



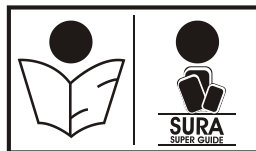
**TNPSC**  
**Group-I, II, IIA, IV**  
**QUANTITATIVE APTITUDE**  
**& MENTAL ABILITY**  
**2016 to 2026**

**11**

**PREVIOUS YEARS' ORIGINAL  
QUESTION PAPERS SOLVED  
WITH EXPLANATORY ANSWERS  
&**

**500+ Chapter-wise Problems for Practice**

**Dr. K. Sanakara Aravind M.Sc., M.Phil., Ph.d.**



**SURA COLLEGE OF COMPETITION**

**Chennai**

© PUBLISHERS

**TNPSC QUANTITATIVE APTITUDE AND MENTAL ABILITY**  
**SOLVED PREVIOUS YEARS' QUESTION & ANSWERS**

**ISBN: 978-93-6417-408-4**  
**Code : B1192**

[NO ONE IS PERMITTED TO COPY OR TRANSLATE IN ANY OTHER LANGUAGE  
THE CONTENTS OF THIS BOOK OR PART THEREOF IN ANY FORM WITHOUT  
THE WRITTEN PERMISSION OF THE PUBLISHERS]

**SURA COLLEGE OF COMPETITION**

**Head Office :** 1620, 'J' Block, 16th Main Road, Anna Nagar, **Chennai - 600 040.**  
Phones: 044-48629977, 42043273.

Printed at Max Printing Press, Chennai - 600 095 and Published by  
V.V.K.Subburaj for Sura College of Competition  
1620, 'J' Block, 16th Main Road, Anna Nagar, Chennai - 600 040.  
Phone : 044-48629977

email: [suracollege@gmail.com](mailto:suracollege@gmail.com); [enquiry@surabooks.com](mailto:enquiry@surabooks.com); website: [www.surabooks.com](http://www.surabooks.com)

## CONTENTS

|                                              |                  |
|----------------------------------------------|------------------|
| •✧ NUMBERS & SEQUENCES .....                 | 2 - 24           |
| •✧ SIMPLIFICATION .....                      | 25 - 42          |
| •✧ ALGEBRA .....                             | 43 - 74          |
| •✧ LCM AND HCF OF NUMBERS .....              | 75 - 92          |
| •✧ SIMPLE INTEREST & COMPOUND INTEREST ..... | 93 - 123         |
| •✧ TIME AND WORK .....                       | 124 - 156        |
| •✧ RATIO AND PROPORTION .....                | 157 - 176        |
| •✧ PERCENTAGE .....                          | 177 - 201        |
| •✧ AVERAGE .....                             | 202 - 211        |
| •✧ PROFIT, LOSS AND DISCOUNT .....           | 212 - 243        |
| •✧ SPEED, TIME AND DISTANCE .....            | 244 - 266        |
| •✧ PROBLEMS ON AGES .....                    | 267 - 271        |
| •✧ TRIGONOMETRY .....                        | 272 - 278        |
| •✧ MENSURATION .....                         | 279 - 316        |
| •✧ PROBABILITY .....                         | 317 - 319        |
| •✧ STATISTICS .....                          | 320 - 325        |
| •✧ GEOMETRY .....                            | 326 - 338        |
| •✧ REASONING & MENTAL ABILITY .....          | 339 - 346        |
| •✧ <b>PROBLEMS FOR PRACTICE .....</b>        | <b>347 - 444</b> |



# Quantitative Aptitude and Mental Ability

- NUMBERS & SEQUENCES
- SIMPLIFICATION
- ALGEBRA
- LCM AND HCF OF NUMBERS
- SIMPLE INTEREST & COMPOUND INTEREST
- TIME AND WORK
- RATIO AND PROPORTION
- PERCENTAGE
- AVERAGE
- PROFIT, LOSS AND DISCOUNT
- SPEED, TIME AND DISTANCE
- PROBLEMS ON AGES
- TRIGONOMETRY
- MENSURATION
- PROBABILITY
- STATISTICS
- GEOMETRY
- REASONING

## Numbers & Sequences

- ◆ **Natural Numbers:** Positive integers starting from 1 (1, 2, 3, .....)
- ◆ **Whole Numbers:** Natural numbers including zero (0, 1, 2, 3, .....)
- ◆ **Integers:** All positive and negative whole numbers, including zero (..... -3, -2, -1, 0, 1, 2, 3, .....)
- ◆ **Rational Numbers:** Numbers that can be expressed as a fraction of two integers  $\left(\frac{1}{2}, \frac{3}{4}\right)$
- ◆ **Irrational Numbers:** Numbers that cannot be expressed as a simple fraction  $(\sqrt{2}, \pi)$
- ◆ **Real Numbers:** All rational and irrational numbers.
- ◆ **Prime Numbers:** Natural numbers greater than 1 that have only two factors : 1 and the number itself (2, 3, 5, 7, 11, .....)
- ◆ **Composite Numbers:** Natural numbers greater than 1 that are not prime (4, 6, 8, .....)

### Divisibility Rules:

- ◆ **By 2:**  
A number is divisible by 2, if its last digit is even. i.e., 0, 2, 4, 6, 8, .....)
- ◆ **By 3:**  
A number is divisible by 3, if the sum of its digits is divisible by 3.  
**Example:** 12345 is divisible by 3  
 $\Rightarrow 1 + 2 + 3 + 4 + 5 = 15$ . 15 is divisible by 3. Hence 12345 is divisible by 3.
- ◆ **By 4:**  
The number is divisible by 4, if the last two digits of the number are divisible by 4 or should be 00.  
**Example:** The number 1816, where the last two digits 16 are divisible by 4. Hence 1816 is divisible by 4.  
The number 1400, where the last two digits are 00.  $1400 \div 4 = 350$ . Hence 1400 is divisible by 4.
- ◆ **By 5:**  
A number is divisible by 5, if it ends with 0 or 5.
- ◆ **By 6:**  
A number is divisible by 6, if it is divisible by both 2 and 3.  
**Example:** 9156  
The given number should be divisible by 2. Here 9156 ends with an even number. Hence, it is divisible by 2.  
 $9156 \div 2 = 4578$   
The given number should be divisible by 3. The sum of the digits of the number 9156 is 21.  $(9 + 1 + 5 + 6 = 21)$ . The number 21 is divisible by 3. 9156 is divisible both 2 and 3, hence it is divisible by 6.

### ◆ By 7:

A number is divisible by 7, if the difference between twice the last digit of the number and the remaining number is 0 or a multiple of 7.

**Example 1:** 798 is divisible by 7.

Twice the last digit =  $8 \times 2 = 16$

$\Rightarrow 79 - 16 = 63$ . 63 is divisible by 7. Hence 798 is divisible by 7.

**Example 2:** 1946 is divisible by 7.

Twice the last digit =  $6 \times 2 = 12$

$\Rightarrow 194 - 12 = 182$

Since 182 is still a big number we repeat the steps.

Twice the last digit =  $2 \times 2 = 4$

$\Rightarrow 18 - 4 = 14$ . 14 is multiple of 7. Hence 1946 is divisible by 7.

**Example 3:** 5219 is not divisible by 7.

Twice the last digit =  $9 \times 2 = 18$

$\Rightarrow 521 - 18 = 503$

We repeat the same procedure.

Twice the last digit =  $3 \times 2 = 6$

$\Rightarrow 50 - 6 = 44$

44 is not divisible by 7. Hence 5219 is not divisible by 7.

### ◆ By 8:

A number is divisible by 8, if its last three digits are either 000 or they form a number that is divisible by 8.

**Example 1:** 3896. The last three digits of 3896 are 896.

$896 \div 8 = 112$  with no remainder

Hence it is divisible by 8.

**Example 2:** 23419. The last three digits of 23419 are 419.

$419 \div 8 = 52.375$  which is not whole number. Hence it is not divisible by 8.

**Example 3:** 52000. The last 3 digits are 000. Hence it is divisible by 8.

### ◆ By 9:

A number is divisible by 9, if the sum of the digits is divisible by 9, then the number is divisible by 9.

**Example 1:** 7209

Sum of the digits =  $7 + 2 + 0 + 9 = 18$ . Hence it is divisible by 9.

**Example 2:** 2807

Sum of the digits =  $2 + 8 + 0 + 7 = 17$ . Hence 2807 is not divisible by 9.

### ◆ By 10:

A number is divisible by 10, if its last digit in a number has to be 0.

**Explanation**

The sequence is of perfect squares:

$$\begin{aligned} 1 &= 1^2 & 4 &= 2^2 \\ 9 &= 3^2 & 16 &= 4^2 \\ 25 &= 5^2 & 36 &= 6^2 \end{aligned}$$

Next term:  $7^2 = 49$

**69. What is the largest 4-digit number that is exactly divisible by 72?**

- A) 9936                      B) 9960  
C) 9984                      D) 9992

**Explanation**

**Given:**

Divisor = 72.

We need the largest 4-digit number divisible by 72.

**Formula Used:**

Dividend = Divisor  $\times$  Quotient + Remainder

**Solution:**

The largest 4-digit number is 9999.

Divide 9999 by 72:

$$9999 \div 72 = 138 \text{ with a remainder of } 63$$

To find the largest divisible number, subtract the remainder from 9999:

$$\text{Number} = 9999 - 63$$

$$\text{Number} = 9936$$

So the correct answer is (A)

**70. Which of the following is both rational and an integer?**

- A)  $\frac{1}{2}$                       B) 3  
C)  $\sqrt{2}$                       D)  $\pi$

**Explanation**

**Check each option:**

- $\frac{1}{2} \rightarrow$  rational, not an integer
- $3 \rightarrow$  integer and also rational
- $\sqrt{2} \rightarrow$  irrational
- $\pi \rightarrow$  irrational

**71. Identify the next number: 97, 89, 83, 79, ?**

- A) 71                      B) 77  
C) 67                      D) 65

**Explanation**

Look at the differences:

$$97 \rightarrow 89 \text{ } (-8)$$

$$89 \rightarrow 83 \text{ } (-6)$$

$$83 \rightarrow 79 \text{ } (-4)$$

Pattern: decreasing by 2 each time

Next difference = -2

$$79 - 2 = 77$$

**72. A student claims that the sum of two irrational numbers is always irrational. Which of the following pair of numbers disproves this claim ?**

**Ans : (D)**

A)  $\sqrt{2} + \sqrt{2}$

B)  $\sqrt{5} + \sqrt{3}$

C)  $\pi + \sqrt{2}$

D)  $\sqrt{2} + (-\sqrt{2})$

**Explanation**

**Ans : (D)**

To disprove the claim, we need a pair of irrational numbers whose sum is rational.

- A)  $\sqrt{2} + \sqrt{2} = 2\sqrt{2} \rightarrow$  irrational
- B)  $\sqrt{5} + \sqrt{3} \rightarrow$  irrational
- C)  $\pi + \sqrt{2} \rightarrow$  irrational
- D)  $\sqrt{2} + (-\sqrt{2}) = 0 \rightarrow$  rational

Hence, option D disproves the claim, since two irrational numbers can sum to a rational number.

**73. Find out the odd number in the series given**

25, 36, 49, 81, 121, 169, 225.

- A) 36                      B) 49  
C) 169                      D) 225

**Explanation :**

**Ans : (A)**

In the given series, except 36 all the other numbers 25, 49, 81, 121, 169 and 225 are odd square numbers.

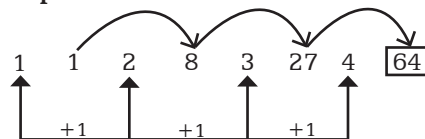
**438. Find the next term of 4 in the series is**

1, 1, 2, 8, 3, 27, 4, .....

- A) 31                      B) 29  
C) 16                      D) 64

**Explanation :**

**Ans : (D)**



**74. Find the sum of the first 40 terms of the series**  
 $1^2 - 2^2 + 3^2 - 4^2 + \dots$

- A) 820                      B) -820  
C) 870                      D) -870

**Explanation :**

**Ans : (B)**

$$1^2 - 2^2 + 3^2 - 4^2 + \dots - 40^2$$

The sum of n terms of the above kind can be calculated

$$\begin{aligned} &\text{using the formulae, } \frac{-n(n+1)}{2} \\ &= \frac{-40(40+1)}{2} = \frac{-40 \times 41}{2} \\ &= \frac{-1640}{2} = -820 \end{aligned}$$

**75. Find the sum of the following series**

$$2^2 + 3^2 + \dots + 20^2$$

- A) 2867                      B) 2868  
C) 2869                      D) 2870

**Explanation :**

$$2^2 + 3^2 + 4^2 + 5^2 + \dots + 20^2$$

The sum of squares of n terms can be calculated using the

formulae,  $\frac{n(n+1)(2n+1)}{6}$

$$\therefore \frac{20(20+1)(40+1)}{6} - 1 \quad (\because 1^2 \text{ is not included})$$

$$= \frac{20 \times 21 \times 41}{6} - 1$$

$$= 2870 - 1 = 2869$$

**76. Find the next number in the following series.**

4, 6, 9, 13½

A) 20¼

B) 22¾

C) 19

D) 17½

**Explanation :**

$$4 + 2 = 6$$

$$6 + [3 = 2 + 1] = 9$$

$$9 + [4.5 = (3 + 1.5)] = 13.5 = 13\frac{1}{2}$$

$$13.5 + [6.25 = 4.5 + 2.25]$$

$$= 20.25 = 20\frac{1}{4}$$

**77. What is the standard deviation of the first n natural numbers?**

A)  $\sqrt{\frac{n^2-1}{12}}$

B)  $\sqrt{\frac{n^2+1}{12}}$

C)  $\sqrt{\frac{n(n+1)}{12}}$

D)  $\sqrt{\frac{n(n+1)(2n+1)}{6}}$

**Explanation :**

**Mean :**

$$\sum x_i = 1 + 2 + 3 + \dots + n = \frac{n(n+1)}{2}$$

**Variance :**

$$\sum x_i^2 = 1^2 + 2^2 + 3^2 + \dots + n^2$$

$$= \frac{n(n+1)(2n+1)}{6}$$

$$\text{Standard deviation } (\sigma) = \sqrt{\frac{\sum x_i^2}{n} - \left(\frac{\sum x_i}{n}\right)^2}$$

$$= \sqrt{\frac{n(n+1)(2n+1)}{6n} - \frac{n^2(n+1)^2}{4n^2}}$$

$$= \sqrt{\frac{(n+1)(2n+1)}{6} - \frac{(n+1)^2}{4}}$$

$$= \sqrt{\frac{2(2n^2 + 3n + 1) - 3(n^2 + 2n + 1)}{12}}$$

**Ans : (C)**

$$= \sqrt{\frac{4n^2 + 6n + 2 - 3n^2 - 6n + 3}{12}}$$

$$= \sqrt{\frac{n^2 - 1}{12}}$$

**78. Which of the following numbers divides 774359327?**

A) 7

B) 12

C) 2

D) 16

**Explanation**

**Ans : (A)**

**Step 1: Check Divisibility by 2, 12, and 16**

A number is divisible by 2 if its last digit is even. The last digit of 774,359,327 is 7, which is an odd number. Therefore, 774,359,327 is not divisible by 2.

Since 12 and 16 are also even numbers, 774,359,327 cannot be divisible by them either.

**Step 2: Check Divisibility by 7**

To check if 774,359,327 is divisible by 7, we can perform long division.

$$\frac{774,359,327}{7} = 110,622,761 \text{ with a remainder of } 0$$

Since the remainder is 0, 774,359,327 is divisible by 7.

**79. Which of the following numbers divides 545714151?**

A) 10

B) 6

C) 7

D) 3

**Explanation**

**Ans : (D)**

**Step 1: Check Divisibility by 10**

For a number to be divisible by 10, its last digit must be 0. The last digit of 545,714,151 is 1, so it is not divisible by 10.

**Step 2: Check Divisibility by 6**

For a number to be divisible by 6, it must be divisible by both 2 and 3. The number 545,714,151 is an odd number (its last digit is 1), so it is not divisible by 2. Therefore, it is not divisible by 6.

**Step 3: Check Divisibility by 7**

While there is a divisibility rule for 7, it is often simpler to perform a quick calculation or note the failures of other rules first. Since we have already found a correct answer, checking 7 is not necessary.

**Step 4: Check Divisibility by 3**

For a number to be divisible by 3, the sum of its digits must be a multiple of 3.

The sum of the digits of 545,714,151 is:

$$5 + 4 + 5 + 7 + 1 + 4 + 1 + 5 + 1 = 33$$

Since 33 is divisible by 3 ( $33 \div 3 = 11$ ), the number 545,714,151 is divisible by 3.

**80. The number of prime numbers lying between 334 and 341 is:**

A) 5

B) 4

C) 3

D) 1

99. A sum of ₹ 1,875 at 4% per annum increased to ₹ 2,028 in certain time. If interest is compounded yearly, then what is the time period?

- A) 2.5 years                      B) 3 years  
C) 3.5 years                      D) 2 years

**Explanation**  
**In Compound Interest**

**Ans : (D)**

$$A = P \left( 1 + \frac{r}{100} \right)^n$$

$$\Rightarrow 2028 = 1875 \left( 1 + \frac{4}{100} \right)^n$$

$$\Rightarrow 2028 = 1875 \times \left( \frac{104}{100} \right)^n$$

$$\Rightarrow 2028 = 1875 \times \left( \frac{26}{25} \right)^n$$

$$\Rightarrow \frac{2028}{1875} = \left( \frac{26}{25} \right)^n$$

$$\Rightarrow \frac{676}{625} = \left( \frac{26}{25} \right)^n$$

$$\Rightarrow \left( \frac{26}{25} \right)^2 = \left( \frac{26}{25} \right)^n$$

$\therefore n = 2$  years

100. What is the difference between the compound interest and simple interest on a sum of ₹ 12000 for  $2\frac{2}{3}$  years at the rate of 15% per annum. If the interest compounded yearly?

- A) ₹ 563                          B) ₹ 657  
C) ₹ 586                          D) ₹ 724

**Explanation**

**Ans : (B)**

$$S.I = \frac{PNR}{100}$$

$$\Rightarrow \frac{12000 \times 8 \times 15}{100 \times 3} = ₹ 4800$$

**Compound Interest**

Interest rate for first 2 years = 15%

Interest rate for  $\frac{2}{3}$  years =  $\frac{2}{3} \times 15 = 10\%$

$$A = P \left( 1 + \frac{r}{100} \right)^n$$

$$C.I = A - P$$

$$12000 \times \left( 1 + \frac{15}{100} \right)^2 \times \left( 1 + \frac{10}{100} \right)^1$$

$$\Rightarrow 12000 \times \frac{115}{100} \times \frac{115}{100} \times \frac{110}{100} = ₹ 17457$$

$$C.I = 17457 - 12000 = ₹ 5457$$

Required Difference (C.I - S.I)

$$\Rightarrow 5457 - 4800 = ₹ 657$$

101. A company charges 10% per annum compound interest on loan. A sum of ₹ 2,20,000 is given by the company for a period of 2 years. The company compounded the interest every six months instead of every year. How much money would have been saved by the borrower if the company compounded the interest annually (rounded up to one decimal place)?

- A) ₹ 1,211.40                      B) ₹ 1,412.20  
C) ₹ 1,312.20                      D) ₹ 1,111.40

**Explanation**

**Ans : (A)**

**Case I: C.I for annum**

$$C.I = P \left( 1 + \frac{R}{100} \right)^n - P$$

$$\Rightarrow 220000 \left( 1 + \frac{10}{100} \right)^2 - 220000$$

$$\Rightarrow 220000 \left( \frac{110}{100} \right)^2 - 220000$$

$$\Rightarrow 220000 \times \frac{11}{10} \times \frac{11}{10} - 220000$$

$$\Rightarrow 266200 - 220000 = ₹ 46200$$

**Case II: C.I for annum**

Rate for annum = 10%

$\therefore$  Rate for six months = 5%

2 years = 4 six months

$$C.I = 220000 \left( 1 + \frac{5}{100} \right)^4 - 220000$$

$$\Rightarrow 220000 \left( \frac{105}{100} \right)^4 - 220000$$

$$\Rightarrow 220000 \times \frac{21}{20} \times \frac{21}{20} \times \frac{21}{20} \times \frac{21}{20} - 220000$$

$$\Rightarrow 267411.37 - 220000 = ₹ 47411.37$$

Required difference

$$\Rightarrow 47411.37 - 46200 = ₹ 1211.37 \approx 1211.40$$

The borrower would have been saved ₹ 1211.40.

102. A sum of ₹ 10,500 deposited 2 years ago, compounded annually, with the rate of interest 10% per annum during the first year, and 12% per annum during the second year, will amount to .....

- A) ₹ 12,937                      B) ₹ 12,936  
C) ₹ 12,705                      D) ₹ 12,396

**Explanation**

**Ans : (B)**

$$\text{Compound Interest} = P \left( 1 + \frac{r}{100} \right)^n$$

**First Year:**

$$10500 \left(1 + \frac{10}{100}\right)^1$$

$$\Rightarrow 10500 \left(\frac{110}{100}\right)$$

$$\Rightarrow 10500 \times \frac{11}{10} = 11550$$

**Second Year:**

$$11550 \left(1 + \frac{12}{100}\right)^1$$

$$\Rightarrow 11550 \times \frac{112}{100} = ₹ 12936$$

**103. In how many years will ₹ 12,500 become ₹ 21,600 at the rate of 20% per annum on compound interest when interest is compounding annually?**

A) 2

B) 7

C) 5

D) 3

**Explanation**

In Compound Interest,

$$A = P \left(1 + \frac{R}{100}\right)^T$$

$$21600 = 12500 \left(1 + \frac{20}{100}\right)^T$$

$$21600 = 12500 \left(\frac{120}{100}\right)^T$$

$$\Rightarrow \frac{21600}{12500} = \left(\frac{120}{100}\right)^T$$

$$\Rightarrow \left(\frac{216}{125}\right) = \left(\frac{6}{5}\right)^3$$

Required Time = 3 years

**104. Under simple rate of growth, the population (P units) of a city becomes 1.5 times of P in 10 years. In how many years, the population of the city would become double (2 times P) under the same growth rate?**

A) 20

B) 15

C) 17

D) 12

**Explanation**

Population of a city becomes 1.5 times of P in 10 years.

$$\Rightarrow 1.5P - P = 0.5P = 10$$

$$\Rightarrow 0.5P = 10 \quad \therefore 2P = 20 \text{ years}$$

**105. A bank offers compound interest at the rate of 10% per annum when interest is compounded half-yearly. A customer deposits ₹ 3,200 each on 1<sup>st</sup> January and 1<sup>st</sup> July of a year. At the end of the year, what will be the amount received by customer as interest?**

A) ₹ 488

B) ₹ 656

C) ₹ 720

D) ₹ 528

**Explanation**

**Ans : (A)**

$$\text{Compound interest for half-yearly} = \frac{10}{2} = 5\%$$

Compound interest for first 6 months

$$\Rightarrow 3200 \times \left(1 + \frac{5}{100}\right)$$

$$\Rightarrow 3200 \times \frac{105}{100} = 3360$$

$$\therefore \text{Interest} = 3360 - 3200 = ₹ 160$$

Principal amount for next 6 months,

$$\Rightarrow 3200 + 3360 = ₹ 6560$$

Compound interest for next 6 months

$$\Rightarrow 6560 \times \left(1 + \frac{5}{100}\right)$$

$$\Rightarrow 6560 \times \frac{105}{100} = 6888$$

$$\therefore \text{Interest} = 6888 - 6560 = ₹ 328$$

$$\text{Total interest} = 160 + 328 = ₹ 488$$

**106. What is the difference between compound interests on ₹ 5,000 compounded yearly and half-yearly for 1 year at 4% per annum?**

A) ₹ 2.04

B) ₹ 2.00

C) ₹ 19.04

D) ₹ 3.20

**Explanation**

**Ans : (B)**

Compound Interest for 1 year,

$$\Rightarrow 5000 \times \left(1 + \frac{4}{100}\right)$$

$$\Rightarrow 5000 \times \frac{104}{100} = 5000 \times \frac{26}{25} = 200 \times 26 = ₹ 5200$$

Compound Interest for  $\frac{1}{2}$  year,

$$\text{Rate} = \frac{4}{2} = 2\%$$

1 year = 2 half year

$$\Rightarrow 5000 \times \left(1 + \frac{2}{100}\right)^2$$

$$\Rightarrow 5000 \times \frac{102}{100} \times \frac{102}{100}$$

$$\Rightarrow 5000 \times \frac{51}{50} \times \frac{51}{50} = ₹ 5202$$

$$\text{Required difference} = 5202 - 5200 = ₹ 2.00$$

**107. The total amount after 3 quarters would be ₹13,310. If the rate of interest is 40% per annum and compounding is performed quarterly, determine the present value (in ₹).**

A) 13000

B) 11000

C) 10000

D) 9000

**Explanation**

**Ans : (C)**

1 year = 4 quarterly

Rate of interest for annum = 40%

∴ Rate of interest for 1 quarterly =  $\frac{40}{4} = 10\%$

$$10\% = \frac{10}{100} = \frac{1}{10}$$

$$\Rightarrow \left(1 + \frac{1}{10}\right)^3 = \left(\frac{11}{10}\right)^3 = \frac{1331}{1000}$$

$$1331 = 1000$$

$$\therefore 13310 = \frac{13310 \times 1000}{1331} = ₹ 10000$$

**108. Find the compound interest on a sum of ₹ 50,000 at the rate of 6% per annum to be compounded half yearly at the end of 2 years. (Approximate to the nearest integer.)**

- A) ₹ 5,676                      B) ₹ 5,978  
C) ₹ 6,275                      D) ₹ 6,933

**Explanation**

2 years = 4 half-yearly

$$\text{Rate for half yearly} = \frac{6\%}{2} = 3\%$$

$$\Rightarrow 50000 \times \left(1 + \frac{3}{100}\right)^4$$

$$\Rightarrow 50000 \times \left(\frac{103}{100}\right)^4 = 50000 \times (1.03)^4$$

$$\Rightarrow 50000 \times 1.03 \times 1.03 \times 1.03 \times 1.03$$

$$\Rightarrow 50000 \times 1.125 = 56250$$

$$\text{CI} = 56250 - 50000 = 6250$$

Approximate to the nearest integer = ₹ 6275

**109. If 3 : 5 = x : 75, then what is the value of x?**

- A) 42                                  B) 45  
C) 50                                  D) 30

**Explanation**

$$3 : 5 = x : 75$$

$$\Rightarrow \frac{3}{5} = \frac{x}{75}$$

$$5x = 3 \times 75$$

$$\therefore x = \frac{3 \times 75}{5} = 3 \times 15 = 45$$

**110. If the difference between compound interest, compounding annually and simple interest on a certain sum at 10% per annum for 2 years is ₹ 464, then find the sum invested.**

- A) ₹ 46,040                      B) ₹ 46,400  
C) ₹ 44,006                      D) ₹ 44,600

**Explanation**

$$\text{Difference of CI and SI for 2 years} = P \left( \frac{r}{100} \right)^2$$

$$464 = P \left( \frac{10}{100} \right)^2$$

$$\therefore P = \frac{464 \times 100 \times 100}{10 \times 10} = ₹ 46,400$$

**111. A sum ₹ P was borrowed and paid back in two equal yearly installments, each of ₹ 35,280. If the rate of interest was 5% per annum and interest is compounding annually, then the value of P is .....**

- A) ₹ 64,400                      B) ₹ 65,600  
C) ₹ 65,400                      D) ₹ 64,800

**Explanation**

Formula for instalments in case of compound interest

$$P = \frac{x}{\left(1 + \frac{r}{100}\right)} + \frac{x}{\left(1 + \frac{r}{100}\right)^2} + \dots + \frac{x}{\left(1 + \frac{r}{100}\right)^n}$$

$$P = \frac{35280}{\left(1 + \frac{5}{100}\right)} + \frac{35280}{\left(1 + \frac{5}{100}\right)^2}$$

$$P = \frac{35280}{\left(\frac{105}{100}\right)} + \frac{35280}{\left(\frac{105}{100}\right)^2}$$

$$P = \frac{35280}{\left(\frac{21}{20}\right)} + \frac{35280}{\left(\frac{21}{20}\right)^2}$$

$$P = 35280 \times \frac{20}{21} + 35280 \times \frac{20}{21} \times \frac{20}{21}$$

$$P = 33600 + 32000 = ₹ 65600$$

**112. The Difference between compound interest, compounding annually and simple interest on an amount of ₹ 500 for 2 years is ₹ 1.25. What is the rate of interest per annum?**

- A) 2%                                  B) 4%  
C) 3%                                  D) 5%

**Explanation**

**Ans : (D)**

$$\text{Difference between C.I and S.I for 2 years} = P \left( \frac{r}{100} \right)^2$$

$$\Rightarrow ₹ 1.25 = 500 \times \left( \frac{r}{100} \right)^2$$

$$\Rightarrow \left( \frac{r}{100} \right)^2 = \frac{1.25}{500} = \frac{1}{400}$$

$$\Rightarrow \frac{r}{100} = \sqrt{\frac{1}{400}} = \frac{1}{20}$$

$$\Rightarrow 20r = 100$$

$$\therefore r = \frac{100}{20} = 5\%$$

**113. A loan of ₹ 1,50,000 is availed with compound interest rate of 10% per annum for two years compounded annually. It is to be paid in equal yearly instalments; and the instalment is to be paid at the end of each year. The value of the equal yearly instalment is : (Rounded off to two places of decimal)**

- A) ₹ 86,428.57      B) ₹ 84,400.44  
C) ₹ 80,000.24      D) ₹ 82,208.67

**Explanation**

Let the value of each instalment be  $x$ .

$$r = 10\% \quad P\left(1 + \frac{10}{11}\right)^2 = P\left(\frac{110}{100}\right)^2$$

$$150000 = x\left(\frac{10}{11} + \left(\frac{10}{11}\right)^2\right)$$

$$\Rightarrow 150000 = x\left(\frac{10}{11} + \frac{100}{121}\right)$$

$$\Rightarrow 150000 = x\left(\frac{110 + 100}{121}\right)$$

$$\Rightarrow 150000 = x\left(\frac{210}{121}\right)$$

$$x = \frac{150000 \times 121}{210} = ₹ 86428.57$$

114. Lara deposited ₹ 8,000 in a bank, which pays her compound interest at the rate of 10% per annum compounded half-yearly. What is the amount she will receive after 18 months?

- A) ₹ 9,162      B) ₹ 9,616  
C) ₹ 9,621      D) ₹ 9,261

**Explanation**

$$P = ₹ 8000$$

$$18 \text{ months} = 1\frac{1}{2} \text{ years} = 3 \text{ half years}$$

$$\text{Rate} = 10\%$$

$$\text{Half yearly rate} = 5\%$$

$$\text{Amount} = P\left(1 + \frac{R}{100}\right)^n$$

$$\Rightarrow 8000\left(1 + \frac{5}{100}\right)^3$$

$$\Rightarrow 8000\left(\frac{105}{100}\right)^3 = 8000\left(\frac{21}{20}\right)^3$$

$$\Rightarrow 8000 \times \frac{21}{20} \times \frac{21}{20} \times \frac{21}{20} = ₹ 9261$$

115. The difference between simple and compound interests compounded annually on a certain sum of money for 2 years at 4% per annum is ₹ 80. The sum (in ₹) is:

- A) 50,000      B) 45,000  
C) 60,000      D) 70,000

**Explanation**

$$\text{The difference between CI and S I for 2 years} = P\left(\frac{r}{100}\right)^2$$

$$\text{CI} - \text{SI} = ₹ 80$$

**Ans : (A)**

$$80 = P\left(\frac{4}{100}\right)^2$$

$$\Rightarrow 80 = P\left(\frac{1}{25}\right)^2$$

$$\therefore P = 80 \times 25 \times 25 = ₹ 50,000$$

116. A principal gives an amount of ₹ 26,450 in 2 years at the rate of 15% per annum on compound interest, interest is compounding annually. What is the principal?

- A) ₹ 23,000      B) ₹ 20,000  
C) ₹ 21,000      D) ₹ 22,000

**Explanation**

**Ans : (B)**

$$A = P\left(1 + \frac{r}{100}\right)^n$$

$$\Rightarrow 26450 = P\left(1 + \frac{15}{100}\right)^2$$

$$\Rightarrow 26450 = P\left(\frac{115}{100}\right)^2$$

$$\Rightarrow 26450 = P \times \frac{23}{20} \times \frac{23}{20}$$

$$\therefore P = \frac{26450 \times 20 \times 20}{23 \times 23} = ₹ 20,000$$

117. If the simple interest on a sum of money for two years at 5% per annum is ₹ 50, then what is the compound interest when compounding annually at the same rate and for the same time?

- A) ₹ 53.00      B) ₹ 50.50  
C) ₹ 53.50      D) ₹ 51.25

**Explanation**

**Ans : (D)**

$$\text{Simple Interest} = \frac{\text{PNR}}{100}$$

$$\Rightarrow 50 = \frac{P \times 2 \times 5}{100}$$

$$\Rightarrow 50 = \frac{P}{10}$$

$$\therefore P = 50 \times 10 = ₹ 500$$

Compound Interest,

$$A = P \times \left(1 + \frac{r}{100}\right)^n$$

$$A = 500 \times \left(1 + \frac{5}{100}\right)^2$$

$$\Rightarrow 500 \times \left(\frac{105}{100}\right)^2$$

$$\Rightarrow 500 \times \frac{21}{20} \times \frac{21}{20} = ₹ 551.25$$

$$\text{C.I} = A - P \Rightarrow 551.25 - 500 = ₹ 51.25$$

**Explanation**

The sum of the twelve numbers =  $12 \times 39 = 468$   
 The sum of the last five numbers =  $5 \times 35 = 175$   
 The sum of the first four numbers =  $4 \times 40 = 160$   
 The sum of the fifth, sixth and seventh numbers,  
 $\Rightarrow (468 - 175 - 160) = 133$   
 Let the fifth number be  $x$   
 Then, the sixth number =  $(x + 6)$   
 The seventh number =  $(x - 5)$   
 $x + (x + 6) + (x - 5) = 133$   
 $\Rightarrow 3x + 1 = 133$   
 $\Rightarrow 3x = 132$   
 $\therefore x = 44$

The average of fifth and sixth number,

$$\Rightarrow \frac{44 + (44 + 6)}{2} = \frac{44 + 50}{2}$$

$$\Rightarrow \frac{94}{2} = 47$$

56. The average weight of A, B and C is 65 kg. If the average weight of A and B is 63.5 kg, and the average weight of A and C is 67.5 kg, then the weight of A (in kg) is

- A) 67                                      B) 60  
 C) 68                                      D) 65

**Explanation**

Sum of all observations = Average  $\times$  Total number of observations

$$A + B + C = 65 \times 3 = 195 \text{ kg} \dots\dots (1)$$

$$A + B = 63.5 \times 2 = 127 \text{ kg} \dots\dots (2)$$

Subtracting (2) from (1) we will get

$$\Rightarrow 195 - 127 = 68 \text{ kg}$$

$$C = 68 \text{ kg}$$

$$A + C = 67.5 \times 2 = 135$$

$$A + 68 = 135$$

$$\therefore A = 135 - 68 = 67 \text{ kg}$$

Weight of A is 67 kg.

57. In a class, there are 54 students.  $33\frac{1}{3}\%$  of the number of students are boys and rest are girls. The average score in mathematics of boys is 50% more than that of the girls. If the average score of all the students is 70, then what is the average score of the boys?

- A) 81                                      B) 84  
 C) 87                                      D) 90

**Explanation**

Total number of Students = 54

$$33\frac{1}{3}\% = \left(\frac{100}{3}\right)\% = \frac{1}{3}$$

$$\text{Number of boys} = 54 \times \frac{1}{3} = 18$$

$$\text{Number of girls} = 54 - 18 = 36$$

**Ans : (A)**

Average score of girls =  $2x$

$$\text{Average score of boys} = 2x \times \left(\frac{3}{2}\right) = 3x$$

According to the question,

$$18 \times 3x + 36 \times 2x = 54 \times 70$$

$$54x + 72x = 3780$$

$$126x = 3780$$

$$x = \frac{3780}{126} = 30$$

$$\text{Average score of boys} = 30 \times 3 = 90$$

58. The average of 19 numbers is 22.8. The average of the first ten numbers is 18.4 and that of the last ten numbers is 28.6. If the 10<sup>th</sup> number is excluded from the given numbers, then what is the average of the remaining numbers? (Your answer should be nearest to an integer)

- A) 21                                      B) 23  
 C) 22                                      D) 20

**Explanation**

**Ans : (C)**

Average of 19 numbers = 22.8

$$\text{The sum of 19 numbers} = 22.8 \times 19 = 433.2$$

Average of next 10 numbers = 18.4

$$\text{The sum of next 10 numbers} = 18.4 \times 10 = 184$$

Average of last 10 numbers = 28.6

$$\text{The sum of last 10 numbers} = 28.6 \times 10 = 286$$

$$10\text{th number} = 286 + 184 - 433.2 = 36.8$$

$$\text{Sum of 18 numbers} = 433.2 - 36.8 = 396.4$$

$$\text{Average of 18 numbers} = \frac{396.4}{18} = \boxed{22}$$

59. The average of a group of 20 numbers is 30 and that of another group of 30 numbers is 50. What is the average of all the numbers in both the groups?

- A) 43.5                                      B) 45  
 C) 40                                      D) 42

**Explanation:**

**Ans : (D)**

$$\text{Total value of first group} = 20 \times 30 = 600$$

$$\text{Total value of second group} = 30 \times 50 = 1500$$

$$\text{Required average} = \frac{600 + 1500}{20 + 30}$$

$$\Rightarrow \frac{2100}{50} = 42$$

60. Average marks obtained by 19 boys of a college is 48. If the highest marks and lowest marks obtained are removed, then the average reduces by 4. What is the average of the highest and lowest marks obtained?

- A) 76                                      B) 80  
 C) 84                                      D) 82

**Explanation:**

**Ans : (D)**

$$\text{Total marks of 19 boys} = 19 \times 48 = 912$$

$$\text{Total marks of 17 boys} = 17 \times 44 = 748$$

$$\text{Difference} = 912 - 748 = 164$$

$$\text{The sum of the highest and lowest marks} = 164$$

$$\therefore \text{Required average} = \frac{164}{2} = 82$$

## Profit, Loss and Discount

◆ **When Selling Price > Cost Price**

- Profit = S.P - C.P
- S.P = C.P + Profit
- C.P = S.P - Profit
- Profit % =  $\frac{\text{Profit}}{\text{C.P}} \times 100\%$
- Profit = Profit%  $\times \frac{\text{C.P}}{100}$

◆ **When C.P profit percentage are given**

$$\text{S.P} = \text{C.P} \times \left( \frac{100 + \text{Profit}\%}{100} \right)$$

◆ **When S.P and profit percentage are given**

$$\text{C.P} = \text{S.P} \times \left( \frac{100}{100 + \text{Profit}\%} \right)$$

◆ **When S.P < C.P**

- Loss = C.P - S.P
- S.P = C.P - Loss
- C.P = Loss + S.P
- Loss % =  $\frac{\text{Loss}}{\text{C.P}} \times 100\%$
- Loss = Loss%  $\times \frac{\text{C.P}}{100}$

◆ **When C.P and Loss percentage are given**

$$\text{S.P} = \text{C.P} \times \left( \frac{100 - \text{Loss}\%}{100} \right)$$

◆ **When S.P and Loss percentage are given**

$$\text{C.P} = \text{S.P} \times \left( \frac{100}{100 - \text{Loss}\%} \right)$$

◆ **Marked price (Listed Price)**

- Discount = Marked price - Selling price
- Discount % =  $\frac{\text{Discount}}{\text{M.P}} \times 100\%$
- S.P = M.P - Discount
- M.P = S.P + Discount

◆ **When M.P and discount % are given**

$$\text{S.P} = \text{M.P} \times \left( \frac{100 - \text{Discount}\%}{100} \right)$$

◆ **When S.P and discount % are given**

$$\text{M.P} = \text{S.P} \times \left( \frac{100}{100 - \text{Discount}\%} \right)$$

◆ **If Profit is made, then**

$$\text{C.P} = \text{M.P} - (\text{Discount} + \text{Profit})$$

◆ **If Loss is made, then**

$$\text{C.P} = \text{M.P} - (\text{Discount} - \text{Loss})$$

◆ **Successive discounts**

$$X + Y - \frac{(XY)}{100}$$

X - First discount, Y = Second discount

◆ **When an article is sold at successive discounts of  $d_1\%$ ,  $d_2\%$  and  $d_3\%$  then its final S.P is,**

$$\text{S.P} = \frac{\text{M.P} \times (100 - d_1)(100 - d_2)(100 - d_3)}{100 \times 100 \times 100}$$

## PREVIOUSYEAR QUESTIONS

1. A and B invested in a business in the ratio 4 : 5. They earned a profit of ₹54,000. They shared one-half of the profit equally and the other half in proportion to their investment. Find the profit share of B.

- A) ₹25,750                      B) ₹28,500  
C) ₹27,550                      D) ₹26,650

**Explanation**

Total profit = ₹54,000

Half profit shared equally:

$$54000 \div 2 = 27000$$

$$27000 \div 2 = 13500$$

Other half shared in ratio 4 : 5

Total parts = 9

$$\text{B's share: } \frac{5}{9} \times 27000 = 15000$$

$$\text{Total profit of B: } 13500 + 15000 = ₹ 28,500$$

**Ans : (B)**

2. A shopkeeper marks a mobile phone 40% above its cost price. He then offers two successive discounts of 10% and 5% on the marked price. Find the profit percentage he makes on the cost price.

- A) 23%                              B) 22.3%  
C) 19.7%                            D) 21%

**Explanation**

**Step 1:** Marked Price

Marked 40% above CP:

$$\text{MP} = 100 + 40 = 140$$

**Step 2:** First discount = 10%

After 10% discount:

$$140 \times \frac{90}{100} = 126$$

**Step 3:** Second discount = 5%

After 5% discount:

**Ans : (C)**

$$126 \times \frac{95}{100} = 119.7$$

**Step 4: Profit %**

Selling Price = ₹119.7

Profit:  $119.7 - 100 = 19.7\%$

$$\text{Profit \%} = \frac{19.7}{100} \times 100 = 19.7\%$$

3. During a sale, 55% of the goods are sold at a 41% profit, 20% of the remaining goods are sold at a 19% profit and the rest are sold at a 21% loss. If there is an overall profit of  $x\%$ , then what is the value of  $x$ ?

- A) 12%                      B) 15%  
C) 10.5%                  D) 16.7%

**Explanation**

**Ans : (D)**

Assume the total cost price (CP) of all goods = 100.

Step 1: First sale

55% goods sold at 41% profit

$$\text{Profit} = 55 \times \frac{41}{100} = 22.55$$

**Step 2: Remaining goods**

Remaining =  $100 - 55 = 45$

20% of remaining goods =  $45 \times \frac{20}{100} = 9$   
Sold at 19% profit:

$$\text{Profit} = 9 \times \frac{19}{100} = 1.71$$

$$9 \times 100 \div 100 = 1.71$$

**Step 3: Rest sold at loss**

Left goods =  $45 - 9 = 36$

Sold at 21% loss:

$$\text{Loss} = 36 \times \frac{21}{100} = 7.56$$

**Step 4: Net profit**

Net profit =  $22.55 + 1.71 - 7.56 = 16.70$

$$\text{So overall profit \%} = \frac{16.70}{100} \times 100 = 16.7\%$$

4. A and B start a business by investing ₹29,000 and ₹95,000, respectively. B withdraws his investment after 6 months, and then C joins the business with an investment of ₹67,000 for the remaining period of the year. If 15% of the total profit is ₹6,600, what is B's share of the profit?

- A) ₹19,500                  B) ₹19,000  
C) ₹20,500                  D) ₹20,000

**Explanation**

**Ans : (B)**

15% of the total profit is ₹6,600, so total profit =  $₹6,600 \div 0.15 = ₹44,000$ .

Now calculate time-weighted investments:

A: ₹29,000 for 12 months =  $29,000 \times 12 = 3,48,000$

B: ₹95,000 for 6 months =  $95,000 \times 6 = 5,70,000$

C: ₹67,000 for 6 months =  $67,000 \times 6 = 4,02,000$

Ratio =  $3,48,000 : 5,70,000 : 4,02,000$   
 $= 58 : 95 : 67$

Total parts =  $58 + 95 + 67 = 220$

B's share =  $(95/220) \times ₹44,000 = ₹19,000$

5. Gopi sold a laptop at 12% gain. If it had been sold for ₹1,200 more, the gain would have been 20%. Find the cost price of the laptop.

- A) ₹15,000                  B) ₹16,000  
C) ₹14,000                  D) ₹15,500

**Explanation :**

**Ans : (A)**

Let the cost price be ₹ $x$ .

Gain = 12%

$$\text{Selling price (1)} = \text{CP} \times \left( \frac{100 + \text{Gain\%}}{100} \right)$$

$$\therefore \text{Selling price (1)} = x \times \left( \frac{100 + 12}{100} \right) = \frac{112}{100}x$$

Gain = 20%

$$\therefore \text{Selling price (2)} = x \times \left( \frac{100 + 20}{100} \right) = \frac{120}{100}x$$

If the selling price was 1200 more,

$$\frac{112}{100}x + 1200 = 20\%$$

$$\Rightarrow \frac{112}{100}x + 1200 = \frac{120}{100}x$$

$$\Rightarrow 1200 = \frac{120}{100}x - \frac{112}{100}x$$

$$\Rightarrow 1200 = \frac{8x}{100}$$

$$\therefore x = \frac{1200 \times 100}{8} = ₹15000$$

Cost price of the laptop = ₹15000

6. Kumaran bought a rain coat and saved ₹25 with discount of 20%. What was the original price of the rain coat?

- A) ₹125                      B) ₹250  
C) ₹175                      D) ₹150

**Explanation**

**Ans : (A)**

Let the original price be ₹ $x$ .

Amount of savings = ₹25

$$\Rightarrow 20\% \text{ of } x = ₹25$$

$$\Rightarrow \frac{20}{100} \times x = 25$$

$$\therefore x = \frac{25 \times 100}{20} = ₹ 125$$

$\therefore$  The original cost of rain coat = ₹ 125

7. A trader buys some goods for ₹200. If the overhead expenses be 10% of the cost price, then at what price should it be sold to earn 25%?

A) ₹285                      B) ₹270  
C) ₹280                      D) ₹275

**Explanation**

Cost price of goods = ₹200

Overhead expenses = 10% of CP ; 10% of 200 = 20

Total cost price : 200 + 20 = 220

Profit required = 25%

**Selling price should be:**

$$220 + 25\% \text{ of } 220 ; 220 + W 55 = 275$$

8. A fruit vendor bought 150 mangoes. He sold them at such a price that the selling price of 120 mangoes equals the cost price of 150 mangoes. Find his profit percentage.

A) 25%                      B) 35%  
C) 30%                      D) 20%

**Explanation**

Let cost price of 1 mango = ₹1 (assume).

Cost price of 150 mangoes = ₹150.

Given:

Selling price of 120 mangoes = cost price of 150 mangoes  
So,

SP of 120 mangoes = ₹150

SP of 1 mango

$$= \frac{150}{120} = 1.25$$

SP of 150 mangoes

$$150 \times 1.25 = ₹187.5$$

$$\text{Profit} = 187.5 - 150 = ₹37.5$$

$$\text{Profit \%} = \frac{37.5}{150} \times 100 = 25\%$$

9. A, B, C share a profit of ₹4800 in the ratio 3:4:5. If C's share is reduced by ₹400, and the remainder is equally divided between A and B, what will be A's final share ?

A) ₹ 3200                      B) ₹ 1400  
C) ₹ 1500                      D) ₹ 1700

**Explanation**

Total ratio = 3 + 4 + 5 = 12

Initial shares:

$$A = \frac{3}{12} \times 4800 = 1200$$

$$B = \frac{4}{12} \times 4800 = 1600$$

$$C = \frac{5}{12} \times 4800 = 2000$$

C's share reduced by 400 → remaining = 400

This 400 is equally divided between A and B → each gets 200

$$\text{Final share of A} = 1200 + 200 = 1400$$

10. An article was bought for ₹8,900. Its price was marked up by 40%. Thereafter, it was sold at a discount of 5% on the marked price. What was the profit percentage on the transaction?

A) 35%                      B) 32%  
C) 33%                      D) 34%

**Explanation**

**Ans : (C)**

Cost Price (CP) = ₹8,900

Marked Price (MP) after 40% markup:

$$MP = 8900 \times 1.40 = 12460$$

Sold at 5% discount on MP:

$$SP = 12460 \times 0.95 = 11837$$

Profit:

$$11837 - 8900 = 2937$$

$$\text{Profit \%} : \frac{2937}{8900} \times 100 = 33\%$$

11. A scheme like 'Buy 6, Get 4 Free' on the same kind of articles with the same MRP attracts a \_\_\_\_\_ % discount.

A) 40                      B) 41  
C) 66.67                      D) 67.67

**Explanation**

**Ans : (A)**

In Buy 6, Get 4 Free, you get 10 items but pay only for 6.  
Let MRP of each item = 1.

Total value of 10 items = 10

Amount paid = 6

$$\text{Discount received: } 10 - 6 = 4$$

$$\text{Discount percentage: } \frac{4}{10} \times 100 = 40\%$$

So, the scheme gives a 40% discount.

12. The difference between the selling price on discount of 32% and two successive discounts of 20% each on a certain bill is ₹ 25. Find the actual amount of the bill.

A) ₹ 576                      B) ₹ 625  
C) ₹ 200                      D) ₹ 425

**Explanation**

**Ans : (B)**

Successive discount on the bill = 20% and 20%

In case of successive discounts,

$$\text{equivalent discount\%} = a + b - \left( \frac{ab}{100} \right)$$

a = First discount percentage, b = Second discount percentage

Let the marked price on the bill be ₹ 100x.

Area of parallelogram:

$$\text{Area} = b \times 24$$

Since areas are equal:

$$b \times 24 = 1296$$

$$b = \frac{1296}{24} = 54 \text{ m}$$

173. The cost of decorating the circumference of a circular lawn at the rate of ₹50 per metre is ₹11,000. The diameter of the lawn is .....

- A) 70 m                      B) 35 m  
C) 17.5 m                  D) 7 m

**Explanation :**

Rate = ₹50 percent

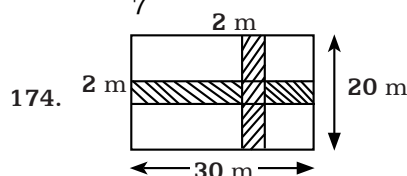
Total cost = ₹11,000

Circumference of the lawn:

$$\frac{11000}{50} = 220 \text{ m}$$

Using  $C = \pi d$ ,

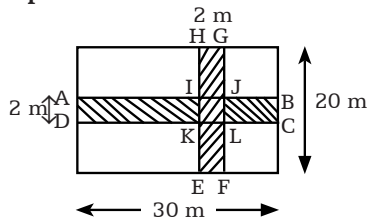
$$d = \frac{C}{\pi} = \frac{220}{\frac{22}{7}} = 220 \times \frac{7}{22} = 70 \text{ m}$$



Area of the shaded region is .....

- A) 100 m<sup>2</sup>                      B) 596 m<sup>2</sup>  
C) 54 m<sup>2</sup>                      D) 96 m<sup>2</sup>

**Explanation :**



$$\begin{aligned} \text{Area of A B C D} &= \ell \times b \\ &= 30 \times 2 = 60 \text{ m}^2 \end{aligned}$$

$$\begin{aligned} \text{Area of E F G H} &= \ell \times b \\ &= 20 \times 2 = 40 \text{ m}^2 \end{aligned}$$

$$\begin{aligned} \text{I J K L area (square)} &= a^2 \\ &= 2 \times 2 = 4 \text{ m}^2 \end{aligned}$$

$$\begin{aligned} \text{Total area} &= \text{A B C D} + \text{E F G H} - \text{I J K L} \\ &= 60 + 40 - 4 \\ &= 100 - 4 \\ &= \boxed{96 \text{ m}^2} \end{aligned}$$

175. One of the diagonals of a rhombus is double the other diagonal. Its area is 25 sq.cm, then the sum of the diagonals is .....

- A) 5 cm                      B) 10 cm  
C) 25 cm                  D) 15 cm

**Explanation :**

**Ans : (D)**

$$\text{Area of rhombus} = \frac{1}{2} \times d_1 \times d_2 = 25 \text{ sq.cm.}$$

$$d_1 = 2d_2$$

$$\frac{1}{2} \times d_1 \times d_2 = 25$$

$$\frac{1}{2} \times 2d_2 \times d_2 = 25$$

$$d_2 \times d_2 = 25$$

$$d_2^2 = 25 ; d_2 = \sqrt{5 \times 5}$$

$$d_2 = 5$$

$$d_1 = 2d_2$$

$$d_1 = 2 \times 5 ; d_1 = 10$$

$$d_1 + d_2 = 10 + 5 = 15 \text{ cm.}$$

176. The base of the parallelogram is 6 times its height.

If the area is 1734 sq.cm, its base and height are respectively:

- A) 100 cm, 15 cm              B) 102 cm, 17 cm  
C) 104 cm, 16 cm              D) 101 cm, 18 cm

**Explanation :**

**Ans : (B)**

Height of parallelogram = h

Base of parallelogram = 6h

Area of parallelogram = bh = 1734 sq.cm

$$6h \times h = 1734$$

$$6h^2 = 1734$$

$$h^2 = \frac{1734}{6} = 289$$

$$h = \sqrt{289} = 17 \text{ cm}$$

$$\text{Base} = 6h = 17 \times 6 = 102 \text{ cm}$$

177. The base of the parallelogram is four times the height and its area is 256 cm<sup>2</sup> then, its height is:

- A) 4 cm                      B) 6 cm  
C) 8 cm                      D) 16 cm

**Explanation :**

**Ans : (C)**

Height of the parallelogram = h cm

Base (b), = 4h cm.

Area of the parallelogram

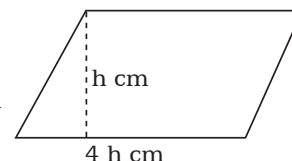
$$(b \times h) = 256 \text{ cm}$$

$$\Rightarrow 4h \times h = 256$$

$$\Rightarrow 4h^2 = 256$$

$$\Rightarrow h^2 = 256 \div 4 = 64$$

$$\therefore h = \sqrt{64} = 8$$



178. An office consists of Rhombus shaped window of area 500 sq.cm, which has been decorated with rhombus shaped glass pieces and each of its length of the diagonals are 10 cm and 5 cm. Then, the number of glass pieces required to cover the window is :

- A) 25                      B) 20  
C) 10                      D) 50

**Explanation :**

**Ans : (B)**

$$\text{Area of Rhombus} = \frac{1}{2} \times d_1 \times d_2$$

$$\text{Area of Rhombus shaped glass pieces} = \frac{1}{2} \times 10 \times 5 = 25 \text{ cm}^2$$

$$\text{Number of glass pieces required to cover the window} = \frac{\text{Area of window}}{\text{Area of 1 glass piece}}$$

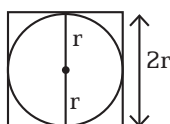
$$\Rightarrow \frac{500}{25} = 20$$

**179. If a circle of radius r is inscribed in a square, then the area of the square is :**

- A)  $4r^2$                       B)  $r^2$   
C)  $\pi r^2$                       D)  $2r^2$

**Explanation**

**Ans (A)**



$$\text{Area of square} = a^2 \text{ sq. units} = (2r)^2 = 4r^2$$

**180. If the area of a rhombus is 50 m<sup>2</sup>, then the product of their diagonals is .....**

- A) 25                      B) 50  
C) 100                      D) 200

**Explanation**

**Ans (C)**

$$\text{Area of the Rhombus} = \frac{1}{2} \times d_1 \times d_2 = 50 \text{ m}^2$$

$$d_1 \times d_2 = 50 \times 2 = 100$$

**181. If the area of a semicircle is 308 cm<sup>2</sup>, then the perimeter of the circle is .....**

- A) 156 cm                      B) 88 cm  
C) 44 cm                      D) 72 cm

**Explanation**

**Ans (B)**

$$\text{Area of the semi circle} = \frac{\pi r^2}{2}$$

$$\frac{\pi r^2}{2} = 308 ; r^2 = 308 \times \frac{7}{22} \times 2$$

$$r^2 = 196$$

$$r = 14 \text{ cm}$$

$$\text{Perimeter of the circle} = 2\pi r = 2 \times \frac{22}{7} \times 14 = 88 \text{ cm}$$

**182. If the sides of a rectangle are  $5x+2$  and  $2x+3$  then its perimeter is \_\_\_\_\_**

- A)  $3x-1$                       B)  $7x+5$   
C)  $14x+10$                       D)  $7x+10$

**Explanation :**

**Ans (C)**

$$\text{Perimeter of the rectangle} = 2(\ell + b)$$

$$\Rightarrow 2(5x + 2) + (2x + 3)$$

$$\Rightarrow 2(7x + 5)$$

$$\Rightarrow 14x + 10.$$

$$\begin{array}{r} 5x + 2 \\ 2x + 3 \\ \hline 7x + 5 \end{array}$$

**183. The slant height of a cone is 5 cm and its diameter is 8 cm. What is the volume of the cone (correct to two decimal places) ?** (Where  $\pi = \frac{22}{7}$ )

- A) 35.66 cm<sup>3</sup>                      B) 50.28 cm<sup>3</sup>  
C) 59.82 cm<sup>3</sup>                      D) 28.28 cm<sup>3</sup>

**Explanation :**

**Ans : (B)**

**Step 1: Formula**

$$V = \frac{1}{3} \pi r^2 h$$

**Step 2: Given values**

- Slant height  $l = 5 \text{ cm}$
- Diameter = 8 cm  $\rightarrow$  Radius  $r = 4 \text{ cm}$

$$\text{Now, } h = \sqrt{l^2 - r^2} = \sqrt{5^2 - 4^2} = \sqrt{25 - 16} = \sqrt{9} = 3 \text{ cm}$$

**Step 3: Substitute into formula**

$$\begin{aligned} V &= \frac{1}{3} \times \frac{22}{7} \times (4^2) \times 3 \\ &= \frac{1}{3} \times \frac{22}{7} \times 16 \times 3 \end{aligned}$$

Cancel 3:

$$= \frac{22}{7} \times 16 = \frac{352}{7} \approx 50.28 \text{ cm}^3$$

**184. An ice cream cone is to be made to have volume  $\frac{128}{3}\pi$  and the height of the cone is double the radius**

**of the cone. What is the slant height of the cone?**

- A)  $\sqrt{40}$                       B)  $\sqrt{90}$   
C)  $\sqrt{60}$                       D)  $\sqrt{80}$

**Explanation :**

**Ans : (D)**

$$\text{Volume of cone} = \frac{128\pi}{3} \text{ cm}^3$$

Height of cone = double its radius

**Formula Used:**

$$\text{Slant height} = l = \sqrt{r^2 + h^2}$$

$$\text{Volume of cone} = \frac{1}{3} \times \pi \times r^2 \times h$$

**Solution:**

Let radius of the cone be  $r$

Then the height will be  $2r$

$$\text{Volume of cone} = \frac{1}{3} \times \pi \times r^2 \times h = \frac{128\pi}{3}$$

$$\frac{1}{3} \times \pi \times r^2 \times 2r = \frac{128\pi}{3}$$

$$2r^3 = 128$$

$$r^3 = 64$$

$$r = 4 \text{ cm}$$

$$\text{Height} = 2r = 8 \text{ cm}$$

$$\text{Slant height} = l = \sqrt{r^2 + h^2}$$

$$l = \sqrt{4^2 + 8^2} \quad l = \sqrt{80} \text{ cm}$$

185. In the isosceles triangle,  $\triangle ABC$  with BC is the unequal side of the triangle, and line AD is the median drawn from the vertex A to the side BC. If the length AC = 5 cm and the length of the median is 4 cm, then find the length of BC. (in cm)

A) 6 cm

B) 5 cm

C) 4 cm

D) 3 cm

**Explanation:**

$$DC^2 = AC^2 - AD^2$$

$$DC = \sqrt{AC^2 - AD^2}$$

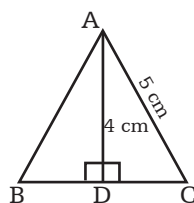
$$DC = \sqrt{(5)^2 - (4)^2}$$

$$DC = \sqrt{25 - 16} = \sqrt{9}$$

$$\therefore DC = 3 \text{ cm}$$

$$\text{Length of BC} = BD + DC$$

$$\Rightarrow 3 + 3 = 6 \text{ cm}$$



**Ans : (A)**

186. A borewell with a diameter of 20 m from the inside is dug 10 m deep. Soil taken out of it has been evenly spread all around it to a width of 30 m to form an embankment. Find the height (in m) of the embankment.

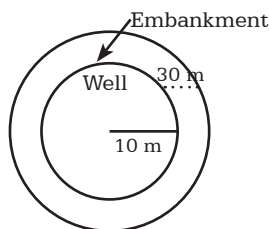
A)  $\frac{1}{3}$

B)  $\frac{3}{4}$

C)  $\frac{1}{4}$

D)  $\frac{2}{3}$

**Explanation:**



The borewell dug is in the shape of a Cylinder.

$$\text{Radius of the borewell} = \frac{20}{2} = 10 \text{ m}$$

$$\text{Volume of a Cylinder} = \pi r^2 h$$

Hence, Volume of earth taken out from the well

$$\Rightarrow \pi \times 10 \times 10 \times 10 = 1000\pi \text{ m}^3$$

The embankment would form a circular ring with internal radius same as radius of the borewell = 10 m.

$$\therefore \text{External radius} = 10 + 30 = 40 \text{ m.}$$

$$\text{Area of embankment} = \pi(40^2 - 10^2)$$

$$\Rightarrow \pi(1600 - 100) = \pi \times 1500 = 1500\pi \text{ m}^2$$

$$\text{Height of the embankment} = \frac{\text{Volume}}{\text{Area}}$$

$$\Rightarrow \frac{1000\pi}{1500\pi} = \frac{2}{3} \text{ m}$$

187. The ratio of length and breadth of a rectangle is 4 : 5. If the perimeter of the rectangle is 18 cm, then the length of its one diagonal is

A)  $\sqrt{40}$  cm

B)  $\sqrt{41}$  cm

C) 7 cm

D) 14 cm

**Explanation:**

**Ans : (B)**

Let the length and breadth of a rectangle be  $4x$  and  $5x$  respectively.

$$\text{Perimeter of the rectangle} = 2(\ell + b)$$

$$\Rightarrow 18 = 2(4x + 5x)$$

$$\Rightarrow 18 = 2(9x)$$

$$\Rightarrow 18 = 18x$$

$$\therefore x = 1$$

$$\text{Diagonal of rectangle} = \sqrt{\ell^2 + b^2}$$

$$\text{Length} = 4 \times 1 = 4$$

$$\text{Breadth} = 5 \times 1 = 5$$

$$\text{Diagonal} = \sqrt{(4)^2 + (5)^2} = \sqrt{16 + 25} = \sqrt{41}$$

188. The sum of radii of two spheres is 28 cm & their volumes are in ratio 27:64. Find the radii of the spheres.

A) 12 cm and 16 cm

B) 10 cm and 18 cm

C) 10 cm and 12 cm

D) 14 cm and 14 cm

**Explanation:**

**Ans : (A)**

$$\text{Volume of Sphere} = \frac{4}{3} \pi r^3$$

$$V : V_2 = 27 : 64$$

$$r_1 : r_2 = 3 : 4$$

Let  $r_1$  be  $3x$  and  $r_2$  be  $4x$ .

$$\Rightarrow 3x + 4x = 28$$

$$\Rightarrow 7x = 28$$

$$\therefore x = \frac{28}{7} = 4$$

Radius of the two spheres

$$\Rightarrow 3 \times 4 = 12 ; 4 \times 4 = 16$$

189. If a nine-digit number  $785x3678y$  is divisible by 72, then the value of  $(x - y)$  is

A) -2

B) 0

C) 2

D) -1

**Explanation**

**Ans : (C)**

**Divisibility law of 8**

A number divisible by 8, if its last three digits are divisible by 8

**Divisibility law of 9**

A number is divisible by 9, if the sum of its digit is divisible by 9.

$785x3678y$  is divisible by 8 if the last three digit  $78y$  is divisible by 8.

$78y$  is divisible by 8 if  $y = 4$ .

$785x36784$  is divisible by 9 if the sum of its digit is divisible by 9.

$$7+8+5+x+3+6+7+8+4 = 48+x$$

Near by 48 is 54.

$$48+x = 54$$

$$\therefore x = 54 - 48 = 6$$

$$x - y \Rightarrow 6 - 4 = \boxed{2}$$

**190. The radius of the base of a cylinder is 14 cm and its curved surface area is  $880 \text{ cm}^2$ . Its volume (in  $\text{cm}^3$ )**

is: (Take  $\pi = \frac{22}{7}$ )

- A) 3080                      B) 1078  
C) 6160                      D) 9240

**Explanation**

The curved surface area of cylinder =  $2\pi rh$

The volume of cylinder =  $\pi r^2 h$

$$2\pi rh = 880 \text{ cm}^2$$

$$\Rightarrow 2 \times \frac{22}{7} \times 14 \times h = 880$$

$$\therefore h = \frac{880 \times 7}{2 \times 22 \times 14} = 10 \text{ cm}$$

The volume of the cylinder

$$\Rightarrow \frac{22}{7} \times 14 \times 14 \times 10 = 6160 \text{ cm}^3$$

**191. The perimeter of a square is the same as the perimeter of a rectangle. The perimeter of the square is 40 m. If its breadth is two-thirds of its length, then the area (in  $\text{m}^2$ ) of the rectangle is**

- A) 121                      B) 96  
C) 100                      D) 84

**Explanation**

Perimeter of rectangle =  $2 \times (l+b)$

Area of the rectangle =  $l \times b$

Perimeter of square =  $4a$

$$4a = 40 \text{ m}$$

$$4a = 2(l+b)$$

$$\Rightarrow 40 = 2 \times (3x+2x)$$

$$\Rightarrow 20 = 5x$$

$$\therefore x = 4$$

$$\left[ \because \frac{b}{l} = \frac{2x}{3x} \right]$$

**Ans : (B)**

$$\text{Length} \Rightarrow 3x = 3 \times 4 = 12 \text{ m}$$

$$\text{Breadth} \Rightarrow 2x = 2 \times 4 = 8 \text{ m}$$

$$\text{Area} = 12 \times 8 = 96 \text{ m}^2$$

**192. One side of a rhombus is 13 cm and one of its diagonals is 10 cm. What is the area of the rhombus (in  $\text{cm}^2$ ) ?**

- A) 60                      B) 90  
C) 30                      D) 120

**Explanation**

Side of rhombus = 13 cm

$$D_1 = 10 \text{ cm}$$

$$\text{Area of rhombus} = \frac{1}{2} \times (D_1 \times D_2)$$

Let the length of other diagonal ( $D_2$ ) be  $2x$  cm.

As diagonals of rhombus bisect each other at  $90^\circ$

$$OB = \frac{10}{2} = 5 \text{ cm}$$

$$OC = \frac{2x}{2} = x \text{ cm}$$

In  $\triangle OBC$ ,  $\angle BOC = 90^\circ$

$$BC^2 = OB^2 + OC^2$$

$$13^2 = 5^2 + x^2$$

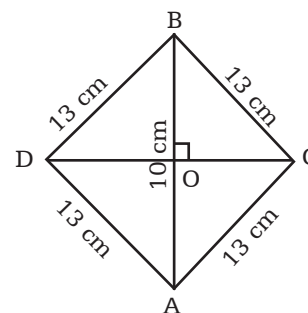
$$169 - 25 = x^2$$

$$x^2 = 144$$

$$\therefore x = \sqrt{144} = 12 \text{ cm}$$

$$D_2 = 2x = 12 \times 2 = 24 \text{ cm}$$

$$\text{Area of rhombus} = \frac{1}{2} \times 10 \times 24 = 120 \text{ cm}^2$$



**Ans : (D)**

**193. The sides of a triangular field are 120 m, 170 m and 250 m. The cost of levelling the field at the rate of ₹ 7.40/ $\text{m}^2$  is**

- A) ₹ 65,120                      B) ₹ 63,640  
C) ₹ 59,200                      D) ₹ 66,600

**Explanation**

**Ans : (D)**

Dimension of triangular field are 120 m, 170 m and 250 m.

$$S = \frac{(120+170+250)}{2} = \frac{540}{2} = 270$$

$$\text{Area of triangle} = \sqrt{s(s-a)(s-b)(s-c)}$$

$$\Rightarrow \sqrt{270(270-120)(270-170)(270-250)}$$

$$\Rightarrow \sqrt{270 \times 150 \times 100 \times 20}$$

$$\Rightarrow \sqrt{9 \times 3 \times 10 \times 5 \times 3 \times 10 \times 4 \times 5 \times 100}$$

$$\Rightarrow 3 \times 3 \times 10 \times 5 \times 2 \times 10 = 9000 \text{ m}^2$$

$$\text{Cost of levelling } 9000 \text{ m}^2 = 7.40 \times 9000 = ₹ 66600$$

**194. A right cylinder of maximum possible size is cut out from a solid wooden cube. The remaining material of the cube is what percentage of the original cube ?**

$$\Rightarrow \frac{\sec \theta}{\tan \theta} = 4$$

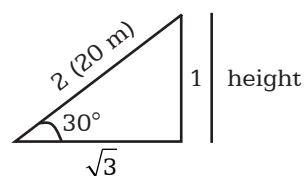
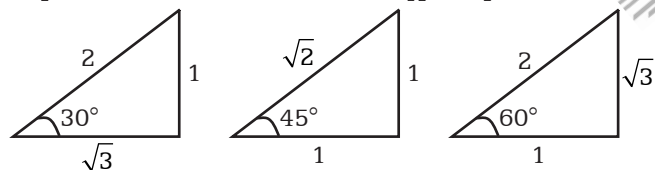
$$\Rightarrow \frac{1}{\tan \theta} = \frac{\cos \theta}{\sin \theta}; \sec \theta = \frac{1}{\cos \theta}$$

$$\Rightarrow \frac{1}{\cos \theta} \times \frac{\cos \theta}{\sin \theta} = 4$$

$$\therefore \sin \theta = \frac{1}{4}$$

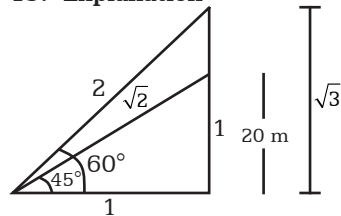
**18. Explanation**

**Important measurement for this type of problems**



2 units = 20 m  
 $\therefore$  1 unit = 10 m

**19. Explanation**

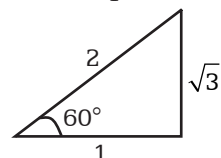
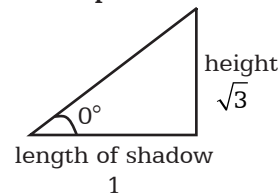


The height of tower, =  $\sqrt{3} - 1$

The value of 1 = 20 m

$$(\sqrt{3} - 1) \times 1 = 20 \times (\sqrt{3} - 1)$$

**20. Explanation**



The angle of elevation =  $60^\circ$

**21. Explanation**

$$\tan \theta = \frac{\text{Opposite side}}{\text{adjacent side}} = \frac{\text{Height}}{\text{Base}}$$

$$\tan 30^\circ = \frac{h}{\text{Base}}$$

$$\Rightarrow \frac{1}{\sqrt{3}} = \frac{h}{\text{Base}}$$

$$\therefore \text{Base} = \sqrt{h} \quad \dots\dots (i)$$

$$\tan 60^\circ = \frac{x}{\text{Base}}$$

$$\sqrt{3} = \frac{x}{\text{Base}} \Rightarrow \text{Base} = \frac{x}{\sqrt{3}} \quad \dots\dots (ii)$$

From (i) and (ii),

$$\sqrt{3}h = \frac{x}{\sqrt{3}}$$

$$\therefore h = \frac{x}{\sqrt{3} \times \sqrt{3}} = \frac{x}{3}$$

**22. Explanation**

**Ans : (B)**

$$\tan 60^\circ = \frac{h_1}{AB}$$

$$\sqrt{3} = \frac{h_1}{AB}$$

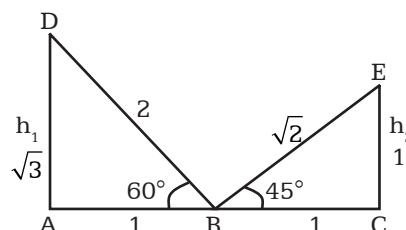
$$\Rightarrow h_1 = \sqrt{3} AB$$

$$\tan 45^\circ = \frac{h_2}{BC}$$

$$1 = \frac{h_2}{BC}$$

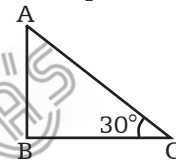
$$h_2 = BC$$

$$\Rightarrow \frac{h_1}{h_2} = \frac{\sqrt{3}}{1} = \sqrt{3} : 1$$



**24. Explanation**

**Ans : (C)**



Height of the tree = AB + BC (top of the tree touches the ground making an angle)

$$\tan 30^\circ = \frac{AB}{18}$$

$$\Rightarrow \frac{1}{\sqrt{3}} = \frac{AB}{18} \Rightarrow AB = \frac{18}{\sqrt{3}}$$

$$\cos 30^\circ = \frac{BC}{AC} = \frac{18}{AC}$$

$$\Rightarrow \frac{\sqrt{3}}{2} = \frac{18}{AC} \Rightarrow AC = \frac{36}{\sqrt{3}}$$

**Ans : (B)**

**Ans : (D)**

**Ans : (A)**

**Ans : (A)**

$$AB + AC = \frac{18}{\sqrt{3}} + \frac{36}{\sqrt{3}} = \frac{54}{\sqrt{3}}$$

Rationalizing to remove root from denominator,

$$\Rightarrow \frac{54}{\sqrt{3}} \times \frac{\sqrt{3}}{\sqrt{3}} = \frac{54\sqrt{3}}{3} = 18\sqrt{3}$$

**24. Explanation**

**Ans : (B)**

If two angles of elevation are complementary to each other,

then height =  $\sqrt{ab}$

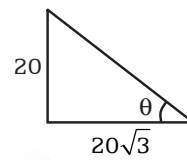
a and b are the length of the pillars.

$$x = \sqrt{ab}$$

$$x = \sqrt{16 \times 9} = \sqrt{144} = 12 \text{ m}$$

**25. Explanation**

**Ans : (A)**



$$\tan \theta = \frac{20}{20\sqrt{3}} = \frac{1}{\sqrt{3}}$$

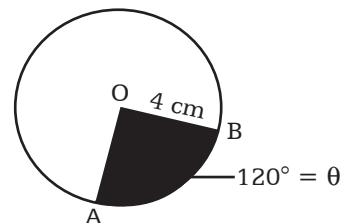
$$\tan \text{ value of } \frac{1}{\sqrt{3}} = 30^\circ$$

## MENSURATION

### Problem for Practice

- The diagonal of a square is  $4\sqrt{2}$  cm. Find the diagonal of another square whose area is double that of the first square.  
A)  $8\sqrt{2}$  cm                      B)  $\sqrt{32}$  cm  
C) 16 cm                          D) 8 cm
- If the diagonals of two squares are in the ratio of 2 : 5, their areas will be in the ratio of  
A)  $\sqrt{2} : \sqrt{5}$                       B) 2 : 5  
C) 4 : 25                          D) 4 : 5
- If a diagonal of a square is 30 cm, what is the area of the square?  
A)  $450 \text{ cm}^2$                       B)  $300 \text{ cm}^2$   
C)  $400 \text{ cm}^2$                       D)  $350 \text{ cm}^2$
- The length of the diagonal of a square is 26 cm. Find the side of the square.  
A)  $13\sqrt{2}$                           B)  $-13\sqrt{2}$   
C) 13                                  D)  $26\sqrt{2}$
- The length of the diagonal of a rectangle is 26 cm and that of one side is 10 cm. What is the area of this rectangle.  
A)  $260 \text{ cm}^2$                       B)  $120 \text{ cm}^2$   
C)  $130 \text{ cm}^2$                       D)  $240 \text{ cm}^2$
- The perimeter of two squares are 52 cm and 20 cm. Find the perimeter of a third square whose area is equal to the difference of the areas of these two squares.  
A) 36 cm                          B) 32 cm  
C) 44 cm                          D) 48 cm
- Each side of a square park is 100 m. At each corner of the park there are flower beds in the form of quadrants of radius 14 m. The area of the remaining part of the park is  
A)  $9384 \text{ m}^2$                       B)  $9290 \text{ m}^2$   
C)  $9150 \text{ m}^2$                       D)  $9454 \text{ m}^2$
- The breadth of a rectangular field is 60% of its length. If its perimeter is 800 m, what is the area of the field?  
A)  $40000 \text{ m}^2$                       B)  $18750 \text{ m}^2$   
C)  $37500 \text{ m}^2$                       D)  $48000 \text{ m}^2$
- The perimeter of the rectangle is 28 cm. If the length is  $\frac{5}{2}$  times its breadth. Find the length and breadth of the rectangle in cm.  
A) 9 and 5                          B) 10 and 4  
C) 6 and 7                          D) 11 and 3
- The diagonal of a rhombus is 8 m and 6 m respectively. Find its area.  
A) 84 sq.m                          B) 24 sq.m  
C) 12 sq.m                          D) 96 sq.m
- If the ratios of areas of two squares is 225 : 256, then the ratio of their perimeter is  
A) 225 : 226                          B) 256 : 225  
C) 15 : 16                          D) 16 : 1
- From four corners of a square sheet of a side 4 cm, four pieces, each in the shape of arc of a circle with radius 2 cm are cut out. The area of the remaining portion is  
A)  $(8 - \pi) \text{ cm}^2$                       B)  $(16 - 4\pi) \text{ cm}^2$   
C)  $(16 - 8\pi) \text{ cm}^2$                       D)  $(4 - 2\pi) \text{ cm}^2$
- A square lawn with side 100 m long has a circular flower bed in the centre. If the area of the lawn, excluding the flower bed is  $8614 \text{ sq.m}$ . Find the radius of the circular flower bed.  
A) 31 m                                  B) 21 m  
C) 41 m                                  D) 51 m
- A lawn is in the form of rectangle having its sides in the ratio of 2 : 3. The area of the lawn is  $600 \text{ m}^2$ . Find the breadth of the lawn.  
A) 50 m                                  B) 20 m  
C) 40 m                                  D) 10 m

15. The base of a triangular field is three times of its altitude. If the cost of cultivating the field at ₹ 24.68 per 100 m<sup>2</sup> be ₹ 333.18, find its base.  
A) 90 m B) 110 m  
C) 120 m D) 150 m
16. The area of a sector of a circle of radius 5 cm, formed by an arc of the length 3.5 cm is,  
A) 8.5 cm<sup>2</sup> B) 8.75 cm<sup>2</sup>  
C) 7.75 cm<sup>2</sup> D) 7.50 cm<sup>2</sup>
17. The area of the ring between two concentric circles, whose circumference are 88 cm and 132 cm is  
A) 780 cm<sup>2</sup> B) 770 cm<sup>2</sup>  
C) 715 cm<sup>2</sup> D) 660 cm<sup>2</sup>
18. The area of a circular garden is 2464 sq.m. How much distance will have to be covered if you like to cross the garden along its diameter?  
A) 56 m B) 48 m  
C) 28 m D) 24 m
19. The area of circle whose radius is 6 cm is trisected by two concentric circles. The radius of the smallest circle is  
A)  $2\sqrt{3}$  cm B)  $2\sqrt{6}$  cm  
C) 2 cm D) 3 cm
20. The difference between the radii of the bigger circle and smaller circle is 14 cm and the difference between their areas is 1056 cm<sup>2</sup>. Radius of the smaller circle is  
A) 7 cm B) 5 cm  
C) 9 cm D) 3 cm
21. The areas of a square and rectangle are equal. The length of the rectangle is greater than the length of any side of the square by 5 cm and the breadth is less by 3 cm. Find the perimeter of the rectangle,  
A) 17 cm B) 26 cm  
C) 30 cm D) 34 cm
22. How many tiles, each 4 decimeter square, will be required to cover the floor of a room 8 m long and 6 m broad?  
A) 1200 B) 1260  
C) 1280 D) 1300
23. A circular wire of diameter 42 cm is folded in the shape of a rectangle whose sides are in the ratio of 6 : 5. Find the area enclosed by the rectangle.  
A) 540 B) 1080  
C) 2160 D) 4320
24. A path of uniform width runs round the inside of a rectangular field 38 m long and 32 m wide. If the path occupies 600 sq.m., then the width of the path is  
A) 30 m B) 5 m  
C) 18.75 m D) 10 m
25. The length and breadth of a rectangle are increased 20% and 25% respectively. The increase in the area of the resulting rectangle will be:  
A) 60% B) 50%  
C) 40% D) 30%
26. A parallelogram ABCD has sides AB = 24 cm and AD = 16 cm. The distance between the sides AB and DC is 10 cm. Find the distance between the sides AD and BC.  
A) 16 cm B) 18 cm  
C) 15 cm D) 26 cm
27. In  $\triangle ABC$ , D and E are the points of sides AB and BC respectively such that  $DE \parallel AC$  and  $AD : DB = 3 : 2$ . The ratio of the area of trapezium ACED to that of  $\triangle BED$  is  
A) 4 : 15 B) 15 : 4  
C) 4 : 21 D) 21 : 4
28. ABCD is a trapezium in which  $AB \parallel DC$  and  $AB = 8$  cm,  $BC = 10$  cm,  $CD = 12$  cm,  $AD = 16$  cm then  $AC^2 + BD^2$  is equal to  
A) 458 cm<sup>2</sup> B) 448 cm<sup>2</sup>  
C) 546 cm<sup>2</sup> D) 548 cm<sup>2</sup>
29. ABCD is a trapezium in which  $AB \parallel CD$ . M and N are the mid points of AD and BC respectively. If  $AB = 14$  cm and  $MN = 18$  cm Find the CD.  
A) 22 cm B) 20 cm  
C) 21 cm D) 24 cm
30. How many tangents can be drawn to the circle from a point outside the circle?  
A) 2 B) 3  
C) 4 D) 1
31. Find the area of a square which is inscribed in a circle of radius of 13 cm.  
A) 169 sq.cm. B) 338 sq.cm.  
C) 507 sq.cm. D) 676 sq.cm.
32. What is the area of the shaded sector for the figure given below.



- A) 8.38 B) 25.28  
C) 16.76 D) 18.56

33. The diameter of a toy wheel is 14 cm. What is the distance travelled by it in 15 revolution?  
A) 880 cm B) 660 cm  
C) 600 cm D) 560 cm
34. Diameter of a wheel is 3 m. The wheel revolves 28 times in a minute. To cover 5.280 km distance, the wheel take  
A) 10 minutes B) 20 minutes  
C) 30 minutes D) 40 minutes
35. How many small cubes, each of 96 sq.cm. surface area can be formed from the material obtained by melting a larger cube of 384 sq.cm. surface area.  
A) 8 B) 5  
C) 10 D) 12

- |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>36. The edges of a cuboid are in the ratio 1 : 2 : 3 and its surface area is 88 sq.cm. The volume of cuboid is<br/>                 A) 120 cm<sup>3</sup>                      B) 64 cm<sup>3</sup><br/>                 C) 48 cm<sup>3</sup>                        D) 24 cm<sup>3</sup></p> <p>37. Find the length of the longest rod can be placed in a hall of 10 m length, 6 m breadth and 4 m height.<br/>                 A) <math>2\sqrt{38}</math> m                      B) <math>4\sqrt{38}</math> m<br/>                 C) <math>2\sqrt{19}</math> m                        D) 19 m</p> <p>38. The number of bricks each measuring 50 cm × 30 cm × 20 cm that will be required to build a wall whose dimensions are 5 m × 3 m × 2 m is<br/>                 A) 1000                              B) 2000<br/>                 C) 3000                              D) 5000</p> <p>39. The curved surface area of a right circular cone of height 15 cm and base diameter 16 cm is<br/>                 A) <math>60\pi</math> cm<sup>2</sup>                      B) <math>68\pi</math> cm<sup>2</sup><br/>                 C) <math>120\pi</math> cm<sup>2</sup>                      D) <math>136\pi</math> cm<sup>2</sup></p> <p>40. The sum of the radius and height of a cylinder is 18 m. The total surface area of the cylinder is 792 sq.m. What is the volume of the cylinder?<br/>                 A) 1440 m<sup>3</sup>                        B) 1724 m<sup>3</sup><br/>                 C) 1694 m<sup>3</sup>                        D) 1848 m<sup>3</sup></p> | <p>41. The total surface area of a solid hemisphere is <math>108\pi</math> cm<sup>2</sup>. The volume of the hemisphere is<br/>                 A) <math>72\pi</math> cm<sup>3</sup>                        B) <math>144\pi</math> cm<sup>3</sup><br/>                 C) <math>108\sqrt{6}</math> cm<sup>3</sup>                      D) <math>54\sqrt{6}</math> cm<sup>3</sup></p> <p>42. A reservoir is in the shape of a frustum of a right circular cone. It is 8 m across at the top and 4 m across the bottom. It is 6 m deep. Find the area of its curved surface.<br/>                 A) 159 m<sup>2</sup>                              B) 162.3 m<sup>2</sup><br/>                 C) 452 m<sup>2</sup>                              D) 119.26 m<sup>2</sup></p> <p>43. The base of prism is right angled triangle and the two sides containing the right angle are 8 cm and 15 cm. If its height is 20 cm, then the volume of the prism is<br/>                 A) 160 cc                              B) 300 cc<br/>                 C) 1200 cc                              D) 600 cc</p> <p>44. The volume of the pyramid on a square base of side 15 cm and height 10 cm is<br/>                 A) 750 cm<sup>3</sup>                              B) 700 cm<sup>3</sup><br/>                 C) 2250 cm<sup>3</sup>                              D) 1125 cm<sup>3</sup></p> <p>45. The material within a hollow sphere of internal and external diameters 4 cm and 8 cm respectively is melted and cast into the form of a right circular cone of base diameter 8 cm. Find the height of the cone.<br/>                 A) 28 cm                              B) 15 cm<br/>                 C) 20 cm                              D) 14 cm</p> |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

### Explanatory Answers

**1. Explanation**

Diagonal of square =  $\sqrt{2}a$

$$\sqrt{2}a = 4\sqrt{2}\text{ cm}$$

$$\therefore a = 4\text{ cm}$$

$$\text{Area of first square} = (4)^2 = 16\text{ cm}^2$$

$$\text{Area of second square} = 16 \times 2 = 32\text{ cm}^2$$

$$\frac{d^2}{2} = 32$$

$$\Rightarrow d^2 = 32 \times 2 = 64$$

$$\therefore d = \sqrt{64} = 8$$

$$\text{Diagonal of the second square} = 8\text{ cm}$$

**Ans : (D)**

**2. Explanation**

$$d_1 : d_2 = 2 : 5$$

$$\frac{d_1}{2} : \frac{d_2}{2} = \frac{2^2}{2} : \frac{5^2}{2} = 4 : 25$$

**3. Explanation**

$$\text{Area of the square} = \frac{d^2}{2}$$

$$\Rightarrow \frac{30 \times 30}{2} = 15 \times 30 = 450\text{ cm}^2$$

**Ans : (C)**

**Ans : (A)**

**4. Explanation**

$$\text{Diagonal of square} = \sqrt{2}a$$

$$\text{Side of the square} = \frac{\text{Diagonal}}{\sqrt{2}}$$

$$\text{Side of the square (a)} = \frac{26}{\sqrt{2}}$$

To simplify  $\frac{26}{\sqrt{2}}$ , multiply the numerator and denominator by  $\sqrt{2}$

$$a = \frac{26 \times \sqrt{2}}{\sqrt{2} \times \sqrt{2}} = \frac{26\sqrt{2}}{2} = 13\sqrt{2}$$

**Ans : (A)**

**5. Explanation**

$$\text{Length of the diagonal} = \sqrt{a^2 + b^2}$$

$$\sqrt{a^2 + b^2} = 26\text{ cm}$$

$$\Rightarrow \sqrt{(10)^2 + b^2} = 26\text{ cm}$$

$$\Rightarrow 10^2 + b^2 = 676$$

$$\Rightarrow b^2 = 676 - 100 = 576$$

$$\therefore b = \sqrt{576} = 24\text{ cm}$$

$$\therefore \text{Area of the rectangle} = 10 \times 24 = 240\text{ cm}^2$$

**Ans : (D)**

22. Statements:

I. All pencils are cups.

II. Some pencils are pens.

Conclusions:

I. Some pencils are cups.

II. No pencils are cups.

III. Some cups are pens.

Choose the conclusion(s) that follows the above statements.

- A) Only Conclusion I follows  
 B) Only Conclusion III follows  
 C) Only conclusions I and II follows  
 D) All the conclusions follow

23. (4, 140, 6)

- A) (9, 396, 4)                      B) (2, 121, 6)  
 C) (5, 234, 7)                      D) (3, 269, 8)

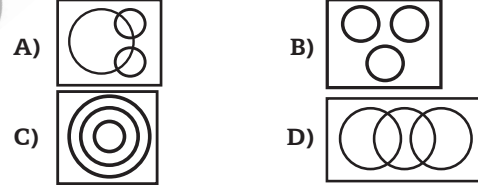
24. Pointing to a boy, Radha said, "He is the son of my mother-in-law's only child." How is the boy related to Radha ?

- A) Grandson                      B) Son  
 C) Nephew                      D) Data inadequate

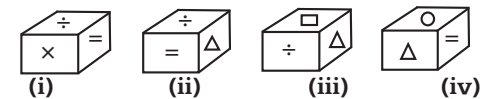
25. Ravi is Raju's father, Sudha is Raju's grandmother, Radha is Sudha's sister, Rani is Ravi's wife. How is Ravi related to Radha ?

- A) Sister                      B) Niece  
 C) Sister-in-law                      D) None of these

26. Which of the following diagrams indicates the best relation between cloth, cotton and shirt?



27.

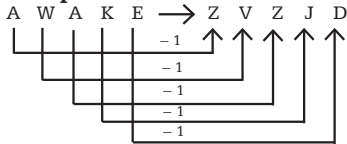


Which symbol will come opposite to symbol '÷' ?

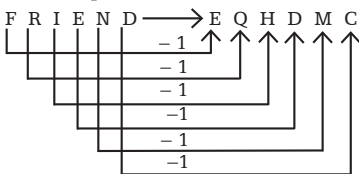
- A) ○                      B) =  
 C) ×                      D) △

## Explanatory Answers

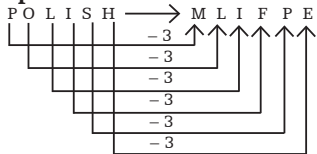
1. Explanation :



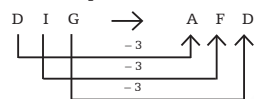
Similarly,



2. Explanation :



Similarly,



3. Explanation :

Moon is a Satellite, similarly Earth is a Planet.

4. Explanation :

Candle is made from Wax. Similarly, Paper is made from Pulp.

5. Explanation :

Gujarat, Maharashtra and Karnataka has coastal areas but Arunachal Pradesh does not.

6. Explanation :

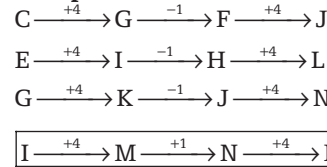
Except the number 215, all other numbers are based on  $x^3 + 1$ .

$$65 = (4)^3 + 1 \quad ; \quad 126 = (5)^3 + 1$$

$$28 = (3)^3 + 1 \quad \quad \quad \text{But, } 215 = (6)^3 - 1$$

Ans : D

7. Explanation :



Ans : D

8. Explanation :

$$12 + 11 = 23 ;$$

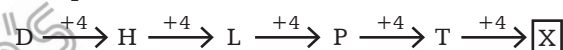
$$18 + 5 = 23 ;$$

$$14 + 9 = 23 ;$$

$$15 + 8 = \boxed{23}$$

Ans : A

9. Explanation :



Ans : B

10. Explanation :

$$6 \times 7 = 42 \quad 12 \times 3 = 36$$

$$12 \times 2 = 24 \quad 9 \times 7 = 63$$

Ans : C

11. Explanation :

Second Column :  $4 + 7 + 3 = 14 ;$   
 $14 \times 2 = 28 ; 28 - 1 = 27$   
 Third Column :  $5 + 6 + 5 = 16 ;$   
 $16 \times 2 = 32 ; 32 - 1 = 31$   
 First Column :  $35 + 1 + 36$   
 $36 \div 2 = 18$   
 $7 + 8 + ? = 18$   
 $\therefore ? = 18 - 15 = \boxed{3}$

Ans : B

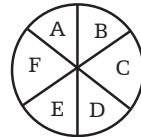
**12. Explanation :**

The second circle contains numbers which are products of the numbers in circle 1<sup>st</sup> and 3<sup>rd</sup> with respect to their positions.

$$A \Rightarrow 1 \times 8 = 8 \quad ; \quad B \Rightarrow 3 \times 2 = 6$$

$$C \Rightarrow 3 \times 4 = 12 \quad ; \quad D \Rightarrow 2 \times 3 = 6$$

$$E \Rightarrow 2 \times 5 = 10 \quad ; \quad F \Rightarrow 4 \times 2 = 8$$



**Ans : B**

**13. Explanation :**

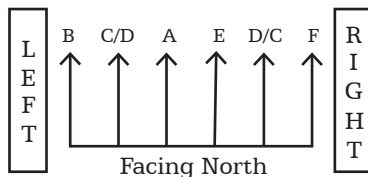
There is no 'M' in the key word. Hence, we cannot form the word 'CONFIRM'

There is no 'J' and 'L' in the key word. Hence, we cannot form the word 'CONJUGAL'

There is no 'E' in the key word. Hence, we cannot form the word 'FINGER'.

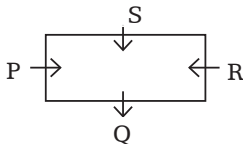
C O N F I **G** U R **A** **T** I **O** N

**14. Explanation :**



Hence, A sits second to the right of B.

**15. Explanation :**



**16. Explanation :**

Ram < Shyam .... (i)

Ram < Mohan < Shyam .... (ii)

Shyam < Krishna .... (iii)

Combining all the statements we get,

Krishna > Shyam > Mohan > Ram

Hence, Krishna is eldest.

**17. Explanation :**

Number of triangles in 3 squares =  $8 + 8 + 8 = 24$

Combine squares having 4 triangles.

Total number of triangles =  $24 + 4 = 28$

**18. Explanation :**

Total number of blocks = 8

$\therefore$  Total number of triangles =  $8 \times 2 = 16$

**19. Explanation :**

$$6 \% 12 \odot 3 @ 8 \$ 3 = ?$$

$$\Rightarrow 6 + 12 \div 3 \times 8 - 3 \Rightarrow 6 + 4 \times 8 - 3$$

$$\Rightarrow 6 + 32 - 3 = 35$$

**20. Explanation :**

$$12 \text{ B } 8 \text{ C } 6 \text{ D } 2 \text{ A } 4 = ?$$

$$\Rightarrow 12 \times 8 - 6 \div 2 + 4 \Rightarrow 12 \times 8 - 3 + 4$$

$$\Rightarrow 96 - 3 + 4 = 97$$

**Ans : D**

**Ans : A**

**Ans : D**

**Ans : (B)**

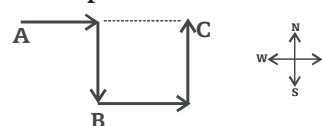
**Ans : (C)**

**Ans : (D)**

**Ans : B**

**Ans : D**

**21. Explanation :**



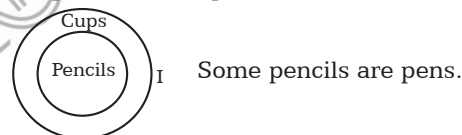
$$AC = 2AB$$

**Ans : B**

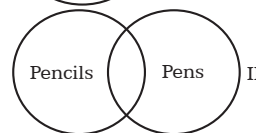
**22. Explanation :**

All pencils are cups.

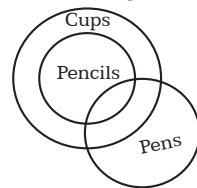
**Ans : (B)**



Some pencils are pens.



Combining I & II we get,



**Conclusion**

Some cups are pens.

Hence the Conclusion III follows.

**23. Explanation :**

$$4^3 + 6^3 = 64 + 216 = 280, 280 \div 2 = 140$$

$$5^3 + 7^3 = 125 + 343 = 468, 468 \div 2 = 234$$

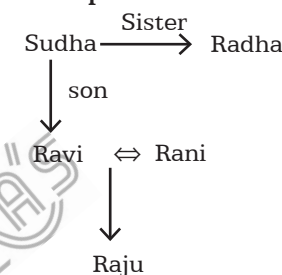
**Ans : (C)**

**24. Explanation :**

Radha's mother-in-law's only child will be husband of Radha. So her husband's son will be the son of Radha also.

**Ans : B**

**25. Explanation :**



Ravi is Radha's nephew.

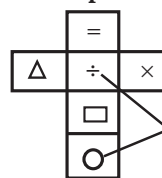
**Ans : D**

**26. Explanation :**

Cloth is made from cotton and shirt is made from cloth.

**Ans : C**

**27. Explanation :**



It is clear that symbols  $\times$ ,  $=$ ,  $\Delta$  and  $\square$  appear on the adjacent surfaces. Hence, symbol 'O' will appear on the opposite side.

**Ans : A**