 400 \times 16$$

$$= ₹ 6400$$
- There are three subjects having books more than 50 i.e., Mathematics, Science and English.
- \therefore Required passed students in English

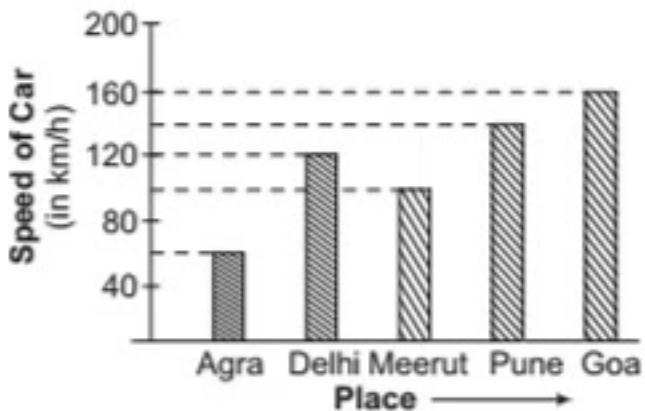
$$= \frac{15 \times 100}{40} = 37.5\%$$
- Number of questions solved by C = 14
 Number of questions solved by D = 10
 \therefore Total = 24
 Number of questions solved by A, B and E

$$= 4 + 8 + 8 = 20$$

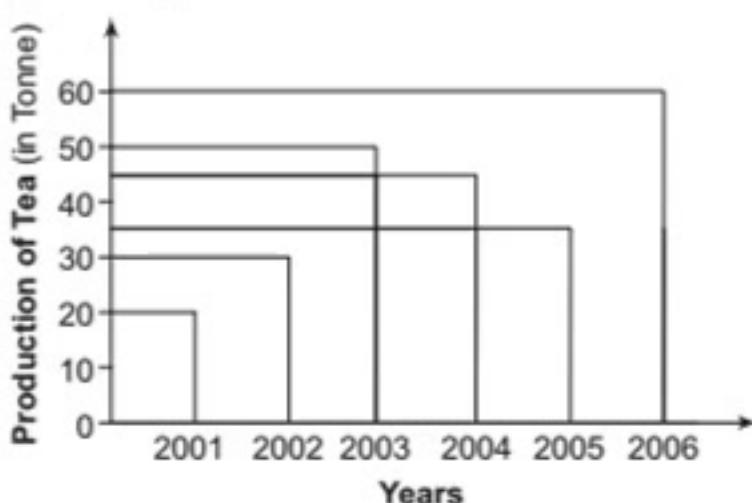
 Required difference = $24 - 20 = 4$

Practice Exercise

Directions (Q. Nos. 1 and 2) Study the graph carefully and answer the questions given below.



- What is the difference between the speed of car at places Delhi and Goa?
(1) 30 km/h (2) 35 km/h
(3) 40 km/h (4) 38 km/h
 - The sum of speed of car at places Agra and Meerut is equal to the speed at which city?
(1) Delhi (2) Pune (3) Meerut (4) Goa
 - Study the graph carefully and answer the question given below.



In which year the production of tea was equal to the production of year 2001 and 2002?

4. A shopkeeper represents the data of his sales during the given months.

Months	Sales				
January					
February					
March					
April					
May					

[Here,  = 3 dozen]

If cost of one dozen articles is ₹ 150, then compute the total sale (in ₹) for the months of February and April.

5. A typist types pages according to given graph. Study the graph carefully and answer the question.

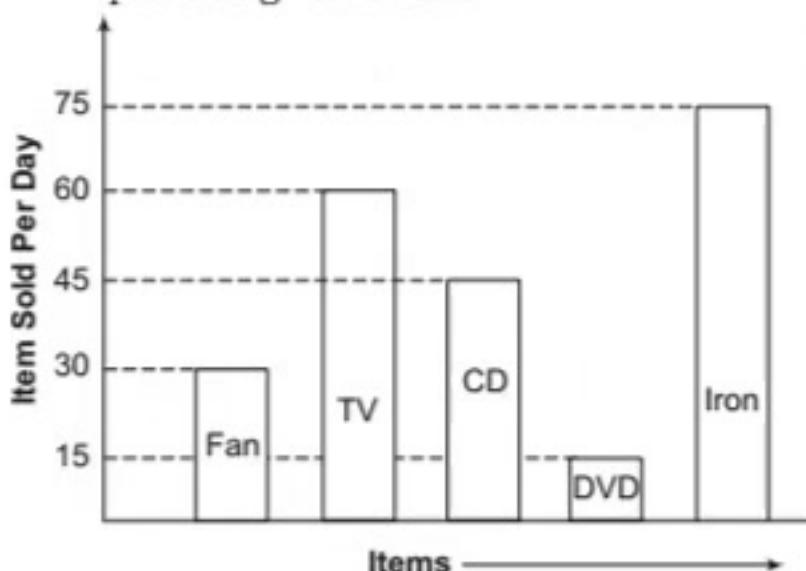
Days	Pages
Monday	● ● ●
Tuesday	● ● ● ●
Wednesday	● ●
Thursday	● ● ● ● ●
Friday	● ● ●
Saturday	● ● ● ● ● ●
Sunday	●

[Here, = 10 pages]

What is the average number of pages typed by the typist during the day Monday, Thursday and Sunday?

- (1) 35 pages (2) 30 pages
(3) 40 pages (4) 25 pages

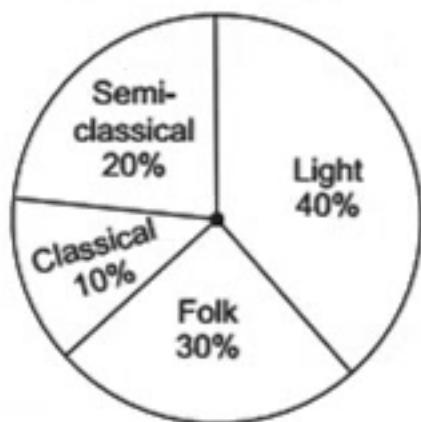
6. Study the graph carefully and answer the question given below.



Ramdas sold the item during a day according to above graph compute the sale of July month on the basis of given informations.

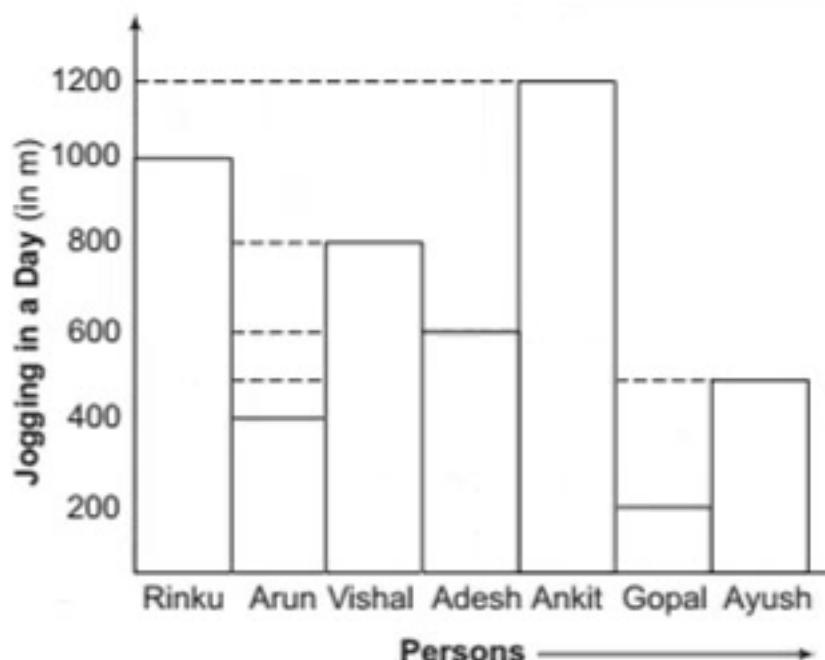
- (1) 6925 (2) 6780 (3) 6980 (4) 6975

7. A Survey was made to find the types of music that a certain group of young people liked in a city. Following pie chart. Show the finding of this Survey.



Which type of music is liked by the maximum number of people

Directions (Q.Nos. 8 and 9) Study the graph carefully and answer the questions given below.



Answers

1. (3) 2. (4) 3. (3) 4. (1) 5. (2) 6. (4) 7. (4) 8. (4) 9. (4)

Hints and Solutions

1. Speed of car at Delhi = 120 km/h

Speed of car at Goa = 160 km/h

$$\therefore \text{Required difference} = 160 - 120 = 40 \text{ km/h}$$

2. Speed of car at Agra = 60 km/h

Speed of car at Meerut = 100 km/h

$$\text{Sum of speed} = 60 + 100 = 160 \text{ km/h}$$

Clearly, sum of speed is equal to the speed at
Goa city ($160 = 160$).

3. Production of tea in year 2001 = 20 tonne

Production of tea in year 2002 = 30 tonne

$$\text{Total production} = 50 \text{ tonne}$$

Clearly, production of year 2001 and 2002 is
equal to the production of year 2003 ($50 = 50$).

4. Sale of articles in February = $4 \times 3 = 12$ dozen

$$\text{Sale of February in rupees} = 12 \times 150 = ₹1800$$

$$\text{Sale of articles in April} = 2 \times 3 = 6 \text{ dozen}$$

$$\text{Sale of April in rupees} = 6 \times 150 = ₹900$$

$$\begin{aligned}\text{Total sale of February and April} &= 1800 + 900 \\ &= ₹2700\end{aligned}$$

5. Pages typed by the typist on Monday = 3×10

$$= 30 \text{ pages}$$

Pages typed by typist on Thursday

$$= 5 \times 10 = 50 \text{ pages}$$

Pages typed by typist on Sunday

$$= 1 \times 10 = 10 \text{ pages}$$

$$\text{Total number of typed pages} = 30 + 50 + 10$$

$$= 90 \text{ pages}$$

$$\begin{aligned}\therefore \text{Required average} &= \frac{\text{Number of typed pages}}{\text{Number of days}} \\ &= \frac{90}{3} = 30 \text{ pages}\end{aligned}$$

6. Sale of a day by Ramdas

$$= \text{Sale of Fan} + \text{TV} + \text{CD} + \text{DVD} + \text{Iron}$$

$$= 30 + 60 + 45 + 15 + 75 = 225 \text{ items}$$

\therefore Number of days in month July = 31 days

$$\therefore \text{Required sale} = 225 \times 31$$

$$= 6975 \text{ items}$$

7. Light music is liked by the maximum number of
peoples 40%.

8. Jogging by Ayush in a day = 500 m

$$\begin{aligned}\text{Jogging by Ayush in 15 days} &= 500 \times 15 \\ &= 7500 \text{ m}\end{aligned}$$

$$\text{Hence, jogging by Ayush} = \frac{7500}{1000} = 7.5 \text{ km}$$

[$\because 1000 \text{ m} = 1 \text{ km}$]

9. Jogging by Arun in a day = 400 m

$$\text{Jogging by Adesh in a day} = 600 \text{ m}$$

$$\text{Total jogging by both} = 1000 \text{ m}$$

$$\text{Jogging by Vishal in a day} = 800 \text{ m}$$

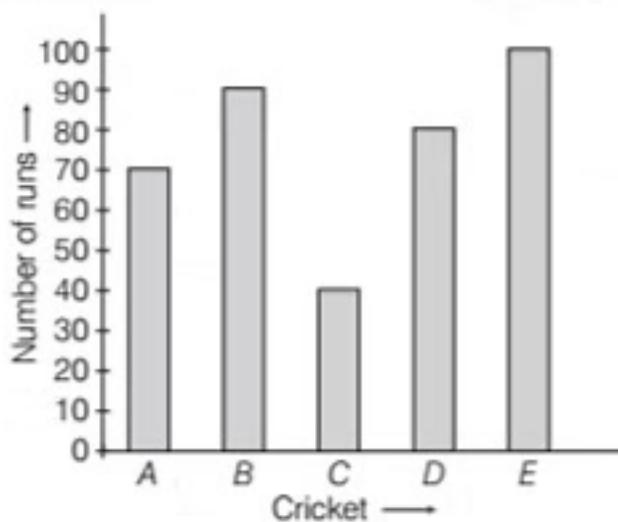
$$\text{Jogging by Rinku in a day} = 1000 \text{ m}$$

$$\text{Total jogging by both} = 1800 \text{ m}$$

$$\begin{aligned}\therefore \text{Required difference} &= 1800 - 1000 \\ &= 800 \text{ m}\end{aligned}$$

Self Practice

1. The following graph shows the runs scored by some cricketers in a selection test. Study the graph carefully and answer the questions.



If 50 is the qualifying run, who failed the test?

2. The number of scouts in a school is depicted by the following pictograph.

Class	Number of scouts	= 10 scouts
VI	4	
VII	2	
VIII	6	
IX	3	
X	1	

What is the total number of scouts in the classes VI to X?

- (1) 150 (2) 160 (3) 140 (4) 130

3. Pie chart shown below gives the expenditure (in percentage) on various items and savings of a family during a month.



On which item, the expenditure was maximum?

- (1) Food (2) Education (3) Others (4) Transport

Answers

1. (3) **2.** (2) **3.** (1)