PERCENTAGES, SIMPLE INTEREST AND COMPOUND INTEREST

Concepts

- To convert any fraction (a/b) to percentage, multiply it by 100. For example, ½ x 100% = 50%
- To convert a percent to fraction, divide it by 100. For example, 8% = 8/100.
- Percentage of a number is the product of equivalent fraction and the number. For example, 25% of 500 = (25/100) x 500 = 125.
- Percentage increase/decrease
  - ✓ If any number is increased by i%, then, New number = Initial number [1 + (i/100)]
  - ✓ If any number is decreased by d%, then New number = Initial number [1 – (d/100)]
- If the price of a commodity increases by a%, then the reduction in consumption so as not to increase expenditure is [a/(100 + a)] x 100 %
- If the price of a commodity decreases by a%, then the increase in consumption so as not to decrease expenditure is [a/(100 - a)] x 100 %
- If A is R% more than B, then B is less than A by [R/(100 + R)] x 100 %
- If A is R% less than B, then B is more than A by [(R/(100 - R)] x 100 %
- If the population of a town is P now and suppose it increases at the rate of R% per annum, then
  - ✓ Population after 'n' years = $P(1 + r/100)^n$
  - ✓ Population 'n' years ago = $P/(1 + r/100)^n$
- Simple Interest = Pnr/100
- Compound Interest = $P [1 - r/100]^n - P$
- Amount with CI = $P [1 + r/100]^n$
- Amount with SI = P + [Pnr/100]
- When rate of interest is compounded a times an year, amount= $P [1 + r/(a \times 100)]^{an}$
- When rate of interest is r_1%, r_2% and r_3% for 1st year, 2nd year and 3rd year respectively. Amount after 3 year = $P [1 + r_1/100] \times [1 + r_2/100] \times [1 + r_3/100]$

Drill

1. Calculate 25% of 80 _____
2. If 15% of apples are bad, out of 200 apples, how many apples are bad? _____
3. Express 3/8 in percentage form _____
4. Express 62.5% as a fraction _____
5. Express 1.25 in percentage form _____
6. The price of a pen is increased from Rs. 5 to Rs. 7. What is the percentage increase?
7. The number of employees in a company decreased from 40 to 28. What is the percentage decrease in the number of employees?
8. Salary of X is 20% more than that of Y. By what percentage is the salary of Y lesser than X?
9. Coconut oil is now being sold at Rs. 27 per kg. During last month, its cost was Rs. 24 per kg. Find by how much percent a family should reduce its consumption, to keep the expenditure the same.
10. A car increases its speed by 25%. After that, it again increases its speed by 20%. By what percentage is the car's final speed greater than its original speed?
11. Interest rates jump from 10% to 12%
    a. What is the percentage increase?
    b. What is the increase in terms of percentage points?
    c. What is the increase in terms of basis points?
12. The table below shows the population (in thousands) of a town over a 5 - year period. Which of the given years registered the maximum percentage change over the previous year?

Year	2002	2003	2004	2005	2006
Production	80	120	110	150	200

13. A man took a loan from a bank at the rate of 12% p.a. simple interest. After 3 years, he had to pay Rs. 5400 as interest for the period. What was the principal amount borrowed by him?
14. How much time will it take for an amount of Rs. 450 to yield Rs. 81 as interest at the rate of 4.5% p.a. simple interest?
15. An amount of Rs. 2400 is due after 6 years under simple interest at 10%p.a. Find its present value.
16. The compound interest on Rs. 30000 at 7% p.a. is Rs. 4347. The period (in years) is _____
17. At what rate of interest p.a. under C.I. will a sum of Rs. 1200 become Rs. 1348.32 in 2 years?
18. A man invests Rs. 10000 in an account that pays 8% interest per year, compounded quarterly. What is the amount of money that he will have after 1.5 years?
19. If a sum of money doubles itself in 5 years, in how many years does it becomes 8 times the original?
20. If the simple interest on a sum of money for 2 years at 5% p.a. is Rs. 50, what is the compound interest on the same amount at the same rate of interest and for the same time?
21. Given the difference between SI and CI for 2 years on the same sum and at the same rate of interest, compounded annually is Rs. 120. The difference between SI and CI for 3 years on the same sum and at the same rate of interest is Rs. 366. Find the rate of interest.

Concept review questions

1. If 45 is 120% of a number, then what is 80% of the same number?

   a. 30 b. 32 c. 36 d. 38

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

   a.6400 b. 6000 c. 5800 d. 6600

3. Two students appeared for an examination. One of them secured 9 marks more than the other and his score was 56% of the sum of their marks. The marks obtained by them are:

   a. 39, 30 b. 43, 32 c.42, 33 d. 43, 34

4. Peter got 30% of the maximum marks in an examination and failed by 10 marks. However, Paul, who took the same

examination, got 40% of the total marks and got 15 marks more than the pass mark. What was the pass mark in the examination?

a. 75 b. 250 c. 90 d. 85

5. A shepherd has 1 million sheep at the beginning of the year 2000. The numbers grow by x%, (x > 0) during the year. A famine hits his village in the next year and many of his sheep die. The sheep population decreases by y% during 2001 and at the beginning of 2002 the shepherd finds that he is left with 1 million sheep. Which of the following is correct?

a. y>x b. x=y c. x>y d. xy=0

6. If the price of petrol increases by 25% and Kevin intends to spend only an additional 15% on petrol, then by what percentage must he reduce the quantity of petrol purchased?

a. 6.67% b. 10% c. 8% d. None

7. A vendor sells 60% of apples he had and throws away 15% of the remaining apples. Next day, he sells 50% of the remaining apples and throws away the rest. What % of the apples does the vendor throw away?

a. 23 b. 17 c. 77 d. 29

8. In how many years will a sum double itself at 12.5% p.a. simple interest?

a. 4 b. 8 c. 10 d. 16

9. Divide Rs. 3000 into two parts such that, the simple interest on the first part for 4 years at 8% per annum is equal to the simple interest on the second part for 2 years at 9% per annum.

a. 1000, 2000 b. 1280, 1720 c. 1160, 1840 d. 1080, 1920

10. Meena deposited a sum of Rs. 8000 in a bank paying simple interest. After one year, she withdraws Rs. 2000. At the end of 3 years, she received Rs. 7800. Find the rate of interest, assuming that she never collected her interests till then.

a. 9% b. 8% c. 10% d. 12%

11. A man invests Rs. 5000 for three years at a certain rate of interest, compounded annually. At the end of one year it amounts to Rs. 5600. Calculate the amount due at the end of the second year.

a. Rs.6200 b. Rs.6272 c. Rs.6260 d. Rs.6320

12. Find the amount due on Rs. 8000 in 2 years if the rate of interest is 10% for the first year and 12% for the second year.

a. Rs.9716 b. Rs.9856 c. Rs.10156 d. Rs.9756

13. Find the difference between S.I. and C.I. on Rs. 2500 for 2 years at 4% p.a., compound interest, interest being compounded semi-annually.

a. Rs.4.00 b. Rs.6.08 c. Rs.4.68 d. Rs.5.88

14. A man invests Rs. 6500 for 3 years at 4.5% p.a. compound interest, compounded annually. 20% is deducted at the end of each year from this investment for expenditures. Find the amount due at the end of the third year.

a. Rs. 3688.24 b. Rs. 4946.62 c. Rs. 3797.80 d. Rs. 5244.04

15. A sum of Rs. 550 was taken as a loan. This is to be paid back in two equal installments. If the rate of interest is 20% p.a. compound interest, being compounded annually, then the value of each installment is:

a. Rs.421 b. Rs.300 c. Rs.360 d. Rs.350