2. PERCENTAGE

Introduction to the Topic

The chapter on percentage forms the base of entire arithmetic. A thorough understanding of percentages lets you save time and solve questions pretty efficiently. The concept of base forms the basic of percentages and the same principle gets used in Fractions, Ratio & Proportions, Mixtures & Alligation and other such topics in the domain.

Relevance in CAT

There have been no direct question asked from percentages in recent years in CAT examination. But the questions on various topics like Profit, Loss, Ratio, Time & Work etc., which require use of fundamentals of percentages have been regularly asked in the CAT examination.

Fundamentals

The word "percentage" literally means "hundred" or "for every hundred." Therefore, whenever we calculate something as a part of 100, that part is numerically termed as percentage.

In other words, percentage is a ratio whose second term is equal to 100. For example, 1 : 5 can be written as 20 : 100 or 20%, 3 : 2 can be written as 150 : 100 or 150%, and so on.

Thus, to convert any percent to a number, divide it by 100

e.g. 6% = 0.06 and 60% = 0.6 and 600% = 6

Fractions, Ratios and Percentage

We can say, x% is nothing but a fraction with numerator x and denominator 100. Identifying certain percentage values in the reduced form of the fractions can be very useful. e.g. whenever we have to calculate 20%, we can calculate $\frac{20}{100}$ that is $\frac{1}{5}$ th .

Conversion of fractions into percentage

Knowing conversion of common fractions into percentages helps in conversion of fractions into percentage immediately. For example, knowing that $\frac{1}{8} \times 100 = 12.5\%$ will help to convert fractions like $\frac{3}{8}$ or $\frac{5}{8}$ into percentage immediately.

In Data Interpretation, if we need to convert fraction like $\frac{3132}{8214}$ into percentage, we will immediately realize that it is as approximately equal to $\frac{3000}{8000} = \frac{3}{8} = 37.5\%$. The actual value of the fraction is 38.1%. Realize how close we can get without moving muscle and saving precious time.

Fraction equivalent of some commonly used percentages are given below.

$\frac{1}{2} = 50\%$	$\frac{1}{3} = 33.33\%$	$\frac{1}{4} = 25\%$
$\frac{1}{5} = 20\%$	$\frac{1}{6} = 16.66\%$	$\frac{1}{7} = 14.28\%$
$\frac{1}{8} = 12.5\%$	$\frac{1}{9} = 11.11\%$	$\frac{1}{11} = 9.09\%$

$\frac{1}{12} = 8.33\%$	$\frac{1}{13} = 7.69\%$	$\frac{1}{14} = 7.14\%$
$\frac{1}{15} = 6.66\%$	$\frac{1}{16} = 6.25\%$	$\frac{1}{21} = 4.76\%$
$\frac{2}{3} = 66.66\%$	$\frac{3}{4} = 75\%$	$\frac{5}{6} = 83.33\%$
$\frac{3}{8} = 37.5\%$	$\frac{5}{8} = 62.5\%$	$\frac{7}{8} = 87.5\%$

Concept of Base

Suppose if we say that India wins 60% of the matches it play neither does it mean that India won 60 matches nor does it mean that India won 0.6 matches. All that it means is that had India played 100 matches, it would have won 60 matches.

The number of matches India played is the base and to calculate the number of matches won, we have to find 60% of this base.

Let say, if a number, 100, increases by 20%, the final number is not really 100 + 20% *i.e.* 100 + 0.2. The 20% is again a percentage of a base, in this case of the number itself. Thus the final number is 100 + 20% of 100 = 100 + $\frac{1}{5}$ of 100 = 100 + 20 = 120. So, we always calculate percentage on the original value *i.e.* base.

What percentage of *a* is *b*?

To calculate what percentage of *a* is *b*, use the formula Percentage $= \frac{b}{a} \times 100$. Therefore, *a* will form the whole and *b* will form the part of the whole.

Example 1: What percentage of 240 is 150?
Solution:
'Here 240 is the whole. So it will be in denominator

Percentage $= \frac{150}{240} \times 100 = 62.5\%$

Percentage increase/decrease:

- Percentage increase of a number

$$= \frac{\text{Final Value} - \text{Initial Value}}{\text{Initial Value}} \times 100$$

Percentage increase $= \frac{\text{Total Increase}}{\text{Initial Value}} \times 100$

Percentage decrease of a number

$$= \frac{\text{Final Value} - \text{Initial Value}}{\text{Initial Value}} \times 100$$

$$\text{Percentage decrease} = \frac{\text{Total Decrease}}{\text{Initial Value}} \times 100$$

Example 2: The price of a clock imported from Singapore was Rs. 1200. Due to devaluation of rupee, its value increased to Rs. 2100. What is the percentage increase in the price of the clock due to devaluation of rupee?

Solution: Percentage increase is given by

$$= \frac{\text{Final price - Initial price}}{\text{Initial price}} \times 100$$

The required percentage increase $= \dfrac{2100 - 1200}{1200} \times 100$

$$= \frac{3}{4} \times 100 = 75\%$$

Example 3: The ratio of the salaries of Charu and Rohit is 20 : 21. By what percentage is Rohit's salary greater than that of Charu?

Solution:

The given ratio = 20 : 21

The salary of Rohit is 21 parts when the salary of Charu's salary is 20 parts. Percentage by which Rohit's salary is greater than Charu's

$$= \frac{21 - 20}{20} \times 100 = 5\%$$

Example 4: *P*'s income is 70% of *Q*'s. *Q*'s income is 50% of *R*'s. If *R*'s income is Rs. 2,00,000, what is *P*'s income?

Solution:

R's income = 2,00,000

Q's income = 50% of *R*'s income

$$= \left(\frac{50}{100} \right) \times \text{Rs. } 200000 = \text{Rs. } 100000$$

P's income = 70% of *Q*'s income

's income $= \left(\dfrac{70}{100} \right) \times \text{Rs. } 100000 = \text{Rs. } 70000$

Example 5: A ball drops from a height of 4802 m. Thereafter, it bounces every time to a height which is 14.28% less than its previous height. What height will the ball reach on its 4th bounce?

Solution:

As we know that $14.28\% = \dfrac{1}{7}$. Therefore, the ball is rising up to a height which is $\dfrac{1}{7}$th less than the previous height. Or, the ball is

rising up to a height which is $\dfrac{6}{7}$ of the previous height. Therefore on its 4th bounce the ball will reach a height of

$$4802 \times \frac{6}{7} \times \frac{6}{7} \times \frac{6}{7} \times \frac{6}{7} = 2592 \text{ m}$$

Note: Here we have used the fraction equilateral of the percentage value 14.28% which makes the solution much earlier than using direct percentage value.

Change of Base

The concept of change of base can be understood with the following example:

If B's income is 100 & A's income is 120. Thus income of B is 20 less than A's income and is $\dfrac{20}{120} = \dfrac{1}{6} = 16.66\%$ less than that of A.

Important points about Change of Base

- Thus, if A is $r\%$ more/less than B.

  then, B is $\dfrac{100\,r}{100 \pm r}\%$ less/more than A.

- Concept of change of base is used widely and helps in saving a lot of calculation time.

- $\dfrac{100\,r}{100 \pm r}\%$ is also the answer to what percentage change will offset $\pm x\%$ change *i.e.* will get the value back to the original magnitude.

Example 6: The salary of Virat is 20% more than that of Sachin. By what percentage is Sachin's salary less than that of Virat's?

Solution:

We know that $20\% = \dfrac{1}{5}$, so if Sachin's salary is divided into 5 parts, Virat's salary will be one more part added to Sachin's salary, *i.e.*

If Sachin's salary is 5 parts, Virat's salary is 6 parts. Now if Virat's salary is 6 parts, Sachin's salary is one part less. Therefore, for Virat, Sachin's salary is $\dfrac{1}{6}$ th or 16.66% less.

Example 7: If prices decrease by 20%, by what percentage can consumption increase without affecting the expenditure?

Solution:

Let the original value of price be 5 as $\dfrac{1}{5} \times 100 = 20\%$

So, New value of price $= 4$

If price decreases from 5 to 4 (a 20% decrease), consumption has to increase from 4 to 5.

So, change in consumption $= \dfrac{1}{4} \times 100 = 25\%$ increase.

Alternate Method:

Using the formula, $\dfrac{100\,r}{100 - r}\%$

$= \dfrac{20}{100 - 20} = \dfrac{1}{4} = 25\%$ increase.

Example 8: As prices of oranges decreased by 20%, I can purchase 6 oranges more for Rs. 120. What is the original price of one orange?

Solution:

Since prices decreased by 20%, had I purchased the same number of oranges as earlier, I would have saved 20% of 120, *i.e.* Rs. 24. This means that in Rs. 24, I can get 6 oranges at new rate.

New rate $= \dfrac{24}{6} = $ Rs. 4

Old rate $= 4 \times \dfrac{5}{4} = $ Rs. 5

Alternate Method:

Let the original price be x.

The equation would be $\dfrac{120}{0.80x} - \dfrac{120}{x} = 6 \Rightarrow x = 5$

Multiplying Factor

Suppose 40 is to be increased by 20%.

Then increased value $= 40 + 20\%$ of 40

$40 + \dfrac{20}{100} \times 40 = 40 + 8 = 48$

One could also calculate this in the following manner.

Increased Value $= 40 + 20\%$ of 40

$= 40\,(1 + 20\%) = 40\,(1 + .2) = 40 \times 1.2 = 48$

Here 1.2 can be called the Multiplying Factor (MF) corresponding to 20% and can simplify a lot of calculations.

The Multiplying Factor (MF) corresponding to x% increase is nothing but $1 + \dfrac{x}{100}$ and is $1 - \dfrac{x}{100}$ for an x% decrease.

MF > 1 implies an increase and MF < 1 implies a decrease. A more than 100% increase would give a multiplying factor more than 2

Multiplying factor comes in handy wherever percentages are present. Try to understand the concept of multiplying factor thoroughly.

Initial value $\times$ MF = Final value

Initial value can be cost, price, principal kept in bank, sales in year x, value of asset in year x and corresponding final value will be selling amount, price, sales in subsequent year and value of asset in subsequent year respectively.

Percentage Increase	New quantity = Old quantity multiplied by a factor of	Percentage Decrease	New quantity = Old quantity multiplied by a factor of
5%	1.05	5%	0.95
10%	1.1	10%	0.9
15%	1.15	15%	0.85
20%	1.2	20%	0.8
25%	1.25	25%	0.75

30%	1.3	30%	0.7
40%	1.4	40%	0.6
50%	1.5	50%	0.5
60%	1.6	60%	0.4

Successive percentage changes

If there are two successive percentage increases of x% and y%.

Net MF $= \left(1 + \dfrac{x}{100}\right)\left(1 + \dfrac{y}{100}\right)$

$= \left(1 + \dfrac{x}{100} + \dfrac{y}{100} + \dfrac{xy}{10000}\right)$

$= \left(1 + \dfrac{x + y + \dfrac{xy}{100}}{100}\right)$

Thus, we can say that, two successive percentage changes of a% and b% is an effective change of $\left(a + b + \dfrac{ab}{100}\right)$% .

The same concept is also applicable in any relation of th type $N = A \times B$

Means if A and B change by a% and b% respectively, then the net percentage change in P is $\left(a + b + \dfrac{ab}{100}\right)$% .

For example, if the length of the rectangle increase by 20% and the breadth increase by 30% then the net change in the are of the rectangle will be $20 + 30 + \dfrac{20 \times 30}{100}$ i.e. 56%.

Example 9: The number of seats in a theatre is increased by 25%. The price per ticket is also increased by 10%. What is the effect on the revenue collected?

Solution:

Here Revenue = Price of the ticket × Number of tickets

Using successive percentage increase $= x + y + \dfrac{x \times y}{100}$

Percentage increase in revenue

$= 25 + 10 + \dfrac{25 \times 10}{100}$

$= 25 + 10 + 2.5 = 37.5\%$.

Alternate Method:

Let the initial number of seats be 100 and price per ticket be Rs. 1

Then, Revenue = number of seats × price per ticket Increased number of seats

Increased Seats $= \dfrac{125}{100} \times 100 = 125$

Increased price of a ticket

$$= \frac{110}{100} \times 1 = \text{Rs. 1.10}$$

Increased revenue $= 125 \times 1.10 = \text{Rs. 137.5}$

Percentage increase in revenue $\left(\frac{137.5 - 100}{100} \right) \times 100 = 37.5\%$

Example 10: The breadth of a rectangle is increased by 10%. What will be the percentage decrease in its length so as to have the same area?

Solution:

Applying percent change $= x + y + \dfrac{xy}{100}$

Let increase in breadth be $x\%$, then

$$0 = 10 - x - \frac{10 \times x}{100} \Rightarrow \frac{11x}{10} = 10$$

$$\Rightarrow x = \frac{100}{11} = 9\frac{1}{11}\%$$

thus, length must be decreased by $9\dfrac{1}{11}\%$.

Example 11: If the side of a square is increased by 15%, then by what percent will the area increase?

Solution:

If x is the percentage increase in the side of a square, then increase in area is given by

$$x + x + \frac{x \times x}{100}$$

$$= 15 + 15 + \frac{15 \times 15}{100} = 32.25\%$$

Example 12: What quantity of water must be added to a 18 litres solution of 50% milk to make it 25% milk?

Solution:

Let volume of the original solution is equal to 18 litres. Therefore, volume of milk in the original solution is equal to 9 litres. Now this volume of milk remains constant in the new solution.

In the new solution, 9 litre of milk = 25% of total.

Therefore, total volume $= \dfrac{9}{25} \times 100$ litres $= 36$ litres.

Therefore, water added

= new volume − old volume

= 36 − 18 = 18 litres

Example 13: A watermelon contains 85% water. 60 g of water evaporated from the watermelon and now it contains 60% water. What was the original weight of the watermelon?

Solution:

Let the original weight of the watermelon be x. Therefore, the solid material contained in the watermelon is equal to 15% of $x = 0.15x$. When 60 g of water evaporates, weight of watermelon becomes $x - 60$, of which $0.15x$ is the solid material. Now this solid material is 40% by weight.

$0.15x = 40\%$ of $(x - 60)$

$$\Rightarrow \frac{0.15x}{x-60} \times 100 = 40 \Rightarrow x = 96 \text{ g}.$$

Practice Exercise – Easy

1. Find $28\frac{1}{2}$ % of 5000.

    a. 1425   b. 1575   c. 1500   d. 1365

2. A cask containing 425 litres lost 8% by leakage. How many litres were left in the cask?
    a. 34 litres   b. 391 litres c. 334 litres d. 389 litres

3. The price of sugar is increased by 25%. If a family wantsto keep its expenses on sugar unaltered, then the family will have to reduce the consumption of sugar by:
    a. 20%   b. 21%   c. 22%   d. 25%

4. The price of a Maruti car rises by 30% while the sales of the car comes down by 20%. What is the percentage change in the total revenue?
    a. -4% b. -2% c. $+4\%$ d. $+2\%$

5. If the price of an article increases by 50% its sales decreases by 30%. What is the consequent percentage change in its revenue?
    a. 12.5%   b. 5%   c. 7.5%   d. 10%

6. If length and breadth of a rectangle became half and double, respectively, what will be the resultant area?
    a. 25%   b. 55%
    c. 75%   d. None of these

7. If wages of a and b are in the ratio of $2\frac{1}{2} : 2\frac{1}{4}$, how much percent a's wages is greater than that of b?

    a. $10\frac{1}{9}\%$ b. $12\frac{1}{9}\%$ c. $11\frac{1}{9}\%$ d. $9\frac{1}{11}\%$

8. Naresh get 40% more than Rajesh. How much percentage does Rajesh get less than Naresh?

    a. $26\frac{5}{7}\%$ b. $28\frac{4}{7}\%$ c. $29\frac{1}{7}\%$ d. $27\frac{3}{7}\%$

9. If the price of a car is increased by 20%, then by how much percent the new price is decreased to get back to the original price?
    a. 20%   b. 25%   c. 16.66%   d. 33.33%

10. The population of a village is 5000 and it increases at the rate of 4% every year. After 2 years, the population will be:
    a. 5416   b. 5402   c. 540   d. 5408

11. Two number are 40% and 50% more than a third number. By what percentage is the first number less than the second number.
    a. 8.75%   b. 6.67%   c. 3.33%   d. 12.5%

12. Two numbers are 25% and 40% more than a third number. What is the first number as a percentage of the second number?

    a. $92\frac{4}{7}\%$ b. $88\frac{3}{7}\%$ c. $89\frac{2}{7}\%$ d. $91\frac{2}{7}\%$

13. 48% of the 1st number is 60% of the 2nd number. What is the ratio of the 1st number to the 2nd number?
    a. 4 : 7
    b. 3 : 4
    c. 5 : 4
    d. Couldn't be determined

14. In a city 50% are males, 20% of the females are married & 10% of them have children. Find the percentage of females with no children.

a. 50%   b. 2%   c. 98%   d. 80%

15. The number of days in eight weeks are what percentage of the number of days in a leap year?

a. $15\dfrac{45}{183}$ %   b. 15%

c. $15\dfrac{55}{183}$ %   d. $15\dfrac{25}{73}$ %

16. The difference between a 40% discount on Rs. 1000 and successive discounts of 30% and 10% on the same amount is
    a. Rs. 10   b. Rs. 20
    c. Rs. 30   d. Rs. 40

17. At an election where there are two candidate only, the candidate who gets 62 percent of the votes is elected by a majority of 144 votes. Find the total number of votes recorded.
    a. 1200   b. 1800   c. 700   d. 600

18. In a class of 96 boys, 16 were absent, 35% of the remaining failed to do home work. How many boys who were present did the home work?
    a. 51   b. 48   c. 52   d. 45

20. A student was asked to measure the length and breadth of a rectangle. By mistake, he measured the length 20% less and the breadth 10% more. If its original area is 200 sq. cm., find the area after this measurement?
    a. 176 sq. cm.   b. 206 sq. cm.
    c. 226 sq. cm.   d. 316 sq. cm.

21. A man had Rs. 4800 in his locker two years ago. In the first year, he deposited 20% of the amount in his locker. In the second year, he deposited 25% of the increased amount in his locker. Find the amount at present in his locker.
    a. 5200   b. 6800   c. 7200   d. 8000

22. In a class, the number of boys is more than the number of girls by 12% of the total strength. The ratio of boys to girls is:
    a. 11 : 14   b. 8 : 11   c. 14 : 11   d. 11 : 8

23. In a Mathematics exam, a student scored 30% in the first paper out of a total of 180. How much should he score in the second paper (out of 150) if he is get at least 50% marks overall?
    a. 75%   b. 80%   c. 74%   d. 84%

[CAT 2009]

24. At an election where there are two candidate only, the candidate who gets 43 percent of the votes is rejected by a majority of 420 votes. Find the total number of votes recorded.
    a. 3000   b. 600   c. 1200   d. 2400

25. Mohit spends 24% of his monthly income on food and 15% on the education of his children. Of the remaining salary, he spends 25% on entertainment and 20% on conveyance. He is now left with Rs. 10736. What is the monthly salary of Mohit?
    a. Rs. 27600   b. Rs. 28000
    c. Rs. 31200   d. Rs. 32000

26. The price of a car depreciates in the first year by 25%, in the second year by 20% in the third year by 15% and so on. Find the final price of the car after 3 years, if the present cost of the car is Rs. 1,00,000:
    a. 78,000   b. 51,000   c. 69,000   d. 17,000

27. One litre of water is evaporated from 6 litres of a solution containing 5% salt. Find the percentage of salt in the remaining solution:
    a. 8%   b. 10%   c. 6%   d. 4%

[CAT 2009]

28. 40% of a number when added to the square of the same number, then it is increased to 4040% of itself the actual number is:
    a. 120   b. 180   c. 40   400

29. If the price of a commodity be raised by 20%, find by how much percent must a householder reduce his consumption of that commodity so as not no increase his expenditure.

a. $17\frac{1}{3}$ % b. $16\frac{2}{3}$ % c. 20% d. 18%

30. The tax on commodity is diminished by 20% and its consumption increases by 15%. Find the effect on revenue.
    a. 8% b. 7.5% c. 10% d. 6%

Practice Exercise – Medium

1. In an examination, Mohit obtained 20% more than Sushant but 10% less than Rajesh. If the marks obtained by Sushant are 1080, find the percentage marks obtained by Rajesh if the full marks are 2000.
    a. 72% b. 86.66%
    c. 78.33% d. None of these
[CAT 2009]

2. A candidate who gets 20% of the maximum marks in an examination fails by 30 marks. Another candidate who get 32% of the maximum marks gets 42 marks more than the pass mark. What is the maximum marks in the examination?
    a. 720 b. 520 c. 600 d. 480

3. On account of a reduction in the price of sugar by 25% Raghav is able to buy $2\frac{1}{2}$ kg of sugar more for Rs. 120.
    I. Find the reduced price per kg of sugar.
    II. Find the original price per kg of sugar.
    a. 16, 21 b. 18, 24 c. 12,16 d. 15, 20

4. When the price of sugar was increased by 32%, a family reduced its consumption in such a way that the expenditure on sugar was only 10% more than before. If 30 kg per month were consumed before, find the new monthly consumption.
    a. 42 kg b. 35 kg c. 25 kg d. 16 kg
[CAT 2010]

5. A reduction of 20% in the price of wheat enables a person to buy 3.5 kg more wheat for Rs. 770. The original price of rice is:
    a. Rs. 55 per kg b. Rs. 45 per kg c. Rs. 65 per kg d. Rs. 37 per kg

6. A cricket team wanted to have a success rate of 90% for the season. Out of 60 games already played it has won 48 games. How many matches must it win form the remaining 90 games to achieve its target and what is the required success rate (for the remaining matches)?
    a. 85, $94\frac{4}{9}$ % b. 87, $96\frac{2}{3}$ %
    c. 83, $92\frac{2}{9}$ % d. 82, $91\frac{1}{9}$ %

7. 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 27 characters per line, then the required number of pages will how much percent greater than the previous pages?
    a. 10% b. 5%
    c. 6.66% d. None of these

8. 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 less than or equal to Rs. 25,000 per year?
    a. 2/11 b. 1/4 c. 1/3 d. 3/4

9. A man earns x% on the first Rs. 2000 and y% on the rest of his income. If he earns Rs. 700 from Rs. 4000 and Rs. 900 from Rs. 5000 of income, find x%.
    a. 20% b. 15%
    c. 25% d. None of these

10. The sales of an article increases by 50% every week. If the difference between the sales of third week and second week is 450, then what is the value of the sales in the third week?
    a. 1200   b. 1350   c. 1500   d. 1450

11. For an examination, it is required to get 36% of maximum marks to pass. A student got 113 marks and failed by 85 marks. The maximum marks for the examination are:
    a. 500   b. 550   c. 565   d. 620

12. Mr. Kamal after selling 5.5% stock at Rs. 92 realizes Rs. 32200. Then he invested $\frac{1}{3}$ of the amount in 4.5% stock at Rs. 92, $\frac{2}{5}$ of the amount at Rs. 115 in 5% stock and the remaining in 6% stock at Rs. 56. The change in his income is: [**Note:** All the share have face value = Rs. 100]
    a. Rs. 56 loss   b. Rs. 78 profit
    c. Rs. 80 profit   d. Rs. 70 loss

13. In an examination 50% of the students passed in English, 60% in Maths and 20% in both. What percentage of the total students failed in both the subjects?
    a. 90%   b. 10%   c. 40%   d. 80%

14. The length, breadth and height of a room are in the ratio 3 : 2 : 1. If the breadth and height are halved while the length is doubled, then the total area of the four walls of the room will:
    a. Remain the same   b. Decrease by 13.64%
    c. Decrease by 15%   d. Decrease by 30%

[CAT 2006]

15. Price of a chair is greater than the price of a table by Rs. 400. If the price of 6 chairs and 6 tables is Rs. 4800, by how much percent the price of a table is less than the price of a chair?
    a. $\frac{200}{3}$ %   b. 25%
    c. $37\frac{1}{2}$ %   d. None of these

16. On April 1, 2015 my salary increased from Rs. 10,000 to Rs. 16,000. Simultaneously the rate of income tax decreased by 37.5%, So the amount of income tax paid by me remains constant then what is the value of income tax paid by me:
    a. Rs. 3000   b. Rs. 6000
    c. Rs. 1600   d. Can't be determined

17. Rajan saves 25% of his monthly salary. On account of a price rise his monthly expenses increase by 20%. Now his saving is Rs. 1800 per month. What is his monthly salary?
    a. 20,000   b. 18,000   c. 16,000   d. 17,500

18. The rate of increase of the price of sugar is observed to be two percent more than the inflation rate expressed in percentage. The price of sugar, on January 1, 1994, is Rs. 20 per kg. The inflation rate for the years 1994 and 1995 are expected to be 8% each. The expected price of sugar on January 1, 1996 would be:
    a. 23.60   b. 24.00   c. 24.20   d. 24.60

19. 1 litre of water is added to 5 litres of alcohol and water solution containing 40% alcohol strength. The strength of alcohol in the new solution will be:
    a. 30%   b. $33\frac{1}{3}$ %   c. $33\frac{2}{3}$ %   d. 33%

20. $\frac{2}{5}$ of the voters promise to vote for *P* and the rest promised to vote for *Q*. Of these, on the last day 15% of the voters went back of their promise to vote for *P* and 25% of voters went back of their promise to vote for *Q*, and *P* lost by 2 votes. Then, the total number of voters is:
    a. 100   b. 110   c. 90   d. 95

21. The wheat sold by a grocer contained 10% low quality wheat. What quantity of good quantity wheat should be added to 150 kg of wheat so that the percentage of low quality wheat becomes 5%?

a. 85 kg   b. 50 kg   c. 135 kg   d. 150 kg

22. At the end of year 1998, Shepard bought nine dozen goats. Henceforth, every year he added p% of the goats at the beginning of the year and sold q% of the goats at the end of the year where $p > 0$ and $q > 0$. If Shepard had nine dozen goats at the end of year 2002, after making the sales for that year, which of the following is true?

a. $p = q$ b. $p < q$ c. $p > q$ d. $p = \dfrac{q}{2}$

Directions for questions 23 and 24: Answer the questions on the basis of the information given below.
ACER Computer has two branches : One in Noida and second in Dwarka : The total number of employees in Noida office grew this year by 25% to 750 but the ratio of male to female employees is same as in the previous year. The number of employees in the Dwarka office grew this year by 9.09% to 1200. The ratio of male to female employees last year in the Dwarka office was 5 : 6 and the number of male employees in the Noida office was 20% less than that of Dwarka office.

23. The total number of female employees this year in both the offices is:
a. 654
b. 546
c. 950
d. Cannot be determined

24. The total number of employees in both the offices last year was:
a. 1500
b. 1700
c. 1650
d. Cannot be determined

25. I bought 5 pens, 7 pencils and 4 erasers. Rajan bought 6 pens, 8 erasers and 14 pencils for an amount which was half more than what I had paid. What percent of the total amount paid by me was paid for the pens.
a. 37.5%
b. 62.5%
c. 50%
d. None of these

26. Fresh grapes contain 80% water, while dry grapes contain 10% water. If the weight of dry grapes is 500 kg,   what is the total weight when they are fresh?
a. 2350 kg
b. 2085 kg
c.   2255 kg   d.   2250 kg

27. A college has raised 75% of the amount it needs for a new building by receiving an average donation of Rs. 600 from the people already solicited. The people already solicited represent 60% of the people the college will ask for donations. If the college is to raise exactly 25% of the amount needed for the new building, what should be the average donation from the remaining people to be solicited?
a. Rs. 300   b. Rs. 250   c. Rs. 400   d. Rs. 500

28. A student took five papers in an examination, where the full marks were the same for each paper. His marks in these papers were in the proportion of 6 : 7 : 8 : 9 : 10. In all papers together, the candidate obtained 60% of the total marks. Then the number of papers in which he got more than 50% marks is:
a. 2   b. 3   c. 4   d. 5

29. Out of the total production of iron from haematite, an ore of iron, 20% of the ore gets wasted. Out of the remaining iron, only 25% is pure iron. If the pure iron obtained in a year from a mine of haematite was 80000 kg, then the quantity of haematite mined in the year is:
a. 400000 kg
b. 500000 kg
c. 450000 kg
d. 600000 kg

30. There are two types of employees in Sun Metals, general graduates and engineers. 40% of the employees in Sun Metals are general graduates, and 75% of the engineers earn more than Rs. 5 lakh/year. If 50% of the organisation's employees earn more than Rs. 5 lakh/year, what proportion of the general employed by the organisation earn Rs. 5 lakh or less?
a. 3/5
b. 3/4
c. 1/2
d. None of the above

Practice Exercise – Difficult

1. A poll was conducted among the respondents as to who among the two, *A* and *B*, would best fill the top spot, in the eventuality of the top leader stepping down. It was found that 64% of the rest respondents favoured *A* as their leader while the favoured *B*. In another poll conducted two days later, it was found that 20% of *A*'s supporters had shifted support to *B*, while 15% of *B*'s supporters had shifted their support to *A*. What minimum percentage of the total respondents must *B* now attract in order to tie with *A*?

   a. 23.2   b. 13.2   c.   11.6   d.   None of the above

2. The number of votes not cast for the Praja Party increased by 25% in the National General Election over those not cast for it in the previous Assembly Polls, and the Praja 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 Praja Party in the Assembly Elections.

   a. 1,10,000   b.   1,50,000
   c. 1,40,000   d.   1,20,000

3. In a MAT paper a student gets 1 mark for every correct answer but $\dfrac{1}{4}$ mark is deducted for every wrong answer. A students, solving 120 questions, gets a score of 90. But next year due to change in the test pattern, the student gets 1 mark for every correct answer and 1 mark is deducted for every wrong answer. By how much percent should he increase his number of attempts to get the same marks? (Assume accuracy rate remains the same.)

   a. 20%   b. 30%
   c. 25%   d. None of these

Directions for questions 4 and 5: Answer the questions on the basis of the information given below.
In an examination, there are 100 questions divided into three groups *A*, *B* and *C* such that each group contains at least one question. Each question in group a carries 1 mark, each question in group *B* carries 2 marks and each question in group *C* carries 3 marks. It is known that the questions in group *A* together carry at least 60% of the total marks.

4. If group *B* contains 23 questions, then how many questions are there in group *C*?

   a. 1   b. 2
   c. 3   d. Cannot be determined

[CAT 2004]

5. If group *C* contains 8 questions and group *B* carries at least 20% of the total marks, which of the following best describes the number of questions in group *B*?

   a. 11 or 12   b. 12 or 13
   c. 13 or 14   d. 14 or 15

[CAT 2004]

6. In a MNC firm, the average salaries per month for the three classes of employees are: Managers Rs. 1200; Associates Rs. 450; Bearers Rs. 180; and the average salary per month for all the employees of the three classes of the firm is Rs. 440. A new scale of pay is introduced wherein the salary of an manager is raised by Rs. 60 per month, that of a associate by Rs. 30 per month, and that of a bearer by Rs. 20 per month. The new average salary per month of all the employees of the three classes is Rs. 470. What percentage of the total of the three classes of employees of the firm are of managers?

   a. $16\dfrac{3}{4}\%$ b. $16\dfrac{2}{4}\%$ c. $16\dfrac{1}{6}\%$ d. $16\dfrac{2}{3}\%$

Directions for questions 7 and 8: Use the following data to answer the given question.
There are less than 12000 students in a particular university. Exactly 0.100100100......% of them study all the time, while exactly 27.272727......% of them study only during the exam time, and the rest do not study at all. Based on this information, answer the questions that follow.

7. How many students could be there in the University?

   a. 11429   b. 7788   c. 10681   d. 10989

8. How many students do not study at all?

a. 7981   b. 7434   c. 7721   d. 7642

9. In fresh grapes, 70% of weight is because of water and in dried grape 40% weight 1 kg because of water. In a basket 60% of the weight is fresh grapes and rest is because of dried grapes. What is the percentage reduction in weight if all the fresh grapes turn into dried grapes?

a. 30%   b. 50%   c. 40%   d. 20%

10. A commodity exhibited the following percentage changes in a particular year - first increased a%, next increased by b%, further decreased by a_1% and yet again by b_1%. What is the net percentage change in the price of the commodity over year if $a \times b = 200$?

a. $-a-b-1$

b. $-a-b+1$

c. $\dfrac{+a^2+b^2-1}{100}$

d. $\dfrac{-a^2-b^2+1}{100}$

11. The volume of the sphere Q is $\dfrac{19}{27}$ or times less than the volume of sphere P and volume of sphere R is or times less than that of sphere Q. By what percentage is surface area of sphere R is $\dfrac{7}{8}$ less than surface area of P?

a. 90%   b. 70%   c. 77.77%   d. 88.88%

12. A Techno Company has 14 machines of equal efficiencies is its factory. The annual manufacturing costs are Rs. 42,000 and establishment charges are Rs. 12,000. The annual output of the company is Rs. 70,000. The annual output and manufacturing costs are directly proportional to the number of machines. The shareholders gets 12.5% profit, which is directly proportional to the annual output of the company.

If 14.28% machines remain closed throughout the year, then the percentage decrease in the amount of profit of the shareholder would be?

a. 12.5%   b. 25%   c. 37.5%   d. 50%

13. Chintu starts a month with provisions expected to last for the entire month. After few days, it is discovered that the provisions will in fact short by 12 days and it is calculated that if the stock of provisions left is immediately tripled, it will be possible to exactly make up for the shortfall. If the stock of provisions left is doubled instead of being tripled, and simultaneously the strength of the Chintu is decreased by 25%, then the provisions will fall short by:

a. 1 days   b. 2 days   c. 3 days   d. 4 days

14. On a train journey, there are 5 kinds of tickets AC-I, AC-II and AC-III, 3-tier and general. The relationship between the rates of the tickets for the same are:

AC-II is 30% higher than the AC-III and AC-I is 70% of AC-III's value higher than the AC-II ticket's value.

The 3-tier tickets is 20% of AC-I's ticket cost and the general ticket is $\dfrac{1}{5}$ the price of the AC-II ticket.

The AC-II ticket cost 650 euros between New York and Washington.
The difference in the rates of 3-tier and general tickets is:

a. 50   b. 60   c. 70   d. 80

15. For the above question, the total cost of one ticket of each class would be:

a. 2280   b. 2000   c. 1820   d. 2480