

**WORKBOOK  
OF  
ADVANCED  
ANALYTICAL  
SKILLS-1**

**PEA-307**



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# **SPEED MATHS**

## **Multiplication of Two 2-Digit Numbers**

1. Write Your Problem Down. Write down your numbers sitting on top of each other, like you would do when multiplying normally

$$\begin{array}{r} 2 \quad 1 \\ * \quad 2 \quad 3 \\ \hline \end{array}$$

2. Multiply. Multiply the numbers in the ones place and put the product directly under the ones

$$\begin{array}{r} 2 \\ * \quad 2 \\ \hline \boxed{1} \\ 3 \end{array}$$

3. Cross Multiply. Cross multiply like you would for fractions by taking the top number's tens digit multiplied by the bottom number's ones place. Then take the top number's ones place multiplied by the bottom number's tens place. Add the two products and place the answer to the left of the ones place's answer.

$$\begin{array}{r} 2 \quad 1 \\ * \quad 2 \diagup \times \diagdown 3 \\ \hline 8 \quad 3 \end{array} \quad \begin{array}{l} 2 \times 3 = 6 \\ 1 \times 2 = 2 \\ (6+2=8) \end{array}$$

4. Multiply Again. Multiply the numbers in the tens place and place the answer to the left of the previous step's answer.

$$\begin{array}{r} 1 \\ \boxed{2} \\ * \quad 2 \\ 4 \quad \quad \quad 3 \end{array}$$

The working in our above example can therefore be depicted as

$$\begin{array}{r} 21 \\ \times 23 \\ \hline \end{array}$$

$$2 \times 2 / 1 \times 2 + 2 \times 3 / 1 \times 3 = 483$$

which can be summarized as

$$\begin{array}{r} 21 \\ \times 23 \\ \hline \end{array}$$

$$4/2 + 6/3 = 483$$

**When the units figure is "one" in both the numbers** being multiplied, the process of multiplication is simplified further. Consider the following multiplication:

$$\begin{array}{r} 41 \\ \times 81 \\ \hline \end{array}$$

$$4 \times 8 / 8 \times 1 + 1 \times 4 / 1 \times 1$$

You will notice that the middle digit of the answer is  $8 \times 1 + 1 \times 4$  i.e.  $(8+4) \times 1$ . So, instead of multiplying "across" for the middle term, you could simply add the tens digit of the two numbers.

Therefore,  $41 \times 81 = 32 / (4+8) / 1 = 3321$ .

Similarly, in  $71 \times 91$ , you could obtain the middle term as 16 by merely adding 7 and 9.

## **Multiplication of Two 3-Digit Numbers**

Let us consider the multiplicand to be ABC and the multiplier to be DEF, as shown below:

$$\begin{array}{r} A \ B \ C \\ \times D \ E \ F \\ \hline \end{array}$$

Step 1    C × F

Step 2  $B \times F + C \times E + \text{Carry of Step 1}$

Step 3  $A \times F + C \times D + B \times E + \text{Carry of Step 2}$

Step 4  $A \times E + B \times D + \text{Carry of Step 3}$

Step 5  $A \times D + \text{Carry of Step 4}$

For Example;

2 3 4

6 5 1

$$\begin{array}{r} 2 \times 6 / 6 \times 3 + 2 \times 5 / 3 \times 5 + 6 \times 4 + 2 \times 1 / 4 \times 5 + 3 \times 1 / 4 \times 1 \\ = 12/28/41/23/4 = 152334 \end{array}$$

## Squares of Numbers

Numbers	Method
1 – 25	Memorization
Numbers ending in a five 15, 25, 35, 45, ...	Remove the last digit (five), multiply the resulting number (n) by the next number (n + 1), and tag on a 25 at the end of the product. Example: $\begin{array}{r} 65 \\ \times 6 \\ \hline 7 \end{array} \quad \begin{array}{r} 65 \\ \times 65 \\ \hline 42 \end{array}$ Tag on a 25 to make 4225. Calculate $35 \times 35 = 1225$
25 – 50	Calculate the difference (d) from 50. First two digits are: 25-d Last two digits are: $d^2$ (if more than two digits then carry hundred's digit number) Example: To calculate 46 $\times 46:$ $d =$ Calculate $46 \times 46 = (25-4)16 = 2116$
50 – 75	Calculate the difference (d) from 50. First two digits are: 25+d Last two digits are: $d^2$ (if more than two digits then carry hundred's digit number) Example: To calculate 54 $\times 54:$ $d =$ Calculate $54 \times 54 = (25+4)16 = 2916$
75 – 100	Calculate the difference (d) from 100. First two digits are: 100-2d Last two digits are: $d^2$ (if more than two digits then carry hundred's digit number) Example: To calculate 94 $\times 94:$ $d =$ Calculate $94 \times 94 = (100-12)36 = 8836$
100 – 125	Calculate the difference (d) from 100. First two digits are: 100+2d Last two digits are: $d^2$ (if more than two digits then carry hundred's digit number) Example: To calculate 113 $\times 113:$ $d =$ Calculate $113 \times 113 = (100+26)169 = 12769$

## Square Root of a Number

Step 1: First of all group the number in pairs of 2 starting from the right.

Step 2: To get the ten's place digit, Find the nearest square (equivalent or greater than or less than) to the first grouped pair from left and put the square root of the square.

Step 3: To get the unit's place digit of the square root.

Remember the following

Squares of numbers from 1 to 9 are 1, 4, 9, 16, 25, 36, 49, 64, 81, and 100.

If number ends in	Unit's place digit of the square root
1	1 or 9(10-1)
4	2 or 8(10-2)
9	3 or 7(10-3)
6	4 or 6(10-4)
5	5
0	0

Step 4: Multiply the ten's place digit (found in step 2) with its consecutive next number and compare the result obtained with the first pair of the original number from left.

Remember,

If first pair of the original number > Result obtained on multiplication then

Select the greater number out of the two numbers as the unit's place digit of the square root.

If first pair of the original number < the result obtained on multiplication, then

Select the lesser number out of the two numbers as the unit's place digit of the square root.

**Example:**  $\sqrt{784}=?$

Step 1: We start by grouping the numbers in pairs of two from right as follows

7 84

Step 2: To get the ten's place digit,

We find that nearest square to first group (7) is 4 and  $\sqrt{4}=2$

Therefore ten's place digit=2

Step 3: To get the unit's place digit,

We notice that the number ends with 4, so the unit's place digit of the square root should be either 2 or 8(Refer table).

Step 4: Multiplying the ten's place digit of the square root that we arrived at in step 1(2) and its consecutive number(3) we get,  $2 \times 3 = 6$

ten's place digit of original number > Multiplication result

$7 > 6$

So we need to select the greater number (8) as the unit's place digit of the square root.

Unit's place digit = 8

Ans:  $\sqrt{784}=28$

## Cube Root of a Number

Step 1: First of all group the number in pairs of 3 starting from the right.

Step 2: To get the ten's place digit, Find the nearest cube (equivalent or greater than or less than) to the first grouped pair from left and put the cube root of the cube.

Step 3: To get the unit's place digit of the cube root.

Remember the following

Number	Cube	Cubes ends with
1	1	1
2	8	8 (Compliment of 2)
3	27	7 (Compliment of 3)
4	64	4

5	125	5
6	216	6
7	343	3 (Compliment of 7)
8	512	2 (Compliment of 8)
9	729	9
10	1000	0

Thus as seen cubes have distinct ending, there is no overlapping. Thus, if the given number is perfect cube, then the last digit will help to find the cube root.

### Example: Find the cube root of 54872?

Step 1: We start by grouping the numbers in pairs of three from right as follows

54 872

Step 2: To get the ten's place digit,

We find that nearest cube to first group (54) is 27 and  $(27)^{1/3}=3$

Therefore ten's place digit=3

Step 3: To get the unit's place digit,

We notice that the number ends with 2, so the unit's place digit of the cube root is 8(Refer table).

Ans: cube root of 54872=38

### Squaring Tricks! Square numbers faster

A number, when multiplied by the number itself the product obtained is called "SQUARE OF THAT NUMBER ". Here are some examples followed by Square tricks.

#### Example

Number	Square of the number
$6^2$	$6 \times 6 = 36$
$8^2$	$8 \times 8 = 64$
$12^2$	$12 \times 12 = 144$

Now we shall learn few basic Vedic mathematics methods or Vedic Maths Squaring Tricks:

#### Type 1: Squaring of number ending with 5.

Step 1: Add 1 to the first digit from the left and multiply by the number itself.

Step 2: Add 25 (25) at the end to the number obtained from step 1.

Number	Steps
65	
$6 \times (6 + 1)$ = $6 \times 7$ = 42	Add 1 to the left number (6) and multiply by the number itself and
= 4225	Add $5^2$ (25) at the last of 42
<b>Answer : <math>65^2 = 65 \times 65 = 4225</math></b>	
85	
$8 \times (8 + 1)$ = $8 \times 9$ = 72	Add 1 to the left number (8) and multiply by the number itself and
= 7225	Add $5^2$ (25) at last of 72
<b>Answer : <math>85^2 = 85 \times 85 = 7225</math></b>	
155	
$15 \times (15 + 1)$	Add 1 to the left number (15) and multiply by the number itself and

$= 15 \times 16$	
$= 240$	
$= 24025$	add $5^2$ (25) at last of 240
<b>Answer : <math>155^2 = 155 \times 155 = 24025</math></b>	

**Type 2: Squaring of numbers less than 50 and numbers not ending with 5.**

Number	Steps
34	$50 - 16 = 34$
$5^2 = 25$ $= 25 + (-16)$ $= 9$	Square the first digit (5) of first part (50) then add part (-16)
$16^2 = 256$	Square the second part of number (16)
$9 + 256 = 1156$	Add the answers got in step 1 (9)and step 2 (256)
<b>Answer : <math>34^2 = 34 \times 34 = 1156</math></b>	
28	$50 - 22 = 28$
$5^2 = 25$ $= 25 + (-22)$ $= 3$	Square the first digit (5) of first part (50) then add second part (-22)
$22^2 = 484$	Square the second part of number (22)
$3 + 484 = 784$	Add the answers got in step 1 (3)and step 2 (484)
<b>Answer : <math>28^2 = 28 \times 28 = 784</math></b>	

**Type 3: Squaring of numbers more than 50 and numbers not ending with 5.**

Number	Steps
74	$50 + 24 = 74$
$5^2 = 25$	Square the first digit (5) of first part (50) then add
$= 25 + 24$ $= 49$	second part (24)
$24^2 = 576$	Square the second part of number 24
$49 + 576 = 5476$	Add the answers got in step 1 (49)and step 2 (576)
<b>Answer : <math>74^2 = 74 \times 74 = 5476</math></b>	
57	$50 + 7 = 57$
$5^2 = 25$ $= 25 + 7$ $= 32$	Square the first digit (5) of first part (50) then add second part 7
$7^2 = 49$	Square the second part of number 7
$32 + 49 = 3249$	Add the answers got in step 1 (32)and step 2 (49)
<b>Answer : <math>57^2 = 57 \times 57 = 3249</math></b>	

**Type 4: Squaring of number near to their base 10, 100, 1000, and so on:**

Number	Steps
105	$100 + 5 =$ Divide the given number to their base and number
$105 + 5 =$ 110	Add the second part of number 5 to the given number (105)
$5^2 = 25$	Square the second part of the $5^2$
11025	Combine the numbers from step 1 and step 2

<b>Answer : <math>105^2 = 105 \times 105 = 11025</math></b>	
986	1000 - 986 = 14
986 - 14 = 972	The given number 986 is less than 14 from its base value 1000, so the deficient number 14 should be subtracted by the given number 986
$14^2 = 196$	Square of deficient number 211
972196	Combine the numbers from step 1 and step 2
<b>Answer : <math>986^2 = 986 \times 986 = 972196</math></b>	

- If the number is lesser than its nearest base number then the deficient number is reduced from the given number.
- If the given number is greater than its nearest base number then the surplus number is added to the given number.

#### Type 5: Squaring of a number near to their sub base:

<b>Number</b>	<b>Steps</b>
306	$300 + 6 =$ Divide the given number to their sub base and number
$3 \times (306 + 6)$ $= 3 \times 312$ $= 936$	Add the second part of number 6 to the given number (306) and multiply it by 3
$6^2 = 36$	Square the second part of the $6^2$
93636	Combine the numbers from step 1 and step 2
<b>Answer : <math>306^2 = 306 \times 306 = 93636</math></b>	
480	$500 - 480 = 20$
$480 - 20 = 5$ $\times (480 - 20)$ $= 5 \times 460$ $= 2300$	The given number 480 is less than 20 from its sub base value 500, so the deficient number 20 should be subtracted by the given number 480 and multiplied by 5
$20^2 = 400$	Square of deficient number 211
230400	Combine the numbers from step 1 and step 2
<b>Answer : <math>480^2 = 480 \times 480 = 230400</math></b>	

### Practice Questions

1. Find the product of following numbers:

- |            |            |            |
|------------|------------|------------|
| 1] 53*28   | 2] 62*39   | 3] 27*83   |
| 4] 37*91   | 5] 76*48   | 6] 542*142 |
| 7] 234*471 | 8] 865*713 | 9] 364*901 |

2. Find the squares of numbers:

- |             |             |             |
|-------------|-------------|-------------|
| 1] $15^2$   | 2] $75^2$   | 3] $45^2$   |
| 4] $85^2$   | 5] $55^2$   | 6] $35^2$   |
| 7] $12^2$   | 8] $18^2$   | 9] $23^2$   |
| 10] $29^2$  | 11] $37^2$  | 12] $44^2$  |
| 13] $59^2$  | 14] $67^2$  | 15] $73^2$  |
| 16] $121^2$ | 17] $125^2$ | 18] $117^2$ |
| 19] $78^2$  | 20] $83^2$  | 21] $88^2$  |

22]  $92^2$   
 25]  $105^2$   
 28]  $65^2-37^2$

23]  $98^2$   
 26]  $109^2$   
 29]  $99^2-78^2$

24]  $94^2$   
 27]  $113^2$   
 30]  $111^2-95^2$

3. Find the square root of numbers:

- |           |           |           |
|-----------|-----------|-----------|
| 1] 4624   | 2] 676    | 3] 961    |
| 4] 1521   | 5] 2304   | 6] 6724   |
| 7] 6241   | 8] 9409   | 9] 13456  |
| 10] 11664 | 11] 15129 | 12] 24964 |

4. Find the cube root of numbers:

- |            |            |            |
|------------|------------|------------|
| 1] 1331    | 2] 4096    | 3] 6859    |
| 4] 10648   | 5] 21952   | 6] 50653   |
| 7] 79507   | 8] 205379  | 9] 262144  |
| 10] 636056 | 11] 830584 | 12] 110592 |

### ANSWER KEY

#### SET-1

1. 1484	2. 2418	3. 2241	4. 3367	5. 3648
6. 76964	7. 110214	8. 616745	9. 327964	

#### SET-2

1. 225	2. 5625	3. 2025	4. 7225	5. 3025
6. 1225	7. 144	8. 324	9. 529	10. 841
11. 1369	12. 1936	13. 3481	14. 4489	15. 5329
16. 14641	17. 15625	18. 13689	19. 6084	20. 6889
21. 7744	22. 8464	23. 9604	24. 8836	25. 11025
26. 11881	27. 12769	28. 2856	29. 3717	30. 3296

#### SET-3

1. 68	2. 26	3. 31	4. 39	5. 48
6. 82	7. 79	8. 97	9. 116	10. 108
11. 123	12. 158			

#### SET- 4

1. 11	2. 16	3. 19	4. 22	5. 28
6. 37	7. 43	8. 59	9. 64	10. 86
11. 94	12. 48			

## ADVANCED NUMERATION

### DIVISIBILITY OF A NUMBER

Divisibility Tests	Example
number is divisible by 2, if the last digit is 0, 2, 4, 6 or	168 is divisible by 2 since the last digit is 8.
number is divisible by 3, if the sum of the digits is divisible by 3.	168 is divisible by 3 since the sum of the digits is 15 $1+6+8=15$ , and 15 is divisible by 3.
number is divisible by 4, if the number formed by the last two digits is divisible by 4.	316 is divisible by 4 since 16 is divisible by 4.
number is divisible by 5, if the last digit is either 0 or 5.	195 is divisible by 5 since the last digit is 5.
number is divisible by 6, if it is divisible by 2 and 3 both.	168 is divisible by 6 since it is divisible by 2 & 3.
number is divisible by 8, if the number formed by the last three digits is divisible by 8.	7120 is divisible by 8 since 120 is divisible by 8.
number is divisible by 9, if the sum of the digits is divisible by 9.	549 is divisible by 9 since the sum of the digits is 18 $5+4+9=18$ , and 18 is divisible by 9.
number is divisible by 10, if the last digit is 0.	1470 is divisible by 10 since the last digit is 0.

#### Divisibility Rule for 7

Subtract 2 times the last digit from remaining truncated number. Repeat the step as necessary. If the result is divisible by 7, the original number is also divisible by 7.

For example : **945**

$94-(2*5)=84$ . Since 84 is divisible by 7, the original no. 945 is also divisible

#### Divisibility Rule for 11

If the difference of sum of odd placed values and sum of even placed values is divisible by 11. Then the given number is also divisible by 11.

For example consider **678234**.

$$(6 + 8 + 3) - (7 + 2 + 4) = 17 - 13 = 4$$

which is not divisible by 11 so **678234 is not divisible by 11**.

Now, try **908193**

$$(9 + 8 + 9) - (0 + 1 + 3) = 22 \text{ which is divisible by 11. So, } \mathbf{908193 \text{ is divisible by 11.}}$$

#### Divisibility Rule for 13

Add 4 times the last digit to the remaining truncated number. Repeat the step as necessary. If the result is divisible by 13, the original number is also divisible by 13.

For example: **3146**

$$314+(4*6) = 338 :: 33+(4*8) = 65. \text{ Since } 65 \text{ is divisible by } 13, \text{ the original no. } 3146 \text{ is also divisible}$$

#### Divisibility Rule for 17

Subtract 5 times the last digit from remaining truncated number. Repeat the step as necessary. If the result is divisible by 17, the original number is also divisible by 17

For example : **2278**

$$227-(5*8)=187. \text{ Since } 187 \text{ is divisible by } 17, \text{ the original number } 2278 \text{ is also divisible.}$$

#### Divisibility Rule for 19

Add 2 times the last digit to the remaining truncated number. Repeat the step as necessary. If the result is divisible by 19, the original number is also divisible by 19

For example : **11343**

$$1134+(2*3)=1140. (\text{Ignore the } 0):: 11+(2*4) = 19. \text{ Since } 19 \text{ is divisible by } 19, \text{ original no. } 11343 \text{ is also divisible}$$

## LCM and HCF

### **Important Terms:**

- 1) **Factors:** Factor is a number which exactly divides other number.
- 2) **Multiple:** A number is said to be multiple of another number, when it is exactly divisible by other number.
- 3) **Common multiple:** A common multiple of two or more numbers is a number which is exactly divisible by each of them.
- 4) **Highest Common Factor (HCF) or Greatest Common Factor (GCF) :** HCF of two or more numbers is the greatest number which divides each number exactly.
- 5) **Lowest Common Multiple (LCM):** The least number exactly divisible by each one of the given numbers is called least common multiple.

### **Tips and Tricks:**

**H.C.F. and L.C.M. of Fractions**

**LCM = LCM of numerators/HCF of denominator**

**HCF= HCF of numerators/ LCM of denominator**

**Product of two numbers = Product of their H.C.F. and L.C.M.**

This condition is only true for two given numbers. If H.C.F. and L.C.M. of three or more numbers are given, then this rule is not applicable.

### **Method to Find H.C.F. of Given Numbers**

#### **Prime Factorization Method**

**Steps to follow :**

- 1) Express the given numbers as product of their prime factors.
- 2) Check for common prime factors and find least index of each common prime factor
- 3) The product of all common prime factors with the respective least indices is H.C.F of given numbers.

**Example : H.C.F. of 12, 36, 48**

**Prime Factors of 12, 36, 48**

$$\begin{aligned}12 &= 2 \times 3 \times 2 = 3 \times 2^2 \\36 &= 2 \times 2 \times 3 \times 3 = 2^2 \times 3^2 \\48 &= 2 \times 2 \times 2 \times 2 \times 3 = 2^4 \times 3\end{aligned}$$

**2 & 3 are common factors.  $2^2$  & 3 have least indices.**

**H.C.F. of 12, 36, 48 = Product of common prime factors with least indices.**

$$\text{H.C.F. of } 12, 36, 48 = 2^2 \times 3 = 12$$

$$\text{H.C.F. of } 12, 36, 48 = 12$$

### **Division Method**

**Steps to follow:**

- 1) Draw a table as shown and arrange the given numbers horizontally.
- 2) Divide the numbers with their common factors.
- 3) Divide till the given numbers have no common factors.
- 4) Finally multiply the common factors on left hand side of the table to find the H.C.F.

**Example:** H.C.F. of 12, 36, 48

2	12	36	48
2	6	18	24
3	3	9	12
	1	3	4

$$\text{H.C.F or G.C.F} = 2 \times 2 \times 3 = 12$$

$$\text{H.C.F of } 12, 36, 48 = 12$$

### **FACTORS OF A NUMBER**

Given an integer N, there is a simple way to find the total number of its factors.

These are certain basic formulas pertaining to factors of a number N, such that,

$$N = p^a \times q^b \times r^c$$

Where, p, q and r are the prime factors of the number N. a, b and c are non-negative powers/ exponents.

1. Number of factors of N =  $(a+1)(b+1)(c+1)$
2. Number of odd factors of N = product of only odd numbers power increased by 1.
3. Number of even factors of N = Total factors – odd factors
4. Product of factors of N =  $(N)^{\frac{\text{No. of factors}}{2}}$
5. Sum of factors of N =  $(p^0 + p^1 + \dots + p^a)(q^0 + q^1 + \dots + q^b)(r^0 + r^1 + \dots + r^c)$

**Example-** Consider the number n = 120. Find the following for n:

- |                    |                       |                        |
|--------------------|-----------------------|------------------------|
| 1. Sum of factors. | 2. Number of factors. | 3. Product of factors. |
| 4. Odd factors.    | 5. Even factors.      | 6. Prime factors.      |

**Solution-** The prime factorization of 120 is  $2^3 \times 3^1 \times 5^1$ . By applying the formulae,

1. **Sum of factors** =  $[(2^0+2^1+2^2+2^3)(3^0+3^1)(5^0+5^1)] = 1560$
2. **Number of factors** =  $(3+1)(1+1)(1+1) = 16$
3. **Product of factors** =  $120^{(16/2)} = 120^8$ .
4. **Odd factors** =  $(1+1)*(1+1) = 4$
5. **Even factors** =  $16-4 = 12$
6. **Prime Factors** = 3 (2, 3 & 5)

### **FACTORIALS**

The factorial function (symbol “ ! ”) means to multiply a series of descending natural numbers.

$$N! = N(N-1)(N-2) \dots \dots \dots 1$$

$$4! = 4 * 3 * 2 * 1 = 24$$

Note-  $0!=1$  and  $1!=1$ .

### Trailing zeros or ending zeros in N!

For example,  $5!=120$ . So, it has only one zero in end.

**Rule for finding trailing zeros-** Divide the given number by the powers of 5 till it is divisible by powers of 5. It means numerator is greater or equal to denominator.

$$N/5 + N/5^2 + N/5^3 + \dots \geq 5^n$$

Here we take only quotient of it.

**Example-** Find the trailing zeros in  $102!$

$102/5 + 102/25 = 20 + 4 = 24$  (Here  $100/125$  is not possible, so divide by 5's powers till it is less or equal to number) So,  $102!$  Have 24 zeros.

### Highest power of a number in a factorial or in a product

**Highest power of p (prime number) in  $N!$  is  $[N/p] + [N/p^2] + [N/p^3] + \dots + [N/p^n]$  till  $N \geq p^n$ .** Take only quotient of these divisions.

**Example 1-** Highest power of 2 in  $50!?$

$$\begin{aligned} & 50/2 + 50/4 + 50/8 + 50/16 + 50/32 \\ &= 25 + 12 + 6 + 3 + 1 = 47 \end{aligned}$$

**Example 2-** Highest power of 6 in  $20!?$

6 is a composite number. To find the highest power of composite number write it into prime factorization, i.e.,  $6 = 2 \times 3$ . Now, find the highest power of 2 and 3 in  $20!.$

$$\begin{aligned} \text{Highest power of 2 is } & 20/2 + 20/4 + 20/8 + 20/16 \\ &= 10 + 5 + 2 + 1 = 18 \end{aligned}$$

$$\text{Highest power of 3 is } 20/3 + 20/9 = 6 + 2 = 8$$

Highest power of 6 is the least value which of individual highest powers. Here values are 18 and 8. So, the highest power of 6 is 8.

## REMAINDER

**Remainder Theorem:-** Dividend = Divisor  $\times$  Quotient + Remainder When dividend is of the form  $a^n + b^n$  or  $a^n - b^n$ :

Theorem 1:  $a^n + b^n$  is divisible by  $a + b$  when  $n$  is ODD.

Theorem 2:  $a^n - b^n$  is divisible by  $a + b$  when  $n$  is EVEN.

Theorem 3:  $a^n - b^n$  is ALWAYS divisible by  $a - b$ .

When  $f(x) = a + bx + cx^2 + dx^3 + \dots$  is divided by  $x - a$

The remainder when  $f(x) = a + bx + cx^2 + dx^3 + \dots$  is divided by  $x - a$  is  $f(a)$ .

So, If  $f(a) = 0$ ,  $(x - a)$  is a factor of  $f(x)$ .

**Example:-** What is the remainder when the product  $1998 \times 1999 \times 2000$  is divided by 7?

Find the individual remainders of 1998, 1999, and 2000 are divided by 7 are 3, 4, and 5 respectively. Hence, the final remainder is the remainder when the product  $3 \times 4 \times 5 = 60$  is divided by 7. So, the final remainder is 4.

### Fermat's theorem-

This theorem is stated in the following form: if  $p$  is a prime and  $a$  is an integer co-prime to  $p$ , then  $a^{(p-1)} - 1$  will be evenly divisible by  $p$ . In other words,  $[a^{(p-1)}]/p$  gives remainder 1.

**Example:-** Find the remainder when  $72^{40}$  divide by 41?

**Answer:** So here we see that 41 is a prime number, so we will target Fermat's little theorem instead of Euler's theorem. Again 72 and 41 are co-prime. so we can apply our little theorem in this problem easily.

$$\rightarrow \text{remainder } [72^{40}/41] = 1.$$

### Wilson's Theorem-

This theorem state that for a prime number  $p$ ,  $(p-1)!$  Divide by  $p$ , then the remainder is  $p-1$ .

**Example:-** Find the remainder when  $16!$  is divided by  $17$ .  $16! = (16! + 1) - 1 = (16! + 1) + 16 - 17$

Every term except 16 is divisible by 17 in the above expression.  
Hence the remainder = the remainder obtained when 16 is divided by 17 = Rem (16).

## UNIT DIGIT

**Unit digit of product-** Multiply last digits of each number.

**Example:-**  $121 \times 76 \times 528 \times 172 = 1 \times 6 \times 8 \times 2 = 96$  = 6 is unit digit here.

**Unit digit of powers-** Either use cyclicity of number or use simple method.

2	3	4	5	6	7	8	9
$2^1=2$	$3^1=3$	$4^1=4$	$5^1=5$	$6^1=6$	$7^1=7$	$8^1=8$	$9^1=9$
$2^2=4$	$3^2=9$	<b><math>4^2=6</math></b>	$5^2=5$	$6^2=6$	$7^2=9$	$8^2=4$	<b><math>9^2=1</math></b>
$2^3=8$	$3^3=7$	$4^3=4$	$5^3=5$	$6^3=6$	$7^3=3$	$8^3=2$	$9^3=9$
$2^4=6$	$3^4=1$	$4^4=6$	$5^4=5$	$6^4=6$	$7^4=1$	$8^4=6$	$9^4=1$
<b><math>2^5=2</math></b>	<b><math>3^5=3</math></b>	$4^5=4$	$5^5=5$	$6^5=6$	<b><math>7^5=7</math></b>	<b><math>8^5=8</math></b>	$9^5=9$
$2^6=4$	$3^6=9$	$4^6=6$	$5^6=5$	$6^6=6$	$7^6=9$	$8^6=4$	$9^6=1$
$2^7=8$	$3^7=7$	$4^7=4$	$5^7=5$	$6^7=6$	$7^7=3$	$8^7=8$	$9^7=9$

**Example:-** Find the unit digit in  $2^{49}$ ?

We know in case of 2, it repeats itself after a cycle of 4 . We will divide 49 by 4     $49/4$  remainder is 1  
We write it as  $2^{49} = 2^1 = 2$ . That means the unit digit in the  $2^{49}$  is 2.

**Rule for numbers ending in digits 0 or 1 or 5 or 6 :-**

Unit digits of that numbers are same as there last digits ending in 0 or 1 or 5 or 6 whatever the power is.

Eg.-  $(235)^{27}$ = unit digit 5  $(126)^{344}$ = unit digit 6

**Rule for numbers ending in digits 2,3,4,7,8 and 9 :-**

Divide the power by 4 find the remainder. Make that remainder to the power of last digit of the number will give us the unit digit.

**Note-** if remainder is 0 (power completely divisible by 4) take remainder as 4 not 0.

**Example.1-**  $(327)^{2222}/4 = \text{Rem}(2)$

Last digit is 7. Make remainder 2 to power of 7= $7^2=49$  So , 9 is a unit digit.

**Example.2-**  $(28)^{36}$

$36/4=\text{Rem}(0)$ . Here take remainder as 4.

Last digit is 8. Then,  $8^4 = 64 \times 64 = 4 \times 4 = 16$ . So, unit digit is 6.

## SET-1

- For the product  $n*(n+1)*(2n+1)$ , where n is a natural number. Which one of the following is

- not necessarily true?
- (a) It is even. (b) Divisible by 3 (c) Divisible by 6 (d) Never divisible by 12
  2. If two digit integers M and N are positive and have same digits, but in reverse order, which of the following cannot be the sum of M and N?  
 (a) 181 (b) 165 (c) 121 (d) 99
  3. What is the value of  $(x-a)(x-b)(x-c)(x-z)$  if  $x=10$  and  $a=1, b=2, c=3$ ?  
 (a) 501 (b) 503 (c) 502 (d) 504
  4. If you write first 252 natural numbers in a straight line, how many times do you write the digit 4?  
 (a) 55 (b) 53 (c) 50 (d) 48
  5. There are three consecutive natural numbers such that the square of the second minus twelve times the first is three less than twice the third. What is the largest of the three numbers?  
 (a) 14 (b) 13 (c) 15 (d) 18

### **Divisibility**

6. What least value should be assigned to \* so that the number  $451^*603$  is exactly divisible by 9?  
 (a) 2 (b) 5 (c) 8 (d) 7
7. What least value should be assigned to \* so that the number  $63576^*2$  is divisible by 8?  
 (a) 2 (b) 1 (c) 4 (d) 3
8. If  $256X561$  is divisible by 11, then what can be the value of 'X'?  
 (a) 3 (b) 0 (c) 6 (d) 8
9. If ABC0 is a 4 digit number divisible by 4, then how many such 4 digit number exist?  
 (a) 360 (b) 400 (c) 450 (d) 500
10. If a number 968A96B is to be divisible by 72, the respective values of A and B can be?  
 (a) 7 and 8 (b) 7 and 0 (c) 5 and 8 (d) 0 and 8
11. The number  $(6n^2 + 6n)$  for any natural number n is always divisible by which maximum number?  
 (a) 6 (b) 24 (c) 12 (d) 18
12. It is given that  $(2^{32} + 1)$  is exactly divisible by a certain number. Which of the following is also definitely divisible by the same number?  
 (a)  $(2^{16} + 1)$  (b)  $(2^8 + 1)$  (c)  $(2^{16} - 1)$  (d)  $(2^{96} + 1)$

### **Lowest Common Multiple (LCM) & Highest Common Factor (HCF)**

13. The LCM of 5,8,12, 20 will not be a multiple of?  
 (a) 3 (b) 9 (c) 8 (d) 5
14. Find L.C.M. of 1.05 and 2.1?  
 (a) 1.3 (b) 1.25 (c) 2.1 (d) 4.30
15. How many numbers between 200 and 600 are divisible by 4, 5 and 6?  
 (a) 5 (b) 6 (c) 7 (d) 8
16. For how many values of k the L.C.M of  $6^6, 8^8$  and k is  $12^{12}$  (k is a natural number)?  
 (a) 1 (b) 24 (c) 25 (d) Infinite
17. Three bells toll at intervals of 9, 12 and 15 minutes respectively. All three begins to toll at 8 a.m. At what time will they first toll together again?  
 (a) 11 a.m. (b) 8:30 a.m. (c) 10 a.m. (d) 10:30 a.m.
18. A person has to completely put each of the three liquids i.e. 403 liters of petrol, 465 litres of diesel and 496 liters of Mobil oil in bottles of equal size without mixing any of the three types of liquids such that each bottle is completely filled. What is the least possible number of bottles required?  
 (a) 44 (b) 34 (c) 31 (d) None of these
19. Five bells begin to toll together at intervals of 9 s, 6 s, 4 s, 10 s and 8 s, respectively. How many times will they toll together in the span of one hour (excluding the toll at the start)?  
 (a) 5 (b) 8 (c) 10 (d) None of these
20. The least perfect square number which is divisible by 3, 4, 5, 6 and 8, is?

- (a) 900 (b) 1200 (c) 2500 (d) 3600

### Factors & Factorials

21. Find the following for the number 84?  
I. Number of odd factors. II. Number of even factors.  
(a) 4,8 (b) 5,5 (c) 8,12 (d) 7,9
22. How many factors of 1200 are odd integers?  
(a) 6 (b) 8 (c) 12 (d) 22
23. Find the total no of prime factors in  $4^{11} \times 7^5 \times 11$ ?  
(a) 17 (b) 27 (c) 28 (d) 30
24. Find the sum of factors of 18?  
(a) 6 (b) 13 (c) 39 (d) 35
25. Find the number of factors of  $6!$ ?  
(a) 25 (b) 30 (c) 35 (d) 32

### Remainders

26. A number when divided by 54 leaves a remainder of 31. Find the remainder when the same number is divided by 27?  
(a) 4 (b) 23 (c) 15 (d) (a) or (b)
27. Find the remainder when  $2^{93}$  is divided by 7?  
(a) 1 (b) 2 (c) 4 (d) 6
28. Find the remainder when  $2^{45}$  is divided by 5?  
(a) 0 (b) 1 (c) 4 (d) None of these
29. The remainder, when  $(15^{23} + 23^{23})$  is divided by 19, is?  
(a) 4 (b) 15 (c) 0 (d) 18
30. What is the remainder when  $4^{96}$  is divided by 6?  
(a) 0 (b) 2 (c) 3 (d) 4
31.  $(7^{4n} - 6^{4n})$ , where n is an integer  $> 0$ , is divisible by?  
(a) 13 (b) 5 (c) 17 (d) All of these

### Unit Digit

32. If the unit's digit in the product of  $(47ax729 \times 345 \times 343)$  is 5, then how many values that a can take?  
(a) 9 (b) 3 (c) 7 (d) 5
33. The rightmost non - zero digit of the number  $30^{2720}$  is?  
(a) 1 (b) 3 (c) 7 (d) 9
34. What is the unit digit in  $2^9$ ?  
(a) 1 (b) 3 (c) 2 (d) 4
35. Find the unit digit in the product  $(243 \times 397 \times 2497 \times 3913)$ ?  
(a) 4 (b) 3 (c) 7 (d) 1
36. What are the respective digits in the unit's place in the expansions of  $7^7$  and  $17^7$ ?  
(a) 2, 6 (b) 3, 3 (c) 1, 4 (d) 9, 9
37. Find the unit's digit in  $(264^{102} + 264^{103})$ ?  
(a) 0 (b) 2 (c) 4 (d) 6
38. Which digits should come in place of @ and # if the number  $62684@\#$  is divisible by both 8 and 5?  
(a) 4,0 (b) 0,4 (c) 4,4 (d) 1,1
39. What will be the last digit of the multiplication  $3153 * 7162$ ?  
(a) 5 (b) 9 (c) 7 (d) 6
40. The digit in the unit place of the number  $7^{295} \times 3^{158}$  is?  
(a) 7 (b) 2 (c) 6 (d) 4

## SET-2

1. Which one of the following is the minimum value of the sum of two integers whose product is 36?  
(a) 37 (b) 20 (c) 15 (d) 12
2. Four digits of the number 29138576 are omitted so that the result is as large as possible. The largest omitted digit is?  
(a) 5 (b) 6 (c) 7 (d) 8
3. A boy writes all the numbers from 100 to 999. The number of zeroes that he uses is 'a', the number of 5's that he uses is 'b' and the number of 8's he uses is 'c'. What is the value of  $b + c - a$ ?  
(a) 280 (b) 380 (c) 180 (d) 80
4. The product of 4 consecutive even numbers is always divisible by?  
(a) 600 (b) 768 (c) 864 (d) 384
5. A set has exactly five consecutive positive integers starting with 1. What is the percentage decrease in the average of the numbers when the greatest one of the numbers is removed from the set?  
(a) 8.54 (b) 12.56 (c) 15.25 (d) 16.66
6. Monica, Veronica and Rachat begin to jog around a circular stadium. They complete their revolutions in 42s, 56s and 63s, respectively. After how many seconds will they be together at the starting point?  
(a) 366 (b) 252 (c) 504 (d) Can't be determined
7. In a meet, persons from five different places have assembled in Bangalore High School. From the five places the persons come to represent are 42, 60, 210, 90 and 84. What is the minimum number of rooms that would be required to accommodate so that each room has the same number of occupants and occupants are all from the same places?  
(a) 44 (b) 62 (c) 81 (d) 96
8. The product of two numbers is 12960 and their HCF is 36. How many pairs of such numbers can be formed?  
(a) 3 (b) 4 (c) 5 (d) 2
9. Calculate H.C.F. of  $\frac{2}{3}, \frac{16}{81}$  and  $\frac{8}{9}$ ?  
(a)  $\frac{2}{9}$  (b)  $\frac{8}{3}$  (c)  $\frac{2}{81}$  (d)  $\frac{3}{16}$
10. H.C.F. of two numbers is 13. If these two numbers are in the ratio of 15: 11, then find the numbers?  
(a) 230, 140 (b) 215, 130 (c) 195, 143 (d) 155, 115
11. The L.C.M. of two numbers is 2310 and their H.C.F. is 30. If one of these numbers is 210, the second number is?  
(a) 330 (b) 1470 (c) 2100 (d) 16170
12. Find the number of trailing zeroes in the expansion of  $23!$ ?  
(a) 5 (b) 4 (c) 20 (d) 21
13. Find the number of trailing zeroes in the expansion of  $1000!$ ?  
(a) 250 (b) 300 (c) 249 (d) 245
14. Find the number of zeros in  $2 * 3 * 4 * 5 * \dots * 124 * 125$ ?  
(a) 30 (b) 35 (c) 38 (d) 31
15. Find the highest power of 24 in  $150!$ ?  
(a) 48 (b) 72 (c) 58 (d) 45
16. Find the highest power of 30 in  $40!$ ?  
(a) 12 (b) 10 (c) 8 (d) 9
17.  $pqr$  is a three digit natural number such that  $pqr = p! + q! + r!$ . What is the value of  $(q+r)*p$ ?  
(a) 1296 (b) 3125 (c) 19683 (d) 9
18. Find the remainder when  $n$  is divided by 12 where  
 $N = 1821 \times 1823 \times 1827$ ?  
(a) 9 (b) 12 (c) 15 (d) 18
19. A number when divided by 5, leaves 3 as remainder. What will be the remainder when the square of this number is divided by 5?  
(a) 0 (b) 1 (c) 2 (d) 4

20. In a division sum, the remainder is 6 and the divisor is 5 times the quotient and is obtained by adding 2 to the thrice of the remainder. The dividend is?  
 (a) 40 (b) 42 (c) 80 (d) 86
21. Find the unit digit of  $(23)^{25}$ ?  
 (a) 0 (b) 2 (c) 3 (d) 1
22. The unit digit of  $(13713)^{47}$  is?  
 (a) 1 (b) 3 (c) 5 (d) 7
23. The unit digit of  $35^{87} + 93^{46}$  is?  
 (a) 2 (b) 4 (c) 6 (d) 8
24. The unit digit of  $44^{91} \times 73^{37}$  is?  
 (a) 2 (b) 4 (c) 6 (d) 8
25. The unit digit of  $12^{34} - 5^9$  is?  
 (a) -1 (b) 1 (c) 9 (d) None of these

### SET-3

1. The greatest number that will divide 63, 138 and 228 so as to leave the same remainder in each case: (**Aricent**)  
 a) 20 (b) 15 (c) 55 (d) None of these
2. What is the highest power of 5 that divides  $90 \times 80 \times 70 \times 60 \times 50 \times 40 \times 30 \times 20 \times 10$ ? (**Aricent**)  
 a) 12 (b) 10 (c) 20 (d) 41
3. In annual examination at C.D. Goenka school, a question was asked from maths topic as follows: The least number, which when divided by 12, 15, 20 or 54 leaves a remainder of 4 in each case, is : (**Bosch**)  
 a) 544 (b) 430 (c) 204 (d) 415
4. When 17 divides  $(21^{23} + 13^{23})$ , what is the remainder? (**Delloite**)  
 a) 1 b) 2 c) 0 d) None of these
5. Find the unit digit in the product  $(243 \times 397 \times 2497 \times 3913)$ ?  
 (a) 4 (b) 3 (c) 7 (d) 1
6. The difference between two numbers is 1365. When the larger number is divided by the smaller one, the quotient is 6 and the remainder is 15. The smaller number is: (**Cocubes**)  
 a) 270 b) 345 C) 435 d) 344
7. How many factors of 840 will be perfect cubes? (**Cocubes**)  
 a) 1 b) 2 c) 3 d) 5
8. Oscar Isaac ate 100 grapes in 5 days. Each day, he ate 6 more grapes than those he ate on the earlier day. How many grapes did he eat on the first day? (**Hacker Rank**)  
 a) 1 b) 2 c) 3 d) 8
9. Hailee Steinfeld had to do a multiplication. Instead of taking 35 as one of the multipliers, she took 53. As a result, the product went up by 540. What is the new product? (**Hacker Rank**)  
 a) 1590 b) 2120 c) 1453 d) 4312
10. Find value of  $7.24242424\dots$  (**HCL**)  
 a) 717/99 b) 724/99 c) 724/100 d) None of these
11. What will be the difference of two digit largest prime number and one digit largest prime number? (**HCL**)  
 a) 91 b) 90 c) 88 d) 95
12. A family X went for a vacation. Unfortunately it rained for 13 days when they were there. But whenever it rained in the mornings, they had clear afternoons and vice versa. In

all they enjoyed 11 mornings and 12 afternoons. How many days did they stay there totally? **(Infosys)**

a) 91    b) 90    c) 18    d) 95

13. If  $A=x^3y^2$  and  $B=xy^3$  then find the HCF of A, B? **(TCS)**

a)  $x^4y^4$     b)  $x^2y^4$     c)  $xy^2$     d) None of these

14. In the town of Unevenville, it is a tradition to have the size of the front wheels of every cart different from that of the rear wheels. They also have special units to measure cart wheels which is called uneve. The circumference of the front wheel of a cart is 133 uneves and that of the back wheel is 190uneves. What is the distance traveled by the cart in uneves, when the front wheel has done nine more revolutions than the rear wheel? **(TCS)**

a) 3590    b) 2344    c) 3990    d) None of these

15. Find the greatest number that will divide 148 246 and 623 leaving remainders 4 6 and 11 respectively? **(TCS)**

a) 10    b) 12    c) 8    d) 9

### **SET-1**

1-D	2-A	3-D	4-A	5-A
6-C	7-A	8-A	9-C	10-B
11-C	12-D	13-B	14-C	15-B
16-C	17-A	18-C	19-C	20-D
21-A	22-A	23-C	24-C	25-B
26-A	27-A	28-D	29-C	30-D
31-D	32-D	33-A	34-C	35-D
36-B	37-A	38-A	39-D	40-A

### **SET-2**

1-D	2-A	3-B	4-D	5-D
6-C	7-C	8-D	9-C	10-C
11-A	12-B	13-C	14-A	15-A
16-D	17-D	18-A	19-D	20-D
21-D	22-D	23-B	24-A	25-C

### **SET-3**

1-B	2-B	3-A	4-C	5-D
6-A	7-B	8-D	9-A	10-A
11-B	12-B	13-C	14-C	15-B

## **Mean**

The result obtained by adding several quantities together and then dividing this total by the number of quantities is called Average.

**Average= Sum of quantities / Number of Quantities**

An average is the mean value of a set of numbers or values. It is given by:-

**Average=  $(x_1+x_2+x_3+\dots+ x_n)/n$**

**Example:** If the ages of 4 students are 20 years, 22 years, 18 years and 24 years, then what is the average age of the students?

**Solution:** Average Age =  $(20+22+18+24)/4$

### ***Important Points to Remember***

1. If all the numbers are increased by 'a' then their average is also increased by 'a'.
2. If all the numbers are decreased by 'a' then their average is also decreased by 'a'.
3. If all the numbers are multiplied by 'a' then their average is also multiplied by 'a'.
4. If all the numbers are divided by 'a' then their average is also divided by 'a'.

### ***Age and Average***

1. If the average age of n persons decreases by x years. Then, the total age of n persons decreases by  $(n*x)$  yr
2. If the average age of n persons increases by x years. Then, the total age of n persons increases by  $(n*x)$  yr

**Example:** The average age of 6 persons is increased by 2 years when one of them, whose age is 26 years is replaced by a new man. What is the age of the new person?

**Solution:** Total age increased =  $6*2=12$  year

Age of new persons =  $(26+12)=38$  year  
The increase in the total age of 6 persons is due to the replacement of a person aged 26 year with a person who is 12 years older to him.

### ***Average of Some Important Series of Numbers***

The average of odd numbers from 1 to n,  
 $= (\text{Last odd number} + 1)/2$  (n=Last odd number)

The average of even numbers from 2 to n,  
 $= (\text{Last even number} + 2)/2$  (n=Last even number)

## Important Points

1. Average of first 'n' natural numbers =  $(n+1)/2$
2. The average of first 'n' consecutive even numbers =  $(n+1)$
3. The average of first 'n' consecutive odd numbers =  $n$
4. The average of consecutive numbers =  $(\text{First Number} + \text{Last Number})/2$
5. The average of 1 to 'n' odd numbers =  $(\text{Last Odd Number}+1)/2$
6. The average of 1 to 'n' even numbers =  $(\text{Last Even Number}+2)/2$
7. The average of square of natural numbers till n =  $[(n+1)(2n+1)]/6$
8. The average of cubes of natural numbers till n =  $[n(n+1)^2]/4$
9. Correct Sum = Wrong Sum - Wrong Value + Right Value
10. The average of squares of 1st n consecutive even no's =  $[2(n+1)(2n+1)]/3$
11. The average of squares of consecutive even no's from 1 to n =  $[(n+1)(n+2)]/3$
12. The average of squares of consecutive odd no's from 1 to n =  $[n(n+2)]/3$
13. If the average of n<sub>1</sub> observation is a<sub>1</sub> and n<sub>2</sub> observation is a<sub>2</sub>. Then, the average of all the observations is:-  
$$A = \frac{n_1 a_1 + n_2 a_2 + n_3 a_3 + \dots}{n_1 + n_2 + n_3 + \dots}$$
14. If the average of 'm' observations is 'a' and average of 'n' observations taken out of 'm' is 'b'. Then, Average of rest of the observations =  $(ma - nb)/(m-n)$

## Average Speed

### 1. Average Speed = Total Distance / Total Time

Let the distance between two points A and B is d and speed in travelling from point A to B is x km/hr and from point B to A is y km/hr.

Then, **average speed** =  $(2xy) / (x+y)$

**Example:** If a person travels two equal distances at 10 km/hr. and 30 km/hr. What is the average speed for the entire journey?

**Solution:** Average Speed =  $2xy / (x+y)$

$$\begin{aligned} &= (2*30*10)/30+10 \\ &= 600 / 40 = 15 \text{ km/hr.} \end{aligned}$$

- 2.** If a person covers three equal distances at a speed of A km/hr,B Km/hr and C Km/hr. Then, the average speedfor the whole journey will be  $=3 \frac{ABC}{(AB+BC+CA)}$

SET-1

## Type 1 - Averages and Numbers



### Type 2 - Partial Average

- Q5.** In a college, 16 girls have the average age as 18 years and 14 boys have the average age as 17 years. What would be the average age of the entire college?  
A. 18.64      B. 17.54      C. 20.84      D. 16.34

**Q6.** The average salary of 25 employees in a company per month is Rs.6000.If the manager's salary is also added then the average increases by Rs.500.What would be the salary of the manager?  
A. 17,000      B. 19,000      C. 21,000      D. 25,000

**Q7.** The average wages of a worker during a fortnight comprising 15 consecutive working days was Rs.90 per day. During first 7 days, his average wages was Rs.87 per day. And the average wages during the last 7 days wasRs.92 per day. What was his wage on the 8th day?  
A. 67      B. 79      C. 97      D. 98

**Q8.** 40% of the employees in a factory are workers. All the remaining employees are executive. The annual income of each worker is Rs.390. The annual income of each executive is Rs.420.What is the average annualincome of all the employees in the factory together?  
A. 480      B. 580      C. 408      D. 690

**Q9.** The average annual income of Ramesh and Suresh is Rs.3800.The average annual income of Suresh and Pratap was Rs.4800.The average annual income of Pratap and Ramesh was Rs.5800.What is the average of theincomes of three?  
A. 3600      B. 4800      C. 5200      D. 4600

**Q10.** On a School's annual day sweets were to be distributed amongst 112 children. But on that particular day,32 children were absent. Thus, the remaining children got extra 6 sweets. How many sweets did each child originally supposed to get?  
A. 15      B. 25      C. 30      D. 45

**Q11.** Arithmetic mean of the scores of a group of students in a test was 52.The brightest 20% of them secured a mean score of 80 and the dullest 25% a mean score of 31.The mean of remaining 55% is?  
A. 52.5%      B. 51.4%      C. 62.5%      D. 72.7%

### Type 3 - With/Without Replacement

**Q12.** When a student weighing 45 kg left a class, the average weight of the remaining 59 students increased by 200 grams. What is the average weight of the remaining 59 students?



**Q13.** There were 35 students in a hostel. Due to the admission of 7 new students the expenses of the mess were increased by Rs.42 per day while the average expenditure per head diminished by Re.1. What was the original expenditure of the mess?



**Q14.** The average age of 40 students of a class is 18 years. When 20 new students are admitted to the same class the average age of the class is increased by 6 months. The average age of the newly admitted students is?

- A. 19 Years 6 months      B. 19 years      C. 18 Years      D. 20 years 2 months

#### Type 4 - Mistaken Average

**Q15.** The average of 8 observations was 25.5. It was noticed later that two of those observations were wrongly taken. One observation was 14 more than the original value and the other observation was wrongly taken as 31 instead of 13. What will be the correct average of those 8 observations?

- A. 22.5      B. 21.5      C. 25      D. 24.5

**Q16.** The Arithmetic mean of 100 numbers was computed as 89.05. It was later found that two numbers 92 and 83 have been misread as 192 and 33 respectively. What is the correct Arithmetic Mean of the numbers?

- A. 88.66      B. 88.55      C. 77.02      D. 90.54

**Q17.** In an examination, the average marks of all the students calculated to be 58 marks. It was later found that marks of 60 students were wrongly written as 70 instead of 50. If the corrected average is 55, find the total number of students who took the exam?

- A. 500      B. 450      C. 400      D. 420

## **Type 5 – Problems on Cricket**

**Q18.** A cricketer has completed 10 innings and his average is 21.5 runs. How many runs must he make in his next 2 innings so as to raise his average to 24?

- A. 50      B. 24      C. 49      D. 52

**Q19.** A cricketer had a certain average of runs for his 64th innings. In his 65th innings, he is bowled out for noscore on his part. This brings down his average by 2 runs. His new average of run is?

- A. 135 Runs      B. 128 Runs      C. 150 Runs      D. 132 Runs

**Q20.** The batting average of a cricket player for 64 innings is 62 runs. His highest score exceeds his lowest score by 180 runs. Excluding these two innings, the average of the remaining innings becomes 60 runs. His highest score is?

Q21. In a group of 15 persons, the average weight is 63.25 kg. A new person joined the group and the average weight decreased to 62.875 kg. Find the weight of the new person.

- (a) 56.25kg (b) 58.5 kg (c) 57.25kg (d) 58.65kg

Q22. The sum of six consecutive odd nos. is 888. What is the average of the nos.?

- (a) 147 (b) 148 (c) 149 (d) 146

Q23. An investor in shares makes a profit of Rs.920 in his fifth investment, thereby increasing his average profit of first four investments by Rs.14. His average profit over the first four investments is

- a) 21 b) 11 c) 13 d) None of these

Q24. The average of certain number of terms is equal to 18. When the number 100 is added to the terms, the average becomes 20. Find the initial number of terms.

- a) 60 (b) 50 (c) 40 (d) 80

Q.25 Find the average of the first 97 natural numbers

- (a)47 (b)37 (c)48 (d)49

## SET-2

1. David obtained 76, 65, 82, 67 and 85 marks (out of 100) in English, Mathematics, Physics, Chemistry and Biology. What are his average marks?

- (a) 65 (b) 69 (c) 72  
(d) 76 (e) None of these

2. In Arun's opinion, his weight is greater than 65 kg but less than 72 kg. His brother does not agree with Arun and he thinks that Arun's weight is greater than 60 kg but less than 70 kg. His mother's view is that his weight cannot be greater than 68 kg. If all of them are correct in their estimation, what is the average of different probable weights of Arun?

- (a) 67 kg (b) 68 kg (c) 69 kg  
(d) Data inadequate (e) None of these

3. The average of 20 numbers is zero. Of them, at the most, how many may be greater than zero?

- (a) 0 (b) 1 (c) 10  
(d) 19 (e) None of these

4. Find the average of all the numbers between 6 and 34 which are divisible by 5.

- (a) 18 (b) 20 (c) 24  
(d) 30 (e) None of these

5. The average of first five multiples of 3 is

- (a) 3 (b) 9 (c) 12  
(d) 15 (e) None of these

6. A library has an average of 510 visitors on Sundays and 240 on other days. The average number of visitors per day in a month of 30 days beginning with a Sunday is

- (a) 250 (b) 276 (c) 280  
(d) 285 (e) None of these

7. If the average marks of three batches of 55, 60 and 45 students respectively is 50, 55 and 60, then the average marks of all the students is

- (a) 53.33 (b) 54.68 (c) 55  
(d) None of these (e) Can't be determined

8. The average weight of 16 boys in a class is 50.25 kgs and that of the remaining 8 boys is 45.15 kgs. Find the average weight of all the boys in the class.

- (a) 47.55 kgs (b) 48 kgs (c) 48.55 kgs  
(d) 49.25 kgs (e) None of these

9. A car owner buys petrol at Rs 7.50, Rs. 8 and Rs. 8.50 per litre for three successive years. What approximately is the average cost per litre of petrol if he spends Rs. 4000 each year?

- (a) Rs. 7.98 (b) Rs. 8 (c) Rs. 8.50  
(d) Rs. 9 (e) None of these

10. The average of six numbers is  $x$  and the average of three of these is  $y$ . If the average of the remaining three is  $z$ , then

- (a)  $x = y + z$  (b)  $2x = y + z$  (c)  $x = 2y + 2z$   
(d) None of these (e) Can't be determined

11. Out of 9 persons, 8 persons spent Rs. 30 each for their meals. The ninth one spent Rs. 20 more than the average expenditure of all the nine. The total money spent by all of them was  
 (a) Rs. 260      (b) Rs. 290      (c) Rs. 292.50  
 (d) Rs. 400.50      (e) None of these
12. The average of 50 numbers is 30. If two numbers, 35 and 40 are discarded, then the average of the remaining numbers is nearly  
 (a) 28.32      (b) 28.78      (c) 29.27  
 (d) 29.68      (e) None of these
13. The average of five numbers is 27. If one number is excluded, the average becomes 25. The excluded number is  
 (a) 25      (b) 27      (c) 30  
 (d) 35      (e) None of these
14. The average age of 35 students in a class is 16 years. The average age of 21 students is 14. What is the average age of remaining 14 students?  
 (a) 15 years      (b) 17 years      (c) 18 years  
 (d) 19 years      (e) None of these
15. The average score of a cricketer for ten matches is 38.9 runs. If the average for the first six matches is 42, then find the average for the last four matches.  
 (a) 33.25      (b) 33.5      (c) 34.25  
 (d) 35      (e) None of these
16. The average of six numbers is 3.95. The average of two of them is 3.4, while the average of the other two is 3.85. What is the average of the remaining two numbers?  
 (a) 4.5      (b) 4.6      (c) 4.7  
 (d) 4.8      (e) None of these
17. The average price of 10 books is Rs. 12 while the average price of 8 of these books is Rs. 11.75. Of the remaining two books, if the price of one book is 60% more than the price of the other, what is the price of each of these two books ?  
 (a) Rs. 5, Rs. 7.50      (b) Rs. 8, Rs. 12  
 (c) Rs. 10, Rs. 16      (d) Rs. 12, Rs. 14  
 (e) None of these
18. The average of runs of a cricket player of 10 innings was 32. How many runs must he make in his next innings so as to increase his average of runs by 4?  
 (a) 2      (b) 4      (c) 70      (d) 76      (e) None of these
19. A company produces on an average 4000 items per month for the first 3 months. How many items it must produce on an average per month over the next 9 months, to average 4375 items per month over the whole?  
 (a) 4500      (b) 4600      (c) 4680      (d) 4710      (e) None of these
20. In the first 10 overs of a cricket game, the run rate was only 3.2. What should be the run rate in the remaining 40 overs to reach the target of 282 runs?  
 (a) 6.25      (b) 6.5      (c) 6.75      (d) 7      (e) None of these

### **SET-3**

1. If we remove two men ages 35 and 45 and replace them by 2 women then the average age of 8 people of a group increases by 2 years. Find the average age of two women?  
**(ZS)**  
 A.48 B. 55 C. 98 D. 99
2. 7 years ago, the average age of Ross and Sam's age was 26 years. Now the age of Ross, Sam, and Max is 38 years. Calculate the age of Max 10 years hence? **(ZS)**  
 A. 58 B. 77 C. 66 D. 67
3. If the average of 35 results is 22. Average of first 17 results is 15, and that of last 17 is 18, find the 18th digit? **(ZS)**  
 A. 209 B. 677 C. 545 D. 343
4. The average weight of a group of persons increased from 48 kg to 51 kg, when two persons weighing 78 kg and 93 kg join the group. Find the initial number of members in the group? **(ZS)**  
 A. 23 B. 67 C. 66 D. 32

5. The average age of a husband and his wife was 25 years when they were married 7 years ago. Now the average age of husband, wife and his son is 23 years. Find the age of son now.

- A. 4 yr      B. 5 yr      C. 6 yr      D. 7 yr

6. Average of age 3 men L, M and N is 48 years. Another man O joins the group and the average becomes 44 years. If another man P whose age is 3 years more than that of O replaces L. Then the average age of M, N, O and P becomes 43 years then the age of L is? (**ZS**)

- A. 39 B. 66 C. 99 D. 22

7. A broker sold two type of property last year A and B. The revenue from the sale of each unit of A is 27lakhs, and that from the sale of each unit of B is rupees 51 lakhs. If Broker sold thrice as many units of B as A, then what were the broker average revenue per unit sold of these two property last year? (**Cocubes**)

- A.45 lacs B. 75 lacs C. 65 lacs D. 46 lacs

8. Dhoni's age is equal to the square of the sum of the ages of his two daughters, Four years from now, the difference between his age and his daughters ages will be twenty six years. Find his present age. (**Cocubes**)

- A. 36 B. 66 C. 55 D. 33

9. The average weight of 17 babies is 92 kg. If 18 new babies are added, the new average increase by 3 kg. What will be the average weight of the 18 new babies? (**Cocubes**)

- A. 97.8 KG B. 88 KG C. 99 KG D. 77 KG

10. The average age of 14 boys and their mentor's age is 15 years. If the mentor's age is excluded, the average reduces by 1. What is the mentor's age? (**Cocubes**)

- A. 29 B. 77 C. 66 D. 21

11. The average score of Saurabh Ganguly after 25 innings is 46 runs per innings. If after the 26th innings, his average runs increased by 2 runs, then what is his score in the 26th inning? (**Cocubes**)

- A. 98 B. 77 C. 76 D. 55

12. If  $37M+37P = 5661$ , find average of M and P? (**Cocubes**)

- A. 76.5 B. 88 C. 77 D. 55

13. If the average price of three packets of 55, 60 and 45 pens respectively is 50, 55 and 60, then the average price of all the pens is? (**Cocubes**)

- A. 54.68 B. 77 C. 66 D. 66.5

14. In the World cup T20 match of India vs Pakistan which happened on 23rd October, as these two countries had the greatest rivalry of all time . In the first 10 overs of the game, the run rate was only 3.2. What should be the run rate in the remaining 40 overs to reach the target of 282 runs? (**L&T**)

- A. 6.25 B. 7 C. 7 D. 8

15. The mean of 30 records is 36. It was later discovered that one of the records was incorrectly taken as 23 in place 48. Find out the correct new mean? (**L&T**)

- A. 36.83 B. 77 C. 88 D. 99

SET-1

1. A	2. B	3. B	4. B	5. B
6. B	7. C	8. C	9. B	10. A

11. B	12. B	13. C	14. A	15. B
16. B	17. C	18. C	19. B	20. C
21. C	22. B	23. D	24. C	25. D

SET-2

1. E	2. A	3. D	4. B	5. B
6. D	7. B	8. C	9. A	10. B
11. C	12. D	13. D	14. D	15. C
16. B	17. C	18. D	19. A	20. A

SET-3

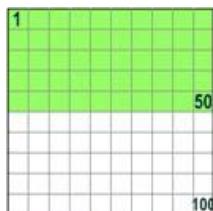
1. A	2. A	3. A	4. A	5. B
6. A	7. A	8. A	9. A	10. A
11. A	12. A	13. A	14. A	15. A

## ADVANCE PERCENTAGE

## PERCENT

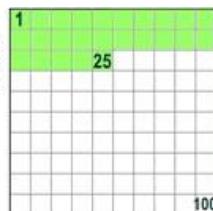
When we say "Percent" we mean "per 100"

One percent (**1%**) means 1 per 100.



**50%** means 50 per 100  
(50% of this box is green)

**25%** means 25 per 100  
(25% of this box is green)



**Remember:**  $x\% \text{ of } y = y\% \text{ of } x = xy/100$

**Example:** Find 8% of 50.

8% of 50 is the same as 50% of 8

And 50% of 8 is 4

So, 8% of 50 is 4



Decimals, Fractions & Percentages are just different ways of showing the same value:

A Half can be written as:



**Common Fractions with Decimal and Percent Equivalents**

Here is a table of commonly used values shown in Percent, Decimal and Fraction form:

Fraction	Decimal	Percent
$\frac{1}{2}$	0.5	50%
$\frac{1}{3}$	0.333...	33.333...%
$\frac{2}{3}$	0.666...	66.666...%
$\frac{1}{4}$	0.25	25%
$\frac{3}{4}$	0.75	75%
$\frac{1}{5}$	0.2	20%
$\frac{2}{5}$	0.4	40%
$\frac{3}{5}$	0.6	60%
$\frac{4}{5}$	0.8	80%
$\frac{1}{6}$	0.1666...	16.666...%
$\frac{5}{6}$	0.8333...	83.333...%
$\frac{1}{8}$	0.125	12.50%
$\frac{3}{8}$	0.375	37.50%
$\frac{5}{8}$	0.625	62.50%
$\frac{7}{8}$	0.875	87.50%
$\frac{1}{9}$	0.111...	11.111...%
$\frac{2}{9}$	0.222...	22.222...%
$\frac{4}{9}$	0.444...	44.444...%
$\frac{5}{9}$	0.555...	55.555...%
$\frac{7}{9}$	0.777...	77.777...%
$\frac{8}{9}$	0.888...	88.888...%
$\frac{1}{10}$	0.1	10%
$\frac{1}{12}$	0.08333...	8.333...%
$\frac{1}{16}$	0.0625	6.25%
$\frac{1}{32}$	0.03125	3.13%

### **LET'S PRACTICE THE CONVERSATIONS NOW -**

#### **A. FROM PERCENT TO DECIMAL:**

: divide by 100, and remove the "%" sign.

The easiest way to divide by 100 is to **move the decimal point 2 places to the left**:

From Percent	To Decimal	
75%	0.75 	0.75 move the decimal point <b>2 places to the left</b> , and remove the "%" sign.

#### B. FROM DECIMAL TO PERCENT:

: multiply by 100, and add a "%" sign.

The easiest way to multiply by 100 is to **move the decimal point 2 places to the right**:

From Decimal	To Percent	
0.125	0.125 	12.5% move the decimal point <b>2 places to the right</b> , and add the "%" sign.

Or you can simply multiply 0.125 with 100 and add the % sign to get 12.5%.

#### C. FROM FRACTION TO DECIMAL:

The easiest way is to divide the top number by the bottom number (divide the numerator by the denominator in mathematical language)

#### Example: Convert $\frac{2}{5}$ to a decimal.

Divide 2 by 5:  $2 \div 5 = 0.4$

Answer:  $\frac{2}{5} = 0.4$

#### D. FROM DECIMAL TO FRACTION:

remove the decimal by adding the denominator with appropriate number of zeroes and then simplify the fraction.

#### Example: To convert 0.75 to a fraction

Remove the decimal =>  $0.75 = 75/100$

Simplify the fraction =>  $75/100 = 3/4$

Answer:  $\frac{2}{5} = 0.4$

#### E. FROM FRACTION TO PERCENTAGE:

The easiest way is to multiply the fraction by 100 and reduce it to decimal to form and add the "%" sign.

### **Example: Convert $\frac{3}{8}$ to a percentage**

Multiply  $\frac{3}{8}$  by 100: 37.5

Add the "%" sign: 37.5%

Answer:  $\frac{3}{8} = 37.5\%$

### **F. FROM PERCENTAGE TO FRACTION:**

To, first convert to a decimal (divide by 100), then use the steps for converting decimal to fractions (like above).

**ATTENTION PLEASE!!!**

**REMEMBER THAT THE BASE TAKEN IS ALWAYS THE ORIGINAL QUANTITY!!!**

### **SET-1**

#### **Basic Questions**

**Q1.** A person who spends  $66\frac{2}{3}\%$  of his income is able to save Rs.1,200 per month. His monthly expense is?

- A. 1,200      B. 2,400      C. 3,000      D. 3,200

**Q2.** If 80% of A = 50% of B and B = X% of A, then the value of X is?

- A. 400      B. 300      C. 160      D. 150

**Q3.** If x is 80% of y, what percent of x is y?

- A. 75%      B. 80%      C. 100%      D. 125%

**Q4.** If 50% of  $(x-y)$  = 30% of  $(x+y)$  then what percent of x is y?

- A. 33%      B. 30%      C. 25%      D. 23%

**Q5.** A is twice B and B is 200% more than C. By what percent is A more than C?

- A. 50%      B. 30%      C. 500%      D. 600%

**Q6.** Arun got 30% of the maximum marks in an examination and failed by 10 marks. However, Sujith who took the same examination got 40% of the total marks and got 15 marks more than the passing marks. What were the passing marks in the examination?

- A. 90      B. 250      C. 75      D. 85

**Q7.** P is six times as large as Q. The per cent that Q is less than P is?

- A.  $83\frac{1}{3}\%$       B.  $16\frac{2}{3}\%$       C. 90%      D. 60%

**Q8.** Dipin's score is 15% more than that of Rafi. Rafi's score is 10% less than that of Chandar. If the difference between the scores of Dipin and Chandar is 14, what is the score of Rafi?

- A. 180      B. 360      C. 120      D. 480

**Q9.** A student multiplied a number by  $\frac{3}{5}$  instead of  $\frac{5}{3}$ . What is the percentage error in the calculation?

- A. 34%      B. 44%      C. 54%      D.

64%

**Q10.** Ritesh and Co. generated revenue of Rs. 1,250 in 2006. This was 12.5% of its gross revenue. In 2007, the gross revenue grew by Rs. 2,500. What is the percentage increase in the revenue in 2007?



## **Successive Changes**

**Q11.** If the price of article is decreased by 10%, then increased by 10%, the net effect on the price of the item is?

- A. 1%  
B. -1%  
C. 0%  
D. 1.5%

**Q12** A person salary is decreased by steps of 20%, 15% and 10%. What will be the percentage decrease, if the salary is decreased in a single shot?



**Q13.** The price of a shirt is increased by 15% and then reduced by 15%. The final price of the shirt is?

- A. 1.25% increases   B. 1.25% decreases   C. 2.25% increases   D. 2.25% decreases

**Q14.** A's salary increased by 12% over last year and has become Rs. 6720. What will be his next year salary if it increases by 20% over last year's salary?



## **Expenditure and Consumption**

**Q15.** Price of sugar rises by 20%. By how much percent should the consumption of sugar be reduced so that the expenditure does not change?

- A: 20      B: 10      C:  $16\frac{2}{3}$       D: 15

**Q16.** The price of an article is cut by 30%. To restore it to the former value the new price must be increased by?

- A. 30%      B.  $300/13\%$       C.  $300 \cdot 1/13\%$       D.  $300/7\%$

**Q17.** A reduction of 20% in the price of sugar enables a housewife to purchase 6 kg more for Rs. 240. What is original price per kg of sugar?

- A. Rs.10/kg      B. Rs.8/kg      C. Rs.6/kg      D. Rs.5/kg

**Q18.** A 10% hike in the price of rice forces a person to purchase 2 kg less for rupees 110. Find the actual price per kg of rice?

- A. Rs.5/kg      B. Rs.5.5/kg      C. Rs.6/kg      D. None of these

## Venn Diagram and Miscellaneous

**Q19.** 30% of the men are more than 25 years old and 80% of the men are less than or equal to 50 years old. 20% of all men play football. If 20% of the men above the age of 50 play football, what percentage of the football players are less than or equal to 50 years?



**Q20.** A bag contains 600 coins of 25p denomination and 1200 coins of 50p denomination. If 12% of 25p coins and 24% of 50p coins are removed, the percentage of money removed from the bag is nearly?

**Q21.** In an election contested by two parties, Party D secured 12% of the total votes more than Party R. If party R got 132,000 votes and there are no invalid votes, by how many votes did it lose the election?



**Q22.** In a game show, the percentage of participants qualified to the number of participants participated from team A is 60%. In team B, the number of participants participated is 40% more than the participants participated from team A and the number of participants qualified from team B is 40% more than the participants qualified from team A. What is the percentage of participants qualified to the number of participants participated from team B?



**Q23.** A student has to secure 40% marks to pass. He gets 178 marks and fails by 22 marks. What are the maximum marks?



**Q24.** Forty percent of the employees of a company are men, and 75 percent of the men earn more than Rs.25,000 per year. If 45 percent of the company's employees earn more than Rs.25,000 per year, what fraction of the women employed by the company earn Rs.25,000 per year or less?

- A.  $\frac{2}{11}$       B.  $\frac{1}{4}$       C.  $\frac{1}{3}$       D.  $\frac{3}{4}$

**Q25.** In a library, 20% of the books are in Hindi. 50% of the remaining in English and 30% of the remaining are in French. The remaining 6,300 books are in regional languages. What is the total number of books in library?

- A. 19,500                  B. 20,500                  C. 21,500                  D. 22,500

SET-2

1. A district has 64000 inhabitants. If the population increases at the rate of  $2 \frac{1}{2}\%$  per annum, then the number of inhabitants at the end of 3 years will be :

- A. 65380      B. 68921      C. 70987      D. 68721

2. In a competitive examination in State A, 6% candidates got selected from the total appeared candidates. State B had an equal number of candidates appeared and 7% candidates got selected with 80 more candidates got selected than A. What was the number of candidates appeared from each State ?

- A. 4000      B. 8000      C. 12000      D. 16000

3. An agent gets a commission of 2.5% on the sales of cloth. If on a certain day, he gets Rs. 12.50 as commission, the cloth sold through him on that day is worth

- A. 300      B. 500      C. 700      D. 900

4. A man lost half of its initial amount in the gambling after playing 3 rounds. The rule of gambling is that if he wins he will receive Rs. 100, but he has to give 50% of the total amount after each round. Luckily he won all the three rounds. The initial amount with which he had started the gambling was :

- A. 500/3      B. 700/3      C. 300      D. 400

5.The average of a set of whole numbers is 27.2. when the 20% of the elements are eliminated from the set of numbers then the average become 34. The number of elements in the new set of numbers can be  
A.27              B. 35              C. 52              D. 63

6.The cost price of goods with a bankrupt is Rs. 25500 and if the goods had realised in their full value, his creditors would have received 85 paise in the rupee. But  $\frac{2}{5}$  of the goods were sold at 17% and the remainder at 22% below their cost price. How many paise in a rupee was received by the creditors?  
A.72 paise              (b) 68 paise              (c) 55 paise              (d) 52 paise              (e) None of these

7.A report consists of 20 sheets each of 55 lines and each such line consists of 65 characters. This report is reduced onto sheets each of 65 lines such that each line consists of 70 characters. The percentage reduction in number of sheets is closest to:

- (a) 20%              (b) 5%              (c) 30%              (d) 35%

8.The number of votes not cast for the PNC Party increased by 25% in the National General Election over those not cast for it in the previous Assembly Polls, and the PNC Party lost by a majority twice as large as that by which it had won the Assembly Polls. If a total 2,60,000 people voted each time, how many voted for the PNC Party in the previous Assembly Polls?

- (a) 1,10,000              (b) 1,50,000              (c) 1,40,000              (d) 1,20,000

9. $\frac{2}{5}$ th of the voters promise to vote for A and the rest promised to vote for B. Of these, on the last day 15% of the voters went back of their promise to vote for A and 25% of voters went back of their promise to vote for B, and A lost by 200 votes. Then, the total number of voters is:

- (a) 10000              (b) 11000              (c) 9000              (d) 9500

10.A person who has a certain amount with him goes to market. He can buy 50 oranges or 40 mangoes. He retains 10% of the amount for taxi fares and buys 20 mangoes and of the balance, he purchases oranges. Number of oranges he can purchase is:

- (a) 36              (b) 40              (c) 15              (d) 20

11.Forty per cent of the employees of a certain company are men and 75% of the men earn more than Rs. 25,000 per year. If 45% of the company's employees earn more than Rs. 25,000 per year, what fraction of the women employed by the company earn Rs. 25,000 or less per year?

- (a)  $\frac{2}{11}$               (b)  $\frac{1}{4}$               (c)  $\frac{1}{3}$               (d)  $\frac{3}{4}$

12.A Shopkeeper undertakes to supply 2000 tables at Rs. 1725 each. He estimates that if 10% are defective which will be sold at 50%, then the profit will be 15% on his whole outlay. When the tables were supplied, 70% of the tables were found defective. What loss did the Shopkeeper Incur?

- (a) Rs. 607500              (b) Rs. 557500              (c) Rs. 550500              (d) Rs. 80680              (e) None of these

13.Sweta invested Rs. 10,000 in a scheme exactly three years ago. The value of the investment increased by 10% during the first year, increased by 5% during the second year, and decreased by 10% during the third year. What is the value of the investment today?

- (a) Rs. 10,500              (b) Rs. 10,395              (c) Rs. 10,342              (d) Rs. 10,230              (e) None of these

14.In Mumbai, 60% of the registered voters are BJP-supporters and the rest are Congress-supporters. In a mayoral race, if 75% of the registered voters who are BJP-supporters and 20% of the registered voters who are Congress-supporters are expected to vote for candidate X, what percent of the registered voters are expected to vote for candidate X?

- (a) 53%              (b) 55%              (c) 57%              (d) 59%              (e) None of these

15.A pharmaceutical company received Rs. 3 million in royalties on the first Rs. 20 million in sales of the generic equivalent of one of its products and then Rs.9 million in royalties on the next Rs. 108 million in sales. By approximately what percent did the ratio of royalties to sales decrease from the first Rs. 20 million in sales to the next Rs. 108 million in sales?

- (a) 10.27%      (b) 20.63%      (c) 38.6%      (d) 44.44%      (e) None of these

16. In Jamshedpur, only two newspapers Dainik Jagran and Prabhat Khabar are published. It is known that 25% of the city population reads Dainik Jagran and 20% reads Prabhat Khabar while 8% reads both the newspapers. It is also known that 30% of those who read Dainik Jagran but not Prabhat Khabar look into advertisement and 40% of those who read Prabhat Khabar but not Dainik Jagran look into advertisement while 50% of those who read both the newspapers look into advertisements. What is the percentage of the population who read an advertisement?

- (a) 13.9%      (b) 15.8%      (c) 17.2%      (d) 21.4%      (e) None of these

17. In my office, at least 50% of the people read an e-newspaper. Among those who read an e-newspaper, at most 25% read more than one e-paper. Only one of the following statements follows from the statements given below. Which one is it?

- (a) At the most 37.5% read exactly one e-paper.  
(b) At least 37.5% read exactly one e-paper.  
(c) At the most 19.8% read exactly one e-paper.  
(d) At least 19.8% read exactly one e-paper.  
(e) none of these

18. In Convent Model School, 60% of the students are boys. In an aptitude test, 80% of the girls scored more than 40 marks (out of a maximum possible 150 marks). If 60% of the total students scored more than 40 marks in the same test, find the fraction of the boys who scored 40 marks or less?

- (a)  $\frac{3}{5}$       (b)  $\frac{6}{7}$       (c)  $\frac{5}{7}$       (d)  $\frac{7}{15}$       (e) None of these

19. In a recent opinion poll held during April, 60% of the respondents favoured India Against Corruption (IAC) while the rest favoured Indian political parties (IPP). It was found in May polls that 10% of IAC supporters switched their preference to IPP, while the same percentage of IPP's supporters also switched their preference to IAC. What percentage of the electorate should now switch their preference from IAC to IPP so that they are at par?

- (a) 14%      (b) 19%      (c) 24%      (d) 29%      (e) None of these

20. Suman's project report on 'Development with dignity', consists of 25 pages each of 60 lines with 75 characters on each line. In case the number of lines is reduced to 55 but the number of characters is increased to 90 per lines, what is the percentage change in the number of pages. (Assume the number of pages to be a whole number.)

- (a) -8% (b) +8% (c) +12% (d) 80% (e) None of these

### **SET-3**

1. The cost of packaging of the mangoes is 40% the cost of fresh mangoes themselves. The cost of mangoes increased by 30% but the cost of packaging decreases by 50%, then the percentage change of the cost of packed mangoes, if the cost of packed mangoes is equal to the sum of the cost of fresh mangoes and cost of packaging:

- (a) 14.17%      (b) 7.14%      (c) 6.66%      (d) none of these      (Hirepro)

2. My salary is Rs 12,345, per month. The salary of my brother is 10% greater than that of mine. The salary of my only sister is 9.09% greater than my only brother. The salary of my wife is 56 (12/ 23) % less than the total salary of my brother and sister together, then the salary of my wife is:

- (a) greater than my sister's salary      (b) 33 (11/ 23) % less than my sister's salary      (DXC)  
(c) equal to my salary      (d) 44 (11/ 23) % greater than my own salary

3. The monthly salary of Shahid and Karina together is \$ 28,000. The salary of Shahid and Karina is increased by 25% and 12.5% respectively then the new salary of Karina becomes 120% of the new salary of Shahid. The new (or increased) salary of Shahid is:

- (a) \$ 15,000      (b) \$ 18,000      (c) \$ 14,000      (d) \$ 16,000      (DXC)

4. In a class of MBA students 16.66% students are from science background and 12.5% students are from

commerce background and 6.66% students from arts background and rest are from Engineering background. The minimum possible students of engineering background are:

- (a) 45      (b) 77      (c) 100      (d) 120      (Hacker Rank)

5. A book consists of 30 pages, 25 lines on each page and 35 characters on each line. If this content is written in another note book consisting of 30 lines and 28 characters per line, then the required no. of pages will be how much per cent greater than the previous pages?

- (a) 4.16%      (b) 5%      (c) 6.66%      (d) none of these      (E-litmus)

6. A salesman gets commission on total sales at 9%. If the sale is exceeded Rs 10,000 he gets an additional commission as bonus of 3% on the excess of sales over Rs 10,000. If he gets total commission of Rs 1380, then the bonus he received is:

- (a) Rs 180      (b) Rs 120      (c) Rs 480      (d) Data insufficient      (Hirepro)

7. The average earning of each member of the Ambani family is 20% less than the average earning of each member of the Sahara family and the total earning of Ambani's family is 20% more than the total earning of Sahara's family. The no. of family members in the Sahara is what per cent of the no. of family members of Ambani?

- (a) 25%      (b) 20%      (c) 66.66%      (d) None of these      (Cocubes)

8. From 2000 onwards, till 2003 the price of computers increased every year by 10%. After that due to government subsidy the price of computers decreases every year by 10%. The price of a computer in 2006 will be approx. how much per cent less than the price in 2000 if the same pattern of price is continued:

- (a) 2      (b) 3      (c) 4      (d) none of these      (DXC)

9. In a test there are total n questions. Bhanu answers 20 out of 25 questions correctly in the first section. In the second section he answers 60% question correct and thus his total score is 66.66% in the test. Given that all the questions carry equal marks, without any negative marking. The total no. of question in the test is:

- (a) 50      (b) 60      (c) 75      (d) 100      (Hacker Rank)

10. Tax is levied on the 60% of the cultivated land. The revenue department collected total ` 3,84,000 through the tax from the village of Sukhiya. Sukhiya, a very rich farmer, paid only ` 480 as tax. The percentage of total land of Sukhiya over the total taxable land of the village is:

- (a) 0.15%      (b) 15%      (c) 0.125%      (d) none of these      (Hirepro)

11. In the previous government, party Q was in the opposition. Now increasing the seats by 33.33% Q is the ruling party and thus party Q enjoys twice the majority than that of party P in the previous government. If there were only two parties P and Q and the fix no. of seats be 500 in the parliament, then the no. of seats of the Q in the new government is:

- (a) 225      (b) 200      (c) 275      (d) 300      (Cocubes)

12. Three candidates A B, and C contested an election. Out of the total votes on a voter list 25% did not vote and 6.66% votes polled were invalid. C got 2450 valid votes, which were 40% more than that of B. If A got only 40% of the total votes, then who is the winner?

- (a) A      (b) B      (c) C      (d) can't be determined      (E-litmus)

13. The cost of a car is 400% greater than the cost of a bike. If there is an increase in the cost of the car is 15% and that of bike is 20%. Then the total increase in the cost of the 5 cars and 10 bikes is:

- (a) 17.5%      (b) 16 (3/7) %      (c) 18.5%      (d) 18.25%      (DXC)

14. Hariharan goes to a shop to buy an FM radio costing Rs 1404 including sales tax at 8%. He asks the shopkeeper to reduce the price of radio so that he can save the amount equal to the sales tax. The reduction of the price of the radio is:

- (a) Rs 108      (b) Rs 104      (c) Rs 112.32      (d) none of these      (Hirepro)

15. 80% of a smaller number is 4 less than 40% of a larger number. The larger number is 85 greater than the smaller one. The sum of these two numbers is:

- (a) 325      (b) 425      (c) 235      (d) 500      (Mercer Mettl)

#### SET- 1

1. B	2. C	3. D	4. C	5. A
6. D	7. A	8. B	9. D	10. C
11. B	12. B	13. D	14. D	15. C
16. D	17. A	18. A	19. C	20. A

21. C	22. C	23. A	24. D	25. D
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SET-2

1.B	2.B	3.B	4.B	5.C
6.B	7.A	8.C	9.A	10.D
11.D	12.A	13.B	14.A	15.D
16.A	17.B	18.E	19.A	20.A

SET-3

1. B	2.C	3.A	4.B	5.C
6.B	7.C	8.B	9.C	10.D
11.D	12.A	13.B	14.B	15.C

## INCOME BASED QUESTIONS

**Cost Price:** C.P. is the price at which one buys anything.

**Selling Price:** S.P. is the price at which one sells anything.

**Profit/Loss:** This is the difference between the selling price and the cost price. If the difference is positive it is called the profit and if negative it is called as loss.

**Profit/Loss %:** This is the profit/loss as a percentage of the C.P.

**Margin:** Normally is in % terms only. This is the profit as a percentage of S.P.

**Marked Price:** This is the price of the product as displayed on the label.

**Discount:** This is the reduction given on the marked price before selling it to a customer. If the trader wants to make a loss he can offer a discount on the cost price as well

**Mark-up:** This is the increment on the cost price before being sold to a customer.

It is also known as list price or Tag price which is written on the item. The markup price written is always greater than the actual C.P of the item and the percentage rise in the mark-up price is on the C.P of the item.  
Percentage increase in the Mark-up price =  $(MP - CP) / CP \times 100$

Profit and Loss Terminologies	Meaning	Formulas
Profit or Gain	The selling price of the object > than its cost price	$Profit = Selling\ price(SP) - Cost\ Price(CP)$
Loss	The cost price of the object > than its selling price	$Loss = Cost\ Price(CP) - Selling\ Price(SP)$
Selling Price	The piece for which a commodity is sold is said to be the selling price for that particular item denoted as SP.	$SP = \left( \frac{100 + Profit\%}{100} \right) \times CP$ OR $SP = \left( \frac{100 - Loss\%}{100} \right) \times CP$
Cost Price	The expense at which an object is bought is termed as the cost price for that object, abbreviated as C.P.	$CP = \left( \frac{100}{100 + Profit\%} \right) \times SP$ OR $CP = \left( \frac{100}{100 - Loss\%} \right) \times SP$
Discount	To manage the competitors in the industry and promote the sale of goods, vendors offer discounts to consumers.	$Discount = MP - SP$ (Marked Price – Selling Price)

Profit and Loss Terminologies	Formulas in Percentage
Profit percentage(%)	$\text{Profit} = (\text{SP}) - (\text{CP})$ $\text{Profit percentage\%} = \left( \frac{\text{Profit}}{\text{Cost Price}} \right) \times 100$
Loss percentage(%)	$\text{Loss} = (\text{CP}) - (\text{SP})$ $\text{Loss percentage\%} = \left( \frac{\text{Loss}}{\text{Cost Price}} \right) \times 100$
Discount (%)	$\left( \frac{\text{Discount}}{\text{Marked Price}} \right) \times 100$
Markup (%)	$\left( \frac{\text{markup}}{\text{cost price}} \right) \times 100$ Where Markup = Selling Price – Cost

## SET-1

### Profit & Loss Percentage

**Q1.** If the cost price is 96% of selling price, then what is the profit %?

- A. 3.13      B. 2.45      C. 2.34      D. 4.17

**Q2.** Monika purchased a pressure cooker at 9/10th of its selling price and sold it at 8% more than its S.P. Find her gain percent?

- A. 20%      B. 10%      C. 15%      D. 30%

**Q3.** A vendor bought bananas at 6 for Rs.10 and sold them at 4 for Rs.6. What is the gain/ loss percent?

- A. 12% profit      B. 20% loss      C. 10% loss      D. 15% profit

**Q4.** A vendor bought toffees at 6 for a rupee. How many for a rupee must he sell to gain 20%?

- A. 10      B. 5      C. 15      D. 22

**Q5.** A shopkeeper buys scientific calculators in bulk for Rs.15 each. He sells them for Rs. 40 each. Calculate the profit on each calculator as percentage of the cost price.

- A. 166.67%      B. 150%      C. 66.67%      D. 123%

**Q6.** If the cost price of a book is Rs. 150 and selling price is 137.50, then calculate the percentage loss on the book?

- A. 12.33%      B. 8.33%      C. 10%      D. 15%

**Q7.** What is the loss percent if a man loses Rs.10 on selling an article for Rs.100?

- A. 120/13      B. 111/12      C. 100/11      D. 120/11

**Q8.** If selling price is doubled, the profit triples. Find the profit percent?

- A. 300%      B. 200%      C. 150%      D. 100%

### Cost Price in Terms of Selling Price

**Q9.** The cost price of 21 articles is equal to selling price of 18 articles. Find gain or loss %?

- A. 50/3% gain      B. 60/3% gain      C. 70/3% loss      D. 80/3% loss

**Q10.** A man sells 320 mangoes at the cost price of 400 mangoes. His gain percent is?  
A. 25%      B. 30%      C. 35%      D. 15%

**Q11.** If the cost of 30 articles is equal to the selling of 20 articles, find the profit percent?  
A. 40      B. 50      C. 45      D. 55

#### **Error in Weight and Dishonest Dealer**

**Q12.** A dishonest dealer professes to sell his goods at cost price but uses a weight of 900 grams for a kg weight. Find his gain percent.

- A. 11.11      B. 33.33      C. 12      D. Cannot be determined

**Q13.** A shopkeeper claims that he is selling sugar at Rs 23/kg which cost him Rs 25/kg but he is giving 800g instead of 1000gm. What is his percentage profit or loss?

- A. 15% profit      B. 15% loss      C. no profit no loss      D. Cannot be determined

**Q14.** Lalit marks up his goods by 40% and gives a discount of 10%. Apart from this, he uses a faulty balance also, which reads 1000 gm for 800 gm. What is his net profit percentage?

- A. 57.5% loss      B. 57.5% profit      C. 60% profit      D. Cannot be determined

**Q15.** A shopkeeper sells rice to a customer, using false weights and gains 100/8 % on his cost. What weight has he substituted for a kilogram?

- A. 750 gms      B. 800 gms      C. 880 gms      D. 888.89 gms

#### **When SP is Same for Two Items**

**Q16.** A man sells 2 flats for Rs 675958 each. On one he gains 16% while on the other his losses 16%. How much does his gain/loss in the whole transaction?

- A. 3.56% loss      B. 3.56% gain      C. 2.56% gain      D. 2.56% loss

**Q17.** If a shopkeeper sells two items at the same price. If he sells one of them at a profit of 10% and the other at a loss of 10%, find his profit/loss percentage?

- A. 1% profit      B. 1% loss      C. No profit no loss      D. None of these

#### **Single and Successive Discounts**

**Q18.** A shopkeeper marks the price of the article at Rs.80. Find the cost if after allowing a discount of 10%, he still gains 20% on the cost price?

- A. 60      B. 40      C. 29      D. 39

**Q19.** An article was sold for Rs. Y after giving a discount of x%. Then, its list price is\_\_?

- A.  $100y/(100-x)$       B.  $(100-x)/y$       C.  $(100-x)/90y$       D.  $x/(100-y)$

**Q20.** Find the single discount equivalent to successive discounts of 40% and 20%.

- A. 52%      B. 45%      C. 46%      D. 48%

**Q21.** An article is listed at Rs. 65. A customer bought this article for Rs. 56.16 and got two successive discounts of which the first one is 10%. What was the other rate of

discount of this scheme that was allowed by the shopkeeper?

- A. 3%                      B. 4%                      C. 6%                      D. 2%

**Q22.** Tarun got 30% concession on the labelled price of an article and sold it for Rs. 8750 with 25% profit on the price he bought. What was the labelled price?

- A. 10000                      B. 12000                      C. 13000                      D. 14000

### **Goods Passing Through Successive Hands**

**Q23.** Peter bought an item at 20% discount on its original price. He sold it with 40% increase on the price he bought it. The new sale price is by what percentage more than the original price?

- A. 12%                      B. 13%                      C. 15%                      D. 17%

**Q24.** A man bought an article and sold it at a gain of 5 %. If he had bought it at 5% less and sold it for Re 1 less, he would have made a profit of 10%. The C.P. of the article was?

- A. Rs. 100                      B. Rs. 150                      C. Rs. 200                      D. Rs. 250

**Q25.** A trader sold an article at a loss of 5% but when he increased the selling price by Rs. 65 he gained 3.33% on the cost price. If he sells the same article at Rs. 936, what is the profit percentage?

- A. 15%                      B. 16.66 %                      C. 20 %                      D. Data  
Insufficient

### **SET-2**

1. A person buys 860 articles at Rs. 1900 due to some reason  $\frac{2}{11}$  part of total articles be destroyed, he sold 66.66% of all articles at 18.18% profit. At what profit or loss % he should sell remaining articles, so that finally he will get neither profit nor loss?

- a)35% loss                      b)40% profit                      c)20% profit                      d)37.5% profit

2. Person buys 1365 articles at Rs. 24150. if he sells 637 articles at 30% profit. 37.5% of remaining article he sells at x% loss and remaining articles sells at 20% profit. the total SP of all articles is Rs. 28175, then find the value x?

- a)16.66                      b)30                      c)25                      d)20

3. CP of 15 articles is equal to SP of 12 articles. While the discount on 8 articles is equal to the profit earn on 6 articles. Find the difference between % of profit and discount?

- a)22(1/23)%                      b)11(22/23)%                      c)13(12/23)%                      d)12.95%

4. CP of 12 oranges is equal to the SP of 9 oranges and the discount on 10 oranges is equal to the profit on 5 oranges. what is the % difference between the profit % and discount%?

- a)20                      b)22.22                      c)16.66                      d)15

5.. CP of 3 Motorcycle is same. One is sold at a profit of 15% and the other for Rs 19550 more than the 1st and the 3rd for Rs 12650 more than the 2nd. If the net profit is 30%. Find the SP of 2nd motorcycle.

- a)151800                      b)115000                      c)132250                      d)150000

6. Two tables were purchased at the same price. first was sold at a profit of 46.66% and the second was sold at a price, which is Rs. 5370 less than the price at which the first one was sold. If the overall profit earned by selling both the tables was 9.375%, what is the cost price of one table?

- a)Rs.7200                      b)Rs.8400                      c)Rs.6000                      d)Rs.9600

7. SP of an article is Rs 272. If value of its profit% is 3 times of CP, then find the CP?

- a)60                      b)80                      c)70                      d)90

8. SP of a book is Rs168. If value of its profit % is 3 times of CP then the CP?  
a)70              b)40              c)90              d)60

9. A bought certain no. of items at 1 for Rs3. He sold all the items to B at 4 for Rs15. Later on, B sold all the items back to A at 5 for Rs12.if A got a profit of 135 in whole transaction, then find the total CP of all the items for A?  
a)Rs..400              b)Rs.240              c)Rs.450              d)Rs.300

10. A man purchases some pencils at 6 for Rs20 and the same quantity at 10 for Rs30. If he sells at the all pencils at 6 for Rs25 then find his profit % on SP?  
a)20%              b)21(1/19) %              c)24%              d)25%

11. Profit on selling 10 candles equals SP of 3 bulbs while loss on selling 10 bulb is equals SP of 4 candles. Also profit % equals to the loss % and cost of candles are half of the cost of bulb. What is the ratio of SP of candle to the SP of bulb?

a)5:4              b)3:2              c)4:5              d)3:4

12. A and B purchased one camera each at the same prices. Later on, C purchased both cameras at equal prices from A and B. But the profit % of A was P while the same of B was Q since B calculated his profit on the SP. Thus  $Q=41(2/3) \%$  of P. If C sells one of the cameras to D at P% profit then what is the CP for D, while C purchased each of the camera at Rs240?

a)Rs676              b)Rs500              c)Rs576              d)None

13. A shopkeeper professes to sell his goods at cost price but uses a weight of 800 gm instead of kilogram weight. Thus, he makes a profit of :  
A. 20%              B. 16              C. 25%              D. None of these

14. A shopkeeper cheats to the extent of 10% while buying as well as selling, by using false weights. His total gain if he is claiming to sell these at cost price :

A. 10%              B. 11.11%              C. 20%              D. 22.22%

15. A grocer sells rice at a profit of 10% and uses weights which are 20% less than the market weight. The total gain earned by him will be :

A. 30%              B. 35%              C. 37.5%              D. None of these

16. A dishonest dealer pretends to sell at the cost price but earns a profit of 25% by under weighing. What weight must he be using for 1 kg?

a)750 gm              b)800 gm              c)500 gm              d)875 gm

17. If SP of a book is 6 times to the discount offered and discount % is equal to the profit %. then find the ratio of discount offered to CP?

a)8:21              b)4:21              c)3:21              d)4:42

18. A person purchased 3500 books for Rs350000. He gives 500 books free while selling. He still gives 25% discount on MP and he further give one book free on every 29 books sold. Find profit or loss if the MP of one book is 160?

a)Rs.3000loss              b) Rs.2000 profit              c) Rs.2000 loss              d) Rs.1000 profit

19. If Fatima sells 60 identical toys at a 40% discount on the printed price, then she makes 20% profit. Ten of these toys are destroyed in fire. While selling the rest, how much discount should be given on the printed price so that she can make the same amount of profit?

a)30%              b)25%              c)24%              d)28%

20. An auto driver earns profits of 20% in every trip when he carries 3 passengers and the price of petrol is Rs30/L. find the % of profit for the same journey if he carries 4 passengers and the revenue per passengers is the same in both cases and the price of petrol is now reduced to 24Rs/L?  
a)80%      b)100%      c)120%      d)75%

### **SET-3**

**Q.1:** Minu sold her watch for 540 and incurred 40% loss. If she sells the watch and incurs loss of 15% then what would be the selling price? (**Accenture**)

- (A) 900      (B) 756      (C) 657      (D) 567      (E)  
None of these

**Q.2:** Dinesh purchased some lemons. He purchased 3 lemons for 2. He sold all the lemons and earned 25% profit. At what rate did he sell all the lemons? (**Bosch**)

- (A) 4 for 3      (B) 5 for 4      (C) 6 for 5      (D) 7 for 8      (E) None of these

**Q.3:** Ratish purchased some lemons. He sold all the lemons. He sold 8 lemons for 7 and earned 40% profit. In order to obtain 50%, profit what should be the selling rate? (**WeCP**)

- (A) 15 for 13      (B) 15 for 16      (C) 16 for 15      (D) 17 for 16      (E) None of these

**Q.4:** A person buys 100 toffees at 10 a rupee and 200 toffees at 5 a rupee. He mixes them together and sells at 4 a rupee. Find his per cent profit. (**Cocubes**)

- (A) 20%      (B) 25%      (C) 40%      (D) 50%      (E) None of these

**Q.5:** The profit earned by selling an article for 832 is equal to the loss incurred when the same article is sold for 448. What should be the sale price of the article for making 50 per cent profit? (**First Naukri**)

- (A) 960      (B) 1060      (C) 1200      (D) 920      (E) None of these

**Q.6:** The profit earned by selling an article for 900 is double the loss incurred when the same article is sold for 600. What should be the sale price of the article for making 40 per cent profit? (**Accenture**)

- (A) 980      (B) 1080      (C) 1200      (D) 700      (E) None of these

**Q.7:** A dishonest fruit vendor professes to sell his goods at a profit of 10% but he uses a weight of 16 gram for 20 gram. Find his gain per cent. (**Infosys**)

- (A) 14%      (B) 24%      (C) 35%      (D) 37.5%      (E) None of these

**Q.8:** A cloth dealer professes to lose 20% on a certain garment, but he uses a meter having a length of 90 cm only and charges for the meter. Find his gain or loss per cent. (**HCL**)

- (A) 11(1/9) % gain      (B) 11(1/9) % loss

**Q.9:** A tradesman marks his goods 20% above the cost price. He offers 10% discount to customers.

What is his gain in per cent? (**Hirepro**)

(A) 10% gain    (B) 8% gain    (C) 12% gain    (D) 32% gain    (E) None of these

**Q.10:** Rishav marks his goods 30% above the cost price but allows 30% discount for cash payment. If he sells the article for 2730, find his cost price. (Accenture)

(A) 3500      (B) 2800      (C) 2950      (D) 3000      (E) None of these

**Q.11:** A dealer wants to earn 20% profit on an article after offering 25% discount to the customer. If the cost price of an item is 300, then the mark price (label price) of the article would be— (**Aricent**)

None of these

**Q.12:** If a discount of 20% is given on the marked price of an article, the shopkeeper gets a profit of 60%. Find his per cent profit if he offers a discount of 25% on the same article. (**Bosch**)

(A) 20%      (B) 30%      (C) 50%      (D) 75%      (E) None of these

**Q.13:** If a discount of 30% is given on the marked price of an article, the shopkeeper gets a profit of 5%. Find his per cent loss if he offers a discount of 50% on the same article. **(DXC)**

(A) 20%      (B) 25%      (C) 30%      (D) 15%      (E) None of these

**Q.14:** What will be the percentage profit after selling an article at label price if there is a loss of 20% when the article is sold at one third of the label price? (**Elitmus**)

(A) 20%      (B) 80%      (C) 75%      (D) 60%      (E) None of these

**Q.15:** By selling 75 meters of cloth, I gain the selling price of 25 meters. Find the gain per cent. (L&T)

(A) 33(1/3) %    (B) 50%                (C) 25%                (D) 45%                (E) None of these

SET-1

1. D	2. A	3. C	4. B	5. A
6. B	7. C	8. D	9. A	10. A
11. B	12. A	13. A	14. B	15. D
16. D	17. B	18. A	19. A	20. A
21. B	22. A	23. A	24. C	25. C

SET-2

1. B	2. D	3. B	4. B	5. A
6. A	7. B	8. D	9. D	10. C
11. B	12. C	13. C	14. D	15. C
16. B	17. B	18. C	19. D	20. B

SET-3

1. E	2. C	3. C	4. D	5. A
6. A	7. D	8. B	9. B	10. D
11. A	12. C	13. B	14. E	15. B

## **INTEREST BASED PROBLEMS**

### **Simple Interest**

If the interest on a sum borrowed for certain period is calculated uniformly, it is called simple interest (SI). Simple interest is a quick method of calculating the interest charge on a loan.

Principal: The amount borrowed or invested.

Loan period or duration: Is the time that the principal amount is either borrowed or invested. It is usually given in years, but in some cases, it may be quoted in months or even days.

Interest: Is the extra money paid by the borrower to the owner (lender) as a form of compensation for the use of the money borrowed.

The statement "rate of interest 10% per annum" means that the interest for one year on a sum of Rs.100 is

Rs.10. If not stated explicitly, rate of interest is assumed to be for one year.

$$\text{SIMPLE INTEREST} = \text{PRINCIPAL} * \text{RATE OF INTEREST} * \text{TIME} / 100$$

Example: Calculate the simple interest on Rs. 1000 at the rate of 5% per annum for a time period of 2 years.

Solution: Principal=1000

Rate of interest=5% p.a. Time= 2 years

$$\text{SIMPLE INTEREST} = P * R * T / 100 = 1000 * 5 * 2 = \text{Rs.100}$$

### **Compound Interest**

Compound Interest is the interest calculated on a sum of money which includes principal and interest calculated for the previous year.

Example: Calculate the interest if compounded annually for an amount of Rs. 100 for a time period of 3 years at the rate of 10 % per annum.

Solution: Here, Principal =Rs. 100 Time Period=3 years

Rate of interest =10% per annum

**compounding is regular addition of interest**

<b>100</b> interest for 1st year at 10% p.a. is 10	<b>110</b> interest for 2nd year at 10% p.a. is 11	<b>121</b> interest for 3rd year at 10% p.a. is 12.1	<b>133.31</b>
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Amount 110 is the principal for the 2nd year, amount 121 is the principal for the 3rd year, and amount 133.1 is the principal for the 4th year.

Under compound interest, Amount is found by the formula given below:

### **SET-1**

#### **Simple Interest**

Q1. A sum of money at simple interest amounts to Rs. 815 in 3 years and to Rs. 945 in 5 years. The sum is?

- A. 650      B. 690      C. 620      D. 700

Q2. How much time will it take for an amount of Rs. 450 to yield Rs. 81 as interest at 4.5% per annum of simple interest?

- A. 3.5 years      B. 4 years      C. 4.5 years      D. 5 years

Q3. A sum of Rs. 12,500 amounts to Rs. 15,500 in 4 years at the rate of simple interest. What is the rate of interest?

- A. 3%      B. 4%      C. 5%      D. 6%

Q4. What will be the ratio of simple interest earned by certain amount at the same rate of interest for 6 years and that for 9 years?

- A. 1: 3      B. 1: 4      C. 2: 3      D. Data inadequate

Q5. A person borrows Rs. 5000 for 2 years at 4% p.a. simple interest. He immediately lends it to another person at  $6\frac{1}{4}\%$  per annum for 2 years. Find his gain in the transaction per year?

- A. Rs. 112.50      B. Rs. 125      C. Rs. 150      D. Rs. 167.50

Q6. A father left a will of Rs.35 lakhs between his two daughters aged 8.5 and 16 such that they may get equal amounts when each of them reach the age of 21 years. The original amount of Rs.35 lakhs has been instructed to be invested at 10% p.a. simple interest. How much did the elder daughter get at the time of the will?

- A. 17.5 lakhs      B. 21 lakhs      C. 15 lakhs      D. 20 lakhs

Q7. At what rate percent per annum will a sum of money double in 8 years?

- A. 12.5%      B. 13.5%      C. 11.5%      D. 14.5%

Q8. A sum of Rs. 725 is lent in the beginning of a year at a certain rate of interest. After 8 months, a sum of Rs.362.50 more is lent but at the rate twice the former. At the end of the year, Rs. 33.50 is earned as interest from both the loans. What was the original rate of interest?

- A. 3.46%      B. 5%      C. 4.5%      D. 6%

#### **Compound Interest**

Q9. The compound interest on Rs. 30,000 at 7% per annum is Rs. 4347. The period (in years) is?

- A. 2      B. 2.5      C. 3      D. 4

Q10. The Compound interest on Rs. 20,480 at  $6\frac{1}{4}\%$  per annum for 2 years 73 days is?

- A. Rs. 2929      B. Rs. 2219      C. Rs. 3021      D. Rs. 3049

Q11. A man invests Rs.5000 for 3 years at 5% p.a. compound interest reckoned yearly. Income

tax at the rate of 20% on the interest earned is deducted at the end of each year. Find the amount at the end of the third year?

- A. Rs. 5624.32      B. Rs. 5423      C. Rs. 5634      D. Rs. 5976

Q12. The population of a town was 3600 three years back. It is 4800 right now. What will be the population three years down the line, if the rate of growth of population has been constant over the years and has been compounding annually?

- A. Rs. 600      B. Rs. 6400      C. Rs. 6500      D. Rs. 6600

Q13. A tree increases annually by  $\frac{1}{5}$  th of its height. If its height today is 50 cm, what will be the height after 2 years?

- A. 64 cm      B. 72 cm      C. 66 cm      D. 84 cm

Q14. The compound interest on Rs. 50,000 at 10% per annum is Rs. 16550. The period (in years) is?

- A. 1      B. 2      C. 3      D. 3.5

Q15. A sum amounts to Rs. 882 in 2 years at 5% compound interest. The sum is?

- A. Rs. 800      B. Rs. 822      C. Rs. 840      D. Rs. 816

Q16. What annual payment will discharge a debt of Rs. 1025 due in 2 years at the rate of 5% compound interest?

- A. Rs. 560      B. Rs. 560.75      C. Rs. 551.25      D. Rs. 550

Q17. The present worth of Rs. 242 due in 2 years at 10% per annum compound interest is?

- A. Rs. 180      B. Rs. 240      C. Rs. 220      D. Rs. 200

Q18. If in a certain number of years Rs. 10000 amounts to Rs. 160000 at compound interest, in half that time Rs. 10000 will amount to?

- A. Rs. 50000      B. Rs. 40000      C. Rs. 80000      D. Rs. 60000

Q19. Find the ratio of S.I. & C.I. on a certain sum of money at 5% per annum for 2 years

- (a) 50 : 51      (b) 40 : 41      (c) 30 : 31      (d) 45 : 46

Q.20 Find the difference between C.I. and S.I. on a sum of Rs. 15000 at 10% for 3 years.

- A. Rs. 440      B. Rs. 465      C. Rs. 455      D. Rs. 485

21. Find the difference between C.I and S.I. for three years. If the principal is 15625 and rate of interest compounded annually is 12%.

- A. Rs. 640      B. Rs. 702      C. Rs. 720      D. Rs. 625

22. Find the rate of interest if the difference between C.I and S.I on ₹ 8000 compounded annually for 2 years is ₹ 20.

- A. 5%      B. 9%      C. 10%      D. 11%

23. A sum of money at compound interest doubles itself in 15 years, It will become eight times of itself in:

- A. 60 yrs      B. 45 yrs      C. 100 yrs      D. 80 yrs

24. A sum of money at compound interest triples itself in 6 years, It will become 27 times of itself in:

- A. 18 yrs      B. 54 yrs      C. 63 yrs      D. 27 yrs

25. Giri invested Rs.10000 at rate of interest 20% per annum. The interest was compounded yearly for the first two years and in the third year it was compounded half yearly. What will be the total interest earned at the end of the third year?

- A. Rs.7224      B.Rs. 7324      C.Rs.7424      D.Rs.7524

### **SET-2**

1. A man deposited Rs.1850 in a bank at 7% per annum and Rs.2150 in another bank at 9% per annum. Find the rate of interest for the whole sum:  
a)8.133%      b)8.075%      c)8.25%      d)8.375%
2. Rs. 9600 is invested in two parts, one part at rate of 11% per annum and remaining part at 15% simple interest. If the simple interest received after four years is Rs.5088. Then find the difference between both parts?  
a) Rs.1200      b) Rs.1000      c)Rs.1600      d)Rs.800
3. A man borrowed a total amount of Rs.45000, one part of it at rate of 10%per annum simple interest and remaining part on 12% per annum. If at the end of three years, he paid in all Rs.59940. To settle the loan amount. What was the amount borrowed at 12% per annum?  
a)Rs.21000      b)Rs.18000      c)Rs.24000      d)Rs.27000
4. A person invested a sum of Rs. 90000 in 3 Schemes A, B & C at the rate of 16%, 19% & 31% per annum respectively. The amount invested in scheme C is 50% more than the amount invested in scheme A. Find the total amount invested in scheme B, if he gets a total amount of Rs.150300 in three years.  
a)30000      b)40000      c)50000      d)35000
5. The rate of simple interest for first 3 years is 8%, for next 4 years it is 8.5% and the period beyond 7 years it is 7.5% per annum. If the total simple interest at the end of 13 years is Rs.9270. Find the initial investment.  
a)Rs.8100      b)Rs.9600      c)Rs.9000      d)Rs.10000
6. The rate of S.I. on a certain sum of money is 6.5% per annum for first four years, 9% per annum for next 7 years, and 10% per annum for the period beyond 11 years. If the Amount received at the end of 19 years is Rs.43040. Find the sum.  
a)14000      b)16000`      c)20000      d)18000
7. A person deposited certain money at the starting of each year, if rate of interest is 13% per annum. At the end of 3<sup>rd</sup> year, the total amount is Rs.24948. Then find how much money he deposited each year.  
a)Rs.6400      b)Rs.6600      c)Rs.6200      d)Rs.6300
8. A person invested five-twelfth of total principal at 9% per annum, 2/9 part at 11% per annum and remaining part at 16% per annum simple interest. If the total simple interest in one year is Rs.38790. Find the total investment.  
a)Rs.324000      b)Rs.288000      c)Rs.360000      d)Rs.252000
9. If a man receives on 1/4th of his capital 7.2% simple interest, 5.3% of the remaining 2/5th capital and on the remaining capital 5.8%. The total amount received by man after three years is Rs.82600. Then find total principal?  
a)Rs.65000      b)Rs.60000      c)Rs.72000      d)Rs.70000
10. A person deposited some money in bank. Bank gives  $6\left(\frac{2}{3}\right)\%$  per annum simple interest. After 4

years he withdraws Rs.2550. Bank gives 12.5% per annum simple interest on remaining amount. At the end of fifth year, total amount is Rs.15300. Find the initial investment.

- |             |             |              |             |
|-------------|-------------|--------------|-------------|
| (a)Rs.12750 | (b)Rs.15750 | (c) Rs.11250 | (d)Rs.12000 |
|-------------|-------------|--------------|-------------|

11. A person deposited some money in a scheme. Scheme gives 6.25% per annum simple interest. After 5 years he invests Rs. 1650 more. After that he receives 9(1/11)% per annum simple interest for three years, now he withdraws rupees Rs.800 from his amount and on remaining amount Scheme gives 5% simple interest for next two years. At the end of tenth year, he received total amount of Rs.17600. Find the initial investment.

a)Rs.8800      b)Rs.8400      c)Rs.8000      d)Rs.10400

12. Prabhat took a certain amount as a loan from bank at the rate of 8% Simple interest per annum and gave the same amount to Ashish as a loan at the rate of 12% p.a. on S.I. If at the end of 12 yrs, he made a profit of Rs. 320 in the deal, What was the original amount?

(a)Rs. 500      (b) Rs. 600      (c) Rs. 666.67      (d) Rs. 750.27

13. A certain sum of money is invested in two parts in such a way that the S.I. from first part at rate of 16% per annum for 18 years is equal to the simple interest on second part at the rate of 22% per annum for 15 yrs. Find the sum of money, if difference between both investments is Rs.4200.

a)56650      b)67800      c)72100      d)61800

14. Rs.11400 is invested in three parts in such a way that the rate of interest is 4%, 5 (1/4)% & 7(1/2)% per annum for 12years, 10 years and 8 year respectively. If simple interest on each part is equal. Find the difference between maximum and minimum invested parts?

a)Rs.840      b)Rs.360      c)Rs.460      d)Rs.920

15. A sum of Rs. 7,930 is divided into three parts and given on loan at 5% simple interest to A. B and C for 2, 3 and 4 years respectively. If the amounts of all three are equal after their respective periods of loan, then A received a loan of

(a) Rs. 3,050      (b) Rs. 2,760      (c) Rs. 2,750      (d) Rs. 2,800

16. Rs. 18210 is invested in three Schemes-A, B and C for 5 years, 8 years and 4 years respectively. If these three Schemes give a simple interest of 12%, 10% and 12.5% respectively. After completion of each scheme a person gets amount in the ratio 3:7:4 from these schemes. Then find the sum of money invested in Scheme C?

a)Rs.4320      b)Rs.5760      b)Rs.5880      c)Rs.5120

17. A certain sum of money becomes 2.25 times of itself in 2 years. Then find the rate of interest if compounded annually.

a)25%      b)50%      c)15%      d)75%

18. A certain sum of money becomes  $\frac{512}{162}$  times of itself in 4 years. Then find the rate of interest if compounded annually.

a)33.33%      b)22.22%      c)25%      d)27.5%

19. If the amount received at the end of 2nd and 3rd year at compound interest on a certain Principal is Rs. 9,600 and Rs.10,272 respectively, what is the rate of interest (in %)?

(a) 7      (b) 8      (c) 6      (d)5

20. A certain sum of money becomes Rs.54000 in 4 years and it becomes Rs.59582 in 7 years. Find the rate of interest, if compounded annually.

a)5%      b)3%      c)3(1/3)%      d)6(2/3)%

### **SET-3**

1. Aditya invest Rs. 50,000 in a fixed deposit at 10% C.I. for 2 years. At the end of 2 years she put the money in another deposit at 12% S.I. for 3 years. What was the final value of the initial Investment?  
(a)Rs. 80000 (b) Rs. 81280 (c) Rs. 82280 (d) Rs. 83280
2. There is 60% increase in an amount in 6 years at simple interest. What will be the compound interest of Rs. 12,000 after 3 years at the same rate?  
(a)Rs. 2160 (b) Rs. 3120 (c) Rs. 3972 (d) Rs. 6240
3. A bank offers 5% compound interest calculated on half-yearly basis. A customer deposits Rs. 1600 each on 1st January and 1st July of a year. At the end of the year, the amount he would have gained by way of interest is:  
(a)Rs. 120 (b) Rs. 121 (c) Rs. 122 (d) Rs. 123
4. Aditya invested certain amount in two different schemes A and B. Scheme A offer S.I @ 12 p.c.p.a. and scheme B offer C.I. @ 10 p.c.p.a. Interest accrued on the amount invested in scheme A in 2 years was Rs. 3600 and the total amount invested was Rs. 35000. What was the interest accrued on the amount invested in scheme B?  
(a)Rs. 4500 (b) Rs. 4200 (c) Rs. 4000 (d) Cannot be determine
5. The population of a town in 2009 was 125000. It increase 10% per year. What is the population after 3 years?  
(a)166375 (b) 170000 (c) 125000 (d) 10000
6. A sum of Rs. 1500 amounts to Rs. 3000 in five years at a certain rate of simple interest. If the rate of interest is increased by 1% the same sum in the same time would amount to:  
(a)Rs. 3,288 (b) Rs. 3,312 (c) Rs. 3,340 (d) Rs. 3075
7. Monica deposited a total of Rs. 10500 with a bank in two different deposit schemes at 10% p.a., interest being compounded annually. As per the schemes, she gets the same amount after 2 years on the first deposit as she gets after 3 years on the second deposit. How much money did she deposit for 3 years?  
(a)Rs. 4500 (b) Rs. 5000 (c) Rs. 6500 (d) Rs. 7200
8. A sum of money invested at simple interest for two years at 5% p.a. amounted to Rs. 2750. The rate at which the sum should have been invested to get Rs. 300 as interest after two years would be?  
(a)6% (b) 6.9% (c) 7.6% (d) 8.1%
9. A sum of Rs. 1000 after 3 years at compound interest becomes a certain amount that is equal to the amount that is the result of a 3 year depreciation from Rs. 1728. Find the difference between the rates of C.I. and depreciation? (Given C.I. is 10% p.a.)  
(a)1.7% (b) 2.9% (c) 4% (d) 7.6%
10. When the rate of interest in a bank is reduced from 5% p.a. to 4.5% p.a., Bani deposited Rs. 4000 in her saving account. She found that the new interest income remained the same as before. Find her original deposit?  
(a)Rs. 3600 (b) Rs. 3150 (c) Rs. 2980 (d) Rs. 2768

11. Two equal sums were lent at simple interest for 4 years and for 3 years respectively. The rate of interest in the latter case was 3% higher than that of the former case, but the amount in each was Rs. 1088. Find the rate of interest of the former case?  
 (a)7% (b) 9% (c) 11% (d) 13%
12. Shruti borrowed Rs. 2500 from her two friends. For one loan she paid 8% p.a. and for the other 6% p.a. simple interest. If she paid Rs. 180 as total interest for one year, how much did she borrow at 8% p.a.?  
 (a)Rs. 1500 (b) Rs. 1700 (c) Rs. 1950 (d) Rs. 2120
13. A part of Rs. 38800 is lent out at 72% for six months. The rest of the amount is lent out at 5% p.a. after one year. The ratio of interest after 3 years from the time when first amount was lent out is 5 : 4. Find the second part that was lent out at 5%.  
 (a)Rs. 28800 (b) Rs. 29586 (c) Rs. 31776 (d) Rs. 32846
14. A certain sum of money invested at compound interest becomes 1.44 times of itself in 2 years. If twice this sum were lent at simple interest, in how many years would it double itself?  
 (a)2 years (b) 2.5 years (c) 3 years (d) 5 years
15. Arun gives his wife Asha a birthday gift, giving her each year a number of rupees equal to the number of years of her age. If her birthday falls on August 8, what sum must be placed at simple interest at 7% on January 1, before she is 42, in order to raise the required sum?  
 (a)Rs. 1000 (b) Rs. 1200 (c) Rs. 1500 (d) Rs. 1900

SET-1

1-C	2-B	3-D	4-C	5-A
6-B	7-A	8-A	9-A	10-A
11-A	12-B	13-B	14-C	15-A
16-C	17-D	18-B	19-B	20-B
21-B	22-A	23-B	24-A	25-C

SET-2

1-B	2- A	3- C	4-B	5-C
6- B	7- B	8-A	9-D	10-A
11-A	12- C	13- D	14- A	15- B
16- B	17- B	18- A	19- A	20- C

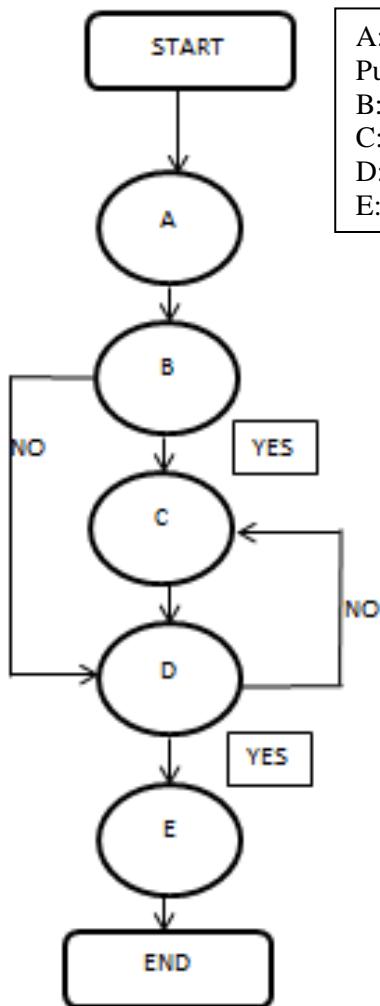
SET-3

1- C	2- C	3- B	4- B	5- A
6- D	7- B	8- A	9- A	10- A
11- B	12- A	13- A	14- D	15- A

## FLOW CHART

Directions (1-2): Study the flowchart given below and answer the questions that follow.

Box No.	1	2	3	4	5	6	7	8	9	10
Value	13	20	7	12	10	2	5	1	0	18



- A: (number in Box 4) – (number in Box 1).  
 Put the result in Box 10.  
 B: Is (number in Box 10) < 0?  
 C: (number in Box 9) + (number in Box 5). Put the result in Box 2.  
 D: Is (number in Box 2) > (number in Box 7)?  
 E: (number in Box 10) \* (number in Box 2). Put the result in Box 3.

1. Is the following statement true or false?

**Statement:** If the condition in Step C updates the value in Box 3 instead of Box 2, then flowchart will enter the infinite loop.

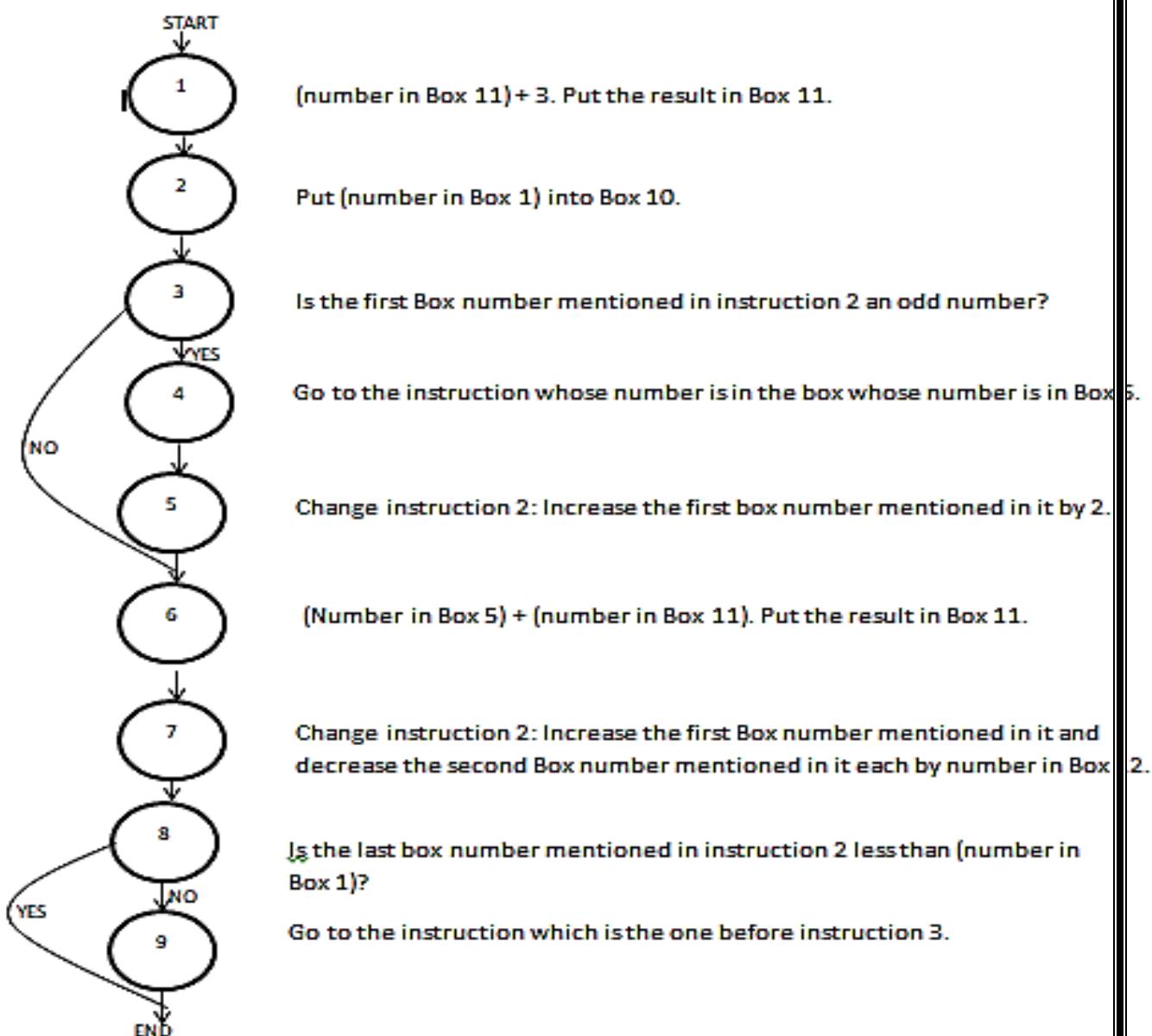
- A. True      B. False      C. Cannot be determined      D. Zero

2. What is the number in box 3 after the process?

- A. 7      B. 10      C. -10      D. 360

Directions (3-4): Study the flowchart given below and answer the questions that follow.

Box No.	1	2	3	4	5	6	7	8	9	10	11	12
Value	8	6	5	7	4	2	2	11	8	-2	2	1



3. What number is in Box 8?

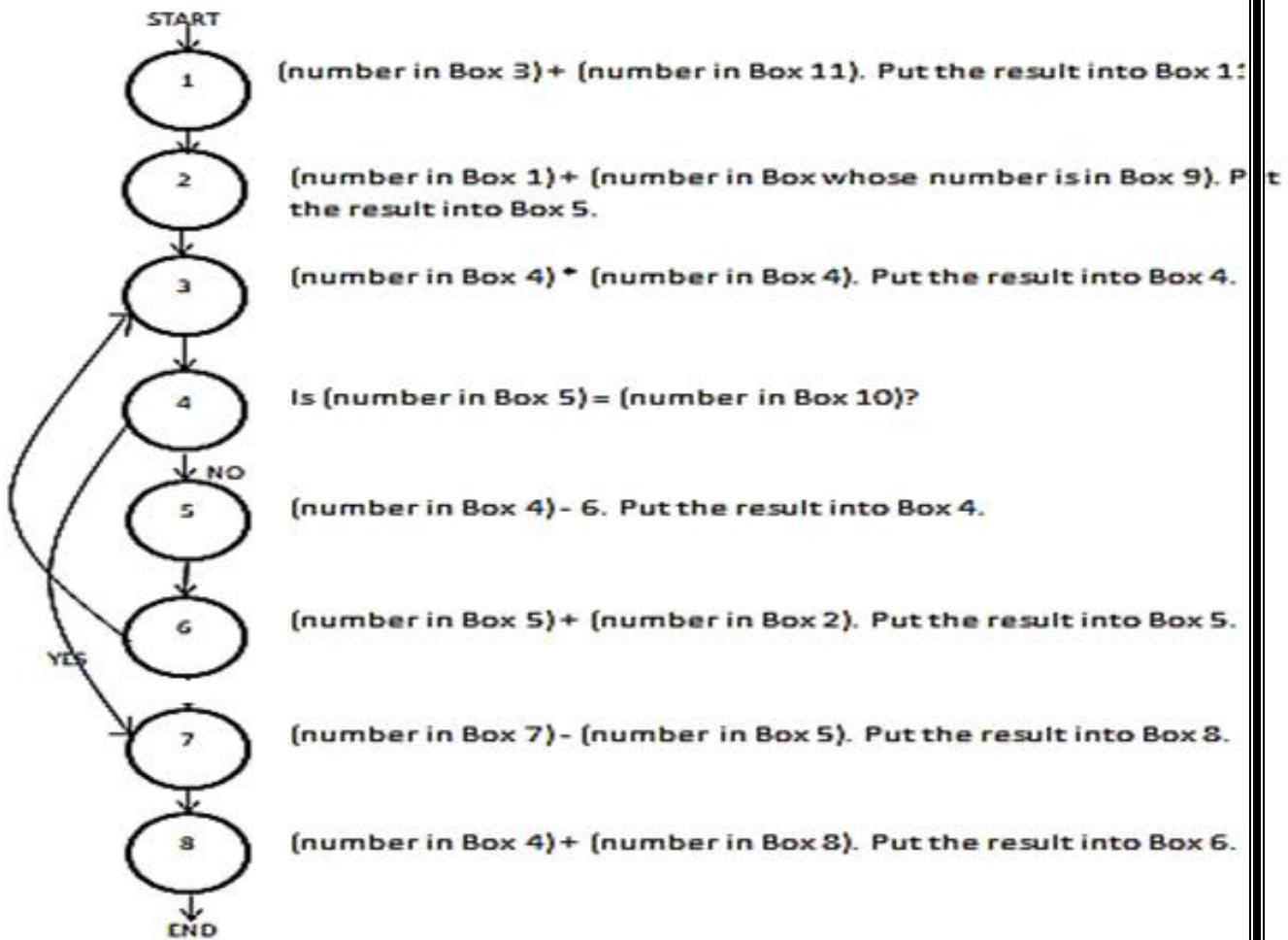
- A. 7                      B. 9                      C. 5                      D. 8

4. What is the number in box 11 after the process?

- A. 15                      B. 17                      C. 12                      D. 36

Directions (5-6): Study the flowchart given below and answer the questions that follow.

Box No.	1	2	3	4	5	6	7	8	9	10	11	12
Value	1	2	0	3	7	5	24	7	11	6	1	5



5. Determine which number is now in Box 6.

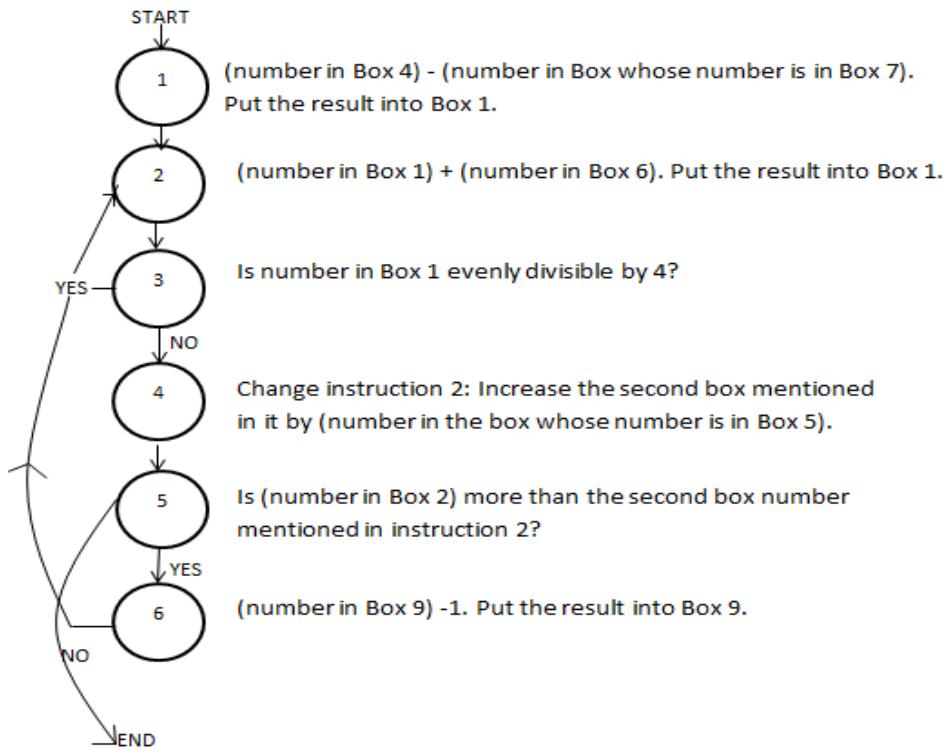
A. 26                      B. 24                      C. 25                      D. 27

6. How many times did the loop run between step 6 and step 3?

A. once                      B. Twice                      C. Thrice                      D. No loop

Directions (7-8): Study the flowchart given below and answer the questions that follow.

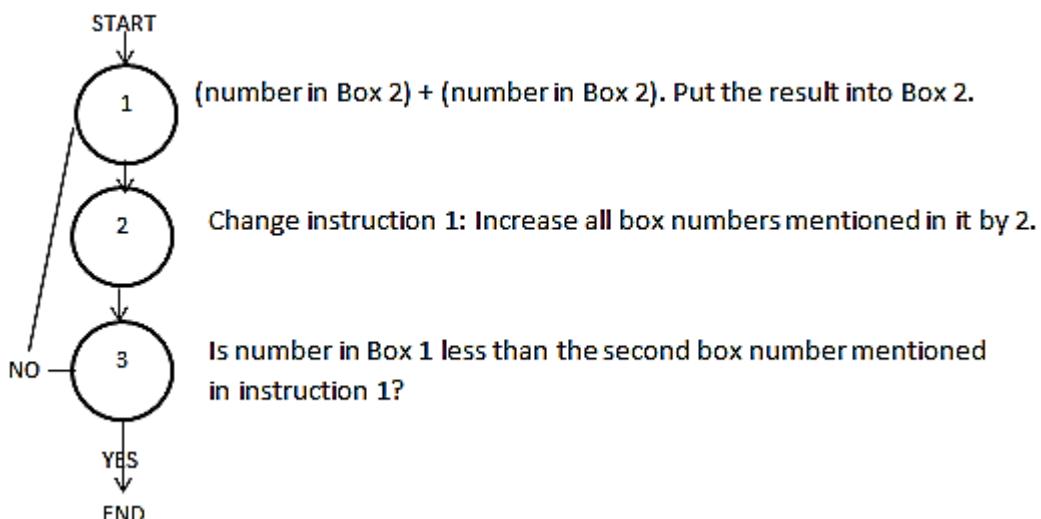
Box No.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Value	4	13	2	5	6	3	10	6	7	2	5	2	6	7	1



7. Determine which number is now in Box 1.  
A. 11      B. 15      C. 8      D. 14  
8. Which number is in box 9 at the end of process?  
A. 6      B. 7      C. 5      D. 4

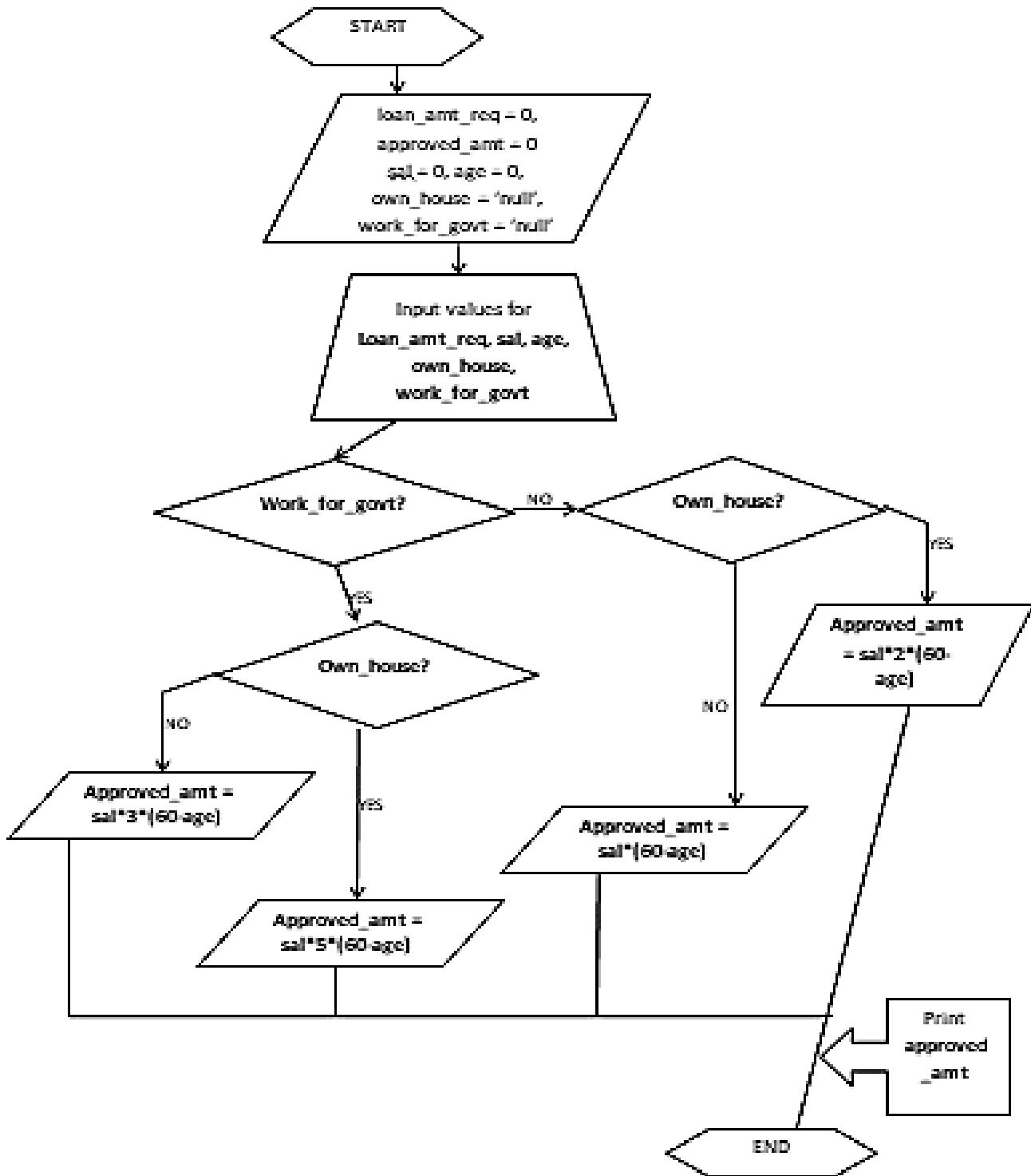
Directions (9-10): Study the flowchart given below and answer the questions that follow.

Box No.	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Value	7	2	3	4	5	6	7	8	9	10	11	12	13	14



9. The purpose of the following flowchart is to double the number in each of the Boxes 2, 4, 6, 8 and 10. In order to accomplish exactly this – no more no less - what is the number in Box 1?  
A. 6      B. 8      C. 10      D. 12  
10. What is the number in box 13 at the end of the process?  
A. 13      B. 26      C. 20      D. 15

Directions (11-12): Study the flowchart given below and answer the questions that follow.



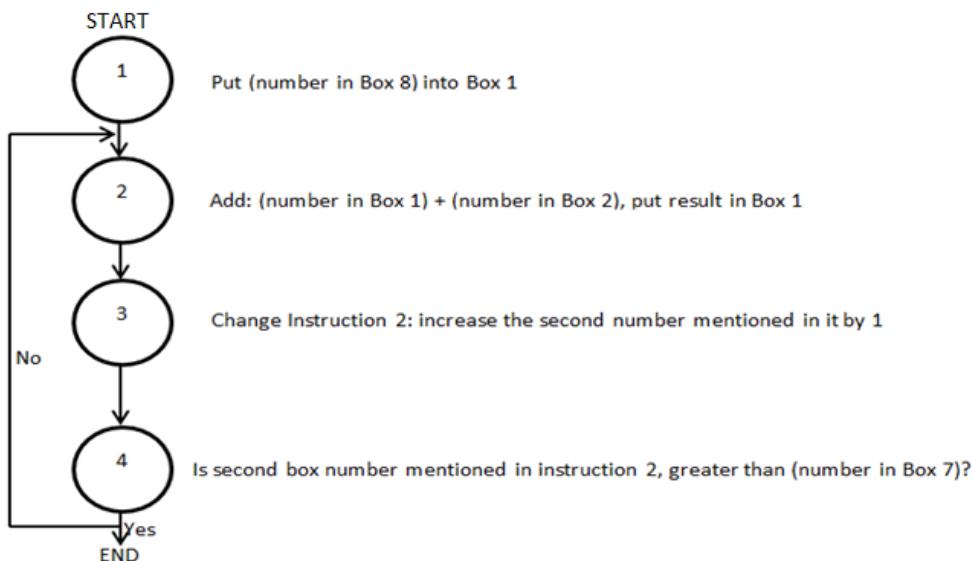
11. For an individual who works for a government organization and owns a house, it is given that he is 35 years old and earns Rs. 15,000 per month. What would be the approved\_amt (in ₹) for him?  
 A. ₹1875000      B. ₹ 1975000      C. ₹ 1825000      D. ₹ 2075000
12. A person wishes to avail a loan of ₹ 50,00,000. He works for a government organization but does not own a house. Would he get the loan if he draws a salary of ₹ 60,000 and his age is 28 years. If he does get

a loan, what amount would he be entitled? If not, by what amount he would be short of the required amount?

Box Number	1	2	3	4	5	6	7	8
Number	3	7	2	1	5	12	4	0

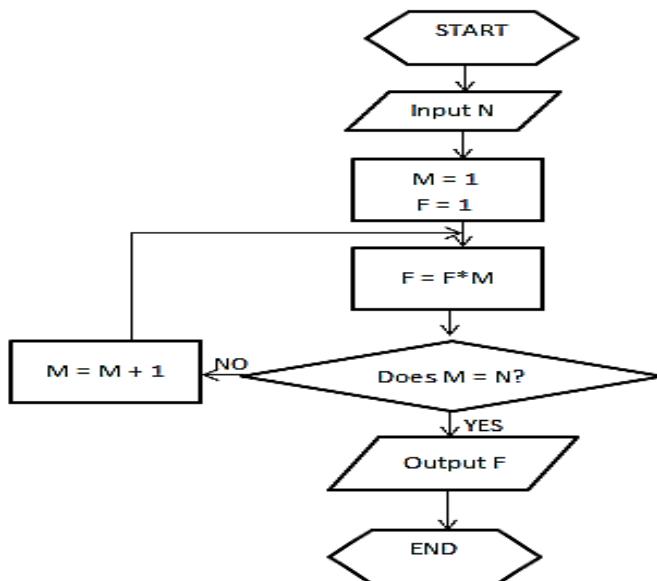
- A. Yes, he would get a loan of exactly ₹ 50,00,000
- B. Yes, he would get a loan equal to ₹ 57,60,000
- C. No, he would not get the loan. He would be short of ₹ 7,00,000
- D. No, he would not get the loan. He would be short of ₹ 7,60,000

Directions (13-14): Study the flowchart given below and answer the questions that follow.



13. What number is not in Box 1?
- A. 9
  - B. 11
  - C. 5
  - D. 10
14. How many times did the loop run?
- A. Once
  - B. Twice
  - C. Thrice
  - D. It is an infinite loop

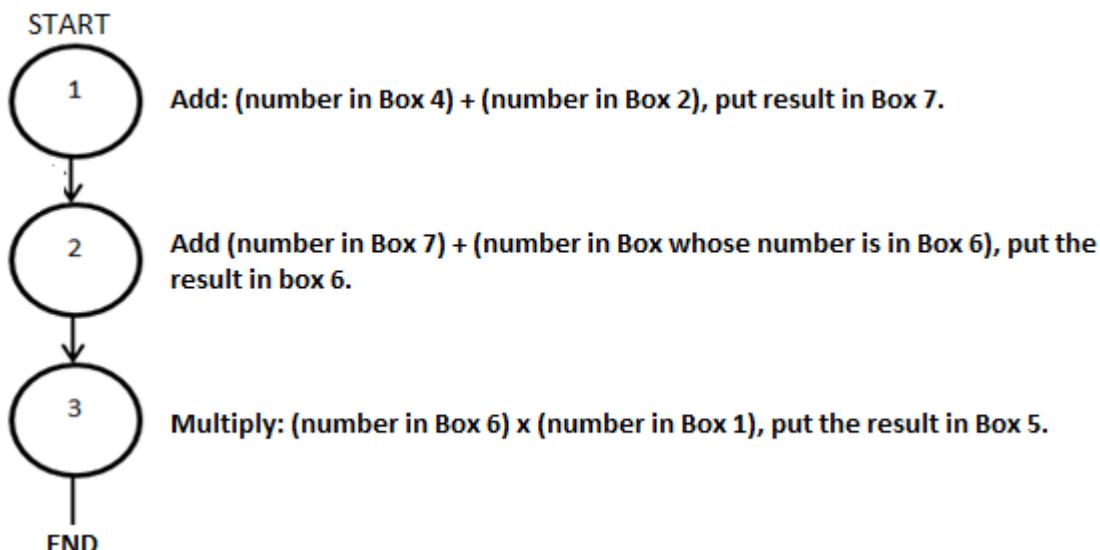
Directions (15-16): Study the flowchart given below and answer the questions that follow.



15. Which of the following value will be printed if the value of  $N = 0$ ?  
 A. Zero      B. 720      C. 540      D. None of these
16. Which of the following value will be printed if the value of  $N = 8$ ?  
 A. 5      B. 1      C. 8      D. It is an infinite loop

Directions (17-18): Study the flowchart given below and answer the questions that follow.

Box No.	1	2	3	4	5	6	7	8	9	10
Value	6	3	9	2	11	2	91	48	66	1



17. What number is in Box 5?  
 A. 55      B. 48      C. 44      D. 34
18. What is the number in Box 7?  
 A. 91      B. 11      C. 8      D. 5

Directions (19-20): Study the flowchart given below and answer the questions that follow.

Box No.	1	2	3	4	5	6	7	8	9	10
Value	4	3	9	2	7	2	63	36	55	9



(number in Box 4) + (number in Box 2). Put the result in Box 8.

(number in Box 8) + (number in the box whose number is in Box 6). Put the result in Box 6.

(number in Box 6) \* (number in Box 1). Put the result in Box 4.

19. Determine which number is now in Box 4.

- A. 32                      B. 23                      C. 31                      D. None of these

20. Which box has the smallest number at the end of the process?

- A. Box 3                      B. Box 4                      C. Box 6                      D. Box 2

Directions (21-22): Study the flowchart given below and answer the questions that follow.

Box Number	1	2	3	4	5	6	7	8	9	10	11	12	13
Value	9	8	5	2	11	3	5	12	7	-2	4	-6	6

START

(1) Subtract: (number in box 7) - (number in the box whose number is in box 6), put Result into box 12.

(2) Add: (number in box 12) + (number in box 13), put result into box 12.

YES (3) Is (number in box 12) exactly divisible by 5?

NO

(4) Change instruction 2: decrease the second box-number mentioned in it, by (number in the box whose number is in box 11).

NO (5) Is (number in box 2) less than the second box-number mentioned in Instruction 2?

YES

(6) Subtract: (number in box 9) - 1, put result into box 9.

END

21. What number is in Box 12?

- A. 34                      B. 12                      C. 19                      D. 20

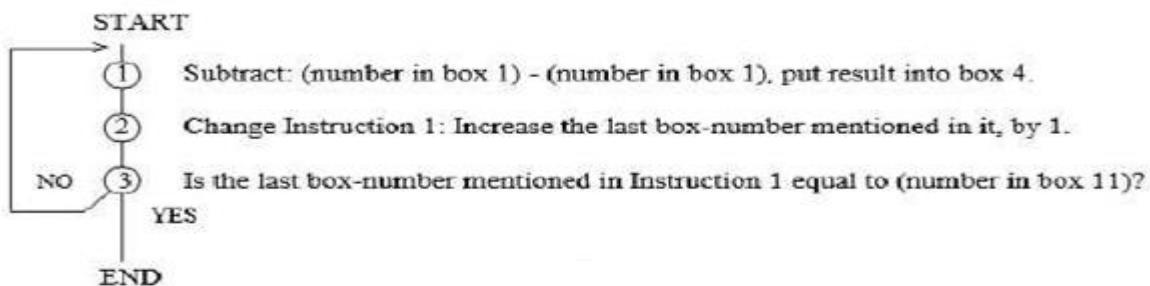
22. Which number is in Box 9 at the end of the process?

- A. 4                              B. 5                              C. 6                              D. 7

Directions (23-24): Study the flowchart given below and answer the questions that follow.

Box Number	1	2	3	4	5	6	7	8	9	10	11	12

Value	7	9	2	2	8	4	1	-9	3	6		4
-------	---	---	---	---	---	---	---	----	---	---	--	---



23. What is the number in Box 1 at the end of the process?

- A. 0                      B. 9                      C. 7                      D. Cannot be determined

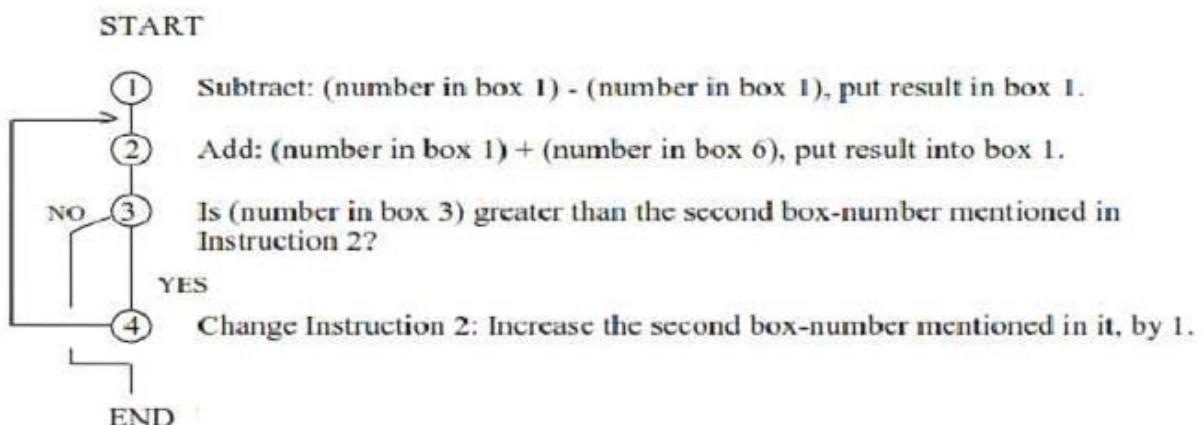
24. The purpose of the flowchart is to put zero in each of the boxes: 4, 5 and 6. In order to accomplish exactly this – no more and no less – what number must be in Box 11?

- A. 8                      B. 3                      C. 7                      D. 9

Directions (25): Study the flowchart given below and answer the questions that follow.

The purpose of the following flowchart is to add up numbers in boxes – 6, 7, 8 and 9 and put the total in box 1.

Box Number	1	2	3	4	5	6	7	8	9
Value	3	15		2	1	4	3	12	10



25. In order to accomplish the purpose of flowchart, what number must be in Box 3?

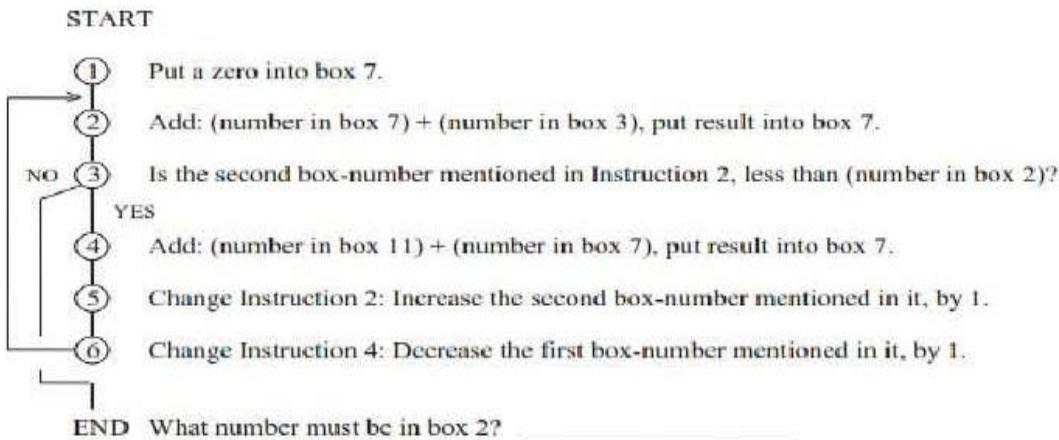
- A. 3                      B. 9                      C. 7                      D. 8

## SET-2

Directions (1-2): Study the flowchart given below and answer the questions that follow.

The purpose of the following flowchart is to add up the numbers in boxes 3, 4, 5, 6, 9, 10 and 11 and to put the total in Box 7.

Box Number	1	2	3	4	5	6	7	8	9	10	11	12	13
Value	1		3	4	5	6		8	9	10	11	12	13



1. In order to accomplish the purpose – no more no less - of the flowchart, what is the smallest number which may be in Box 2?

A. 6                      B. 7                      C. 11                      D. None of these

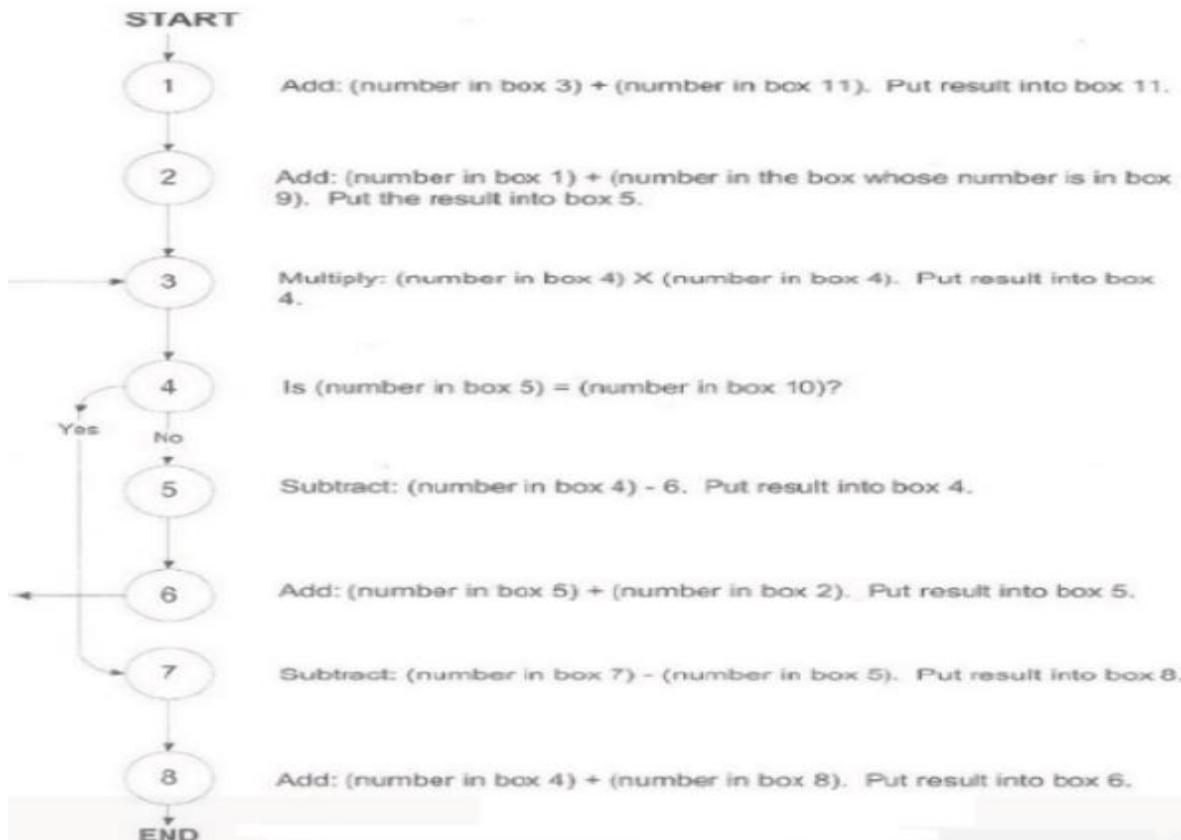
28. What is the number in Box 7 at the end of the process (assuming that the purpose has been fulfilled)?

A. 48                      B. 45                      C. 56                      D. None of these

3.

Study the flowchart and answer the questions

Box No.	1	2	3	4	5	6	7	8	9	10	11	12
	1	2	0	3	7	5	24	7	11	6	1	5

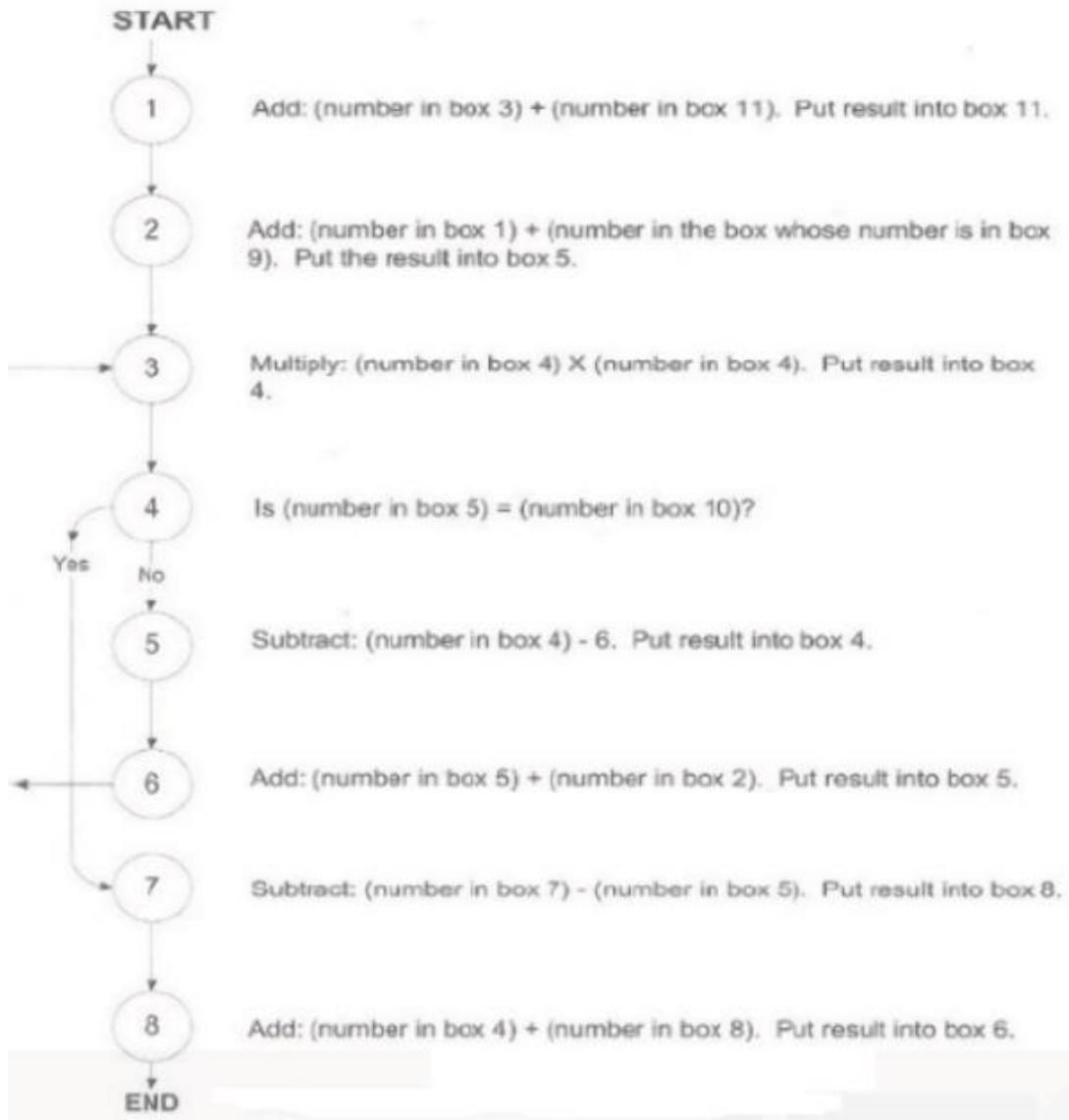


At the end of the flowchart what number is in box 11?

A.1                      B.2                      C.3                      D.0

4.  
Study the flowchart and answer the questions

Box No.	1	2	3	4	5	6	7	8	9	10	11	12
	1	2	0	3	7	5	24	7	11	6	1	5

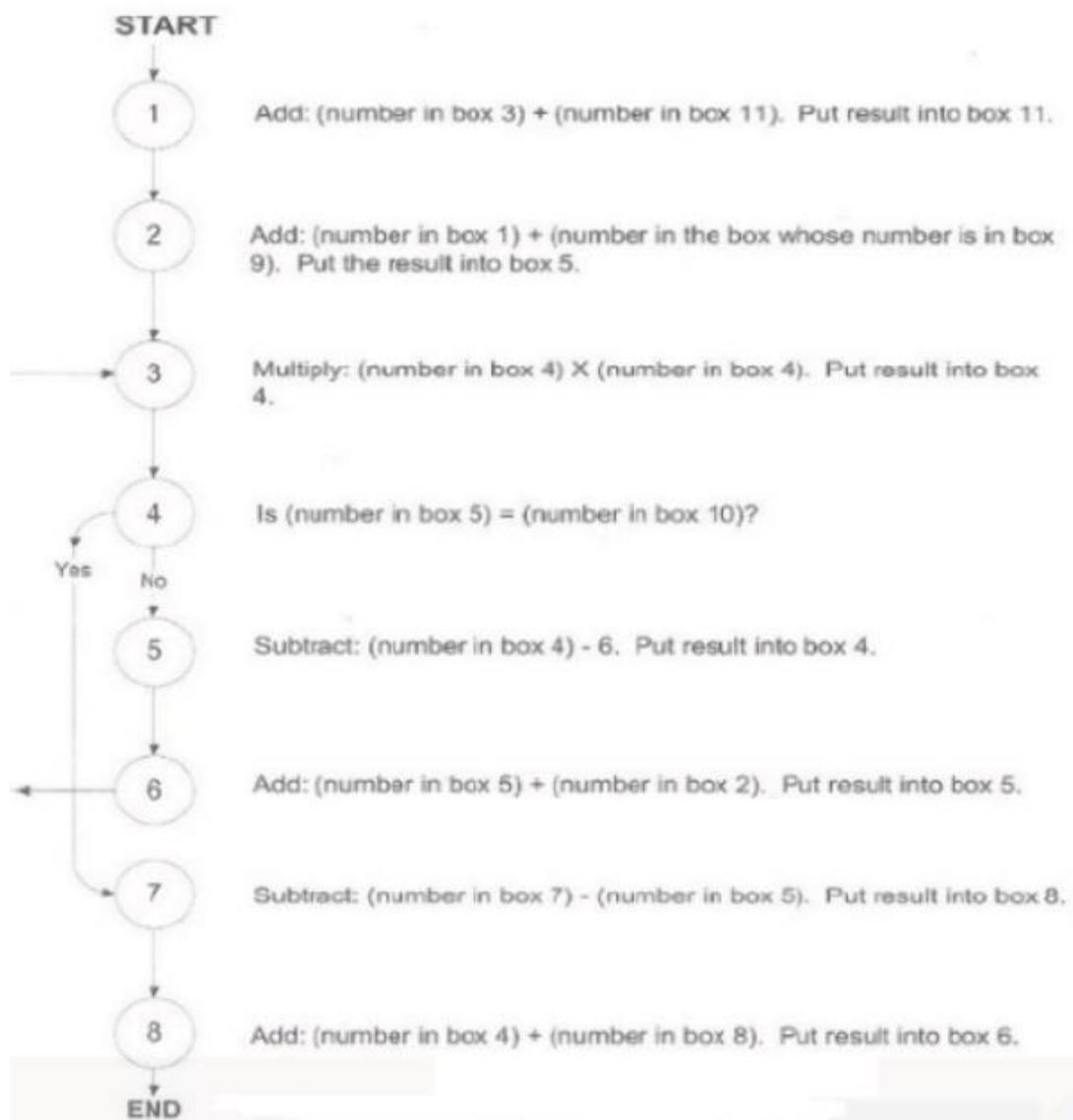


Determine whether the condition 4 is true or not?

- A. True
- B. False
- C. Can't be determined

5.  
Study the flowchart and answer the questions

Box No.	1	2	3	4	5	6	7	8	9	10	11	12
	1	2	0	3	7	5	24	7	11	6	1	5



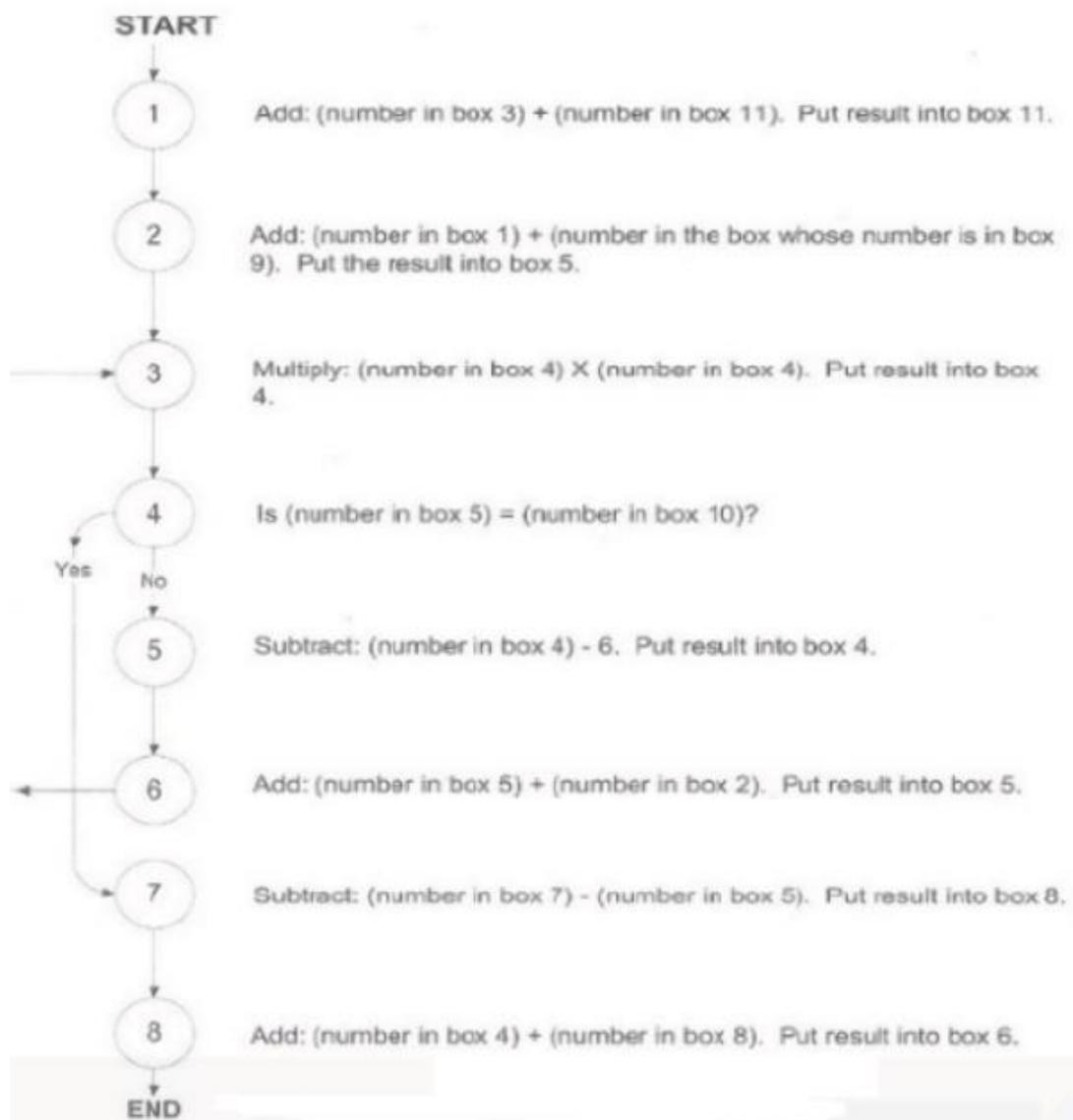
At the end of the flowchart what number is in box 12?

- A. 1
- B. 5
- C. 6
- D. 11

6.

Study the flowchart and answer the questions

Box No.	1	2	3	4	5	6	7	8	9	10	11	12
	1	2	0	3	7	5	24	7	11	6	1	5



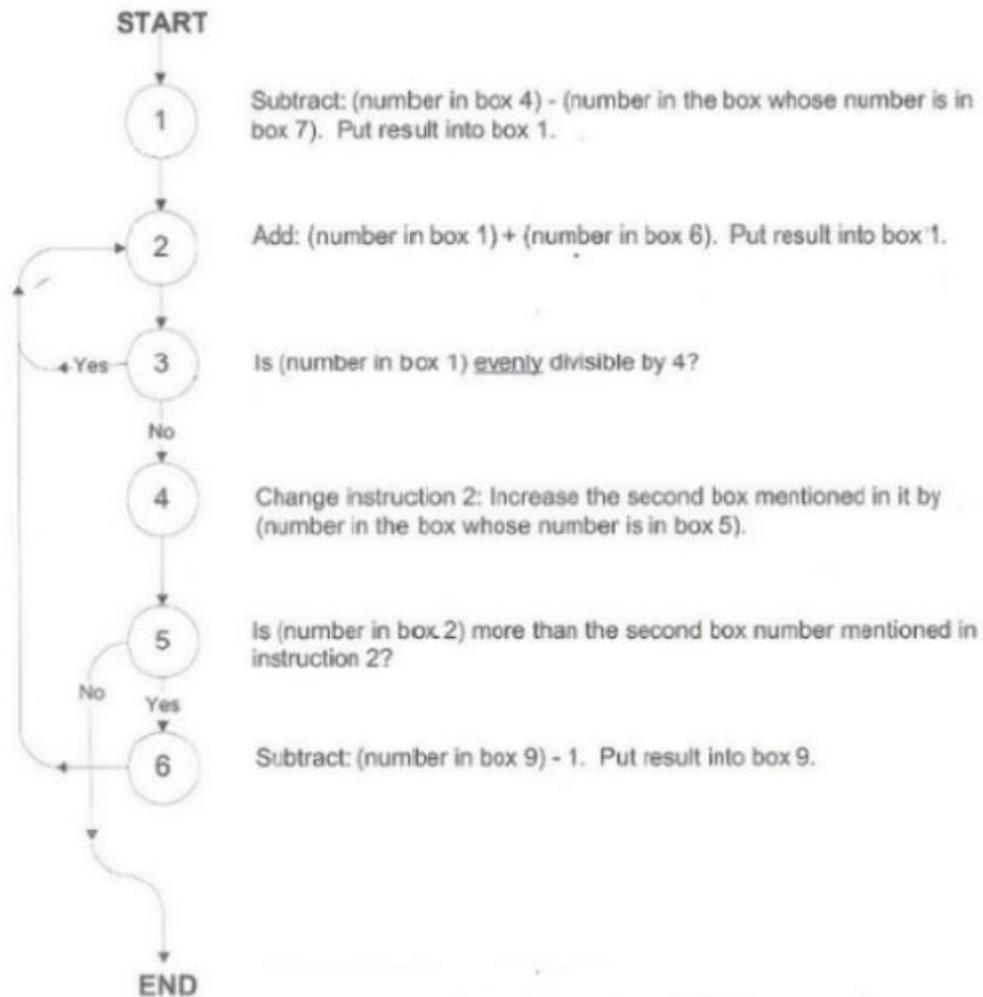
At the end of the flowchart what result will come on adding the number in box 6 and box 2?

- A. 27
- B. 25
- C. 29
- D. 31

7.

study the flowchart and answer the questions

Box No.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
	4	13	2	5	6	3	10	6	7	2	5	2	6	7	1

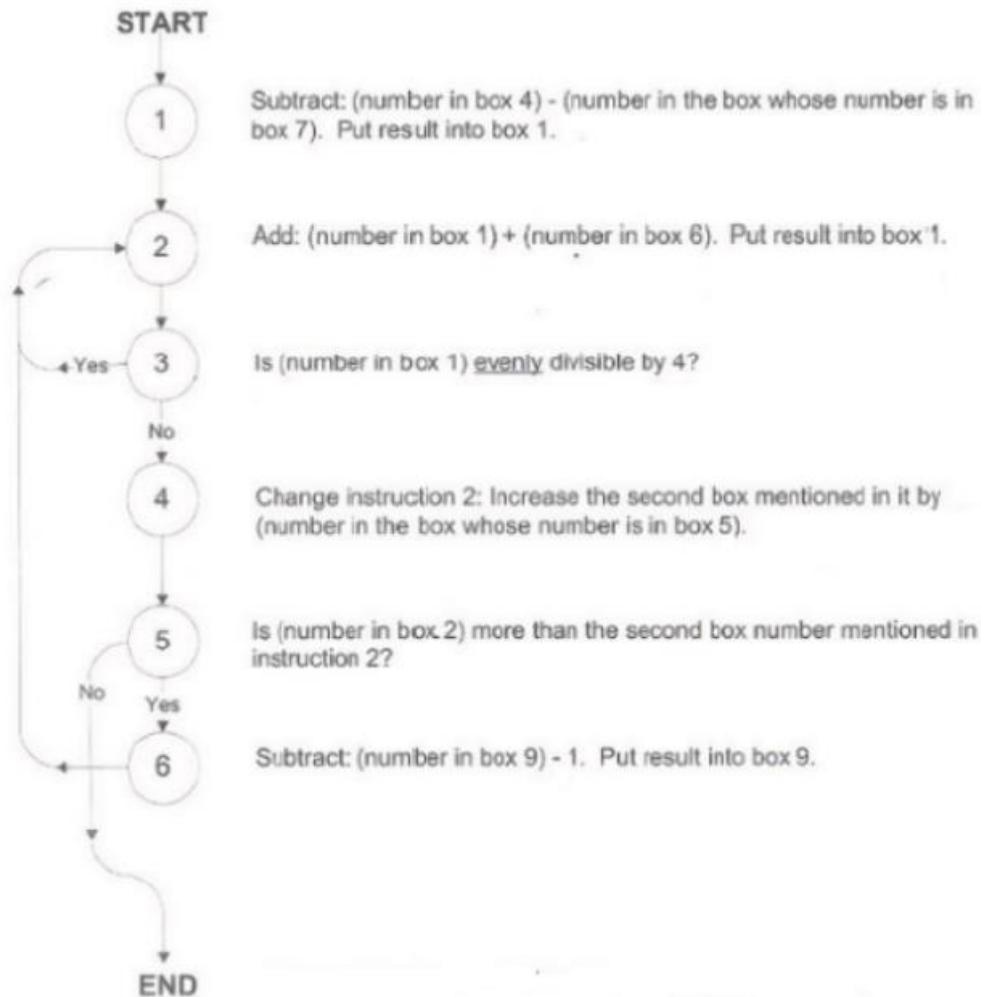


Is condition 3,true or false?

- A. True
- B. False
- C. Can not be determined

8.

Box No. 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
4	13	2	5	6	3	10	6	7	2	5	2	6	7	1

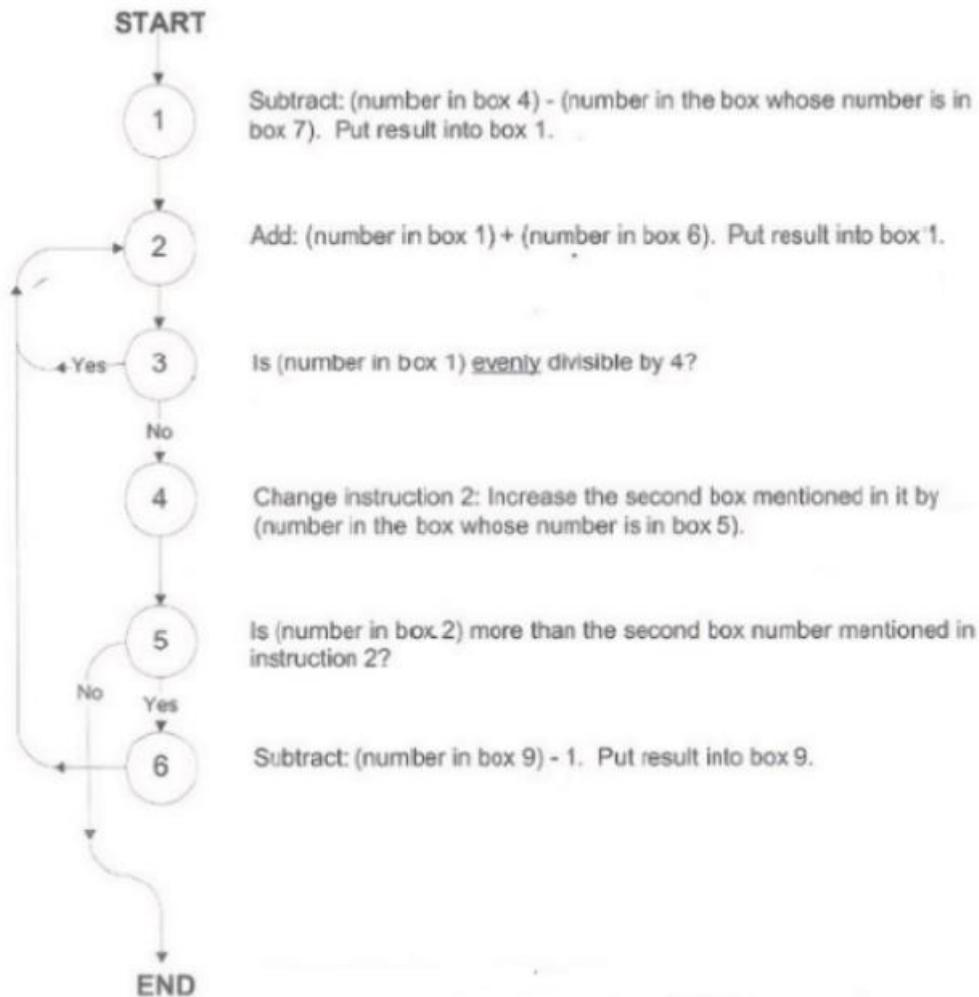


At the end of the flowchart what number is in box 5?

- A. 3
- B. 6
- C. 5
- D. 2

9.

Box No. 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
4	13	2	5	6	3	10	6	7	2	5	2	6	7	1

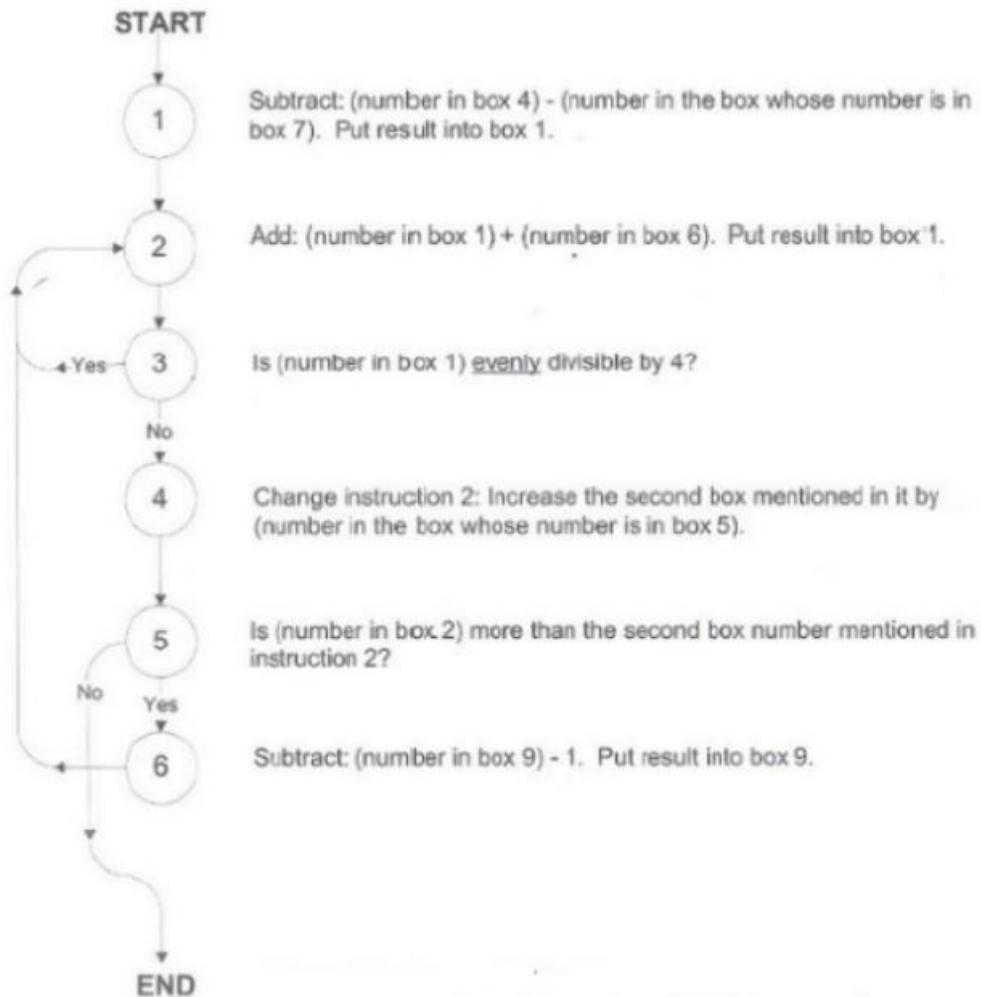


What number of boxes remained unchanged after following all the instructions properly?

- A. 12
- B. 13
- C. 11
- D. 10

10.

Box No. 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
4	13	2	5	6	3	10	6	7	2	5	2	6	7	1



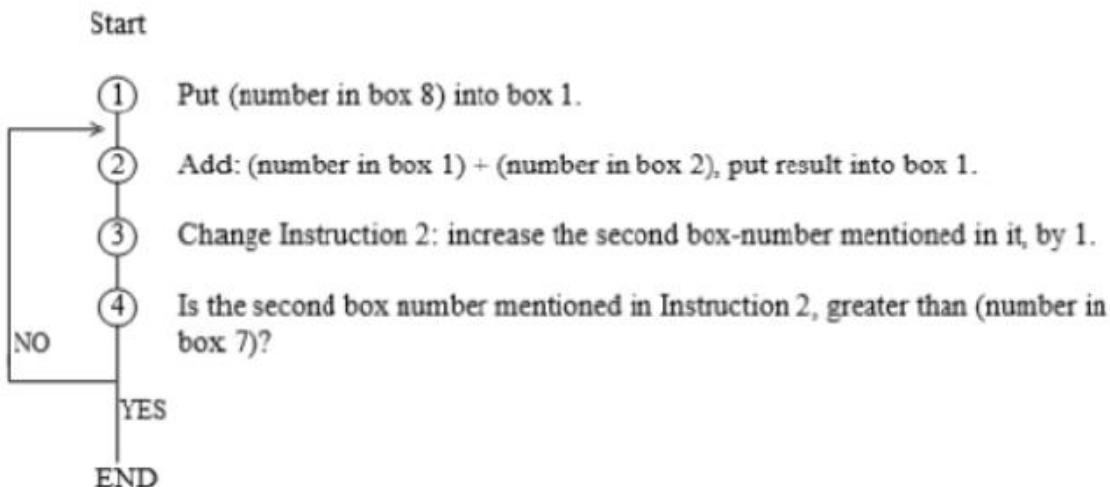
Is the statement given below true or false? The number in box 9 is greater than the number in box 10.

- A. True
- B. False
- C. Can not be determined

11.

Study the flowchart and answer the question

Box #	1	2	3	4	5	6	7	8
	3	7	2	1	5	12	4	0

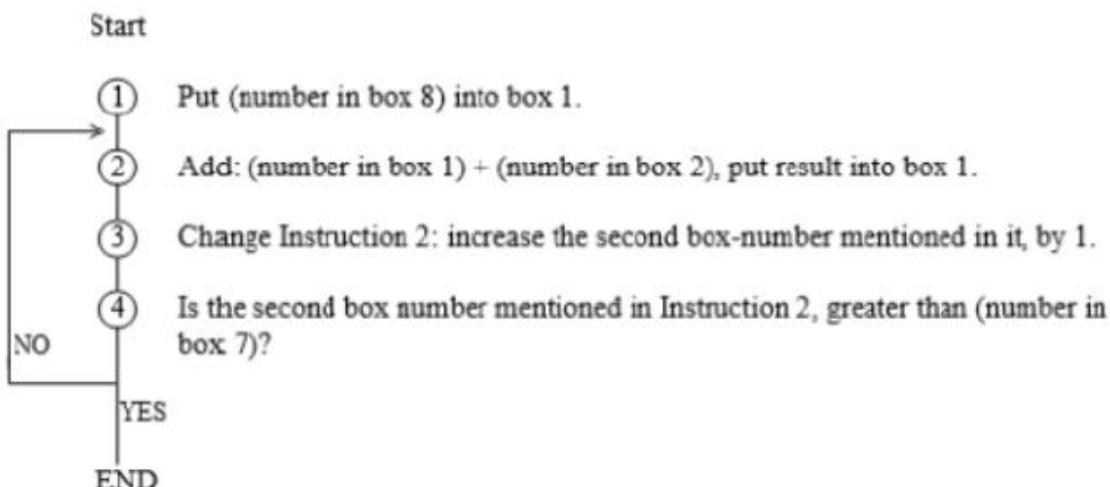


What number is in box 1 at the end of the flowchart?

- A. 7
- B. 9
- C. 6

12.

Box #	1	2	3	4	5	6	7	8
	3	7	2	1	5	12	4	0

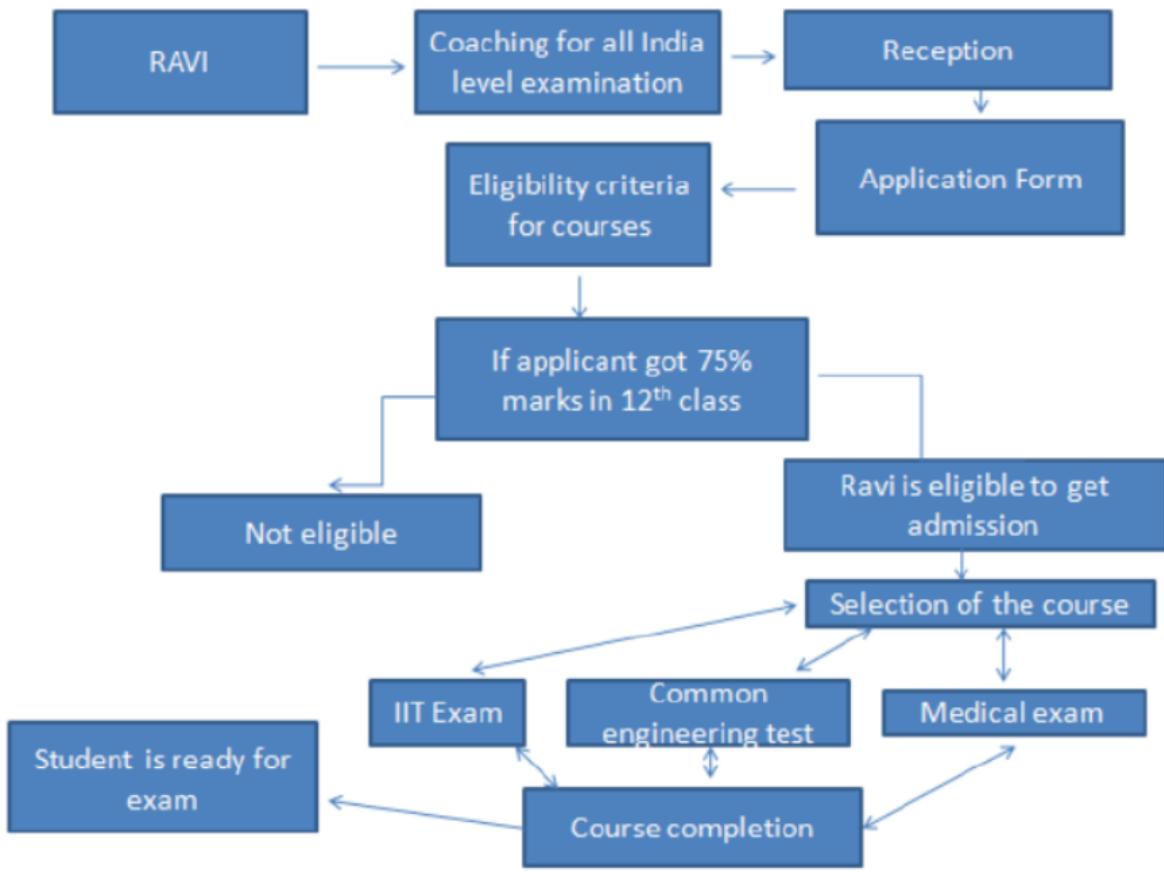


Is the number in Box 2 greater than number in Box 6?

- A. Yes
- B. No
- C. Can't be determined

13.

See the following flowchart carefully and answer the given questions.

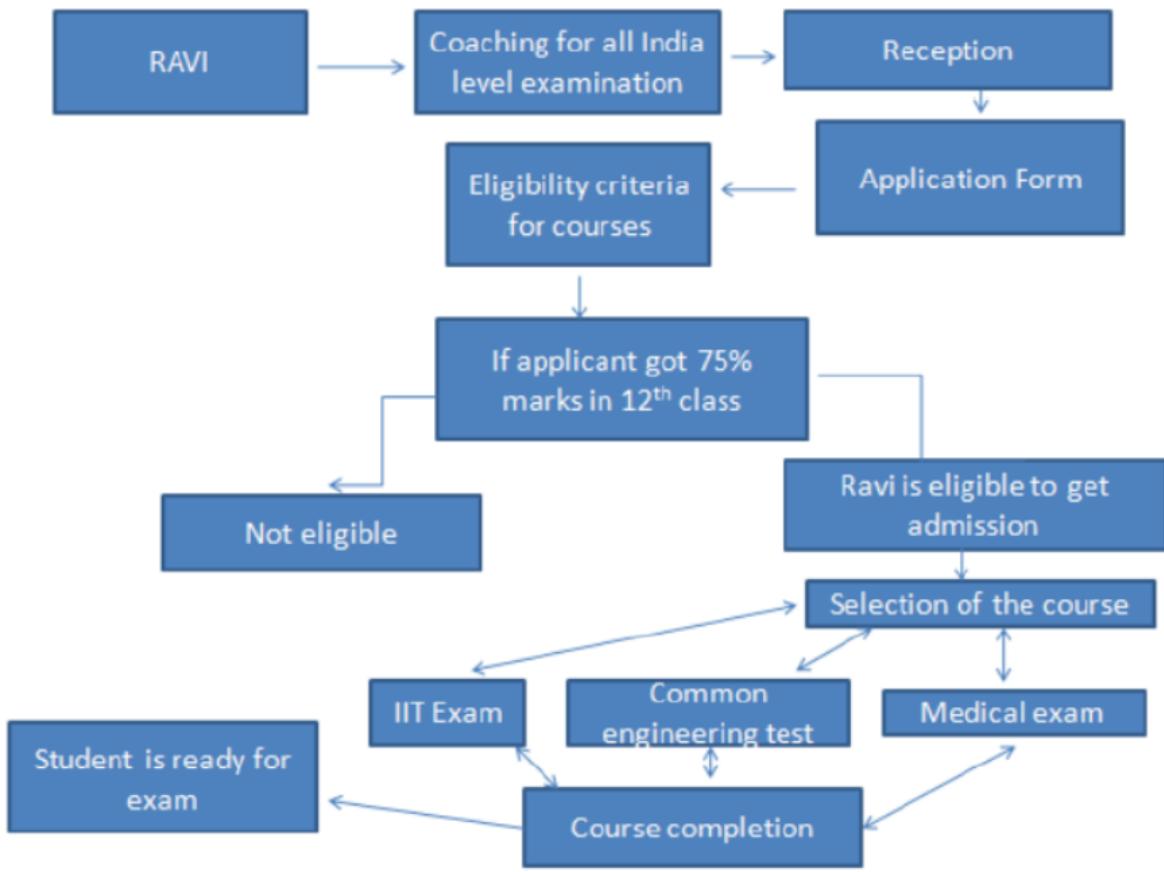


Student ‘Ravi’ wants admission in the coaching center. Choices are given in Data flow diagram. Please read the information given in the diagram carefully and answer the given questions:  
 Ravi wants to appear for the Medical exam but has scored only 40% marks in biology but 90% in math. Considering the same which of the below is correct

- A. Ravi can get admission for IIT exam course.
- B. Ravi can get admission in common engineering test course.
- C. Ravi can get admission in medical exam course.
- D. None of these

14.

See the following flowchart carefully and answer the given questions.

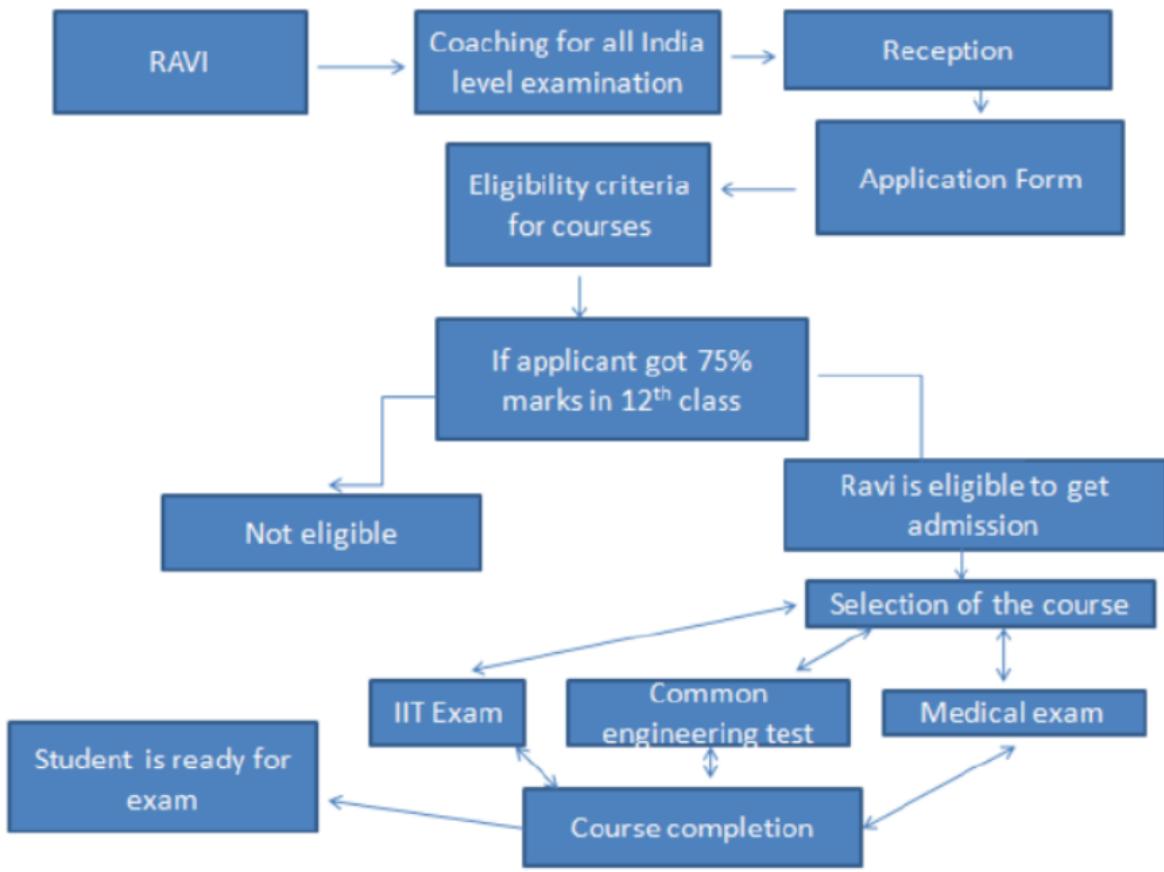


What can be the possible grounds that Ravi does not get admission in the Common Engineering test coaching even though he got 85% marks in intermediate?

- A. Ravi is eligible to get right of entry in the coaching, but he does not like the faculty and infrastructure of the coaching
- B. Ravi is entitled to get admission but could not provide some valid documents.
- C. Ravi got 80% marks in 12th but got less than 40 marks in Chemistry.
- D. Ravi is very poor and cannot afford the high fees of that coaching.

15.

See the following flowchart carefully and answer the given questions.

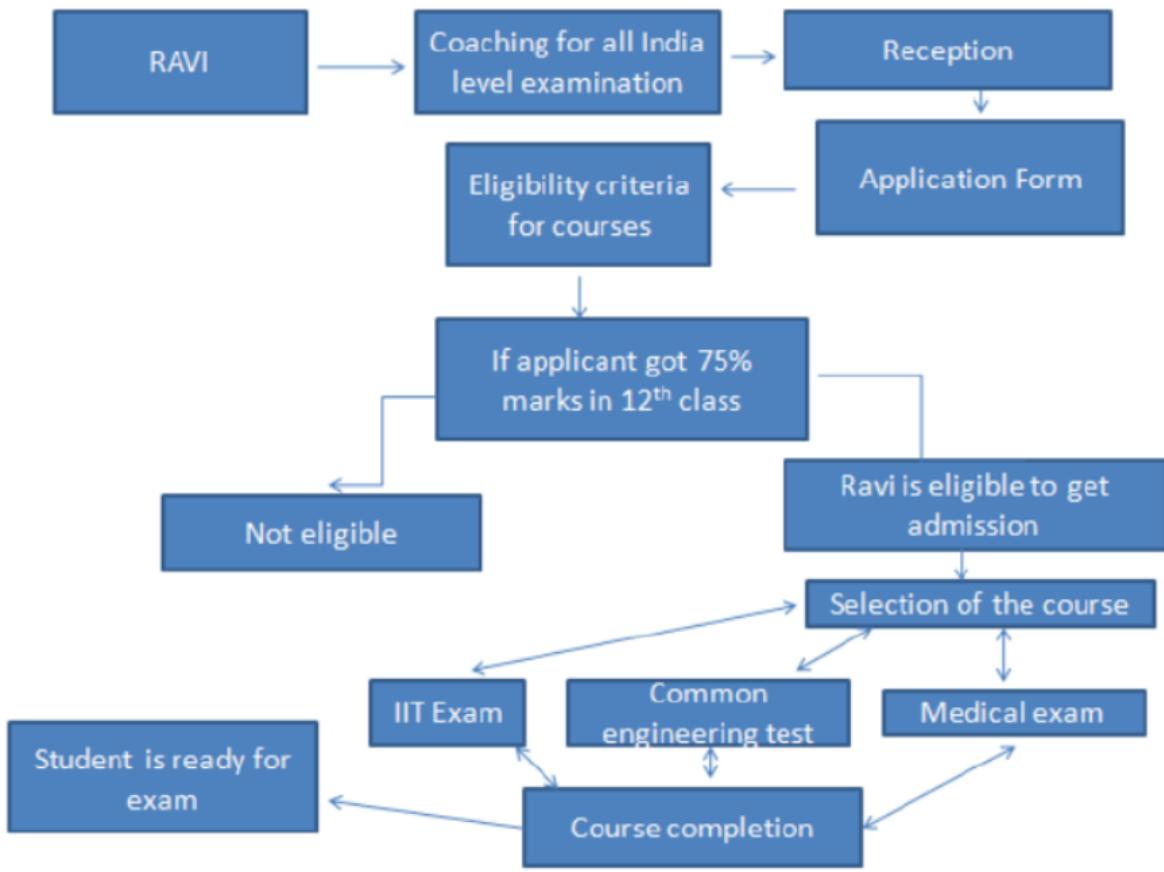


On what ground Ravi did not get selection in IIT, even though he has completed his course from any of the coaching above?

- A. Ravi failed in one of the test of the coaching.
- B. Ravi changed his mind to give the exam at the last moment.
- C. Ravi left the coaching in the middle time of course
- D. Data insufficient

16.

See the following flowchart carefully and answer the given questions.

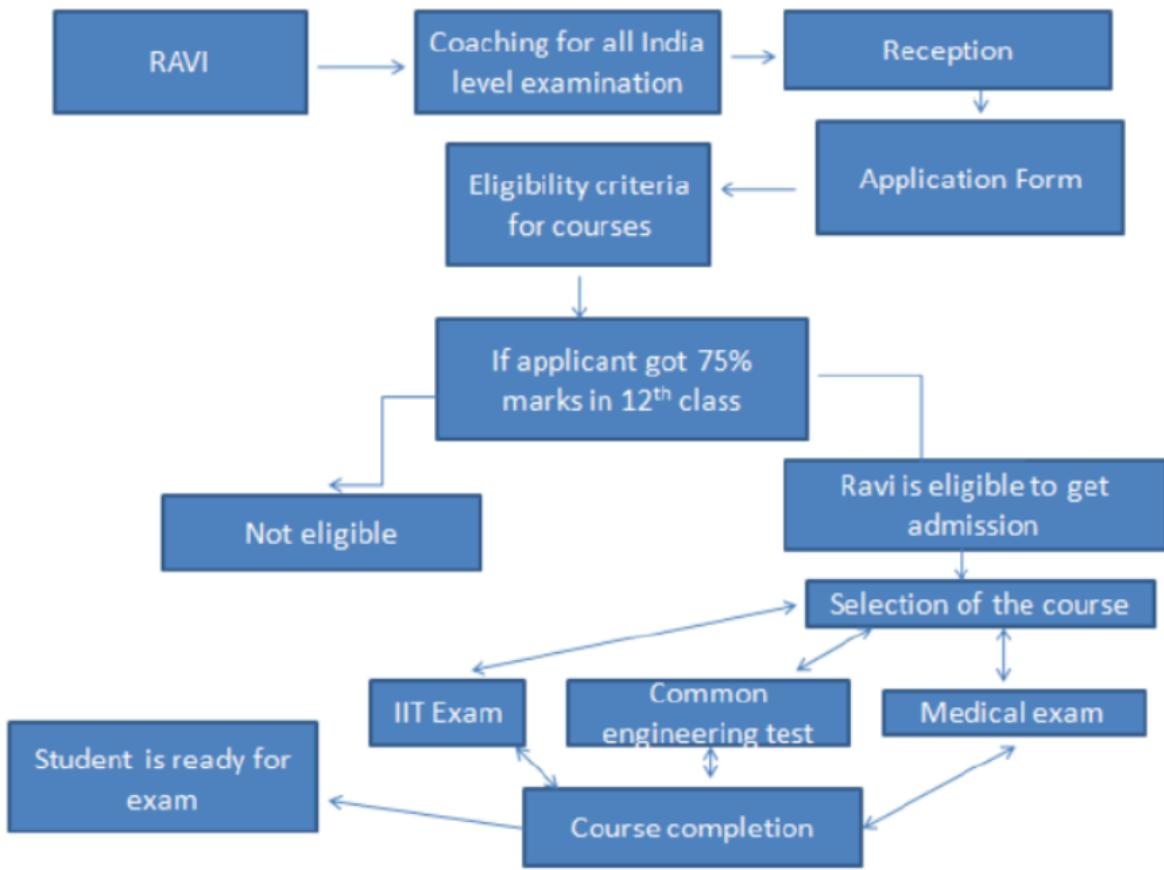


What could be the possible reasons if Ravi goes to the coaching for the admission but here turns from that coaching after discussing with the receptionist?

- A. Ravi forgot to take some documents which are necessary for admission.
- B. Ravi does not like the receptionist as she is very rude and does not provide the proper answer to his queries.
- C. Ravi went to the photo studio to get hard copies of the passport size photograph which is necessary for the admission.
- D. Both (a) and (c)

17.

See the following flowchart carefully and answer the given questions.

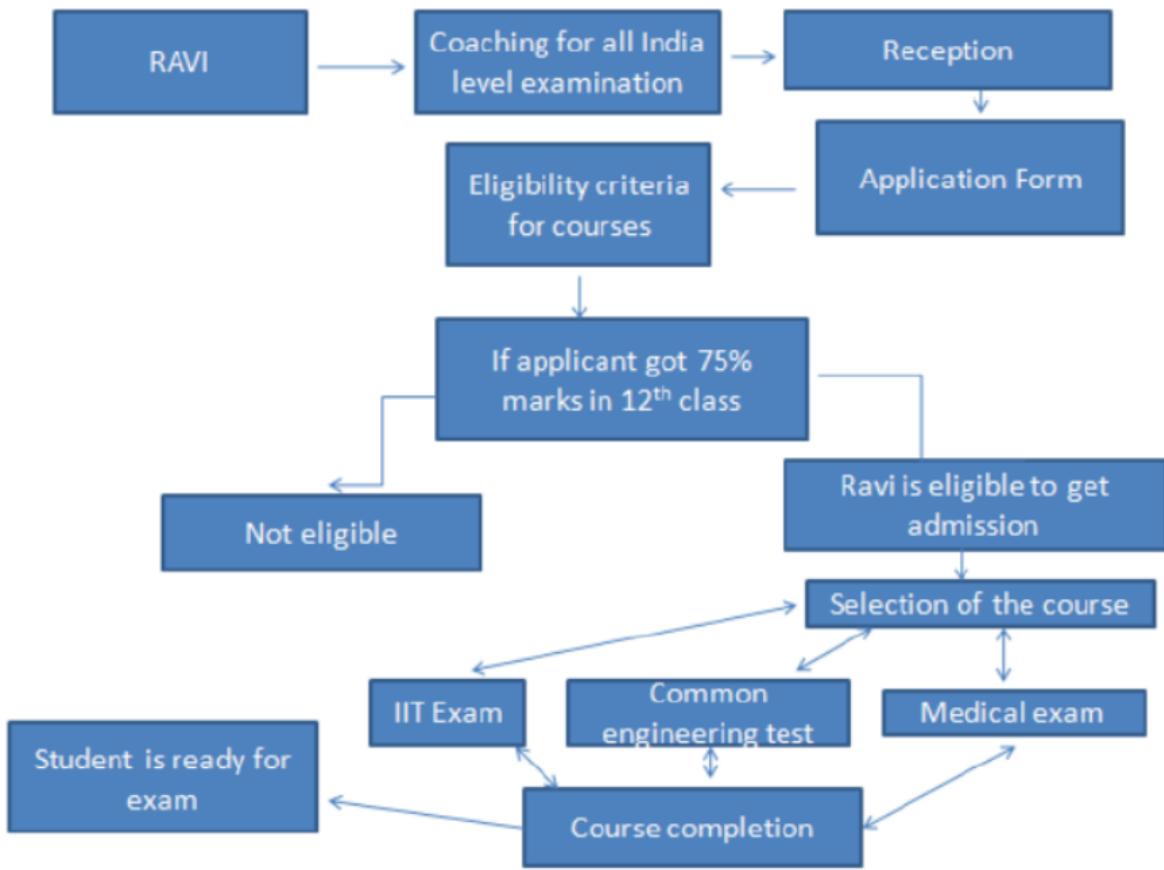


If Ravi got 74.5 % marks in intermediate, then what can be the likely cause that he can get admission in Medical course of that coaching?

- A. If Ravi can provide some high reference for the admission in that coaching.
- B. If Ravi cannot get admission in Medical but he can get admission in some other course.
- C. Ravi cannot get admission in that coaching as it is given in DFD diagram, that only after getting 75% marks, a student can get admission
- D. After giving some donation to the coaching authority Ravi can secure admission in that coaching.

18.

See the following flowchart carefully and answer the given questions.



Even If Ravi is eligible to take admission, he decided not take admission? What can be the possible reasons of that?

- A. Ravi wanted to interchange the course with other course after filling the form and that facility is not provided by coaching.
- B. Ravi did not like the strict rules and regulations of the coaching.
- C. Ravi did not like the test series and the material provided by the coaching..
- D. None of these

19.

**See the following structure carefully and answer the given questions.** Tourist 'from Britain' wants to stay in hotel. Conditions are mentioned in the diagram to process further. Answer the below questions after going through the diagram.



What could be the possible reason that the tourist did not stay in the hotel after he had paid the deposit money.

- A. The receptionist did not find the customer behavior normal and doubts his authenticity.
- B. The tourist completed the check-in formalities and paid the deposit but found the room below his expectations.
- C. The tourist found that he was charged for the room which was not on the first floor.
- D. The tourist found the hotel name to be unattractive.

20.

**See the following structure carefully and answer the given questions.** Tourist 'from Britain' wants to stay in hotel. Conditions are mentioned in the diagram to process further. Answer the below questions after going through the diagram.



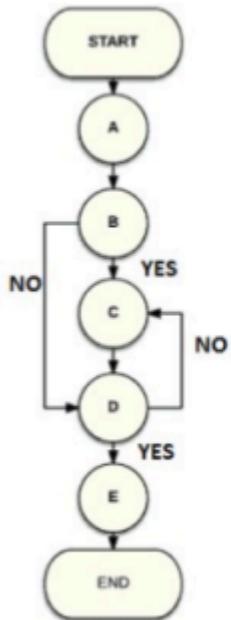
If tourist is willing to submit 7500 Rupees in cash form only and requested to accept the same at the reception, then what will be the result?

- A. Tourist will be allowed to stay in hotel and he will be provided a room by hotel.
- B. After submitting seventy five hundred rupees, tourist receives an acknowledgment of bill.
- C. Receptionist will argue with the tourist to submit the full amount.
- D. Receptionist will refuse to take money from the tourist as per rules he has to submit 8000Rs. Fully.

### SET-3

1. Direction: Study the flow chart and answer the questions. (MUSIGMA)

Box No.	1	2	3	4	5	6	7	8	9	10
	13	20	7	12	10	2	5	1	0	18



Subtract : (number in Box 4) - (number in Box 1). Put the result in Box 10.

Is (number in Box 10) < 0 ?

Add : (number in Box 9) + (number in Box 5). Put the result in Box 2.

The value of

Is (number in Box 2) > (number in Box 7)?

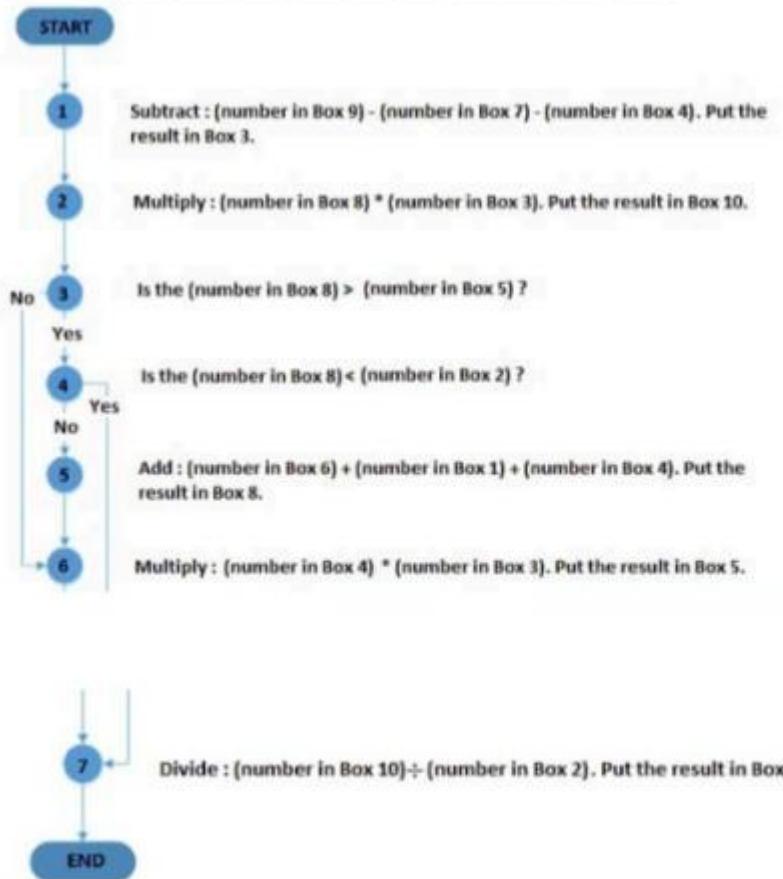
Multiply : (number in Box 10) x (number in Box 2). Put the result in Box 3.

which box will change at the end of the flow chart?

- a) 7
  - b) 8
  - c) 10
  - d) 1
2. At the end of the flowchart what will be the value in box 3?
- a) 360
  - b) 7
  - c) -20
  - d) -10
3. Is the statement given below true or false? After updating the condition 1 in box 10, the value of box 10 is greater than 0.
- a) True
  - b) False
  - c) Can not be determined
4. Is the statement given below true or false? After updating the condition 1 st and 3 rd , the value in box 7 is smaller than the value in box 2.
- a) True
  - b) False
  - c) Can not be determined
5. Direction: Study the flow chart and answer the questions. (**COCUBES**)

Box No.	1	2	3	4	5	6	7	8	9	10
---------	---	---	---	---	---	---	---	---	---	----

25	9	16	5	32	21	13	19	27	4
----	---	----	---	----	----	----	----	----	---



At the end of the

flowchart what is the ratio of the values in box 2 and box 9?

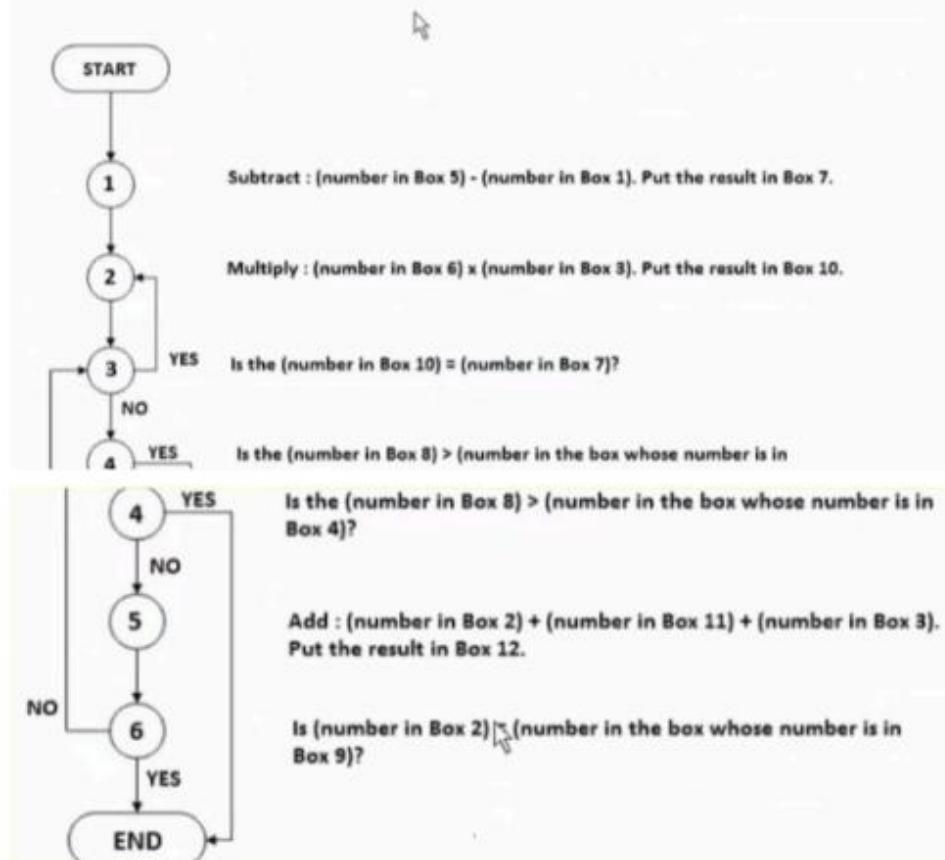
- a) 1:3
  - b) 1:9
  - c) 3:9
  - d) 2:7
6. What could be the value of box 6 according to step 7, if the original value of box 10 was used?
- a) 4.44
  - b) 0.44
  - c) 44.4
  - d) 33.77
7. What could be the value in box 8, if the 3 rd condition is true and 4 th condition is false?
- a) 52
  - b) 19
  - c) 51
  - d) 21
8. Is the statement given below true or false? After following the instruction 3 rd the next instruction followed is condition 4 th?
- a) True
  - b) False
  - c) Cannot be determined

9. Is the statement given below true or false? At the end of the flowchart the number in box 5 is greater than the number in box 3.

- a) True
- b) False
- c) Cannot be determined

10. Direction: Study the flowchart and answer the question. (COCUBES)

Box No.	1	2	3	4	5	6	7	8	9	10	11	12
	6	19	2	1	5	10	18	12	3	15	21	9



condition would be followed after the condition 4 th ?

- a) End
- b) 5<sup>th</sup>
- c) 3<sup>rd</sup>
- d) Can not be determined

11. How many loops are implemented in the flowchart?

- a) 1
- b) 3
- c) 4
- d) Zero

12. The number in box 7 at the end of the flowchart is?

- a) Less than number in box 4
- b) Equals to the number in box 5
- c) More than number in box 10
- d) None of the above

13. What number of boxes remained unchanged after following all the instructions properly?

- a) 8
- b) 7
- c) 1
- d) 9

14. According to which instruction the condition of infinite loop will be created?

- a) Instruction 4
- b) Instruction 5
- c) Instruction 2
- d) Cannot be determined

15. Direction: Study the flow chart and answer the questions. (COCUBES)

Box #	1	2	3	4	5	6	7	8	9	10
	6	3	9	2	11	2	91	48	66	1

Start

- (1) Add: (number in box 4) + (number in box 2), put result into box 7.
- (2) Add: (number in box 7) + (number in the box whose number is in box 6), put result into box 6.
- (3) Multiply: (number in box 6) X (number in box 1), put result into box 5

At the end of the

END

flowchart, what number is in box 6?

- a) 2
- b) 6
- c) 8
- d) 5

SET-1

1. C	2. C	3. D	4. C	5. E
6. C	7. D	8. E	9. B	10. D
11.C	12.C	13.A	14.D	15.D
16.C	17.C	18.C	19.C	20.D
21.C	22.C	23.E	24.C	25.C

SET-2

1.	2.	3. A	4.	5. B
6. C	7. A	8. B	9. B	10. A
11.A	12.B	13.D	14.B	15.D
16.D	17.C	18.D	19.B	20.D

SET-3

1. C	2. D	3. B	4. A	5.A
6. B	7. C	8. B	9. A	10. A
11.A	12.A	13.D	14.A	15.C

## **ALPHA NUMERIC CODING**

### **NUMBER SERIES**

#### **Series completion**

In this type of questions, some numbers and/or alphabetical letters are given. They all form a series and the series changes in certain order.

The series may also have one or more numbers/letters missing.

The candidates are required to observe that specific order in which the series changes and then complete the series.

Similarly, the candidates have to decide about the missing letter or number that would suit for the blank space if they continue to change in some order. Some common types are explained in the following slides.

#### **Types of Series:**

Number Series Alpha series Letter series

Number and letter Analogy

#### **Tricks to solve series completion**

**Step 1:** Observe are there any familiar numbers in the given series like prime numbers, perfect squares, cubes and so on which are easy to identify.

**Step 2:** Calculate the differences between the numbers. Observe the pattern in the differences.

If the differences are growing rapidly it might be a square series, cube series or multiplicative series. If the numbers are growing slowly, then it is an addition or subtraction series.

If the differences are not having any pattern then,

1. It might be a double or triple series. Here every alternate number or every 3rd number forms series
2. It might be a sum or average series. Here sum of two consecutive numbers gives 3rd number or average of first two numbers give next number.

**Step 3:** Sometimes number will be multiplied and will be added another number.

#### **Types of number series:**

##### **I. Prime number Series:**

Example: 2, 3, 5, 7, 11, 13,

Solution: The given series is prime number series. The next prime number is 17.

Example: 2, 5, 11, 17, 23, 41.

Solution: The prime numbers are written alternately.

##### **II. Difference Series:**

Example: 2, 5, 8, 11, 14, 17... 23.

Answer: The difference between the numbers is 3. ( $17+3 = 20$ )

Example: 45, 38, 31, 24, 17... 3.

Answer: The difference between the numbers is 7. ( $17-7=10$ ).

### III. Multiplication Series:

Example: 2, 6, 18, 54, 162... 1458.

Answer: The numbers are multiplied by 3 to get next number. ( $162 \times 3 = 486$ ).

### IV. $n^2$ Series:

Example: 1, 4, 9, 16, 25,....., 49

Answer: The series is  $1^2, 2^2, 3^2, 4^2, 5^2, \dots$ . The next number is  $6^2=36$ ;

Example : 0, 4, 16, 36, 64,..... 144.

Answer: The series is  $0^2, 2^2, 4^2, 6^2$ , etc. The next number is  $10^2=100$ .

### V. $n^2-1$ Series :

Example : 0, 3, 8, 15, 24, 35, 48, .....

Answer : The series is  $1^2-1, 2^2-1, 3^2-1$  etc. The next number is  $8^2 -1=63$ .

**Another logic :** Difference between numbers is 3, 5, 7, 9, 11, 13 etc. The next number is ( $48+15=63$ ).

### VI. $n^2 +1$ Series :

Example: 2, 5, 10, 17, 26, 37,....., 65.

Answer: The series is  $1^2+1, 2^2+1, 3^2+1$  etc. The next number is  $7^2+1=50$ .

Example: 3, 12, 48, 192, ....., 3072.

Answer : The numbers are multiplied by 4 to get the next number. ( $192 \times 4 = 768$ ).

### VII. Division Series:

Example : 720, 120, 24,....., 2, 1

Answer:  $720/6=120, 120/5=24, 24/4=6, 6/3=2, 2/2=1$ . \*\*

Example : 32, 48, 72, 108,....., 243.

Answer: . Number  $\times 3/2$ = next number.  $32 \times 3/2=48, 48 \times 3/2=72, 72 \times 3/2=108, 108 \times 3/2=162$ .

### VIII. $n^2+n$ Series (or) $n^2-n$ Series :

Example : 2, 6, 12, 20, ....., 42.

Answer : The series is  $1^2+1, 2^2+2, 3^2+3, 4^2+4$  etc. The next number =  $5^2+5=30$ .

**Another Logic :** The series is  $1 \times 2, 2 \times 3, 3 \times 4, 4 \times 5$ . The next number is  $5 \times 6=30$ .

**Another Logic :** The series is  $2^2-2, 3^2-3, 4^2-4, 5^2-5$ . The next number is  $6^2-6=30$ .

### IX. $n^3$ Series :

Example : 1, 8, 27, 64, 125, 216, .....

Answer : The series is  $1^3, 2^3, 3^3$ , etc. The missing number is  $7^3=343$ .

**X.  $n^3+1$  Series :**

Example : 2, 9, 28, 65, 126, 217, 344, .....

Answer : The series is  $1^3+1$ ,  $2^3+1$ ,  $3^3+1$ , etc. The missing number is  $8^3+1=513$ .

**XI.  $n^3-1$  Series :**

Example : 0, 7, 26, 63, 124,....., 342.

Answer: The series is  $1^3-1$ ,  $2^3-1$ ,  $3^3-1$  etc. The missing number is  $6^3-1=215$ .

**XII.  $n^3+n$  Series :**

Example : 2, 10, 30, 68, 130,....., 350.

Answer : The series is  $1^3+1$ ,  $2^3+2$ ,  $3^3+3$  etc .The missing number is  $6^3+6=222$ .

**XIII.  $n^3-n$  Series :**

Example :0, 6, 24, 60, 120, 210, .....

Answer : The series is  $1^3-1$ ,  $2^3-2$ ,  $3^3-3$ , etc. The missing number is  $7^3-7=336$ .

**Another Logic :** The series is  $0 \times 1 \times 2$ ,  $1 \times 2 \times 3$ ,  $2 \times 3 \times 4$ , etc. The missing number is  $6 \times 7 \times 8=336$ .

**XIV.  $n^3+n^2$  Series :**

Example : 2, 12, 36, 80, 150,.....,

Answer: The series is  $1^3+1^2$ , $2^3+2^2$ , $3^3+3^2$ etc. The missing number is  $6^3+6^2=252$

**XV.  $n^3-n^2$  Series**

Example: 0,4,18,48,100,.....,

Answer : The series is  $1^3-1^2$ , $2^3-2^2$ , $3^3-3^2$  etc. The missing number is  $6^3-6^2=180$

**XVI.  $xy$ ,  $x+y$  Series:**

Example: 48,12,76,13,54,9,32,..... ,

Answer :  $4+8=12$ ,  $7+6=13$ ,  $5+4=9$  ,  $3+2=5$ .

**XVII. Factorial Series:**

Example: 1,1,2,6,24,120,..... ,

Answer :  $0!=1$ ,  $1!=1$ ,  $2!=2$ ,  $3!=6$ ,  $4!=24$ ,  $5!=120$ ,  $6!=7$

**Coding Decoding**

A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26

To remember them use the Code- **EJOTY (5, 10, 15, 20, 25)**

**A-Z , B-Y .....**are opposite to each other. The sum of two opposite letters is 27.  $A=1$  ,  $Z=26$  so  $A+Z=1+26=27$ .

**Number coding**

In this, either the numerals are assigned to the alphabets of the given code or the alphabets are assigned to the numerals. The candidate has to observe the direction of solving the problem.

**Mixed coding**

In this, three or more complete messages are given. The procedure to solve is any two messages bearing the common word are picked up. Proceeding similarly, all possible combinations of two messages are analyzed.

### **Mixed number coding**

It is the same as mixed coding but instead of alphabetical codes numerical codes are given.

### **Decoding**

Conversion of the coded numbers or alphabets to the original text. The procedure to decode is the same as coding. That is, find the pattern that is followed in the given series.

### **SYMBOLS CODING**

In this type of coding, symbols like!, @, # and so on will be used for coding the numbers or alphabets.

### **SET-1**

**Q1.** In following question, a number series is given with one term missing. Choose the correct alternative that will same pattern and fill in the blank spaces.: 1, 4, 9, 16, 25, x

- A.** 35                   **B.** 36                   **C.** 48                   **D.** 49

**Q2.** In following question, a number series is given with one term missing. Choose the correct alternative that will same pattern and fill in the blank spaces.: 1, 6, 13, 22, 33,

- A.** 44                   **B.** 45                   **C.** 46                   **D.** 47

**Q3.** In following question, a number series is given with one term missing. Choose the correct alternative that will same pattern and fill in the blank spaces.: 19, 2, 38, 3, 114, 4,

- A.** 228                   **B.** 256                   **C.** 352                   **D.** 456

**Q4.** In following question, a number series is given with one term missing. Choose the correct alternative that will same pattern and fill in the blank spaces.: 4, 5, 9, 18, 34, (.....)

- A.** 43                   **B.** 49                   **C.** 50                   **D.** 59

**Q5.** In following question, a number series is given with one term missing. Choose the correct alternative that will same pattern and fill in the blank spaces.: 2, 1, 2, 4, 4, 5, 6, 7, 8, 8, 10, 11,

- A.** 9                   **B.** 10                   **C.** 11                   **D.** 12

**Q6.** In following question, a number series is given with one term missing. Choose the correct alternative that will same pattern and fill in the blank spaces.: 11, 10, (.....), 100, 1001, 1000, 10001

- A.** 101                   **B.** 110                   **C.** 111                   **D.** None of these

**Q7.** In following question, a number series is given with one term missing. Choose the correct alternative that will same pattern and fill in the blank spaces.: 123456147, 12345614, 2345614, 234561,

- A.** 3456                   **B.** 2345                   **C.** 23456                   **D.** 34561

**Q8.** In following question, a number series is given with one term missing. Choose the correct alternative that will same pattern and fill in the blank spaces.: In the Series 3, 9, 15, ... what will be the 21st term ?

- A.** 117                   **B.** 121                   **C.** 123                   **D.** 129

**Q9.** In following question, a number series is given with one term missing. Choose the correct alternative that will same pattern and fill in the blank spaces.: Which term of the series 5, 8, 11,

14, ... is 320 ?

- A. 104th                    B. 105th                    C. 106th                    D. 64<sup>th</sup>

**Q10.** In following questions, one term in number series is incorrect. : Find out the incorrect number 24, 27, 31, 33, 36

- A. 24                    B. 27                    C. 31                    D. 33

Q11. If COURSE is coded as FRXUVH, how is RACE coded as?

- A.ABHF    B.UDFH    C.DUHF    D.WQYF

Q12. In a certain code, MONKEY is written as XDJMNL. How is TIGER written in that code?

- A.QDFHS    B.FHSQD    C.DQSFH    D.STFDQ

Q13. If BOMBAY is written as MYMYMY, how will TAMIL NADU be written in that code?

- A.YMNYMNYMN    B.ABHABHABH    C.ABCDABCDA    D.MNUMNUMNU

Q14. In a certain code, TOGETHER is written as RQEGRJCT. In the same code, what will PAROLE be written as?

- A.PQJGNC    B.CNGJPQ    C.NCPQJG    D.NCJQPG

Q15. If in a certain language, COUNSEL is coded as BITIRAK, how is GUIDANCE written in that code?

- A.OHYFZJBB    B.OFHBJZYB    C.BJZYBHFO    D.FOHYZJBB

Q16. If in a certain code, TWENTY is written as 863985 and ELEVEN is written as 323039, how is TWELVE written in that code?

- A.203863    B.368302    C.863203    D.320368

Q17. In a certain code, if LOGIC is coded as 1512201824, how is PEARL coded as?

- A.112226915    B.113331596    C.112226571    D.113336734

Q18. If APPLE is written as 24991320, how is LOVELY coded as?

- A.13101310130    B.1310320130    C.13101350140D.13101340120

Q19. If ENGLAND is written as 1234526 and FRANCE is written as 785291, how is GREECE coded?

- A.117186    B.381191    C.131871    D.112235

Q20. If tee see pee means drink fruit juice, see kee lee means juice is sweet, lee ree mee means he is intelligent, then which word means sweet?

- A.See    B.Pee    C.Tee    D.Kee

Q21. If white is called blue, blue is called red, red is called yellow, yellow is called green, green is called black, black is called violet and violet is called orange, what would be the color of human blood?

- A.Blue    B.Yellow    C.BlackD.Violet

Q22. If the animals which can walk are called swimmers, animals who crawl are called flying,

those living in water are called snakes and those which fly in the sky are called hunters, then what will a lizard be called?

- A.Flying    B.Swimmer    C.Snakes    D.Hunters

Q23.In a certain code language, 'col tip mot' means 'singing is appreciable ', 'mot baj min' means 'dancing is good' and 'tip nop baj' means 'singing and dancing', then, which of the following means 'good' in that code language?

- A.Mot    B.Bai    C.Min    D.Nop

Q24. In a certain code language, '851' means 'good sweet fruit', '783' means 'good red rose' and '341' means 'rose and fruit'. Which of the following digits stands for 'sweet' in that language?

- A.2    B.3    C.4    D.5

Q25.In a certain code, 2 is coded as P, 3 as N, 9 as Q, 5 as R, 4 as A and as B. How is 599423 coded in that code?

- A.QRQPAN B.RQQAPN    C.AQPQRN    D.QRANPA

## SET-2

Q1.In a certain code language, '123' means 'hot filtered coffee'

, '356' means 'very hot day' and '589' means 'day and night'. Which digit stands for 'very'?

- A.3    B.6    C.9    D.7

Q2. In a certain code, '256' means 'you are good'; '637' means 'we are bad' and '358' means 'good and bad'. Which of the following represents 'and 'in that code?

- A.5    B.6    C.7    D.8

Q3. If in a certain language NZTUJGZ is coded as MYSTIFY, how is OFNFTJT coded in that language?

- A.REGULAR    B.MORNING    C.MINDFUL    D.NEMESIS

Q4. In a certain code, SQHOOKD is written as TRIPPLE. How CHRONRD is written in that code? A.GLITTER    B.TROUSER    C.JANUARY    D.DISPOSE

Q5. If HUMJTK is coded as FRIEND, how is EDRIRL written in that code ?

- A.SUNDAY B.MONDAY    C.BEAUTY    D.CANDLE

Q6. In a certain code language TUTDNES is written as STUDENT. How will SUORECS be written in that code language?

- A.BATTERY    B.FASHION    C.SOURCES    D.LIMITED

Q7. ZA5, Y4B, XC6, W3D,?

- A.E7V    B.V2E    C.VE5    D.VE7

Q8. In a certain code 'TOME' is written as '@ \$ \* ?' and ARE is written as ' • £ ? ' How can 'REMOTE' be written in that code?

- A. ?\*\$@?£    B. \*\$@?£?    C. £?\*\$@?    D. \*\$?£@?

Q.9.In a certain code 'PALM' is coded as '!@?\$' and 'ARM' is written as '@\*\$', how can

‘ALARM’ be written in that code?

- A. @!@?\$ B. @\$?!@ C. ?@ @!\$ D.NONE OF THESE

Q10. 3, 5, 9, 17, 33 \_\_

- a. 60 b. 62 c. 65 d. 64

Q11. . 98 72 50 32 18 \_\_

- a.10 b.8 c.6 d.12

Q12.46, 60, 52, 54, 58, 48 \_\_

- a. 64 b. 54 c. 66 d. 58

Q13. 20, 20, 19, 16, 17, 13, 14, 11 \_\_

- a. 11,13 b. 12,12 c.10,10 d. 10,12

Q14 .500,356,456,392 \_\_

- a. 400 b. 418 c. 430 d. 428

Q15. 41, 42, 41, 45, 37, 46, \_\_

- a.56 b.19 c.28 d.62

Q16. 4, 6, 9, 14, 21, 32, \_\_

- a.45 b.48 c.51 d.55

Q17. 3, 7, 17, 31, 53 \_\_

- a.71 b.69 c.79 d.83

Q18. 6, 24, 96, 384, \_\_

- a.1568 b.1563 c.1655 d.1536

Q19 . 8, 17, 35, 71, 143, \_\_

- a.287 b.299 c.285 d.286

Q20. 1,2,6,21,88,445, \_\_

- a.2760 b.2600 c.2670 d.2676

### SET-3 (DXC)

1. In a certain code, BOXER is written as AQWGQ. How VISIT is written in that code?

- A UKRNU B UKRKS C WKRKU D WKRKS

2. If CLOTHES is EXHAUST and THRICE is STABLE, then SHIRT is

- A BLUSH B STAUL C THULE D BLASH

3. In a certain code, the INSTITUTION is written as NOITUTITSNI. How is PERFECTION written in that code?

- A NOICTEFREP B NOITCEFERP C NOITCEFRPE D NOITCEFREP

4. If FESTIVAL is coded as MBWJUTFG, then OPIUM would be coded as

- A NOHTL B NTHNO C NVJQP D MUIPO

5. In a certain code, RIPPLE is written as 613382 and LIFE is written as 8192. How is PILLER written in that code?

A 318826 B 318286 C 618826 D 328816

6. In a certain code language, the QUEUE is written as Q 22, and CHURCH is written as 1UR1.

Which of the following would be the most appropriate code for the BANANA in that language?

A B5A5 B 5N5A C B55A D BA5A5A

7. If PORTER is written as QNSSFQ, then BRIGHT would be coded as

A CQJFIS B CNJHIS C CQJFGS D CNJHIU

8. In a certain code, EXPLAINING is written as PXEALNIGNI. How is PRODUCED written in that code?

A ORPBUDEC B ROPUDEC D C ORPUDEC D None of these

9. In a certain code, GIGANTIC is written as GIGTANCI. How is MIRACLES written in that code?

A MIRLCAES B MIRLACSE C RIMCALSE D RIMLCAES

10. In a certain code, BOY is written as \$\*? and HOUR is written @\*?0. How is RUBY written in that code?

A 0 ? \$ ? B 0 \$ ? ? C ? \$ ? 0 D ? ? \$ 0

11. In a certain code BEHAVE is written down as CEIAWE. Then how SEVERE will be written on the basis of

the same code language?

A TWEKSE B TEWESE C SETEWE D EWESET

12. In a certain code TRADITION is written down as ARTTIDNOI. Then how VERIFY will be written on the basis of

the same code language?

A T EVORYF B T EVIPYF C EVIRYF D EVIRYG

13. In a certain code PROPER is written down as POREPR. Then how ISSUES will be written on the basis of

the same code language?

A ISSEUS B ISSUE C IUESSS D ISUSES

14. In a certain code DARK is written down as ECVP. Then how HOUR will be written on the basis of

the same code language?

A KCIUQ B JRYW C JBITP D JBHTP

15. In a specific code VOCABULARY is written down as WNDZCTMZSX. Then how PROPERTY will be written

on the basis of the same code language?

A QQPOUQUX B QQPOVQUY C QQPOWQUZ D QQPOFQUX

### SET-1

1. B	2. C	3. D	4. D	5. B
6. A	7. D	8. C	9. C	10. C
11.B	12.A	13.D	14.C	15.D
16.C	17.A	18.B	19.B	20.D
21.B	22.A	23.C	24.D	25.B

### SET-2

1. B	2. D	3. D	4. D	5. D
6. C	7. D	8. C	9. D	10. C

11.B	12.A	13.C	14.D	15.B
16.A	17.C	18.D	19.A	20.D

SET-3

1. B	2. D	3. D	4. C	5. A
6. C	7. A	8. D	9. B	10. B
11.A	12.A	13.B	14.B	15.D

## ADVANCE RATIO AND PROPORTION

RATIO

Ratio is a comparison of two quantities by division. Ratio represents the relation that one quantity bears to the other. If **a** and **b** are two quantities of the same kind, then **a/b** is known as the ratio of **a** and **b**.

Denoted as **a : b**, where the first term of the ratio is called as **antecedent**, while the second term is called as **consequent**.

A "ratio" is just a comparison between two different things. The ratio between 30 kg and 50 kg is 3:5.

**Example:** In the park mentioned above, the ratio of ducks to geese is 16 to 9. How many of the 300 birds are geese?

**Solution:** The ratio tells that, out of every  $16 + 9 = 25$  birds, 9 are geese. That is,  $\frac{9}{25}$  of the birds are geese. Then there are  $(9/25) (300) = 108$  geese.

**Example:** In a school the ratio of number of boys and girls is 9:6. If there are present 180 boys. Find the total number of students in the school?

**Solution:** Let the number of boys and girls be  $9x$  and  $6x$ . Then  $9x=180$ ,  $x=20$   
Therefore, the total number of students= $15x$ , Thus,  $15(20)=300$

## Different Types of Ratios

### 1. Duplicate Ratio:

$a^2 : b^2$  is called duplicate ratio of  $a : b$

### 2. Triplicate Ratio:

$a^3 : b^3$  is called triplicate ratio of  $a : b$

### 3. Compound Ratio:

$ab : cd$  is the compound ratio of  $a : c$  and  $b : d$ . It is the ratio of the products of the antecedents to that of the consequents of the two or more given ratios.

## PROPORTION

The equality of two ratios is called as proportion.  $a$ ,  $b$ ,  $c$ , and  $d$  are said to be in proportion if,

$$a : b = c : d \quad \text{or} \quad a : b :: c : d$$

In a proportion, the first and fourth terms are known as extremes, while second and third terms are known as means.

### PRODUCT OF EXTREMES=PRODUCT OF MEANS

$$a \cdot d = b \cdot c$$

## Continued Proportion

Four quantities:  $a$ ,  $b$ ,  $c$  and  $d$  are said to be in continued proportion, if  $a:b=b:c=c:d$ .

Three quantities:  $a$ ,  $b$  and  $c$  are said to be in continued proportion, if  $a:b=b:c$  or  $ac=b^2$

**b** is said to be the **mean proportional** between **a** and **c** and **c** is said to be a **Third proportional** to **a** and **b**.

**Example:** If 40, x, x, 40 are in proportion, then find the value of x.

**Solution:** Product of means = product of extremes

$$x * x = 40 * 40$$

$$\Rightarrow x^2 = 1600 \Rightarrow x = 40$$

**FOURTH Proportion** – If four quantities a, b, c and x are such that  $a : b :: c : x$ , then  $ax=bc$  and x is called fourthproportion of a, b and c.

**Example:** A can do a piece of work in 12 days, B is 60% more efficient than A. Find the number of days that Btakes to do the same piece of work.

**Solution:** Ratio of efficiencies of A and B=100 : 160 = 5 : 8

Since, efficiency is inversely proportional to the number of days.

Ratio of days taken to complete the job=8:5No. of days taken by B=5/8 \*12=15/2

## Variation

If two quantities are related in such a way that as quantity ‘x’ changes, it also brings a change in the second quantity ‘y’, then the two quantities are in variation. There are two types of variations:-

1. **Direct Variation:** The quantity ‘x’ is in direct variation to ‘y’, if an increase in ‘x’ causes an increase in ‘y’ and decrease in ‘x’ causes ‘y’ to decrease proportionally. Therefore,  $x = ky$ , where ‘k’ is constant of proportionality.

2. **Inverse Variation:** The quantity ‘x’ is in inverse variation to ‘y’, if an increase in ‘x’ causes an decrease in ‘y’ and decrease in ‘x’ causes ‘y’ to increase proportionally. Therefore,  $x = k/y$ , where ‘k’ is constant of proportionality.

3. **Joint Variation:** If there are more than 2 quantities x,y and z; and x varies with both y and z, then x is in jointvariation to y and z. It can be expressed as  $kyz$ , where k is constant of proportionality.

Example: Men doing a work in some number of days working certain hours a day

## Partnership

Persons two or more than two persons when start and run the new business jointly of their own choice, the persons who start the business are called **partners** and the agreement between them is called **partnership**.

### Working and Inactive partners:

A partner who manages the business is called **working/active partner** and the one who simply invests the money is called **inactive partner**.

### Ratio of division of gains:

1. The amount investment of all the partners are for the same time period, the gain or loss amount is distributedamong the partners in the ratio of their invested amount.

2. When investments are for different time periods

**Example:** A invests Rs. **R1 for T1 months** and B invests Rs. **R2 for T2 months**, then(A’s share of profit) : (B’s share of profit) =  $A*T1 : B*T2$

**Partnership is of two types:**

- Simple Partnership
  - Compound Partnership

**1. Simple Partnership:** When investments of all the partners are for the same period of time, the profit or loss is distributed among the partners in the ratio of their original investments.

Suppose A and B invest  $p$  and  $q$  respectively for a year in a business, then at the end of the year,

**Share of A's profit (loss): Share of B's profit (loss) = p : q**

**2. Compound Partnership:** When investments of all the partners are for different period of time, then equivalent capitals are calculated for a unit of time and the profit or loss is divided in the ratio of the product of time and investment.

Suppose A and B invest ` p and ` q for x months and y months respectively, **then Share of A's profit (loss) : Share of B's profit (loss) = px : qy**

- Example:** A and B started a business investing Rs. 90,000 and Rs 20,000 respectively. In what ratio should the profit earned after 2 years be divided between A and B respectively?



**Solution:** Exp: A: B = 90000 : 20000 = 90 : 20 = 18 : 4 = 9 : 2

**Example:** Ajay, Bhavan and Chetan started a business together. Thrice the investment of Ajay, twice the investment of Bhavan and the investment of Chetan are equal. Find the ratio of their respective profits at the end of the year?



**Solution:** Let the investments of Ajay, Bhavan and Chetan be Rs. a, Rs. b and Rs. c respectively.

$$3b = 2b = c, a = c/3, b = c/2.$$

Ratio of profits of Ajay, Bhavan and Chetan at the end of one year = Ratio of their respective investments = 2:3:6.

SET- 1

## Percentage & Ratio

**Q1.** The salaries of A, B, C are in the ratio 2:3:5. If the increments of 15%, 10% and 20% are allowed respectively in their salaries, then what will be new ratio of their salaries?

- A. 3:3:10      B. 10:11:20      C. 23:33:60      D. Can't be determined

**Q2.** In a class of 125, 20% students can dance.  $\frac{2}{5}$  of the total students can sing and  $\frac{2}{5}$  of the remaining students are good at sports. What is the respective ratio of the students who can dance to students who are good at sports?

- A 5:4      B 3:2      C 4:5      D 3:7

**Q3.** X: Y: Z is in the ratio of 3: 2: 5. Then how much money will Z get out of Rs 500?

- A Rs 200      B Rs 250      C Rs 300      D Rs 350

**Q4.** Rate of income tax is increased from 4% to 5%. However, the total tax liability of a person

remains the same as was in the last year. If his income for the last year was Rs.10000, find his present income.

- A. 9000      B. 8000      C. 5000      D. 6000

**Q5.** Mohan distributed his assets to his wife, three sons, two daughters and five grandchildren in such a way that each grandchild got one-eighth of each son and one-tenth of each daughter. His wife got 40% of the total share of his sons and daughter together. If each daughter receives asset of Rs.1.25 lakhs, what is the salary of his wife?

- A. 2.5 Lakhs      B. 2.7 Lakhs      C. 2.2 Lakhs      D. 3.2 Lakhs

### **Coin Based Problem**

**Q6.** A sum of Rs. 36.90 is made up of 180 coins which are either 10 p coins or 25 p coins. The number of 10 p coins is?

- A. 48      B. 54      C. 56      D. 60

**Q7.** A bag contains Rs 410 in the form of Rs 5, Rs 2 and Rs 1 coins. The numbers of coins are in the ratio 4:6:9. So, find the number of 2 Rs coins.

- A. 40      B. 50      C. 60      D. 70

**Q8.** A bag contains 50 P, 25 P and 10 P coins in the ratio 5: 9: 4, amounting to Rs. 206. Find the number of coins of each type respectively.

- A. 360, 160, 200      B. 160, 360, 200      C. 200, 360, 160      D. 200, 160, 300

**Q9.** A bag contains some coins in the denominations 50, 20 and 10 paisa coins in the ratio 4:2:1. If their total value is Rs 12.50, then the number of 10 paisa coins is?

- A. 10      B. 5      C. 20      D. 15

**Q10.** In a bag, there are coins of 25 p, 10 p and 5 p in the ratio of 1 : 2 : 3. If there is Rs. 30 in all, how many 5 p coins are there?

- A. 50      B. 100      C. 150      D. 200

### **Income and Expenditure**

**Q11.** Share of Rs.4200 among Rahul, Vijay and Mahinder in the ratio of 2:4:6. Find the amount received by Mahinder?

- A. 3100      B. 2500      C. 2100      D. 4200

**Q12.** The ratio of the incomes of four persons A, B, C and D is 5:3:9:4. The sum of the incomes of A and C is 84,000. Find the difference of the incomes of B and D?

- A. 5000      B. 7000      C. 6000      D. 8000

**Q13.** The ratio of income of A and B is 3:4. The Ratio of expenditure of both is 2: 3 and each saves RS 200. Find the income of A and B.

- A. Rs 500,600      B. Rs 600,800      C. Rs 600,900      D. Rs 800, 1000

**Q14.** The salary of two friend's Ramu and Raju are in the ratio of 4:5. If the salary of each one increases by Rs.6000, then the new ratio becomes 48:55. What is Raju's present salary?

- A. 11,500      B. 16,500      C. 9000      D. 8,500

### **Ratios of Ratios**

**Q15.** In a school, the ratio to the number of boys and girls is 4:9, after inclusion of 32 new girls, the ratio becomes 4:17. How many boys were present at the start in this school?

- A. 20                      B. 16                      C. 25                      D. 18

**Q16.** In an examination, the number of those who passed and the number of those who failed were in the ratio 25:4. If five more had appeared and the number of failures was 2 less than earlier, the ratio of passers to failures would have been 22:3. The number of students who appeared at the examination, is?

- A. 154                      B. 145                      C. 160                      D. 150

**Q17.** The students in the three classes are in the ratio 2:3:5. If 20 students are increased in each class the ratio changes to 4:5:7. What was the total number of students in the three classes before the increase?

- A. 125                      B. 130                      C. 100                      D. 150

**Q18.** At the start of a seminar, the ratio of the number of male participants to the number of female participants was 3:1. During the tea break 16 participants left and 6 more female participants registered. The ratio of the male to the female participants now becomes 2:1. What was the total number of participants at the start of the seminar?

- A. 54                      B. 64                      C. 34                      D. 44

### **Simple & Compound Partnership**

**Q19.** A and B start a business jointly. A invests Rs.16,000 for 8 months and B remains in the business for 4 months. Out of total, B claims  $\frac{2}{7}$  of the profit. How much money was contributed by B?

- A. 12,500                      B. 12,000                      C. 12,800                      D. 13,000

**Q20.** A and B are partners and invested Rs.50,000 and Rs.60,000 respectively. After 8 months B leaves and C joins with a capital of Rs.90,000. If the profit for 1 year is Rs.36,000, find A's share of profit.

- A. 15000                      B. 12000                      C. 9000                      D. 14000

**Q21.** A, B and C started a business with investment in ratio 5:6:8 respectively. After 1 year, C withdrew 50% of his capital and A increased his capital by 60% of his investment. After 2 years, in what ratio should the earned profit be distributed among A, B and C respectively?

- A. 12:12:13                      B. 13:12:12                      C. 12:13:13                      D. 13:12:13

**Q22.** A began with Rs.45000 and was joined afterwards by B with Rs.54000. After how many months did B join, if the profits at the end of the year were divided in the ratio 2:1?

- A. 7 months                      B. 9 months                      C. 5 months                      D. 7.5 months

### **Partnership with Ratio**

**Q23.** A, B and C shared profits in ratio of 5:7:8. They partnered for 14 months, 8 months and 7 months respectively. Find the ratio of their investments.

- A. 64:49:20                      B. 49:64:20                      C. 20:49:64                      D. 20:64:49

**Q24.** A and B invests in the business in ratio 3:2. Assume that 5% of total profit goes to charity. If

A's share is Rs.855, what is the total profit?

- A. 1000      B. 4275      C.2525      D.1500

**Q25.** In a business, A and C invested amounts in the ratio 2:1, whereas the ratio between amount invested by A and B was 3:2. If Rs.1, 57,300 was their profit, how much amount did B receive?

- A. 48,400      B. 46, 400      C.72,600      D.36,300

### **SET-2**

Q1. The ratio of income of A, B and C is 3: 7: 4 and the ratio of their expenditure is 4: 3: 5 respectively. If A saves Rs. 300 out of Rs. 2400, find the savings of B.

- (a) Rs. 4025      (b) Rs. 570      (c) Rs. 575      (d) Rs. 580

Q2. A person cover certain distance by Train, Bus and Car in ratio 4 : 3 : 2. The ratio of fair is 1 : 2 : 4 per km. The total expenditure as a fair is Rs. 360. Then, total expenditure as fair on bus.

- (a) Rs. 140      (b) Rs. 120      (c) Rs. 160      (d) Rs. 170

Q3. The price of copper is directly proportional to square of its weight. Rajesh broke down the copper in the ratio of 3 : 2 : 1 and faces a loss of Rs. 4730. Find the initial price of copper.

- (a) Rs. 7520      (b) Rs. 7530      (c) Rs. 7540      (d) Rs. 7740

Q4. The ratio of cooper and Tin in a 63kg alloy is 4: 3. Some amount of copper is extracted from the alloy and the ratio becomes 10: 9. How much copper is extracted.

- (a) 6 kg      (b) 8 kg      (c) 12 kg      (d) 10 kg

Q5. A shopkeeper earns a profit of 12% on selling a book at 10% discount on the printed price. The ratio of the cost price to the printed price of the book is?

- (a) 45 : 56      (b) 50 : 61      (c) 55 : 69      (d) 99 : 125

Q6. If  $(a + b) : (b + c) : (c + a) = 3 : 4 : 5$  and  $a + b + c = 17$ . Find C.

- (a) 17/2      (b) 17/3      (c) 17/4      (d) 17/5

Q7. Rs. 4300 is divided between 45 persons in which men, women and children are included. The money received by men, women and children is in the ratio 12 : 15 : 16 while the money received by each is in the ratio 6 : 5 : 4. Find the number of men, women & children?

- (a) 10,15,20      (b) 15,15,15      (c) 5,15,25      (d) 30,10,5

Q8. A man divides his property so that his son's share to his wife's and wife's share to his daughter's are both as in the ratio 3 : 1. If the daughter gets Rs. 10,000 less than son, the value (in rupees) of the whole property is?

- (a) Rs. 16,250      (b) Rs. 16,000      (c) Rs. 18,250      (d) Rs. 17,000

Q9. The ratio of the numbers of boys and girls in a school was 5 : 3. Some new boys and girls were admitted to the school, in the ratio 5 : 7. At this, the total no. of students in the school become 1200 and the ratio of boys to girls changed to 7 : 5. The number of students in the school before new admissions was?

- (a) 700      (b) 720      (c) 900      (d) 960

Q10. 555 Rs. was to be divided among A, B and C in the ratio of  $1/4 : 1/5 : 1/6$ . But by mistake it was divided in the ratio 4 : 5 : 6. The amount in excess received by C was?

- (a) Rs. 72      (b) Rs. 75      (c) Rs. 22      (d) Rs. 52

Q11. In the income statement of Asha and Ravenna, the ratio of their income in the year 2017 was 5 : 4. The ratio of Asha's income in the year 2018 to that in 2017 is 3 : 5 and the ratio of Ravenna's income in the year 2018 to that in 2017 is 3 : 2. If Rs. 10242 is the sum of the income of Asha and Ravenna in the year 2018, then find the income of Ravenna in the year 2017?

- (a) Rs. 1024      (b) Rs. 1138      (c) Rs. 2776      (d) Rs. 4552

Q12. Two vessels A and B of equal volume contain milk and water in the ratio 3 : 2 and 2 : 1 to their brim respectively. Two litres of the solution from vessel A and three litres of the solution from vessel B are poured into a big empty vessel C. If the solution in C occupied 40% of the capacity of C, what proportion of the volume of vessel C should be the volume of water that shall be added so that the ratio of milk and water in vessel C becomes 1 : 1?

- (a) 21/125      (b) 2/25      (c) 4/75      (d) 14/125

Q13. A bag contains certain number of coins of different denominations. The ratio of the number of Rs. 1 coins to Rs. 2 coins is 5 : 7, respectively and the ratio of number of Rs. 2 coins to Rs. 5 coins is 7 : 6 respectively. Find the total value of the Rs. 5 coins, if the total value of the Rs. 1 coins in the bag is Rs. 15.

- (a) Rs. 180      (b) Rs. 90      (c) Rs. 45      (d) Rs. 115

Q14. A father distributed some chocolates among his four children and kept some with him. The eldest three children got chocolates in the ratio 3 : 11 : 7. The total number of chocolates with father and youngest child is three times the total chocolates with the three eldest children. The ratio of chocolates with father and that with all the children is 3 : 4. Find the total number of chocolates if the youngest child has 81 chocolates with him?

- (a) 273      (b) 252      (c) 278      (d) 303

Q15. Out of three positive numbers, the ratio of the first and the second numbers is 3 : 4 that of the second and the third numbers is 5 : 6 if the product of the second and the third numbers is 4320. What is the sum of three numbers?

- (a) 177      (b) 165      (c) 185      (d) 160

Q16. A and B started a business with Rs. 4000 and Rs. 3000 respectively. After 6 months, C joined them by investing Rs. 4,000. At the end of 2 years, profit was Rs. 5,000, then find B's share of profit?

- A. 2000      B. 1500C. 2500D. 1000

Q17. A started a business with capital of Rs. 1,00,000. 1 year later, B joined him with capital of Rs. 2,00,000. At the end of 3 years, from the start of the business, profit was Rs. 84,000. B's share in profit exceeded A's share in profit by?

- A. 12,000      B. 24,000      C. 48,000      D. 60,000

Q18. P, Q and R started a business by investing Rs.120000, Rs.135000 and Rs. 150000 respectively. Find the share of Q, out of annual profit of Rs.56,700?

- A. 16800      B. 21000      C. 18900      D. 27000

Q19. Out of 120 applications for a post, 70 are males and 80 have a driver license. What is the ratio of between the minimum to maximum number of males having driver's license.

- a.1:2      b.2:3      c.3:7      d.5:7

Q20. In a rare coin collection, there is one gold coin for every three non-gold coins. 10 more gold coins are added to the collection and the ratio of gold coins to non-gold coins would be 1 : 2. Based on the information; the total number of coins in the collection now becomes.

(UPSC 2013)

- a. 90      b. 80      c. 60      d. 50

### **SET-3**

1. A bag contains coins of 1 rupee, 2 rupee and 5 rupee in the ratio 4:8:5. The total amount in the bag is Rs 90. The number of 5 rupee coins is(Capgemini)  
(a) 8      (b) 16      (c) 15      (d) 10
2. In what ratio should a coffee blend containing coffee and chicory in the ration 3:7 and another blend with coffee to chicory ration as 2:3 be mixed so that the resultant blend will have a coffee to chicory ration of 7:13? (Capgemini)  
a)1:1      b) 2:1      c) 3:2      d) 1:2
3. Sea water contains 5% salt by weight .How many kilograms of fresh water must be added to 40 kg of sea water for the salt content of the solution to be 2%?(Bosch)  
a) 50      b) 60      c) 65      d) 70
4. Divide Rs 500 among A,B,C and D so that A and B together get thrice a much as C and D together , B gets 4 time of what C gets and C gets 1.5 times as much as D . now the value of what B gets is (HCL)  
(a)300      b)75      (c)125      (d)150
5. If  $6x^2 + 6y^2 = 13xy$ ,what is the ratio of x to y? (Capgemini)  
(a)1:4      (b)3:2      (c)4:5      (d)1:2
6. In a mixture of 40 litres , the ratio of milk and water is 4:1 . how much water must be added to this mixture so that the ratio of milk and water becomes 2:3?(Cognizant)  
(a) 20L      (b)32L      (c)40L      (d)30L
7. IF three no. are in the ratio of 1:2:3 and half the sum is 18,then the ratio of squares of the numbers (Cognizant)  
(a)6:12:13      (b)1:2:4      (c)36:144:324      (d) 3:5:7
8. A and B two alloys of argentums and brass prepared by mixing metals in proportions 7:2 and 7:11 respectively. If equal quantities of two alloys are melted to form a third alloys C,the proportions of argentum and brass in C will be (Capgemini)  
(a)5:9      (b)5:7      (c)7:5      (d)9:5
9. The incomes of A and B are in the ratio 3:2 and their expenditures are in the ratio 5:3.if each saves Rs 1000, then , A's income can be (Capgemini)  
(a)Rs3000 (b)Rs 4000      (c)Rs 6000      (d)Rs9000
10. The cost of a book and the cost of a pen are in the ratio 3 : 2. If the cost of 10 books and 6 pens is Rs. 63, the cost of a book is (Cognizant)  
a) Rs. 5.50      b) Rs. 6.50      c) Rs. 3.50      d) Rs. 4.50

11. Rs. 432 is divided amongst three workers A, B and C, such that 8 times A's share is equal to 12 times B's share which is equal to 6 times C's share. How much did A get? (Bosch)
- a) Rs. 192      b) Rs. 133      c) Rs. 144      d) Rs. 128
12. A,B and C started a business in which A invested Rs.10000/- for 1year, B invested Rs.20000/- for 2 years, C invested Rs.30000/- for 3 years. At the end of the profit received by them is Rs.5600/-. What is C's share? (Cognizant)
- a)Rs.1600      b) Rs.400/-      c) Rs.3600/-      d) Rs.2000/-
13. P , Q, R enter into a partnership & their share are in the ratio  $1/2 : 1/3 : 1/4$  , after two months , P withdraws half of the capitals & after 10 months , a profit of Rs 378 is divided among them . What is Q's share? (Bosch)
- a) 144      b) 154      c) 164      d) None of these
14. If  $4 \text{ (P's Capital)} = 6 \text{ (Q's Capital)} = 10 \text{ (R's Capital)}$  , then out of the total profit of Rs 4650 , R will receive(CoCubes)
- a) 700      b) 900      c) 600      d) 750
15. A invested Rs 76000 in a business. After few months, B joined him with Rs 57000. The total profit was divided between them in the ratio 2 : 1 at the end of the year. After how many months did B join? (CoCubes)
- a) 3      b) 4      c) 5      d) 8

### **SET- 1**

1. C	2. A	3. B	4. B	5. C	6. B	7. C
8. C	9. B	10. C	11. C	12. C	13. B	14. B
15. B	16. B	17. C	18. B	19. C	20.A	21.B
22.A	23.C	24.D	25.A			

### **SET-2**

1. A	2. B	3. D	4. A	5. A	6. A
7. A	8. A	9. D	10. A	11. D	12. D
13. B	14. B	15. A	16. B	17.A	18.C
19.C	20.A				

### **SET-3**

1. D	2. A	3. B	4. A	5. B	6. C
7.C	8. C	9. C	10.D	11. C	12. C
13. A	14. B	15. D			

## **Components and blending**

### **ALLIGATIONS**

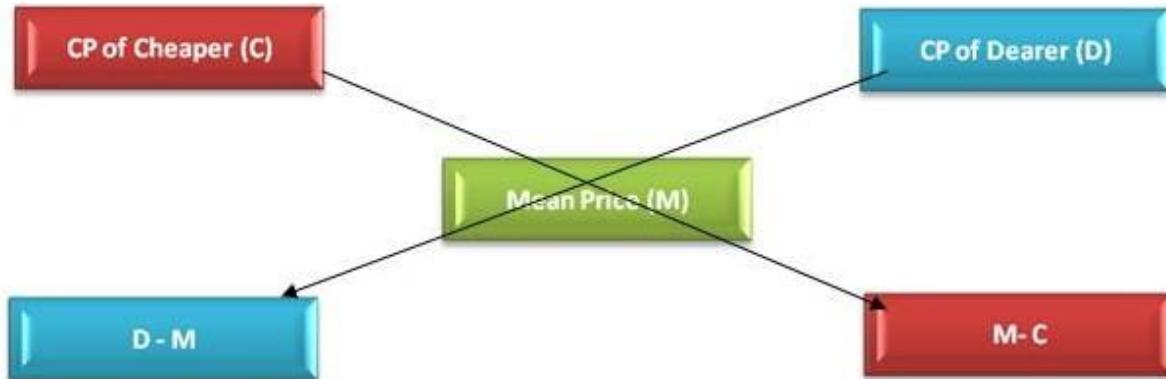
The technique of alligation is applicable in all the cases where two extreme values are given and one average value is given. It is a very useful technique which can be applied in chapters like Percentage, Simple interest, Ratio & proportion, Average etc.

This technique enables us to calculate the ratio in which extreme values/ prices/ interests/ ratios and averages should be mixed so that a given average value/price/interest/ratio and average can be obtained.

Alligation is the rule that enables us to find the proportion in which the two or more ingredients at the given price must be mixed to produce a mixture at a given price. Thus,

$$\frac{\text{Quantity of cheaper}}{\text{Quantity of dearer}} = \frac{(\text{C.P. of dearer}) - (\text{Mean Price})}{\text{Mean Price} - \text{CP of cheaper}}$$

Find it complicated to remember the Formula?? Don't worry, keep in mind the below short cut by following the direction of the arrows:



#### **Attention please!!**

1. Mean price is always less than dearer price and is always more than cheaper price.
2. The price of the first kind should always be on the left hand side.
3. Keep in mind the simple point that the order of the ratio follows the order of what is written at the top.

#### **MIXTURES**

Mixture or alloys contains two or more ingredients of certain quantity mixed together to get a desired quantity. The quantity can be expressed as a ratio or percentage. For ex: 1 liter of a mixture contains 250ml water and 750ml milk. That means,  $\frac{1}{4}$  of mixture is water and  $\frac{3}{4}$  of mixture is milk. In other words, 25% of mixture is water and 75% of mixture is milk.

### Concept 1: Finding the Quantity of an Ingredient in the Mixture

#### **Illustration 1:**

A mixture contains alcohol and water in the ratio 4 : 3. If 7 litres of water is added to the mixture, the ratio of alcohol and water becomes 3 : 4. Find the quantity of alcohol in the mixture.

#### **Solution:**

Let the alcohol : water be  $4x : 3x$ .

Adding 7 litres of water, the fraction becomes  $4x/(3x + 7) = 3/4$ . On solving, we get  $x = 3$  and alcohol =  $4x = 12$ .

### Concept 2: Quantity of Ingredient to be Added to Increase the Content of Ingredient in the Mixture to y%

#### **Illustration 2:**

A mixture of water and milk contains 80% milk. In 50 litres of such a mixture, how many litres of water is required to increase the percentage of water to 50%?

#### **Solution:**

Total mixture = 50 litres                    Milk = 80% of 50 = 40 litres                    Water = 20% of  
50 = 10 litres Let 'x' litres of water is added.

Now, milk = 40 litres Water = 10+x

Total = 50+x

Now, 50% of total = Water

$\frac{1}{2}x(50 + x) = 10 + x$   $x = 30$  litres

### Concept 3: Quantity of Ingredient to be Added to Change the Ratio of Ingredients in a Mixture

#### **Illustration 3:**

729 ml of a mixture contains milk and water in the ratio 7 : 2. How much more water is to be added to get a new mixture containing milk and water in the ratio of 7 : 3?

#### **Solution:**

Milk and water in the original liquid =  $7/9 \times 729 = 567$  and water =  $2/9 \times 729 = 162$ . Let water to be added = x.

Then,  $567/(162 + x) = 7/3$

Hence, we get  $1701 = 1134 + 7x$ ; or  $7x = 567$ ; or  $x = 81$

### Concept 4: Replacement of a Part of a Solution

If a vessel contains A liters of milk and if B litres of milk is withdrawn and replaced by water, and again if B litres of mixture is withdrawn and replaced by water and this operation is repeated n times in all, then

Thus, quantity of milk/alcohol left after nth operation =  $[A(1 - (B/A))^n]$  Or in other words,

**Final Amount of ingredient that is not replaced =**

$$\text{Initial Amount} \times \left( \frac{\text{Vol. after removal}}{\text{Vol. after replacing}} \right)^n$$

**SET-1**

## Alligation

**Q1.** In what ratio must rice at Rs. 43/kg be mixed with rice at Rs 56/kg, so that mixture be worth Rs. 51/kg?

- A. 3:7                    B. 5:8                    C. 7:3                    D. 7:5

**Q2.** In what ratio must rice at Rs. 20/kg be mixed with rice at Rs 12/kg, so that mixture be sold at Rs. 18/kg, with profit of 20%?

- A. 3:5                    B. 5:3                    C. 7:5                    D. 7:3

**Q3.** In what ratio must rice at Rs. 42/kg be mixed with rice at Rs 24/kg, so that by selling the mixture at 40/kg, shopkeeper gain 25%?

- A. 3:4                    B. 5:4                    C. 4:5                    D. 4:3

**Q4.** A shopkeeper has 50 kg rice, some part of rice he sold at 8 % profit & remaining at 18% profit. He gain 14% on the whole transaction. Find the quantity of rice sold at 8 % profit?

- A. 20 kg                    B. 21 kg                    C. 22 kg                    D. 23 kg

**Q5.** A merchant has 25 kg rice, some part of rice he sold at 10 % profit & remaining at 5% loss. He gain 7% on the whole transaction. Find the quantity of rice sold at 10 % profit?

- A. 20 kg                    B. 30 kg                    C. 25 kg                    D. 35 kg

**Q6.** A shopkeeper has 1000 kg sugar, some part he sold at 14 % profit & remaining at 6% loss. He lost 4% on the whole transaction. Find the quantity of rice he sold at 6 % loss?

- A. 700 kg                    B. 900 kg                    C. 800 kg                    D. 600 kg

## Mixtures

**Q7.** When 16 liter water be mixed with 108 Rs/liter pure milk. The price of mixture becomes 90 Rs/liter. Find the quantity of pure milk in the mixture?

- A. 83 liters                    B. 80 liters                    C. 82 liters                    D. 81 liters

**Q8.** When 25 liter water be mixed with Rs. 12/liter pure milk so that the cost of mixture becomes Rs. 2 /liter. Find the quantity of pure milk in the mixture?

- A. 3 liters                    B. 4 liters                    C. 5 liters                    D. 6 liters

**Q9.** How much water must be added to a bucket containing 40 liter of milk at 3.5 Rs/liter so that the cost of mixture becomes 2 Rs/liter?

- A. 30 liters                    B. 40 liters                    C. 50 liters                    D. 60 liters

## Removal of Some Quantity of the Mixture

**Q10.** From 100 liter milk 10 liter milk is taken out instead of milk 10 liter water is added & this process repeated 2 more times than find quantity of pure milk left after 3 such processes (in liter)?

- A. 70                    B. 80                    C. 72.9                    D. 80.9

**Q11.** From 100 liter milk 10 liter milk is taken out. Instead of milk, 10 liter water is added ,again 9 liter milk is taken out instead of this 9 liter water is added, again 8 liter water is taken out instead 8 liter water is added .Find the quantity of pure milk left after such processes (in liter)?

- A. 72                    B. 80                    C. 75.34  
                        D. 76

**Q12.** A container has 80 litres mixture of milk & water, if we pour out 70 % milk & 30 % water then an average 55 % container is empty, find quantity of milk and water in container?

- A. 30 lt, 50 lt            B. 50 lt, 40 lt            C. Rs. 50 lt, 30 lt            D. 20 lt, 30 lt

**Q13.** A can contains a mixture of two liquids A and B is the ratio 7 : 5. When 9 litres of mixture are drawn off and the can is filled with B, the ratio of A and B becomes 7 : 9. How many litres of liquid A was contained by the can initially?

- A. 10                    B. 20                    C. 21                    D. 25

**Q14.** A jar contains a mixture of two liquids A and B in the ratio 4 : 1. When 10 litres of the mixture is taken out and 10 litres of liquid B is poured into the jar, the ratio becomes 2 : 3. How many litres of liquid A was contained in the jar?

- A. 14 litres                    B. 18 litres                    C. 20 litres                    D. 16 litres

### **Mixing of Mixtures**

**Q15.** Two equal glass having milk & water in ratio 3:2 & 4:1. Both glasses get mixed in third glass, than ratio of milk & water in third glass is?

- A. 3:7                    B. 7:3                    C. 7:2                    D. 2:7

**Q16.** Three equal glass are having milk & water in ratio 9:2, 7:4 & 6:5. These glasses are mixed in fourth glass, then ratio of milk & water in fourth glass is?

- A. 2:1                    B. 1:2                    C. 3:1                    D. 1:3

**Q17.** Two equal glass having milk & water in ratio 4:3 & 3:2 respectively. If content of both glasses are mixed in third glass, than ratio of milk & water in third glass is?

- A. 41:29                    B. 29:41                    C. 40:15                    D. 15:40

**Q18.** Milk and water in two vessels are in ratio 4:3 & 2:3. In what ratio the liquid in both the vessels should be mixed to obtain the new mixture in vessel C, containing half milk & half water?

- A. 7:5                    B. 5:3                    C. 5:7                    D. 3:5

**Q19.** Zinc and copper in two ports A&B are in ratio 1:2 & 2:3. In what ratio zinc & copper from both the ports can be mixed to obtain the new mixture in port C, in the ratio of 5:8?

- A. 10:3                    B. 3:10                    C. 5:10                    D. 10:5

**Q20.** A vessel contain a mixture of 2 liquid A & B in the ratio 3:2, when 20 liter of mixture is taken out & 20 liter of liquid of type B is added, than ratio becomes 1:4. Find quantity of liquid A & B in the container (in liter)?

- A. 18, 12                    B. 20, 12                    C. 12, 20                    D. 12, 18

**Q21.** One type of liquid contains 25% of milk, the other contains 30% of milk. A container is filled with 6 parts of the first liquid and 4 parts of the second liquid. The percentage of milk in the mixture is?

- A. 27%                    B. 31%                    C. 29%                    D.

33%

**Q22.** There are 2 bottles containing a mixture of wine, water and alcohol. The first bottle contains wine, water and alcohol in the ratio  $3 : 5 : 2$ . The second bottle contains water and wine in the ratio  $5 : 4$ . 1 litre of the first and 2 litres of the second are mixed together. What fraction of the mixture is alcohol?

- A.  $\frac{1}{15}$  litres      B.  $\frac{6}{13}$  litres      C.  $\frac{2}{15}$  litres  
D.  $\frac{6}{19}$  litres

## **Applications**

**Q23.** In what ratio milk and water be mixed so that the mixture be sold at CP, The milkman gain 20%?

- A. 1:3      B. 2:3      C. 3:4      D. 5:1

**Q24.** In what ratio milk and water be mixed so that the mixture be sold at CP, The milkman gain 25%?

- A. 4:1      B. 1:4      C. 1:5      D. 5:1

**Q25.** In what ratio must water be mixed with milk to gain  $16 \frac{2}{3}\%$  on selling the mixture at cost price?

- A. 1:6      B. 6:1      C. 2:3      D. 4:3

## **SET-2**

1. There are three containers of equal capacity. The ratio of Sulphuric acid to water in the first container is  $3 : 2$ , that in the second container is  $7 : 3$  and in the third container it is  $11 : 4$ . If all the liquids are mixed together, then the ratio of Sulphuric acid to water in the mixture will be?  
(a) 61 : 29      (b) 61 : 28      (c) 60 : 29  
(d) 59 : 29
2. A trader has 44 kg of rice, a part of which he sells at 14% profit and the rest at 8% loss. On the whole, his loss is 4%. What is the quantity sold at 8% loss?  
(a) 36 kg      (b) 20 kg      (c) 28 kg  
(d) 30 kg
3. A container contained 80 L milk. From this container 8 L of milk was taken out and replaced by water. This process was further repeated two times. How much milk is now contained in the container?  
(a) 50 L      (b) 58.32 L      (c) 60 L  
(d) 67.8 L
4. In an alloy, zinc and copper are in the ratio 1: 2. In the second alloy, the same elements are in the ratio 2: 3. If these two alloys be mixed to form a new alloy in which two elements are in the ratio 5 : 8, the ratio of these two alloys in the new alloys is?  
(a) 3 : 10      (b) 3: 7      (c) 10: 3      (d) 7: 3



taken out and replaced with water. If the initial quantity of the milk in the vessel is 80 liters, then what is the final quantity of the milk?



### **SET-3**

1. A beaker contains 180 litres of alcohol. On day 1, 60 litres of alcohol is replaced with water. On 2nd and 3rd days 60 litres of the mixture in the beaker is replaced with water. What will be the quantity of alcohol in the beaker after 3rd day? **TCS**  
(A) 100      (B) 53.33      (C) 50      (D) 200

2. In a mixture of milk and water, there is only 26% water. After replacing the mixture with 7 liters of pure milk , the percentage of milk in the mixture become 76%. The quantity of mixture is: **TCS**  
 (A) 88                    (B) 91                    (C) 87                    (D) 25
3. There are two alloys made up of copper and aluminium. In the first alloy copper is half as much as aluminium and in the second alloy copper is thrice as much as aluminium. How many times the second alloy must be mixed with first alloy to get the new alloy in which copper is twice as much as aluminium? **WIPRO**  
 (A) 4                    (B) 6                    (C) 7                    (D) 2
4. Calculate the ratio in which water should be mixed with milk which costs Rs 12 per litre so as to get a mixture of Rs. 10 per litre? **WIPRO**  
 (A) 1:5                    (B) 1:3                    (C) 1:7                    (D) 2:7
5. Yuvan had a barrel filled with liquid, with two parts water and six parts glucose. To make the combination 1/2 water and 1/2 glucose, how much of the combination would Yuvan draw and replace with water? **(MTTLE)**  
 (A) 0.33                    (B) 1.33                    (C) 33                    (D) 83
6. Karishma bought wheat for Rs. 124 per kg and Rs. 130 per kg, which she blended with a third wheat choice in a 1:1:2 ratio. If the combination is worth Rs. 150 per kg what is the value of the third variation per kg ? **(METTLE )**  
 (A) 173                    (B) 174                    (C) 176                    (D) 180
7. An alloy of aluminium, copper and Iron contains 85% aluminium, 8% copper and 7% iron. A second alloy of aluminium and iron melted with the first and the mixture then contains 75% aluminium, 5% copper and 20% iron. Find the percentage of aluminium in the second alloy. A. 49.4%      B. 58.33%      C. 53.75%      D. 62.6%
8. From ‘A’ kg of pure tea a shopkeeper removes A% of the mixture (Either pure tea or adulterated tea) and replaces it with same quantity of adulteration. If he repeated this process once more and now the amount of pure tea remaining in the mixture is (90% of 40% of A) kg, then find the value of  
 A. 60%                    B. 50%                    C. 40%                    D. 30%
9. A jar contains 30 lit of fruit juice. If 5 lit of the same is replaced by same amount of Water twice, Find the final amount of fruit juice in the mixture at the end. **(HCL)**  
 (A)40                    (B) 27                    (C) 20.83                    (D) 17.23
10. The price of T1 rice is Rs. 20 per kg and T 2 rice is Rs. 30 per kg. If both T1 and T2 are mixed in the ratio of 2 : 3, then the price per kg of the mixed type of rice is:(( **HCL**)  
 (A) 23                    (B) 10                    (C)26                    (D) 26
11. A milk man mixed 1 : 4 solution of milk and water with another 1 : 2 solution of milk and water in the volume of ratio 3 : 2. If the profit earned by selling the first solution was 20% and the mixture was sold at the same price, what is the profit or loss percentage? You have to assume that water comes free of cost. **(TCS NQT)**  
 (A) 5.26% loss      (B) 4.25% loss      (C) 6.25% loss      (D) 5.25% profit
12. A mixture X of milk and water contains 87.5% of milk. After 12 litres of water is added, the milk content gets reduced to 50%. If another mixture Y contains the quantity of milk equal to the total quantity of mixture X initially such that the ratio of milk to water is 4: 3, then find the quantity of water in mixture Y. **(TCS NQT)**

A. 24 litres

B. 20 litres

C. 12 litres

D. 8 litres

13. A grocery store owner sells pepper at some cost price. As pepper is very expensive, so to gain profit on the cost price with which he purchased but he mixes it with papaya seeds and gains a profit of 35%. Find the percentage of papaya seeds mixed with pepper? (COCUBE)  
(A) 25.20                   (B) 25.92                   (C) 20.6                   (D) 12.85
14. Calculate the ratio in which two types of cement, one at Rs. 20 per kg and Rs. 60 per kg should be mixed to get a blend that can be traded at Rs. 35 per kg. (COCUBE)  
(A) 5: 7                   (B) 5:9                   (C) 5:3                   (D) 5:1
15. Find the ratio in which water must be mixed with milk which costs Rs. 40 per liter to get a mixed liquid worth Rs. 24 per liter. (COCUBE)  
(A) 2:3                   (B) 5:6                   (C) 6:7                   (D) 3:7

### **SET-1**

1. B	2. A	3. C	4. A	5. A	6. B
7. B	8. C	9. A	10. C	11. C	12. C
13. C	14. D	15. B	16. A	17. A	18. A
19. B	20. A	21. A	22. A	23. D	24. A
25. A					

### **SET-2**

1. A	2. A	3. B	4. A	5. A	6. D
7. A	8. C	9. D	10. A	11. C	12. C
13. A	14. B	15. C	16. C	17. B	18. C
19. A	20. D				

### **SET-3**

1.B	2.B	3.A	4.A	5.A
6.A	7.A	8.B	9.C	10.B
11.A	12.C	13.C	14.C	15.A

## **COUNTING METHODS**

### **Principal Of Multiplication:**

AND suggests the use of Multiplication and shows that more than one operation has to be performed at a time. It also gives the idea that there should be one starting point and one end point.

### **Multiplication**

If an event can occur in m different ways, and following which another event can occur in n different ways, then the total number of occurrence of the events in the given order is  $m * n$

### **Principal Of Addition:**

OR suggests the use of Addition and shows that exactly one operation has to be performed at a time out of the given set of all the possible operations.

## **PERMUTATION**

A permutation is an arrangement in a definite order of a number of objects taken some or all at a time.

### **Linear Arrangement**

Number of permutations of n distinct objects among r different places, where repetition is not allowed, is  $P(n,r)$  kind, and where repetition is not allowed, is

$$= n! / p! q! r! \dots$$

(Where,  $p+q+r+\dots \leq n$ )

Number of permutations of n objects, when all of them are identical =  $n!/n!$

### **Circular Arrangement**

Number of ways to arrange n distinct objects on n places around a circle =  $(n-1)!$

Number of arrangements of n beads forming a necklace =  $(n-1)!/2$

(In case of the necklace or garland, anticlockwise and clockwise arrangements are same)

Number of selection of k consecutive things out of n things in a circle

$$= n, \quad \text{when } k < n$$

$$= 1, \quad \text{when } k = n$$

### **Polygon Arrangement**

Number of ways to arrange n distinct objects along the sides of a r sided regular polygon with every side having  $n/r$  objects =  $n!/r$

If the polygon is not regular, then the number of arrangements will be

$${}^n P_r = \frac{n!}{(n-r)!} \quad (0 < r < n)$$

Number of permutations of  $n$  distinct objects among  $r$  different places, where repetition is allowed, is  $n^r$

If  $n$  people are to be arranged around a rectangular table, such that there are equal number of people on each side of the table, then total number of arrangements will be  $n!/2$

### **Dearrangement**

Number of arrangements of  $n$  distinct things in a row, such that none of them occupies its original place is

$$= n! [1/0! - 1/1! + 1/2! - 1/3! + \dots + (-1)^n/n!]$$

Dearr.(2) = 1, Dearr.(3) = 2,

### **COMBINATION**

A combination is a selection, in no definite order, of a number of objects taken some or all at a time.

Number of combinations of  $n$  distinct objects taken  $r$  at a time, where repetition is not allowed, is  $C(n,r)$

Dearr.(4) = 9, Dearr.(5) = 44

### **Miscellaneous**

$${}^n C_r = \frac{n!}{r!(n-r)!} \quad (0 < r < n)$$

Number of ways 4 different letters can be posted in 7 different letter boxes = 4<sup>7</sup>

Number of ways  $n$  identical things can be arranged among  $r$  different places =  $r^n$

e.g. Number of ways 4 identical rings can be worn in 5 fingers of a hand = 5<sup>4</sup>

Number of ways  $n$  different things can be arranged among  $r$  different places

$$= (n + r - 1)!/(r - 1)!$$

e.g. Number of ways 4 different rings can be worn in 5 fingers of a hand = 5 . 6 . 7 . 8

Sum of all 'r' digit numbers formed by using each of the given 'n' non-zero distinct digits exactly once (no repetition) = (Sum of all the digits) (1111... r times)  $nPr-1$

Sum of all 'r' digit numbers formed by using each of the given 'n' non-zero distinct digits (with repetition) = (Sum of all the digits) (1111... r times)  $n^{r-1}$

Number of combinations of  $n$  distinct objects among  $r$  different places, where repetition is allowed, is  $n^{r-1}C_r$

Number of combinations or distributions of  $n$  identical objects among  $r$  different places is  $n^{r-1}C_{r-1}$

Also the whole number solutions of Equation ,

$$(x + y + z + \dots + r \text{ variables}) = n^{r-1}C_{r-1}$$

Number of combinations or distributions of  $n$  identical objects among  $r$  different places such that each place gets at least 1 is  $n-1C_{r-1}$

Also the natural number solutions of Equation,  $(x + y + z + \dots + r \text{ variables}) = (n) = n-1C_{r-1}$

Number of selections out of  $n$  distinct objects

= (Select None) + (Select One) + (Select Two)

$$= {}^n C_0 + {}^n C_1 + {}^n C_2 + \dots + {}^n C_n = 2^n$$

Number of ways in which a selection can be made by taking some or all out of  $p + q + r + \dots$  things where  $p$  are alike of one kind,  $q$  alike of second,  $r$  alike of third and so on is  $(p+1)(q+1)(r+1)\dots - 1$

Number of zero or more selections out of  $n$  same objects =  $1 + 1 + 1 + \dots + 1 = n + 1$

Number of one or more selections out of  $n$  same objects =  $1 + 1 + 1 + \dots + 1 = n$

Number of lines in a plane formed by  $n$  points (where no three points are collinear) =  $nC_2$

Number of diagonals in a regular polygon =  $nC_2 - n$

Number of triangles formed in a plane using  $n$  points (where no three points are collinear) =  $nC_3$

### Formulae related to Combination

- a)  $nC_0 = 1 = nC_n$
- b)  $nC_1 = n = nC_{n-1}$
- c)  $nC_{n-r} = nC_r$
- d)  $nC_a = nC_b \quad a + b = n$
- e)  $nC_r + nC_{r-1} = n+1C_r$
- f)  $nC_0 + nC_1 + nC_2 + \dots + nC_{n-1} + nC_n = 2^n$
- g)  $nC_0 + nC_2 + nC_4 + \dots = nC_1 + nC_3 + nC_5 + \dots = 2^{n-1}$

### GROUPING & DISTRIBUTION

Number of ways in which  $n$  distinct objects can be distributed equally among  $r$  people

$$= n! / p! q! r! \dots \quad (n = p + q + r \dots)$$

Number of ways in which  $n$  distinct objects can be distributed equally among  $r$  groups

$$= n! / [(n/r)!]^r \quad (\text{if groups are distinct})$$

$$= n! / r! [(n/r)!]^r \quad (\text{if groups are not distinct})$$

### SET-1

1. How many 3 digit number can be formed with the digits 5, 6, 2, 3, 7 and 9 which are divisible by 5 and none of its digit is repeated?

- a) 12
- b) 16
- c) 20
- d) 24

2. In how many different ways can the letter of the word ELEPHANT be arranged so that vowels always occur together?

- a) 2060
- b) 2160
- c) 2260
- d) 2360

3. There are 4 bananas, 7 apples and 6 mangoes in a fruit basket. In how many ways can a person make a selection of two fruits from the basket.

- a) 269
- b) 280
- c) 136
- d) 256

4. There are 15 points in a plane out of which 6 are collinear. Find the number of lines that can be formed from 15 points.

- a) 105
- b) 90
- c) 91
- d) 95

5. In how many ways 4 Indians, 5 Africans and 7 Japanese be seated in a row so that all persons of same nationality sit together?

- a)  $4! 5! 7! 3!$
- b)  $4! 5! 7! 5!$
- c)  $4! 6! 7! 3!$
- d) can't be determined

6. In how many ways 5 Americans and 5 Indians be seated along a circular table, so that they are seated in alternative positions

- a)  $5! 5!$
- b)  $6! 4!$
- c)  $4! 5!$
- d)  $4! 4!$

7.4 matches are to be played in a chess tournament. In how many ways can result be decided?

- a) 27              b) 9              c) 81              d) 243

Q(8–9) There are 6 players in a cricket which is to be sent to Australian tour. The total number of members is 12.

If 2 particular member is always included

- a) 210              b) 270              c) 310              d) 420

If 3 particular player is always excluded

- a) 76              b) 82              c) 84              d) 88

10. In a group of 6 boys and 8 girls, 5 students have to be selected. In how many ways it can be done so that at least 2 boys are included

- a) 1524              b) 1526              c) 1540              d) 1560

11. How many words of 4 letters with or without meaning be made from the letters of the word ‘NUMBER’, when repetition of letters is not allowed?

- A) 480              B) 360              C) 240              D) 260

12. In how many ways the letters of the word ‘ALLIGATION’ be arranged taking all the letters?

- A)  $10!/2!2!2!$               B)  $9!/2!2!2!$               C)  $11!/2!2!2!$               D)  $10!/2!2!$

13. In how many ways all the letters of the word ‘MINIMUM’ be arranged such that all vowels are together?

- A) 60              B) 30              C) 90              D) 70

14. In how many ways a group of 4 men and 3 women be made out of a total of 8 men and 5 women?

- A) 700              B) 140              C) 120              D) 360

15. How many 3 digit numbers are divisible by 4?

- A) 256              B) 225              C) 198              D) 252

16. How many 3 digits numbers have exactly one digit 2 in the number?

- A) 225              B) 240              C) 120              D) 160

17. There are 8 men and 7 women. In how many ways a group of 5 people can be made such that the particular woman is always to be included?

- A) 860              B) 1262              C) 1001              D) 1768

18. There are 6 men and 7 women. In how many ways a committee of 4 members can be made such that a particular man is always to be excluded?

- A) 280              B) 420              C) 220              D) 495

19. How many 4 digit words can be made from the digits 7, 8, 5, 0, and 4 without repetition?

- A) 70              b) 96              c) 84              d) 48

20. In how many ways 8 students can be given 3 prizes such that no student receives more than 1 prize?

- A) 348              B) 284              C) 224              D) 336

21. A box contains 27 marbles some are blue and others are green. If a marble is drawn at random from the box, the probability that it is blue is  $1/3$ . Then how many number of green marbles in

the box?

- A. 10      b)15      c)14      d)18

22. In how many ways can 3 prizes be given away to 12 students when each student is eligible for all the prizes?

- A.1234      B.1728      C.5314 D.1331

23. Total no of ways in which 30 sweets can be distributed among 6 persons?

- A.35 C 5      B.36 C 5      C.36 C 6      D.35!/5!

24. A bag contains 4 red balls and 5 black balls. In how many ways can make a selection of 3 balls so as to take atleast 1 red ball?

- A.64      B.45      C.74      D.24

25. In how many ways can 7 beads be strung into necklace ?

- A.2520      B.5040      C.720      D.360

### **SET-2**

1. Find the no of 3 digit numbers such that atleast one of the digit is 6 (with repetitions) ?

- A.252      B.345      C.648      D.560

2. In how many ways can 4 girls and 4 boys stand in a row so that no 2 boys are together ?

- A.843      B.906      C.1152      D.576

3. In how many ways the letters of the word PERMUTATION be arranged ?

- A.10!/2!      B.10!      C.11!      D.11!/2!a

4. How many numbers can be formed with the digits 1, 7, 2, 5 without repetition ?

- A.89      B.56      C.64      D.72

5. There are 3 boxes and 6 balls. In how many ways these balls can be distributed if all the balls and all the boxes are different?

- A.243      B.512      C.729      D.416

6. In how many ways can 4 books be selected out of 10 books on different subjects ?

- A.210      B.320      C.716      D.5040

7. In how many ways can 5 boys and 4 girls can be seated in a row so that they are in alternate position.

- a) 2780      b) 2880      c) 2800      d) 2980

8. In how many ways 5 African and 5 Indian can be seated along a circular table, so that they occupy alternate position.

- a) 5! 5!      B) 4! 5!      C) 5! 4!      D) 4! 4!

9. There is a meeting of 20 delegates to be held in a hotel. In how many ways these delegates can be seated along a round table, if three particular delegates always seat together.

- a) 17! 3!      B) 18! 3!      C) 17! 4!      d) can't be determined

10. In how many ways 8 prizes can be given to 3 boys, if all boys are equally eligible of getting the prize.

- a) 512      b) 343      c) 256      d) 526

11. There are 10 points in a plane out of which 5 are collinear. Find the number of lines that can be formed from 10 points.

- a) 45      b) 90      c) 36      d) 35

12. In party there is a total of 120 handshakes. If all the persons shake hand with every other person. Then find the number of persons present in the party.

- a) 15      b) 16      c) 17      d) 18

13. There are 8 boys and 12 girls in a class. 5 students have to be chosen for an educational trip. Find the number of ways in which this can be done if 2 particular girls are always included

- a) 812      b) 816      c) 818      d) 820

14. In how many different ways the letters of the word INSIDE be arranged in such a way that all vowels always come together

- a) 64      b) 72      c) 84      d) 96

15. How many 3 digit numbers can be formed by 9, 2, 5, 3, 7 which is divisible by 5 and none of the digits is repeated.

- a) 12      b) 36      c) 48      d) 60

16. In a party there are 20 persons and they handshake with each other. Find the number of handshakes in that party.

- a) 200      b) 190      c) 180      d) 210

17. The total number of handshakes in a party was 300. Find the number of persons in that party.

- a) 20      b) 19      c) 24      d) 25

18. If all the arrangements of the word NASIK is arranged according to the dictionary (alphabetically) Then what will be the rank of the word NASIK.

- a) 70      b) 76      c) 77      d) 80

19. If all the arrangements of the word DEHRADUN is arranged according to the dictionary (alphabetically) Then what will be the rank of the word DEHRADUN.

- a) 4272      b) 4274      c) 4797      d) None of these

20. There are 20 points in a plane out of which 5 points are collinear. Find the number of lines and triangles drawn from these points are:

- a) 181, 1100      b) 180, 1130      c) 181, 1130      d) None of these

### **SET-3**

#### **(CoCubes)**

1. How many 5 digit numbers can be formed from the given numbers 0, 4, 5, 6, 2?

- A. 500      B. 2500      C. 300      D. 600

2. What are the possible number of ways in which a team can be formed which has 4 boys and 2 girls from a group of 10 boys and 5 girls?

- A. 2100      B. 3200      C. 1000      D. 1500

3. A security system has a lock with 5 rings. Each of these rings is marked with 5 different letters. Calculate the total number of failed attempts made to open the lock.

- A. 1300      B. 2154      C. 3124      D. 3125

4. A fruitseller has 10 mangoes which wants to place in 5 boxes. Each box can hold more than 10 mangoes. Find out the number of ways in which the fruitseller can arrange 10 mangoes in 5 boxes.

- A.  $5^{10}$       B.  $2^5$       C.  $10^5$       D. None
5. Calculate the number of arrangement of the letters of the word "STRAIGHT" such that vowels must always be placed at odd places.  
 A. 6570      B. 5004      C. 8640      D. None
6. Out of 7 consonants and four vowels ,how many words of three consonants and 2 vowels can be formed?  
 A. 21000      B. 10500      C. 25200      D. 21400
7. 3 distinct books of mathematics and 5 distinct books of physics are placed on a shelf so that the books on the same subject always remain together .The possible arrangements are .  
 A. 1440      B. 1956      C. 2420      D. None of these
8. The number of triangles that can be formed by choosing the vertices from a set of 12 points, seven of which lie on the same straight line is  
 A. 185      B. 105      C. 132      D. 167
9. In how many different ways can the letters of the word "MANGO" be arranged?  
 A. 24      B. 120      C. 40      D. 48
10. In how many ways 6 girls can be seated in 2 distinct chairs?  
 A. 30      B. 10      C. 40      D. 12
11. A college has 10 basketball players. A 5-member team and a captain will be selected out of these 10 players. How many different selections can be made?  
 A. 1260      B. 210      C. 540      D. 620
12. A lady gives dinner party to five guests to be selected from 9 friends .The number of ways of forming the party of 5,given that two of the friends will not attend the party together is  
 A. 248      B. 257      C. 125      D. None of these
13. In how many ways can the 7 letters A,B,C,D,E,F and G be arranged so that C and E never together.  
 A. 1200      B. 2100      C. 2700      D. 3600
14. How many numbers are there in all from 4000 to 4999 (both 4000 and 4999 included) having at least one of their digits repeated?  
 A. 512      B. 232      C. 384      D. 496
15. In how many different ways can the letters of the word 'OPTICAL' be arranged so that the vowels always come together?  
 A. 220      B. 450      C. 235      D. 720

### Set 1

1. C	2. B	3. B	4. C	5. A
6. C	7. C	8. A	9. C	10. B
11. B	12. A	13. A	14. A	15. B
16. A	17. C	18. D	19. B	20. D
21. D	22. B	23. A	24. C	25. D

### Set 2

1. A	2. C	3. D	4. C	5. C
6. A	7. B	8. B	9. A	10. A
11. C	12. B	13. B	14. B	15. A
16. B	17. D	18. C	19. B	20. C

### Set 3

1. B	2. A	3. C	4. A	5. C
6. C	7. A	8. A	9. B	10. A
11. A	12. D	13. D	14. D	15. D

## **PROBABILITY**

Probability or chance is a common term used in day-to-day life. For example, we generally say, 'it may rain today'. This statement has a certain uncertainty.

Probability is quantitative measure of the chance of occurrence of a particular event.

If all the possible outcomes of an experiment are known but the exact output cannot be predicted in advance, that experiment is called a random experiment.

Examples

Tossing of a fair coin

When we toss a coin, the outcome will be either Head (H) or Tail (T)

Throwing an unbiased die

Die is a small cube used in games. It has six faces and each of the six faces shows a different number of dots from 1 to 6. Plural of die is dice.

When a die is thrown or rolled, the outcome is the number that appears on its upper face and it is a random integer from one to six, each value being equally likely.

Drawing a card from a pack of shuffled cards

A pack or deck of playing cards has 52 cards which are divided into four categories as given below

Spades ( $\spadesuit$ ) Clubs ( $\clubsuit$ )

Hearts ( $\heartsuit$ ) Diamonds ( $\diamondsuit$ )

Each of the above mentioned categories has 13 cards, 9 cards numbered from 2 to 10, an Ace, a King, a Queen and a jack

Hearts and Diamonds are red faced cards whereas Spades and Clubs are black faced cards.

Kings, Queens and Jacks are called face cards

Taking a ball randomly from a bag containing balls of different colours

Sample Space

Sample Space is the set of all possible outcomes of an experiment. It is denoted by S.

Examples

When a coin is tossed,  $S = \{H, T\}$  where H = Head and T = Tail

When a dice is thrown,  $S = \{1, 2, 3, 4, 5, 6\}$

When two coins are tossed,  $S = \{HH, HT, TH, TT\}$  where H = Head and T = Tail

Events are said to be equally likely if there is no preference for a particular event over the other.

### **Examples**

When a coin is tossed, Head (H) or Tail is equally likely to occur.

When a dice is thrown, all the six faces (1, 2, 3, 4, 5, 6) are equally likely to occur.

Two or more than two events are said to be mutually exclusive if the occurrence of one of the events excludes the occurrence of the other

This can be better illustrated with the following examples

When a coin is tossed, we get either Head or Tail. Head and Tail cannot come simultaneously. Hence occurrence of Head and Tail are mutually exclusive events.

When a die is rolled, we get 1 or 2 or 3 or 4 or 5 or 6. All these faces cannot come simultaneously. Hence occurrences of particular faces when rolling a die are mutually exclusive events.

Note : If A and B are mutually exclusive events,  $A \cap B = \emptyset$  where  $\emptyset$  represents empty set.

Consider a die is thrown and A be the event of getting 2 or 4 or 6 and B be the event of getting 4 or 5 or 6. Then

$$A = \{2, 4, 6\} \text{ and } B = \{4, 5, 6\}$$

Here  $A \cap B \neq \emptyset$ . Hence A and B are not mutually exclusive events.

Events can be said to be independent if the occurrence or non-occurrence of one event does not influence the occurrence or non-occurrence of the other.

Example : When a coin is tossed twice, the event of getting Tail(T) in the first toss and the event of getting Tail(T) in the second toss are independent events. This is because the occurrence of getting Tail(T) in any toss does not influence the occurrence of getting Tail(T) in the other toss.

Exhaustive Event is the total number of all possible outcomes of an experiment.

### **Examples**

When a coin is tossed, we get either Head or Tail. Hence there are 2 exhaustive events.

When two coins are tossed, the possible outcomes are (H, H), (H, T), (T, H), (T, T). Hence there are 4 (=2<sup>2</sup>) exhaustive events.

When a dice is thrown, we get 1 or 2 or 3 or 4 or 5 or 6. Hence there are 6 exhaustive events.

Let A and B are two events with sample space S. Then

$A \cup B$  is the event that either A or B or Both occur. (i.e., at least one of A or B occurs)

$A \cap B$  is the event that both A and B occur

Let E be an event and S be the sample space. Then probability of the event E can be defined as

$$P(E) = n(E)/n(S)$$

where  $P(E)$  = Probability of the event  $E$ ,  $n(E)$  = number of ways in which the event can occur and  $n(S)$  = Total number of outcomes possible

$$P(S) = 1$$

$$0 \leq P(E) \leq 1$$

$$P(\emptyset) = 0$$

Addition theorem

Let  $A$  and  $B$  be two events associated with a random experiment. Then

$$P(A \cup B) = P(A) + P(B) - P(A \cap B)$$

If  $A$  and  $B$  are mutually exclusive events, then  $P(A \cup B) = P(A) + P(B)$  because for mutually exclusive events,  $P(A \cap B) = 0$

If  $A$  and  $B$  are two independent events, then  $P(A \cap B) = P(A).P(B)$

Let  $A$  be any event and  $A^-$  be its complementary event (i.e.,  $A^-$  is the event that  $A$  does not occur). Then  $P(A^-) = 1 - P(A)$

Let  $E$  be an event associated with a random experiment. Let  $x$  outcomes are favourable to  $E$  and  $y$  outcomes are not favourable to  $E$ , then

Odds in favour of  $E$  are  $x:y$ , i.e.,  $x/y$  and Odds against  $E$  are  $y:x$ , i.e.,  $y/x$

$$P(E) = x/x+y \quad P(E^-) = y/x+y$$

### **SET-1**

1. A bag contains 5 red balls and 7 blue balls. Two balls are drawn at random without replacement, and then find the probability of that one is red and other is blue.  
a) 33/65              b) 35/66              c) 37/66              d) 41/65
2. A bag contains 3 red balls and 8 black balls and another bag contains 5 red balls and 7 black balls, one ball is drawn at random from either of the bag, find the probability that the ball is red.  
a) 93/264              b) 95/264              c) 91/264              d) 97/264
3. 12 persons are seated at a circular table. Find the probability that 3 particular persons always seated together.  
a) 9/55              b) 7/55              c) 4/55              d) 3/55
4. P and Q are two friends standing in a circular arrangement with 10 more people. Find the probability that exactly 3 persons are seated between P and Q.  
a) 5/11              b) 4/11              c) 2/11              d) 3/11
5. A basket contains 5 black and 8 yellow balls. Four balls are drawn at random and not replaced. What is the probability that they are of different colors alternatively?  
a) 56/429              b) 57/429              c) 61/429              d) 68/429

Direction (Q6 – Q8):

6. A bag contains 6 red balls and 8 green balls. Two balls are drawn at random one after one with replacement.

6. What is the probability that Both the balls are green?

- a)  $13/49$       b)  $15/49$       c)  $16/49$       d)  $17/49$

7. First one is green and second one is red

- a)  $16/49$       b)  $14/49$       c)  $11/49$       d)  $12/49$

8. Both the balls are red

- a)  $14/49$       b)  $9/49$       c)  $11/49$       d)  $12/49$

9. Find the probability that in a leap year, the numbers of Mondays are 53?

- a)  $1/7$       b)  $2/7$       c)  $3/7$       d)  $4/7$

10. A urn contains 4 red balls, 5 green balls and 6 white balls, if one ball is drawn at random, find the probability that it is neither red nor white.

- a)  $1/3$       b)  $1/4$       c)  $1/5$       d)  $2/3$

11. A six-digit is to be formed from the given numbers 1, 2, 3, 4, 5 and 6. Find the probability that the number is divisible by 4.

- a)  $3/17$       b)  $4/15$       c)  $4/19$       d)  $4/17$

12. A bag contains 6 red balls and 7 white balls. Another bag contains 5 red balls and 3 white balls. One ball is selected from each. Find the probability that one ball is red and one is white?

- a)  $53/104$       b)  $47/104$       c)  $63/104$       d)  $51/104$

13. A lottery is organized by the college ABC through which they will provide scholarship of rupees one lakhs to only one student. There are 100 fourth year students, 150 third year students, 200 second year students and 250 first year students. What is the probability that a second year student is chosen?

- a)  $1/7$       b)  $2/7$       c)  $3/7$       d)  $4/7$

14. A card is drawn from a pack of 52 cards. The card is drawn at random; find the probability that it is neither club nor queen?

- a)  $4/13$       b)  $5/13$       c)  $7/13$       d)  $9/13$

15. A box contains 50 balls, numbered from 1 to 50. If three balls are drawn at random with replacement. What is the probability that sum of the numbers are odd?

- a)  $1/2$       b)  $1/3$       c)  $2/7$       d)  $1/5$

16. From a pack of cards, if three cards are drawn at random one after the other, find the probability that one is ace, one is jack and one is queen?

- a)  $16/7725$       b)  $16/5525$       c)  $18/5524$       d)  $64/5515$

17. A and B are two persons sitting in a circular arrangement with 8 other persons. Find the probability that both A and B sit together.

- a)  $1/9$       b)  $2/7$       c)  $2/9$       d)  $2/5$

18. Find the probability that in a random arrangement of the letter of words in the word 'PROBABILITY' the two I's come together.

- a)  $2/11$       b)  $1/11$       c)  $3/11$       d)  $4/11$

19. In a race of 12 cars, the probability that car A will win is  $1/5$  and of car B is  $1/6$  and that of car C is  $1/3$ . Find the probability that only one of them won the race.

- a)  $2/7$       b)  $7/10$       c)  $9/10$       d)  $3/7$

20. A bag contains 3 red balls and 8 blacks ball and another bag contains 5 red balls and 7 black balls, one

ball is drawn at random from either of the bag, find the probability that the ball is red.

- a) 93/264      b) 95/264      c) 91/264      d) 97/264

21. In a bag there are 4 white, 4 red and 2 green balls. Two balls are drawn at random. What is the probability that at least one ball is of red colour?

- A. 4/3      B. 7/3      C. 1/3      D. 2/3

22. Sahil has two bags (A & B) that contain green and blue balls. In the Bag 'A' there are 6 green and 8 blue balls and in the Bag 'B' there are 6 green and 6 blue balls. One ball is drawn out from any of these two bags. What is the probability that the ball drawn is blue?

- A. 15/28      B. 13/28      C. 17/28      D. 23/28

23. In an examination, there are three sections namely Reasoning, Maths and English. Reasoning part contains 4 questions. There are 5 questions in maths section and 6 questions in English section. If three questions are selected randomly from the list of questions, then what is the probability that all of them are from maths?

- A. 7/91      B. 8/91      C. 2/91      D. 4/91

24. A basket contains 5 red 4 blue 3 green marbles. If three marbles picked up random, what is the probability that either all are green or all are red?

- A. 1/20      B. 7/20      C. 3/20      D. 9/20

25. A basket contains 5 red 4 blue 3 green marbles. If three marbles picked up random, what is the probability that at least one is blue?

- A. 41/55      B. 53/55      C. 47/55      D. 49/55

### **SET-2**

1. A basket contains 5 red 4 blue 3 green marbles. If two marbles picked up random, what is the probability that both are red?

- A. 4/33      B. 5/33      C. 7/33      D. 8/33

2. A bag contains 5 red caps, 4 blue caps, 3 yellow caps and 2 green caps. If three caps are picked at random, what is the probability that two are red and one is green?

- A. 22/55      B. 15/81      C. 10/91      D. 5/91

3. A bag contains 5 red caps, 4 blue caps, 3 yellow caps and 2 green caps. If four caps are picked at random, what is the probability that two are red, one is blue and one is green?

- A. 22/1001      B. 80/1001      C. 21/1001      D. 55/1001

4. A bag contains 2 red caps, 4 blue caps, 3 yellow caps and 5 green caps. If three caps are picked at random, what is the probability that none is green?

- A. 2/13      B. 3/13      C. 1/13      D. 5/13

5. A bag contains 5 red and 7 white balls. Four balls are drawn out one by one and not replaced. What is the probability that they are alternatively of different colours?

- a) 7/99      b) 11/99      c) 14/99      d) 19/99

6. P and Q are sitting in a ring with 11 other persons. If the arrangement of 11 persons is at random, then the probability that there are exactly 4 persons between them?

- a) 1/3      b) 1/4      c) 1/5      d) 1/6

7. 10 persons are seated around a round table. What is the probability that 4 particular persons are always seated together?

- a) 1/21      b) 4/21      c) 8/21      d) 11/21

8. A box contains 4 red, 5 black and 6 green balls. 3 balls are drawn at random. What is the probability that all the balls are of same colour?

- a) 33/455      b) 34/455      c) 44/455      d) 47/455

9. An apartment has 8 floors. An elevator starts with 4 passengers and stops at 8 floors of the apartment.

What is the probability that all passengers travel to different floors?

- a) 109/256      b) 135/256      c) 105/256      d) 95/256

10. A speaks truth in 60% cases and B in 80% cases. In what percent of cases they likely to contradict each other narrating the same incident?

- a) 9/25      b) 7/25      c) 11/25      d) 13/25

11. A box contains 30 electric bulbs, out of which 8 are defective. Four bulbs are chosen at random from this box. Find the probability that at least one of them is defective?

- a) 432/783      b) 574/783      c) 209/784      d) 334/784

12. Two persons A and B appear in an interview. The probability of A's selection is  $1/5$  and the probability of B's selection is  $2/7$ . What is the probability that only one of them is selected?

- a) 11/35      b) 12/35      c) 13/35      d) 17/35

13. A 4-digit number is formed by the digits 0, 1, 2, 5 and 8 without repetition. Find the probability that the number is divisible by 5.

- a) 1/5      b) 2/5      c) 3/5      d) 4/5

14. A bag contains 6 red balls and 8 green balls. 2 balls are drawn at random one by one. Find the probability that both the balls are green.

- a) 16/49      b) 25/49      c) 12/49      d) 21/49

15. A card from a pack of 52 cards is lost. From the remaining cards of the pack, two cards are drawn and are found to be both hearts. Find the Probability of the lost card being a heart?

- A. 12/50      B. 8/50      C. 11/50      D. 9/50

16. A and B take part in a duel. A can strike with an accuracy of 0.6. B can strike with an accuracy of 0.8. A has the first shot, post which they strike alternately. What is the probability that A wins the duel?

- a. 7/10      b. 15/23      c. 2/3      d. 11/17

17. If all the rearrangements of the word AMAZON are considered, what is the probability that M will feature between the 2As?

- a. 1/3      b. 1/6      c. 2/5      d. 3/8

18. N is a 3-digit number that is a multiple of 7; what is the probability that it will be a multiple of 5?

- a. 1/5      b. 11/54      c. 13/64      d. 13/66

19. A bag contains 4 red and 3 black balls. A second bag contains 2 red and 3 black balls. One bag is selected at random. If from the selected bag one ball is drawn, then what is the probability that the ball drawn is red?

- a. 39/70      b. 41/70      c. 29/70      d. 17/35

20. A coin of radius 3 cm is randomly dropped on a square floor full of square shaped tiles of side 10 cm each. What is the probability that the coin will land completely within a tile? In other words, the coin should not cross the edge of any tile.

- a. 0.91      b. 0.5      c. 0.49      d. 0.16

### SET-3

1. In a horse racing competition, there were 18 numbered 1 to 18. The organizers assigned a probability of winning the race to each horse based on horses' health and

training. The probability that horse 1 would win is  $1/7$ , that 2 would win is  $1/8$ , and that 3 would win is  $1/7$ . Assuming that tie is impossible. Find the chance that one of these three will win the race?

**(Infosys)**

- a)  $2/63$       b)  $234/567$       c)  $1/396$       d)  $23/56$

2. A shopkeeper has 13 washing machines out of which 5 are defective. A customer buys 3 washing machines. What is the probability that exactly one machine is defective?

**(Infosys)**

- a)  $70/143$       b)  $35/143$       c)  $1/2$       d)  $1$

3. Three cards are chosen at random from a deck of 52 cards without replacement. Find the probability that all 3 cards are of red colour.

**(My Anatomy)**

- a) 0.12      b) 0.38      c) 0.71      d) 2.13

4. There are 5 Maths books, 6 Science books and 9 Storybooks in a bookstall. Find the probability that two random books selected belongs to different categories.

**(My Anatomy)**

- a)  $129/190$       b)  $19/10$       c)  $171/190$       d)  $29/185$

5. A pair of 8 sided dice has sides numbered 1 to 8. Each side has same probability or chance of landing faces up. The probability that the product of 2 number on the sides that land faces up exceed 36 is:

**(TCS)**

- a)  $5/32$       b)  $11/64$       c)  $3/16$       d)  $1/4$

6. A man who goes to work long before sunrise every morning gets dressed in the dark. His sock drawer has 6 black and 8 blue socks. What is the probability that his first pick was a black sock but his second pick was a blue sock?

**(TCS)**

- a)  $23/91$       b)  $24/91$       c)  $24/92$       d)  $24/94$

7. A bag contains 35 balls of three different colors viz. red, orange and pink. The ratio of red balls to orange balls is 3: 2, respectively and probability of choosing a pink ball is  $3/7$ . If two balls are picked from the bag, then what is the probability that one ball is orange and one ball is pink?

**(Mettl)**

- a)  $24/119$       b)  $60/119$       c)  $3/17$       d)  $96/595$

8. A child paints the six faces of a cube with six different colors red, blue, pink, yellow, green and orange. What is the probability that red, pink and blue faces share a common corner?

**(Mettl)**

- a)  $1/6$       b)  $1/20$       c)  $1/10$       d)  $1/5$

9. Ravi wants to create a password for his trolley bag. In that trolley bag password can be made using digits 0 to 9. What is the probability that the unit digit of that password is a prime number?

(HCL)

- a) 1/3              b) 2/5              c) 4/7              d) 1/6

10. Tickets numbered 1 to 160 are in a bag. What is the probability that the ticket drawn has a number which is a multiple of 2 or 5?

(HCL)

- a) 2/5              b) 1/4              c) 3/7              d) 3/5

11. Fifteen people sit around a circular table. What are odds against two particular people sitting together?

(ZS)

- a) 6:1              b) 5:1              c) 4:1              d) 5:3

12. Find the probability that a leap year has 52 Sundays.

(ZS)

- a) 5/7              b) 6/7              c) 8/7              d) 4/7

13. In a deck of cards, there are 12 distinct cards out of which 4 are face cards and 2 are joker cards. Calculate the probability that if we shuffle, all the 6 cards will be together.

(Wipro)

- a) 1/145              b) 1/120              c) 1/132              d) none

14. In a bank locker there are 3 digits in a password and digit will be from 0 to 9 what is the probability that the Rohan had selected the wrong password?

(Wipro)

- a) 998/1000              b) 997/1000              c) 999/1000              d) 996/1000

15. If A and B are 2 independent events and  $P(A)=0.5$  and  $P(B) = 0.4$ , find  $P(A/B)$ :

(Cocubes)

- a) 0.4              b) 0.5              c) 0.88              d) None of these

**SET-1**

1. B	2. C	3. D	4. C	5. A
6. C	7. D	8. B	9. B	10. A
11. B	12. A	13. B	14. D	15. A
16. B	17. C	18. A	19. B	20. C
21. D	22. A	23. C	24. A	25. A

**SET-2**

1. B	2. D	3. B	4. B	5. C
6. D	7. A	8. B	9. C	10. C
11. B	12. C	13. B	14. A	15. C
16. B	17. A	18. C	19. D	20. D

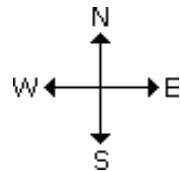
**SET-3**

1. D	2. A	3. A	4. A	5. A
6. B	7. A	8. D	9. B	10. D
11. A	12. A	13. C	14. C	15. B

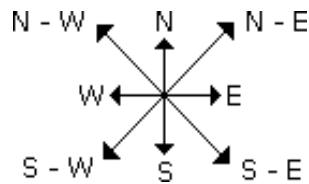
## **ANALYTICAL REASONING**

### **DIRECTION SENSE**

1. There are four main directions - East, West, North and South as shown below:



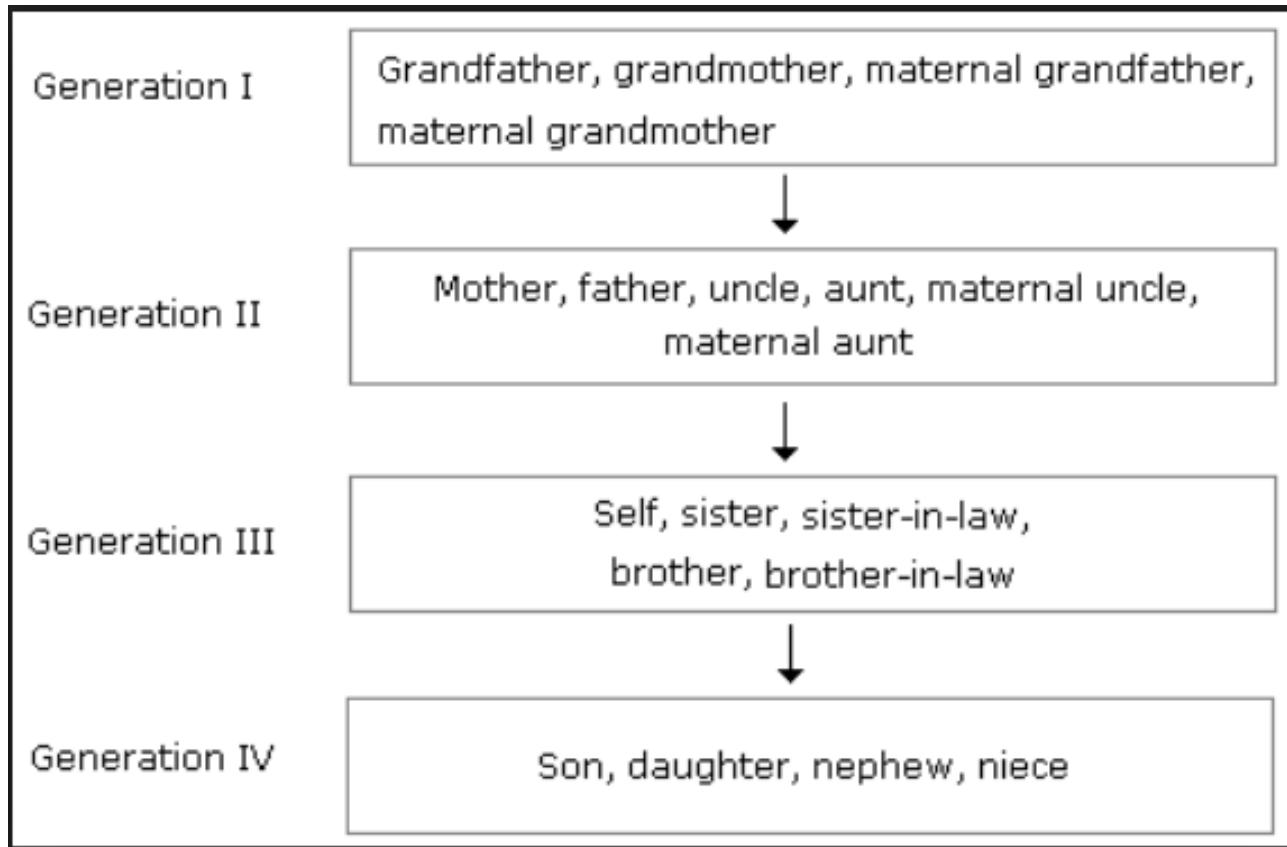
2. There are four cardinal directions - North-East (N-E), North-West (N-W), South-East (S-E), and South-West(S-W) as shown below:



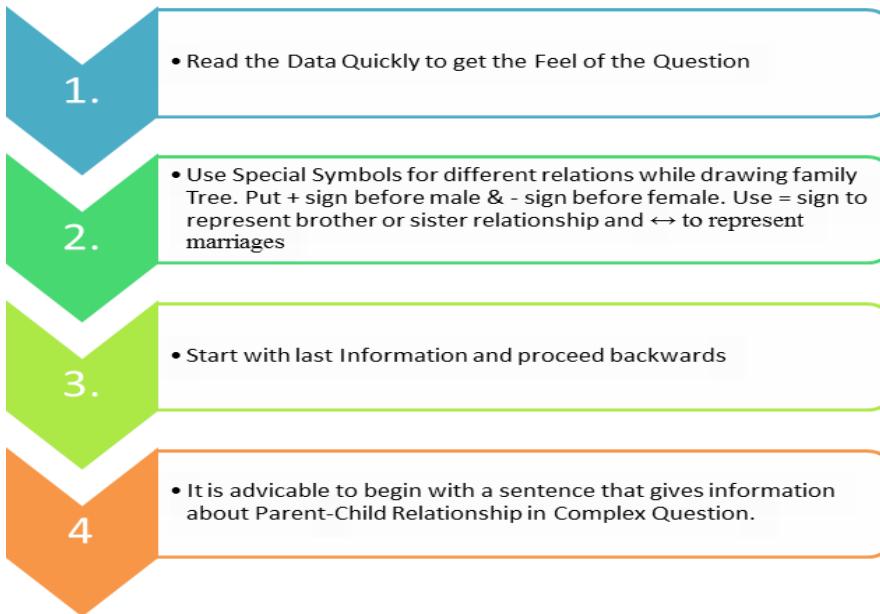
3. At the time of sunrise if a man stands facing the east, his shadow will be towards west.
4. At the time of sunset the shadow of an object is always in the east.
5. If a man stands facing the North, at the time of sunrise his shadow will be towards his left and at the time of sunset it will be towards his right.
6. At 12:00 noon, the rays of the sun are vertically downward hence there will be no shadow.
7. Left Right Movement:-
  - ✚ A person facing north, on taking left will face towards west and on taking the right turn towards east.
  - ✚ A person facing west, on taking left will face towards south and on taking right turn towards north.
  - ✚ A person facing east, on taking left will face towards north and on taking the right turn towards south.
  - ✚ A person facing south, on taking left will face towards east and on taking the right turn towards west
  - ✚ Whenever a person moves to his left side, he will move towards anti-clockwise direction.
  - ✚ Whenever a person moves to his right side, he will move towards clockwise direction.
8. When a question says moved towards left or right side, we assume that the movement is at an angle of 90degrees.

## **BLOOD RELATION**

### **COMMON RELATIONS-**



### **How To Solve Questions:**



## **SET-1**

**Q1.** If A is to the south of B and C is to the east of B, in what direction is A with respect to C?

- A. South-East      B. North      C. None of These      D. South-West

**Q2.** A is 40 m south-west of B. C is 40 m south-east of B. Then C is in which direction of A?

- A. East      B. West      C. South      D. North

**Q3.** There are four towns P, Q, R and T. Q is to the south-west of P, R is to the east of Q and south-east of P, and T is to the north of R in line with QP. In which direction of P is T located?

- A. South-East      B. North      C. North-East      D. West

**Q4.** A, B, C and D playing cards. A and B are partners. D faces towards North. If A faces towards West, then who faces towards South?

- A. A      B. C      C. D      D. Data Inadequate

**Q5.** Laxman travels 7 km towards south and then 5 km towards his left. He further travels 5 km towards south. How far is he from the starting point?

- A. 13 Km      B. 10 Km      C. 20 Km      D. 25 Km

**Q6.** One evening before sunset two friends Sumit and Mohit were talking to each other face to face. If Mohit's shadow was exactly to his right side, which direction was Sumit facing?

- A. North      B. South      C. East      D. West

**Q7.** A man is facing north-west. He turns 90 degree in the clockwise direction and then 135 degree in the anticlockwise direction. Which direction is he facing now?

- A. East      B. West      C. North      D. South

**Q8.** Keshav walks 10 km towards North. From there, he walks 6 km towards South. Then, he walks 3 km towards East. How far and in which direction is he with reference to his starting point?

- A. 5 km West      B. 5 km North-east      C. 7 km East      D. 7 km West

**Q9.** Suganya moves towards South-east a distance of 7 m, and then she moves towards West and travels a distance of 14 m. From here, she moves towards North-west a distance of 7 m and finally she moves a distance of 4 m towards East and stood at that point. How far is the starting point from where she stood?

- A. 3 m      B. 4 m      C. 5 m      D. 10 m

**Q10.** Vimal walks northwards. After a while, he turns to his right and a little further to his left. Finally, after walking a distance of one kilometer, he turns to his left again. In which direction is he moving now?

- A. North      B. South      C. West      D. East

**Q11.** Raju moved to his North- West side for 2 km. From there he turned 90 degrees clockwise & moved 2 km. From there he turned 90 degrees clock wise & travelled 2km, then he would be in which direction from the original position?

- A. South East Region      B. North East Region      C. South West Region      D. Western Region

**Q12.** Ravi started walking from his house east direction on Bus stop which is 3km away. Then he set off in thebus straight towards his right to the school 4 km away. What is the crow flight distance from his house to the school?

- A. 1 km      B. 5 km      C. 7 km      D. 12 km

**Q13.** Debu walks towards East then towards North and turning  $45^\circ$  right walks for a while and lastly turns towards left. In which direction is he walking now?

- A. North      B. East      C. South-East      D. North-West

**Q14.** Suman is 40 metres South-West of Ashok. Prakash is 40 meters South-East of Ashok. Prakash is in which direction of Suman?

- A. South      B. West      C. East      D. North-East

**Q15.** Mohan started from point 'A' and preceded 7 km straight towards East, then he turned left and proceeded straight for a distance of 10 km. He then turned left again and proceeded straight for a distance of 6 km, and then turned left again and proceeded straight for another 10 km. In which direction is Mohan fromhis starting point?

- A. East      B. West      C. North      D. South

**Q.16.** Pointing to a photograph, a man said, "I have no brother or sister but that man's father is my father'sson." Whose photograph was it?

- A. His own      B. His son      C. His Father      D. His Grandfather

**Q17.** Pointing to a man, a woman said, "His mother is the only daughter of my mother." How is the womanrelated to the man?

- A. Mother      B. Daughter      C. Sister      D. Brother

**Q18.** Pointing to the photograph, Vipul said, "She is the daughter of my grandfather's only son." How is Vipul related to the girl in the photograph?

- A. Father      B. Sister      C. Brother      D. Son

**Q19.** A's father is B's son-in-law. C, A's sister, is the daughter of P. How is B related to P?

- A. Brother      B. Sister      C. Mother      D. Can't be determined

**Q20.** Divyansh said to Nimish, "The boy playing with the football is the younger of the two brothers of the daughter of my father's wife." How is the boy playing football related to Divyansh?

- A. Cousin      B. Brother      C. Son      D. Brother-in-law

**Q21.** B is the brother of A, S is the sister of B, E is the brother of D, D is the daughter of A, F is the father of S. Then, the uncle of E is?

- A. A      B. F      C. B      D. D

**Q22.** R is the brother of G. Q is the sister of R. O is the brother of N. N is the daughter of G. L is the father of Q, who is the uncle of O?

- A. R      B. L      C. G      D. Q

**Q23.** If A + B means A is the mother of B; A - B means A is the brother B; A % B means A is the father of B and A x B means A is the sister of B, which of the following shows that P is the maternal uncle of Q?

- A. Q - N + M x P      B. P + S x N - Q      C. P - M + N x Q      D. Q - S % P

**Q24.** If A + B means A is the brother of B; A x B means A is the son of B; and A % B means B is the daughter of A then which of the following means M is the maternal uncle of N?

- A. M + O x N      B. M % O x N + P      C. M + O % N      D. None of these

**Q25.** If A + B means A is the father of B; A - B means A is the brother B; A % B means A is the wife of B and A x B means A is the mother of B, which of the following shows that M is the maternal grandmother of T?

- A. M x N % S + T      B. M x N - S % T      C. M x S - N % T      D. M x N x S % T

## SET-2

1. One evening before sunset Rekha and Hema were talking to each other face to face. If Hema's shadow was exactly to the right of Hema, which direction was Rekha facing?

- A. North      B. South      C. West      D. Data Inadequate

2. K is 40 m South-West of L. If M is 40 m South-East of L, then M is in which direction of K?

- A. East B. West      C. North-East      D. South

3. A is east of B and west of C. H is south-west of C, B is south-east of X. Which is the farthest west?

A. A    B. B

C. C

D. X

4. Rahul put his timepiece on the table in such a way that at 6 p.m. hour-hand points to North. In which direction the minute-hand will point at 9.15 p.m.?

- A. South-East    B. South    C. North    D. West

5. P started from his house towards west. After walking a distance of 25 m, he turned to the right and walked 10 m. He then again turned to the right and walked 15 m. After this he is to turn right at 135 degree and to cover 30 m. In which direction should he go?

- A. West    B. South    C. South-West    D. South-East

6. A boy rode his bicycle northward, then turned left and rode 1 km and again turned left and rode 2 km. He found himself 1 km west of his starting point. How far did he ride northward initially?

- A. 1 Km    B. 2 Km    C. 3 Km    D. 5 Km

7. Starting from the point X, Jai walked 15 m towards west. He turned left and walked 20 m. He then turned left and walked 15 m. After this he turned to his right and walked 12 m. How far and in which directions is now Jai from X?

- A. 32 m, South    B. 47 m, East    C. 42 m, North    D. 27 m, South

8. Two cars start from the opposite places of a main road, 150 km apart. First car runs for 25 km and takes a right turn and then runs 15 km. It then turns left and then runs for another 25 km and then takes the direction back to reach the main road. In the mean time, due to minor break down the other car has run only 35 km along the main road. What would be the distance between two cars at this point?

- A. 65 Km    B. 75 Km    C. 80 Km    D. 85 Km

9. Rajat walked 20 m towards north. Then he turned right and walks 30 m. Then he turns right and walks 35m. Then he turns left and walks 15 m. Finally he turns left and walks 15 m. In which direction and how many metres is he from the starting position?

- A. 15 m West    B. 30 m East    C. 30 m West    D. 45 m East

**Study the given information and answer the following questions.**

‘A + B’ means ‘A is son of B’

‘A ÷ B’ means ‘A is wife of B’

‘A × B’ means ‘A is brother of B’

‘A – B’ means ‘B is daughter of A’

10. How is R related to P in the expression ‘P + Q × R + T’?

- (A) Paternal uncle    (B) Sister    (C) Brother  
(D) Father    (E) None of these

11. How is M related to L in the expression ‘L × R + Q ÷ M’?

- (A) Grandfather    (B) Mother    (C) Father  
(D) Brother    (E) None of these

12. Which of the following means ‘P is sister of S’?

- (A) P + Q ÷ R - S    (B) P × Q - R ÷ S  
(C) P ÷ Q + R × S    (D) P + Q ÷ R × S  
(E) None of these

13. What should be placed in place of question marks to establish that T is father of Q in the given expression?

- Q × P ? V ? T × R  
(A) ×, ×    (B) +, -    (C) ×, +  
(D) +, +    (E) None of these

14. How is S related to Z in the expression ‘S + T ÷ Q + Z’?

- (A) Father    (B) Sister    (C) Mother  
(D) Grandson    (E) None of these

**Read the following information carefully and answer the questions which follow:**

- 'A \* Z' means 'A is the wife of Z'.
- 'A × Z' means 'A is the husband of Z'.
- 'A + Z' means 'A is the sister of Z'.
- 'A - Z' means 'A is the brother of Z'.
- 'A > Z' means 'A is the son of Z'.
- 'A < Z' means 'A is the daughter of Z'.

15. Which of the following relations will not be true if the expression ' $A < P \times T + F > L \times M$ ' is definitely true?

- 1) A is the daughter of T      2) F is the son of M
- 3) P is the son-in-law of L      4) A is the cousin of F
- 5) M is the grandmother of A

16. Which of the following means N is the daughter-in-law of A?

- 1)  $M + N * P > A$       2)  $N < M \times P + A$
- 3)  $M - N \times P < A$       4)  $A < P + N \times M$
- 5)  $A < N < P * M$

17. How is P related to F if ' $Q \times P < B + F$ '?

- 1) Daughter      2) Niece      3) Daughter-in-law
- 4) Granddaughter      5) Aunt

18. Which of the following means P is the father of R?

- 1)  $R > S < P * J$       2)  $J + R - S < P$       3)  $R > S * P - J$
- 4)  $S + J \times R < P$       5) None of these

19. How is M related to B if ' $A * B > Z \times S + M$ '?

- 1) Aunt      2) Grandfather      3) Uncle
- 4) Cousin      5) Cannot be determined

20. Pointing to a photograph, Prabhat tells his friend, "She is the grandmother of the elder brother of my father." How is the girl in the photograph related to Prabhat?

- 1) Great Grand Mother      2) Aunt      3) Sister
- 4) Sister in Law      5) Uncle

### **SET-3**

1. Pointing to a photograph, a man said, "I have no brother or sister but that man's father is my father's son." Whose photograph was it?(Amcat)

- A. His own B. His son C. His Father D. His Grandfather

2. Pointing to a man, a woman said, "His mother is the only daughter of my mother." How is the woman related to the man?(Cocubes)

- A. Mother B. Daughter C. Sister D. Brother

3. Pointing to the photograph, Vipul said, "She is the daughter of my grandfather's only son." How is Vipul related to the girl in the photograph?(Wipro)

- A. Father B. Sister C. Brother D. Son

4. Pointing to a girl in photograph. Amar said, "Her mother's brother is the only son of my mother's father." How the girl's mother related to Amar?(Infosys)

- A. Mother B. Sister C. Daughter D. Father

5. Pointing to a gentleman, Deepak said, " His only brother is the father of my daughter's father." How is gentleman related to Deepak?(Infineon)

- A. Brother B. Sister C. Father D. Uncle

6. If Kamal says, "Ravi's mother is the only daughter of my mother", how is Kamal related to

Ravi?(TCS)

A. Brother B. Sister C. Maternal Uncle D. Aunt

7. A's father is B's son-in-law. C, A's sister, is the daughter of P. How is P related to B?(Capgemini)

A. Brother B. Sister C. Mother D. Daughter

8. Divish said to Nitish, "The boy playing with the football is the younger of the two brothers of the daughter of my father's wife." How is the boy playing football related to Divish?(Cognizant)

A. Cousin B. Brother C. Son D. Brother-in-law

9. Bunny is the brother of A, Shalu is the sister of Bunny, Eshan is the brother of Divya, Divya is the daughter of A, Fateh is the father of Shalu. Then, the uncle of Eshan is?(TCS)

A. A B. Fateh C. Bunny D. Divya

10. Rohit is the brother of G. Queen is the sister of Rohit. Om is the brother of Nisha. Nisha is the daughter of G. Lovish is the father of Queen, who is the uncle of Om?(TCS)

A. Rohit B. Lovish C. G D.Queen

11. Kunal walks 10 kms towards North, from here he goes 6 kms towards South. Then he goes 3 kms towards East. How far and in which direction is he from the starting point?(Wipro)

1) 5 km West 2) 5 km North-East 3) 7 km East 4) 7 km West 5) None of these.

12. A man goes 30 km to South and then turning left he goes 20 km. Then turning to North he goes 30 km. After this, turns to his left and goes 40 km. How far is he from his starting point?(TCS)

(1) 10 km (2) 6 km (3) 20 km (4) 25 km (5) None of these

13. A boy walks northwards. After a while he turns towards his right and a little further to his left. Finally after walking a distance of one kilometer, he turns to his left again. In which direction is he moving now ?

(1) North (2) South (3) East (4) West (5) None of these

14. From his office, Rakesh walks 10 km to the East turns left walks 6 km and turns left and walks another 14 km. Which direction is he facing ?(Accenture)

(1) South (2) East (3) West (4) North (5) None of these

15. One morning Meena started walking towards the Sun. After walking a while she turned towards her left and again towards her left. After walking a while . She turned left. In which direction is she facing now?(Accenture)

(1) West (2) South (3) North (4) East (5) None of these

### SET-1

1.D	2. A	3. C	4. B	5.A
6. B	7. B	8. B	9. D	10. C
11. B	12. B	13. D	14. C	15. A
16. A	17. A	18. C	19. D	20. B
21. C	22. A	23. C	24. D	25.A

**SET-2**

1.B	2. A	3. D	4. D	5.C
6. B	7. A	8. A	9. D	10. A
11. C	12. E	13. C	14. D	15. D
16. A	17. B	18. C	19. E	20. A

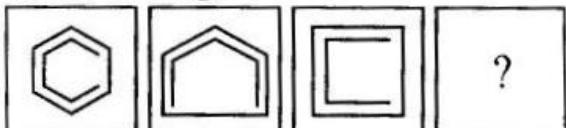
**SET-3**

1.B	2. A	3. B	4. A	5.D
6. C	7. D	8. B	9. C	10. A
11. B	12. C	13. D	14. C	15. B

## Non Verbal Reasoning

1. Out of the given answer figures, which is the correct one to replace the question mark?

**Question Figures**

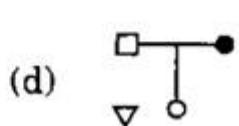
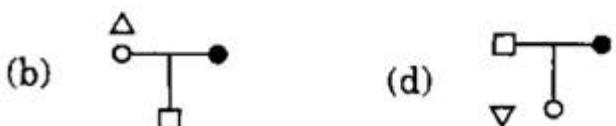
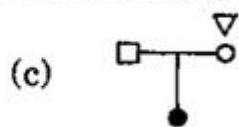
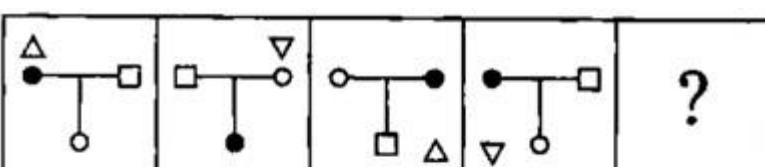


**Answer Figures**



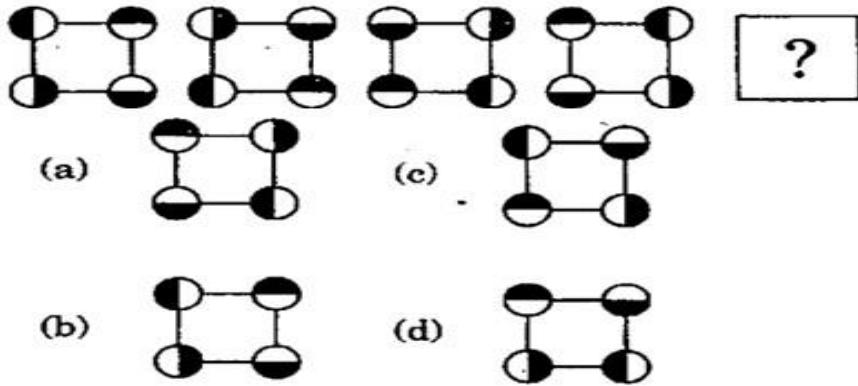
- A) A      B) C      C) B      D) D

2) Out of the given answer figures, which is the correct one to replace the question mark?



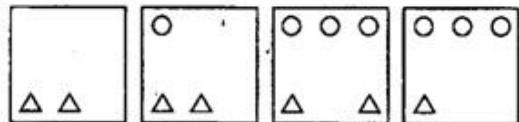
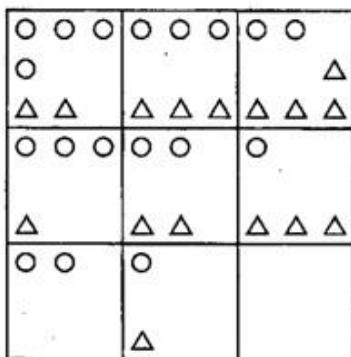
- A) A      B) C      C) B      D) D

3) Out of the given answer figures, which is the correct one to replace the question mark?



- A) A      B) C      C) B      D) D

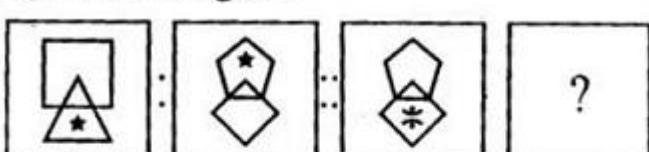
4) Out of the given answer figures, which is the correct one to replace the empty box?



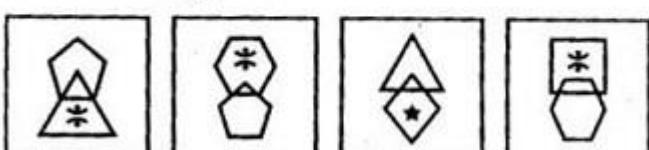
- A) A      B) C      C) B      D) D

5) Out of the given answer figures, which is the correct one to replace the question mark?

### Question Figure

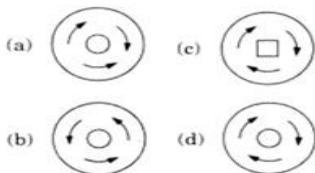
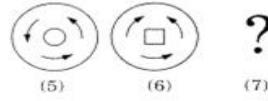
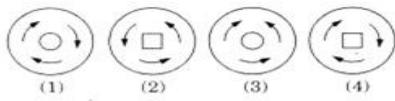


### Answer Figures



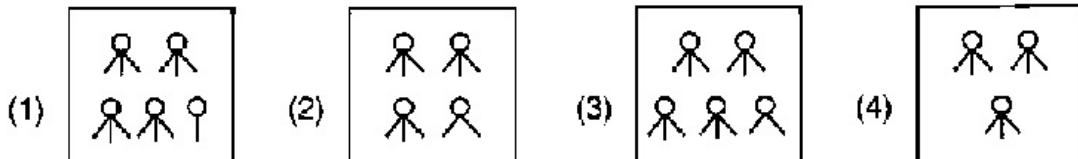
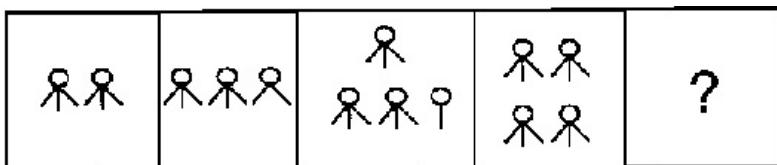
- A) A      B) C      C) B      D) D

6) What will be the seventh image in the sequence out of the given options a, b, c and d?



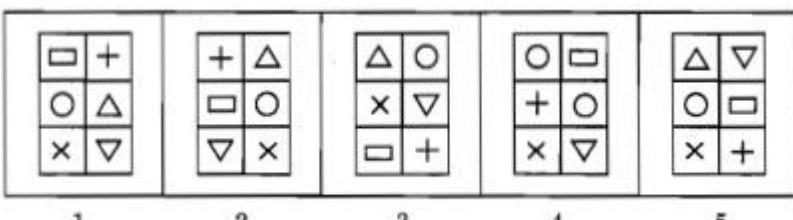
- A) A      B) C      C) B      D) D

7) What will be next in the sequence out of the given answer figures?



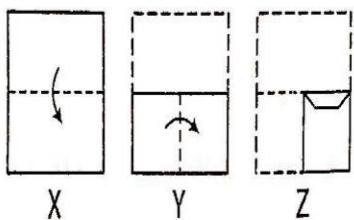
- A) 1      B) 3      C) 2      D) 4

8) Out of the given 5 images, one image is not same as the other 4. Which is it?

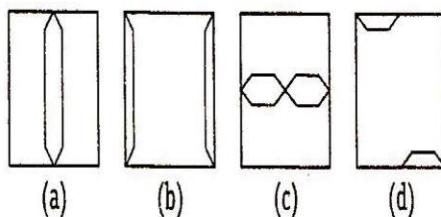


9) A piece of paper is folded and cut as shown below in the question figures. From the given answer figures, indicate how it will appear when opened.

### Question Figures



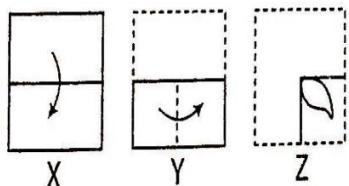
### Answer Figures



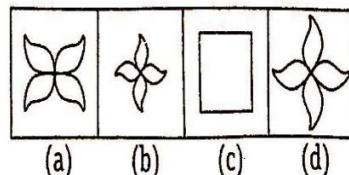
- A) A      B) C      C) B      D) D

10) The three question figures marked X, Y, and Z show the manner in which a paper is folded step by step and then cut. From the answer figures (a),(b),(c) and (d), select the one showing the unfolded pattern of the paper after the cut.

### Question Figures

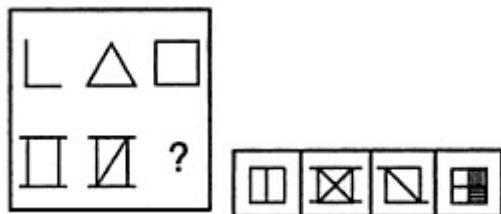


### Answer Figures



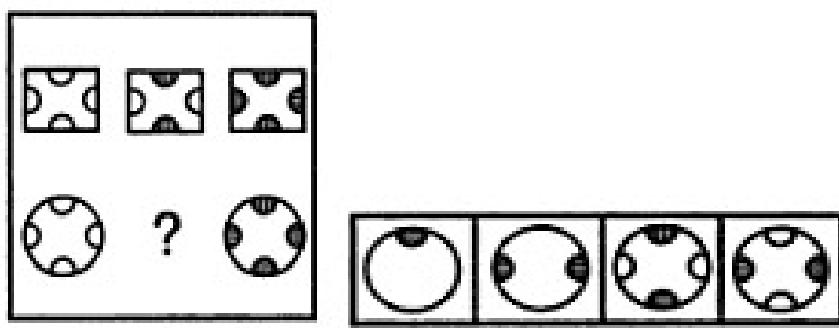
- A) A      B) C      C) B      D) D

11) Select a suitable figure from the four alternatives that would complete the figure matrix.



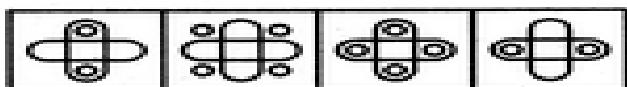
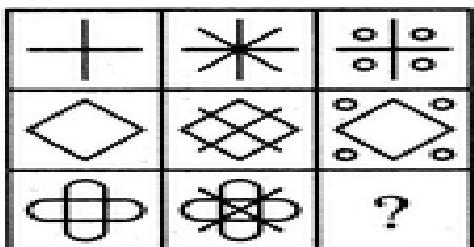
- A) 1      B) 4      C) 3      D) 2

12) Select a figure from the four alternatives that would complete the Figure Matrix.



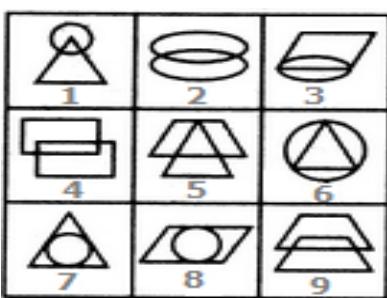
- A) 1      B) 4      C) 3      D) 2

13) Select a suitable figure from the four alternatives that would complete the figure matrix



- A) 1                      B) 4                      C) 3                      D) 2

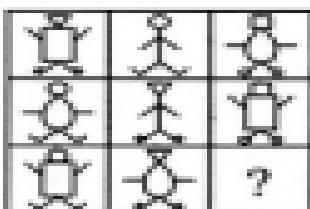
14) Group the given figures into three classes using each figure only once.



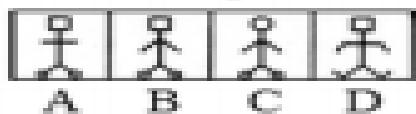
- A) 1,5,9 ; 2,7,8 ; 3,4,6                      B) 2,4,9 ; 6,7,8 ; 1,3,5  
 C) 3,7,8 ; 4,5,9 ; 1,2,6                      D) 1,5,6 ; 4,7,8 ; 2,3,9

15) Complete the Problem figure with an appropriate option from the Answer figure.

#### Problem Figures



#### Answer Figures



- A) C                      B) D                      C) B                      D) A

16) A piece of paper is folded and cut as shown below in the question figures. From the given answer figures, indicate how it will appear when opened.



**Options:**



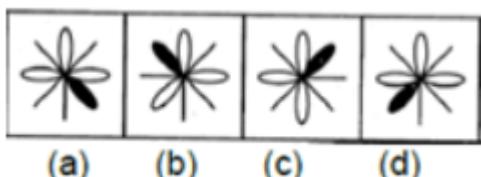
A) 1

B) 2

C) 3

D) 4

17) In each problem, out of the four figures marked (a) (b) (c) and (d), three are similar in a certain manner. However, one figure is not like the other three. Choose the figure which is different from the rest.



A) a

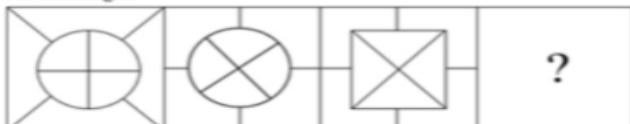
B) b

C) c

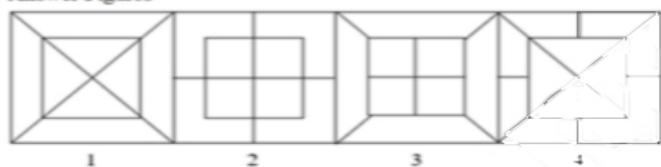
D) d

18) Choose the correct figure that replaces the question mark.

Problem Figure



Answer Figures



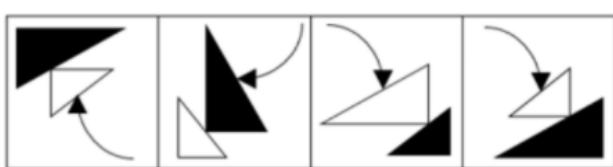
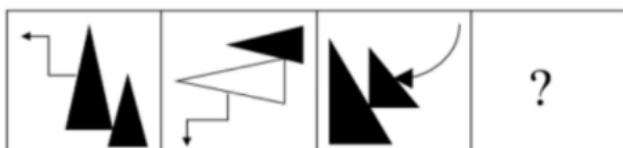
A) 1

B) 3

C) 2

D) 4

19) Choose the correct figure that can replace the question mark.



1

2

3

4

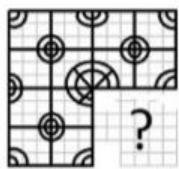
A) 1

B) 2

C) 3

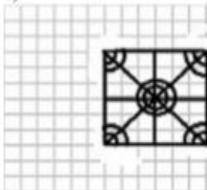
D) 4

20) Which answer figure will complete the pattern in the question figure?

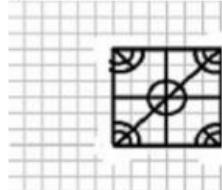


Options:

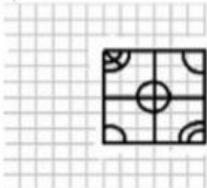
1)



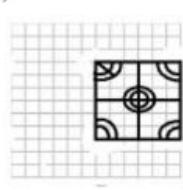
3)



2)



4)



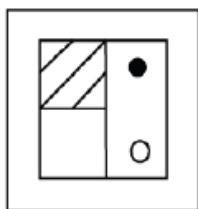
A) 1

B) 2

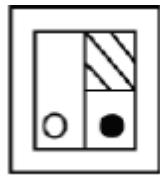
C) 3

D) 4

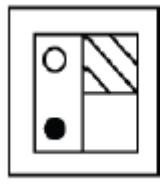
21) Find the Mirror Image



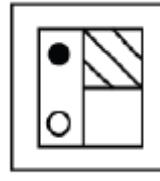
A.



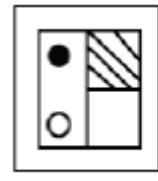
B.



C.



D.

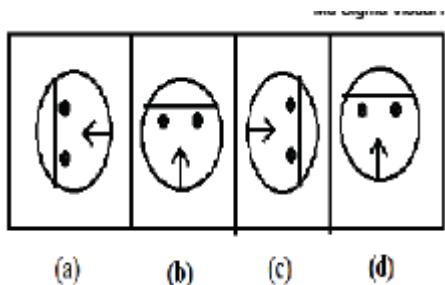


22. A piece of paper is folded and punched as shown below in the Question figures. From the given answer figures, indicate how it will appear when opened?





23. . Choose the figure which is different from the others



- A. a      B. b      C. c      D. d

24. Look carefully at the sequence of symbols to find the pattern. Select the correct pattern



- A. 1      B. 2      C. 3      D. 4

25. Look carefully at the sequence of symbols to find the pattern. Select the correct pattern.



- A. 1      B. 2      C. 3      D. 4

## SET-2

1. Look carefully at the sequence of symbols to find the pattern. Select the correct pattern.



- A. 1      B. 2      C. 3      D. 4

2. Look carefully at the sequence of symbols to find the pattern. Select the correct pattern.



- A. 1      B. 2      C. 3      D. 4

3. Look carefully at the sequence of symbols to find the pattern. Select the correct pattern.



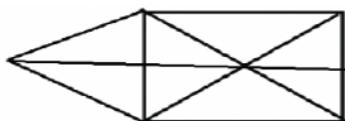
- A. 1      B. 2      C. 3      D. 4

4. Look carefully at the sequence of symbols to find the pattern. Select the correct pattern.



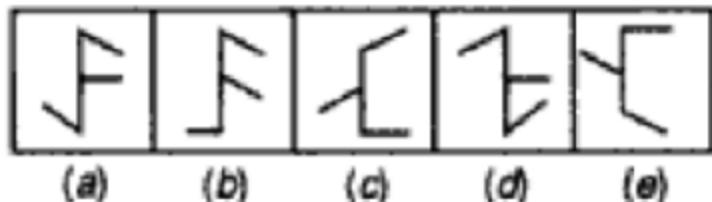
- A. 1      B. 2      C. 3      D. 4

5. Count no of triangles



- A. 17      B. 20      C. 30      D. 14

6. Choose the figure which is different from the rest.



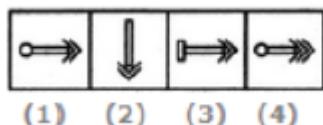
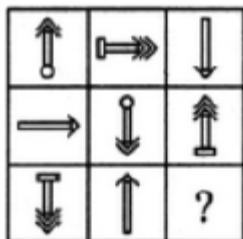
- A. a      B. b      C. c      D. d

7. Choose the alternative which most closely resembles the mirror-image of the given combination.

**STROKE**

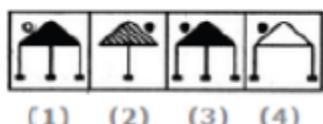
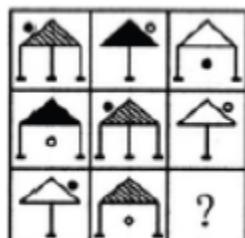
- A. EKORTS  
 B. EKORTS  
 C. ROKETS  
 D. STROKE

8. Select a suitable figure from the four alternatives that would complete the figure matrix.



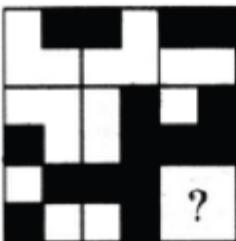
- A. 1              B. 2              C. 3              D. 4

9. Select a suitable figure from the four alternatives that would complete the figure matrix.



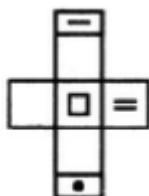
- A. 1              B. 2              C. 3              D. 4

10. Select a suitable figure from the four alternatives that would complete the figure matrix.



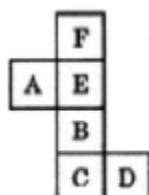
- A. 1      B. 2      C. 3      D. 4

11. Choose the box that is similar to the box formed from the given sheet of main paper.



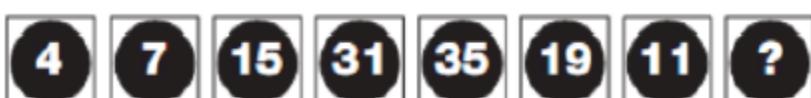
- A. 1      B. 2 and 3      C. 3 and 4      D. 4

12. Choose the box that is similar to the box formed from the given sheet of main paper.



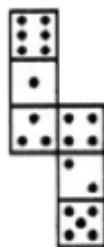
- A. 1      B. 2      C. 3      D. 4

13. Which number swaps the question mark?



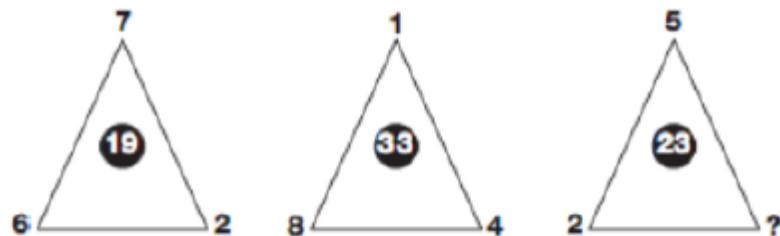
- A. 1      B. 8      C. 6      D. 4

14. If the below given diagram form a dice, how many points lie reverse to the main face having 3 points?



- A. 1      B. 5      C. 6      D. 4

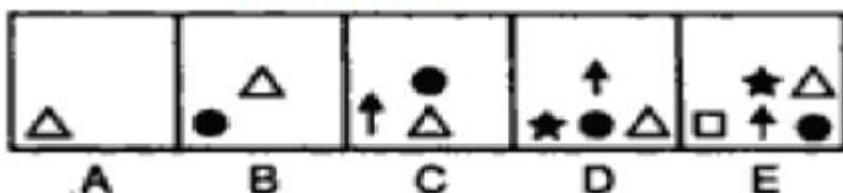
15. Which numeral will fill the question mark??



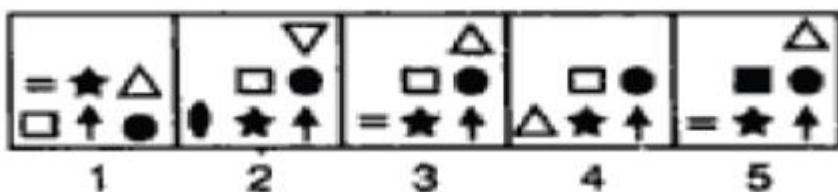
- A. 1      B. 9      C. 6      D. 4

16. In the figure below find out the right solution from the five choices given in the solution

**Problem figure**



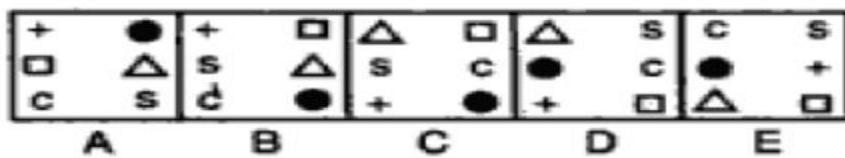
**Answer figure**



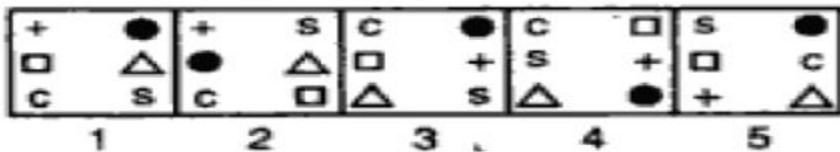
- A. 1      B. 3      C. 6      D. 4

17. In the figure below find out the right solution from the five choices given in the solution

**Problem figure**



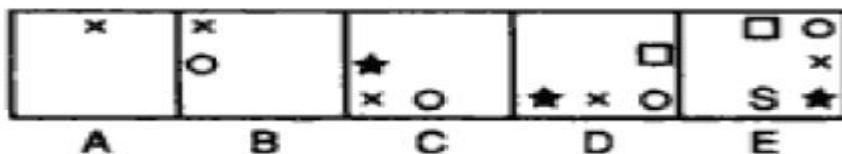
**Answer figure**



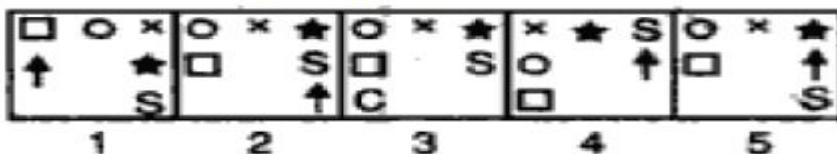
- A. 1      B. 3      C. 2      D. 4

18. In the figure below find out the right solution from the five choices given in the solution

**Problem figure**



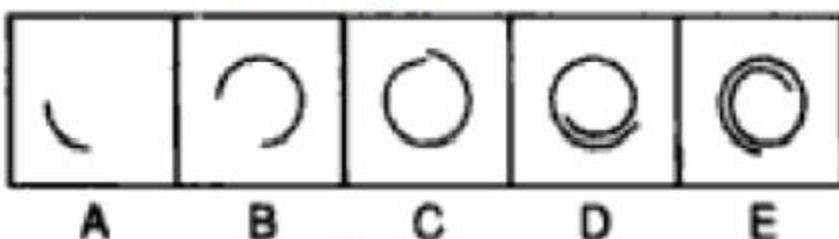
**Answer figure**



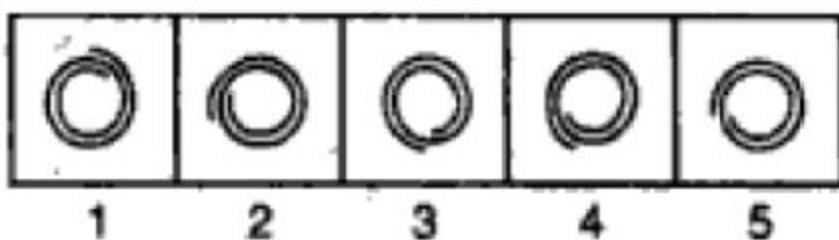
- A. 1      B. 3      C. 2      D. 4

19. In the figure below find out the right solution from the five choices given in the solution

**Problem figure**

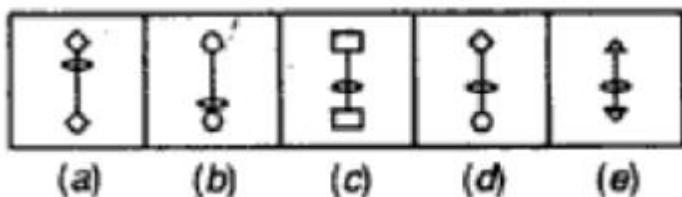


**Answer figure**



- A. 1      B. 3      C. 2      D. 4

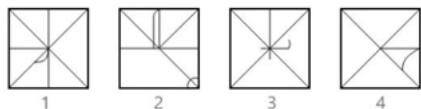
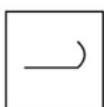
20. Choose the figure which is different from others



- A. a      B. b      C. c      D. d

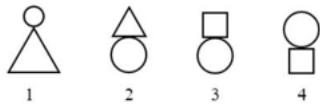
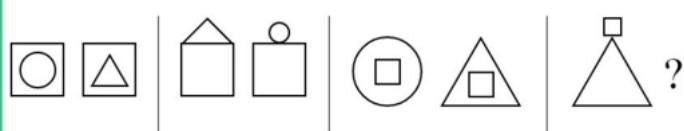
### SET-3

1. Find the answer in which the given figure is embedded. (Rotation is not allowed) (Mettl)



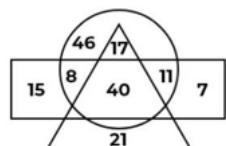
- A.1  
B.2  
**C.3**  
D.4

2. Select which image will follow the corresponding series (Mettl)



- A. 1  
B. 2  
**C. 3**  
D. 4

3. In the given Venn diagram, the circle represents 'PhD students', the triangle represents 'science students' and the rectangle represents 'girls'. The numbers given in the shapes represent the number of persons of that particular category. How many girls are PhD students but are NOT science students? (Mettl)



A.19

B.20

C.21

D.22

4. There is a sequence in the questions in which one term is missing. Choose the option from the four given alternatives that will complete the sequence. (**Mettl**)

Question figure



Answer Figure



A

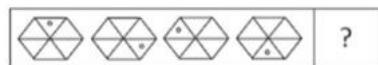
B

C

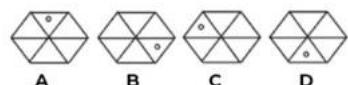
D

5. There is a sequence in the questions in which one term is missing. Choose the option from the four given alternatives that Will complete the sequence. (**Mettl**)

Question figure



Answer Figure



A

B

C

D

6. Find the missing figure in the following sequence. (**HCL**)



(a)

(b)

(c)

(d)

7. Find the missing figure in the following sequence. (**HCL**)



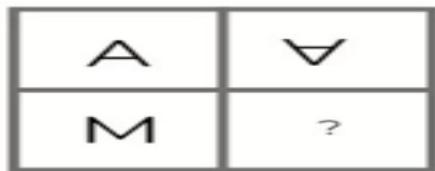
(a)

(b)

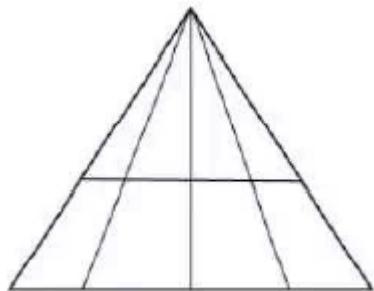
(c)

(d)

8. Find the missing figure in the following sequence. (HCL)

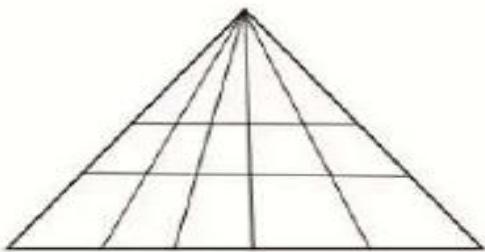


9. Count the number of triangles (Hackerrank)



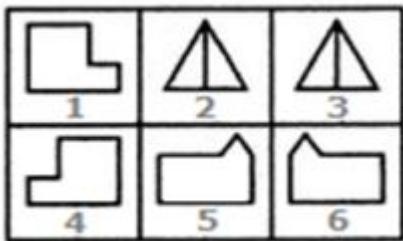
- A. 14      B. 20      C. 13      D. 15

10. Count the number of triangles (Hackerrank)



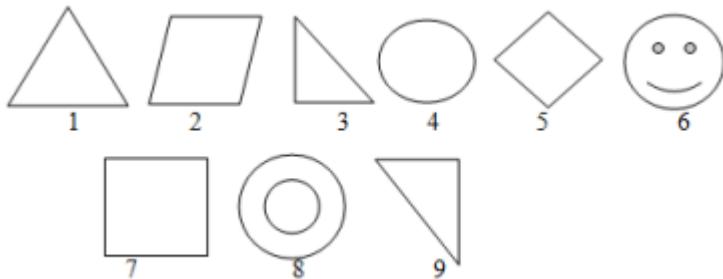
- A. 14      B. 45      C. 13      D. 15

11. Group the figures in such a way that identical figure comes in same group(Cocubes)



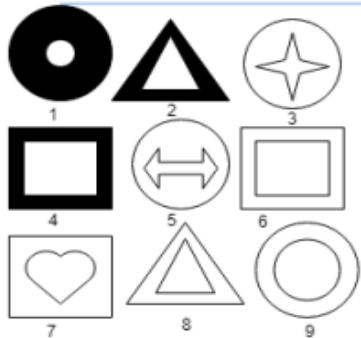
- a. 1 and 5, 2 and 3, 4 and 6
- b. 1 and 4, 2 and 3, 5 and 6
- c. 1 and 2, 5 and 4, 3 and 6
- d. 1 and 5, 2 and 3, 4 and 6

12. Group the figures in such a way that identical figure comes in same group. (**Cocubes**)



- a. 1,2,3 ; 4,8,9 ; 5,7,6
- b. 1,3,5 ; 2,7,9 ; 4,6,8
- c. 1,3,9; 2,5,7 ; 4,6,8
- d. None of the above

13. Group the figures in such a way that identical figure comes in same group. (**Cocubes**)

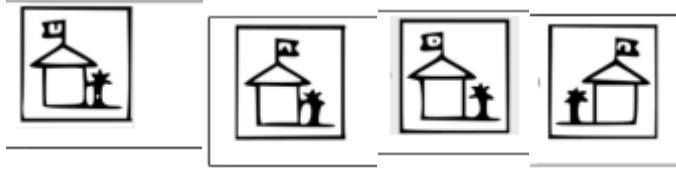


- a. 1,2,3 ; 4,5,6 ; 7,8,9
- b. 1,2,4 ; 3,5,7 ; 6,8,9
- c. 1,2,5 ; 7,6,9 ; 4,8,3
- d. 1,8,9 ; 2,5,7 ; 3,4,6

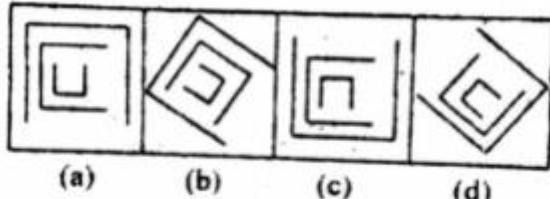
14. If a mirror is placed on the line MN ,then which of the answer figures is the correct image of the given figure.



- A.
- B.
- C.
- D.



15. Choose the figure which is different from the others.



- A]A      B]B      C]C      D]D

#### SET-1

1. D	2. A	3. C	4. A	5. C
6. D	7. B	8. B	9. B	10. A
11. D	12. C	13. D	14. B	15. C
16. A	17. B	18. B	19. D	20. D
21. C	22. A	23. D	24. C	25. B

#### SET-2

1. D	2. D	3. C	4. A	5. A
6. B	7. D	8. A	9. A	10. D
11. C	12. B	13. B	14. C	15. B
16. B	17. C	18. A	19. C	20. D

#### SET-3

1. C	2. C	3. A	4. B	5. B
6. A	7. C	8. B	9. B	10. B
11. B	12. C	13. B	14. C	15. A