Percentage

INTRODUCTION

The term *per cent* means per hundred or for every hundred. It is the abbreviation of the Latin phrase *per centum*.

Scoring 60 per cent marks means out of every 100 marks the candidate scored 60 marks.

The term per cent is sometimes abbreviated as p.c. The symbol % is often used for the term per cent.

Thus, 40 per cent will be written as 40%

A fraction whose denominator is 100 is called a *percentage* and the numerator of the fraction is called *rate per cent*, e.g. $\frac{5}{100}$ and 5 % means the same thing, i.e., 5 parts out of every hundred parts.

SOME BASIC FORMULAE

1. To convert a fraction into a per cent:

To convert any fraction $\frac{l}{m}$ to rate per cent, multiply it by 100 and put % sign, i.e., $\frac{l}{m} \times 100\%$

Illustration 1 What percentage is equivalent to $\frac{3}{5}$?

Solution: $\frac{3}{5} \times 100 = 60\%$

2. To convert a per cent into a fraction:

To convert a per cent into a fraction, drop the per cent sign and divide the number by 100.

Illustration 2 What fraction is $16\frac{2}{3}\%$?

Solution: $16\frac{2}{3}\% = \frac{\left(\frac{50}{3}\right)}{100} = \left(\frac{50}{3} \times \frac{1}{100}\right) = \frac{1}{6}$

3. To find a percentage of a given number:

x % of given number (N) $= \frac{x}{100} \times$ N.

Illustration 3 75% of 400 = ?

Solution: 75% of 400 $= \frac{75}{100} \times 400 = 300$

Illustration 4 Find a number whose 4% is 72

Solution: Let the required number be x

Then, 4% of $x = 72$

$\Rightarrow \frac{4}{100} \times x = 72 \Rightarrow x = \frac{100}{4} \times 72 = 1800$

Illustration 5 What per cent of 25 kg is 3.5 kg?

Solution: Let x% of 25 kg be 3.5 kg.

Then, x% of 25 kg = 3.5 kg

$\Rightarrow \frac{x}{100} \times 25 = 3.5 \Rightarrow x = \frac{3.5 \times 100}{25} = 14$

Hence, 3.5 kg is 14% of 25 kg

SOME USEFUL SHORT-CUT METHODS

1. (*a*) If A is $x\%$ more than that of B, then B is less than that of A by

$$\left[\frac{x}{100+x}\times 100\right]\%$$

(*b*) If A is $x\%$ less than that of B, then B is more than that of A by

$$\left[\frac{x}{100-x}\times 100\right]\%$$

Explanation

Given $$A = B + \frac{x}{100}B = \frac{100+x}{100}B$$

$$\therefore \quad A - B = \frac{100+x}{100}B - B$$

$$= \left(\frac{100+x}{100} - 1\right)B = \frac{x}{100}B$$

So, $$\frac{A-B}{A} = \frac{\frac{x}{100}B}{\frac{100+x}{100}B} = \frac{x}{100+x}$$

$$\Rightarrow \quad A - B = \left(\frac{x}{100+x}\times 100\right)\% \text{ of } A$$

Therefore, B is less than that of A by

$$\left(\frac{x}{100+x}\times 100\right)\%$$

Similarly, (*b*) can be proved.

Illustration 6 If Mohan's salary is 10% more than that of Sohan, then how much per cent is Sohan's salary less than that of Mohan?

Solution: Here $x = 10$

$$\therefore \text{ Required answer } = \left(\frac{x}{100+x}\times 100\right)\%$$

$$= \left(\frac{10}{100+10}\times 100\right)\%$$

$$= 11\frac{1}{9}\%$$

Illustration 7 If A's income is 40% less than B's income, then how much per cent is B's income more than A's income?

Solution: Here $x = 40$

$$\therefore \text{ Required answer } = \left(\frac{x}{100-x}\times 100\right)\%$$

$$= \left(\frac{40}{100-40}\times 100\right)\%$$

$$= 66\frac{2}{3}\%$$

2. If A is $x\%$ of C and B is $y\%$ of C, then

$$A = \frac{x}{y} \times 100\% \text{ of } B.$$

Explanation

Given $$A = \frac{x}{100}C \Rightarrow C = 100\frac{A}{x}$$

and, $$B = \frac{y}{100}C \Rightarrow C = 100\frac{B}{y}$$

$$\therefore \quad C = 100\frac{A}{x} = 100\frac{B}{y} \Rightarrow A = \frac{x}{y}B$$

or, $$\frac{x}{y} \times 100\% \text{ of } B$$

Illustration 8 If A is 20% of C and B is 25% of C, then what percentage is A of B?

Solution: Here $x = 20$ and $y = 25$

$$A = \frac{x}{y} \times 100\% \text{ of } B$$

$$= \frac{20}{25} \times 100\% \text{ of } B, \text{ i.e., } 80\% \text{ of } B$$

3. (*a*) If two numbers are, respectively, $x\%$ and $y\%$ more than a third number, then the first number is $\left(\frac{100+x}{100+y}\times 100\right)\%$ of the second and the second is $\left(\frac{100+y}{100+x}\times 100\right)\%$ of the first.

(*b*) If two numbers are, respectively, $x\%$ and $y\%$ less than a third number, then the first number is $\left(\frac{100-x}{100-y}\times 100\right)\%$ of the second and the second is $\left(\frac{100-y}{100-x}\times 100\right)\%$ of the first.

Explanation

Let A, B and C be the three numbers.

Given

$$A = C + \frac{x}{100}C = \left(\frac{100+x}{100}\right)C \Rightarrow C = A\left(\frac{100}{100+x}\right)$$

and, $$B = C + \frac{y}{100}C = \left(\frac{100+y}{100}\right)C \Rightarrow C = B\left(\frac{100}{100+y}\right)$$

$$\therefore \quad A\left(\frac{100}{100+x}\right) = B\left(\frac{100}{100+y}\right)$$

$$\Rightarrow \quad A = \left(\frac{100+x}{100+y}\right)B \text{ or } \left(\frac{100+x}{100+y}\right) \times 100\% \text{ of } B$$

and, $$B = \left(\frac{100+y}{100+x}\right)A \text{ or } \left(\frac{100+y}{100+x}\right) \times 100\% \text{ of } A$$

Similarly, (b) can be proved.

Illustration 9 Two numbers are respectively 20% and 50% more than a third number. What per cent is the first of the second?

Solution: Here $x = 20$ and $y = 50$.

$$\therefore \quad \text{First number} = \left(\frac{100+x}{100+y}\right) \times 100\% \text{ of the second}$$

$$= \left(\frac{100+20}{100+50}\right) \times 100\% \text{ of the second}$$

i.e., 80% of the second

Illustration 10 Two numbers are, respectively, 32% and 20% less than a third number. What per cent is the first of the second?

Solution: Here $x = 32$ and $y = 20$.

$$\therefore \quad \text{First number} = \left(\frac{100-x}{100-y} \times 100\right)\% \text{ of the second}$$

$$= \left(\frac{100-32}{100-20} \times 100\right)\% \text{ of the second}$$

i.e., 85% of the second

4. (a) If the price of a commodity increases by P%, then the reduction in consumption so as not to increase the expenditure is

$$\left(\frac{P}{100+P} \times 100\right)\%$$

(b) If the price of a commodity decreases by P%, then the increase in consumption so as not to decrease the expenditure is

$$\left(\frac{P}{100-P} \times 100\right)\%$$

Explanation

Let the original price of the commodity be ₹ 100.

Then, the increased price $= 100 + \frac{P}{100} \times 100$

$= ₹ (100 + P)$

Therefore, to keep the price unchanged, there should be a reduction in the consumption of the commodity by ₹ P.

$\because$ Decrease in ₹ $(100 + P)$ = ₹ P

$\therefore$ Decrease in ₹ 100 $= \frac{P}{100+P} \times 100$

$\therefore$ Required reduction in consumption is

$$\left(\frac{P}{100+P} \times 100\right)\%$$

Similarly, (b) part can be proved.

Illustration 11 If the price of sugar increases by 25%, find how much per cent its consumption be reduced so as not to increase the expenditure

Solution: Reduction in consumption

$$= \left(\frac{P}{100+P} \times 100\right)\%$$

$$= \left(\frac{25}{100+25} \times 100\right)\% \text{ or } 20\%$$

Illustration 12 If the price of a commodity decreases by 25%, find how much per cent its consumption be increased so as not to decrease the expenditure

Solution: Increase in consumption

$$= \left(\frac{P}{100-P} \times 100\right)\%$$

$$= \left(\frac{25}{100-25} \times 100\right)\% \text{ or } 33\frac{1}{3}\%$$

5. If a number is changed (increased/decreased) successively by x% and y%, then net % change is given by $\left(x + y + \frac{xy}{100}\right)\%$ which represents increase or decrease in value according as the sign is +ve or –ve.

If x or y indicates decrease in percentage, then put –ve sign before x or y, otherwise +ve sign.

Explanation

Let the given number be N.

If it is increased by x%, then it becomes

$$N + x\% \text{ of } N = N + \frac{Nx}{100} = \frac{N(x+100)}{100}$$

If it is further increased by $y\%$, then it becomes

$$\frac{N(x+100)}{100}+\frac{y}{100}\times\frac{N(x+100)}{100}$$

$$=\frac{N(x+100)(y+100)}{(100)^2}$$

$\therefore$ Net change $=\dfrac{N(x+100)(y+100)}{(100)^2}-N$

$$=\frac{N(100x+100y+xy)}{(100)^2}$$

$\therefore$ % change $=N\left(x+y+\dfrac{xy}{100}\right)\times\dfrac{1}{100}\times\dfrac{100}{N}$

$$=\left(x+y+\frac{xy}{100}\right)\%$$

Illustration 13 If salary of a person is first increased by 15% and thereafter decreased by 12%, what is the net change in his salary?

Solution: Here $x = 15$ and $y = -12$

$\therefore$ The net change in the salary

$$=\left(x+y+\frac{xy}{100}\right)\% =\left(15-12-\frac{15\times12}{100}\right)\% \text{ or } 1.2\%$$

Since the sign is +ve, the salary of the person increases by 1.2%

Illustration 14 The population of a town is decreased by 25% and 40% in two successive years. What per cent population is decreased after two years?

Solution: Here $x = -25$ and $y = -40$.

$\therefore$ The net % change in population

$$=\left(x+y+\frac{xy}{100}\right)\%$$

$$=\left(-25-40+\frac{25\times40}{100}\right)\% \text{ or } -55\%$$

Since the sign is –ve, there is decrease in population after two years by 55%

6. If two parameters A and B are multiplied to get a product and if A is changed (increased/decreased) by $x\%$ and another parameter B is changed (increased/decreased) by $y\%$, then the net % change in the product ($A \times B$) is given $\left(x+y+\dfrac{xy}{100}\right)\%$ which represents increase or decrease in value according as the sign in +ve or –ve.

If x or y indicates decrease in percentage, then put –ve sign before x or y, otherwise +ve sign.

Illustration 15 If the side of a square is increased by 20%, its area is increased by $k\%$ Find the value of k

Solution: Since side × side = area

$\therefore$ Net % change in area

$$=\left(x+y+\frac{xy}{100}\right)\% =\left(20+20+\frac{20\times20}{100}\right)\%$$

[Here $x = 20$ and $y = 20$]

$= 44\%$

Therefore, the area is increased by 44%

Here $k = 44$

Illustration 16 The radius of a circle is increased by 2% Find the percentage increase in its area

Solution: Since $\pi \times$ radius × radius = area

$\therefore$ Net % change in area

$$=\left(x+y+\frac{xy}{100}\right)\% =\left(2+2+\frac{2\times2}{100}\right)\%$$

[Here $x = 2$ and $y = 2$]

$$=4\frac{1}{25}\%$$

Therefore, the percentage increase in area is $4\dfrac{1}{25}\%$.

Illustration 17 The tax on a commodity is diminished by 15% and its consumption increases by 10% Find the effect on revenue

Solution: Since tax × consumption = revenue

$\therefore$ Net % change in revenue

$$=\left(x+y+\frac{xy}{100}\right)\% =\left(-15+10-\frac{15\times10}{100}\right)\%$$

[Here $x = -15$ and $y = 10$]

$= -6.5\%$

$\therefore$ The revenue decreases by 6.5%

7. If the present population of a town (or value of an item) be P and the population (or value of item) changes at $r\%$ per annum, then

(a) Population (or value of item) after n years

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

(b) Population (or value of item) n years ago

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

where r is +ve or –ve according as the population (or value of item) increases or decreases.

Explanation

Population at the end of first year

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

Now, the population at the beginning of second year

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

$\therefore$ Population at the end of second year

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

$$\vdots \qquad \vdots \qquad \vdots$$

Population at the end of n years $= P\left(1+\frac{r}{100}\right)^n$

Illustration 18 The population of a town increases 5% annually. If its present population is 84000, what will it be in 2 years time?

Solution: Here $P = 84000$, $r = 5$ and $n = 2$

$\therefore$ Population after 2 years

$$= P\left(1+\frac{r}{100}\right)^n = 84000\left(1+\frac{5}{100}\right)^2$$

$$= 84000 \times \frac{105}{100}\times\frac{105}{100} = 92610$$

Illustration 19 The population of a town increases at the rate of 5% annually. If the present population is 4410, what it was 2 years ago?

Solution: Here $P = 4410$, $r = 5$ and $n = 2$.

$\therefore$ Population of the town 2 years ago

$$= \frac{P}{\left(1+\frac{r}{100}\right)^n} = \frac{4410}{\left(1+\frac{5}{100}\right)^2} = \frac{4410}{\frac{105}{100}\times\frac{105}{100}} = 4000$$

8. If a number A is increased successively by x% followed by y% and then by z%, then the final value of A will be

$$A\left(1+\frac{x}{100}\right)\left(1+\frac{y}{100}\right)\left(1+\frac{z}{100}\right)$$

In case a given value decreases by any percentage, we will use a negative sign before that.

Illustration 20 The population of a town is 144000. It increases by 5% during the first year. During the second year, it decreases by 10% and increases by 15% during the third year. What is the population after 3 years?

Solution: Here $P = 144000$, $x = 5$, $y = -10$ and $z = 15$

$\therefore$ Population after 3 years

$$= A\left(1+\frac{x}{100}\right)\left(1+\frac{y}{100}\right)\left(1+\frac{z}{100}\right)$$

$$= 144000\left(1+\frac{5}{100}\right)\left(1-\frac{10}{100}\right)\left(1+\frac{15}{100}\right)$$

$$= \frac{144000\times105\times90\times115}{100\times100\times100} = 156492$$

9. In an examination, the minimum pass percentage is x% If a student secures y marks and fails by z marks, then the maximum marks in the examination is $\frac{100(y+z)}{x}$.

Explanation

Let the maximum marks be m

Given x% of $m = y + z$

$$\Rightarrow \qquad \frac{x}{100}\times m = y+z \text{ or } m = \frac{100(y+z)}{x}$$

Illustration 21 In an examination, a student must get 60% marks to pass. If a student who gets 120 marks, fails by 60 marks, find the maximum marks

Solution: Here $x = 60$, $y = 120$ and $z = 60$.

$\therefore$ Maximum marks

$$= \frac{100(y+z)}{x} = \frac{100(120+60)}{60} = \frac{100\times180}{60} = 300$$

10. In an examination x% and y% students respectively fail in two different subjects while z% students fail in both the subjects, then the percentage of students who pass in both the subjects will be $(100 - (x + y - z))$%

Explanation

% of students who failed in one subject only $= (x - z)$%

% of students who failed in other subject only $= (y - z)$%

% of students who failed in both the subjects $= z$%

$\therefore$ % of students who passed in both the subjects

$= [100 - [(x - z) + (y - z) + z]]$%

$= (100 - (x + y - z))$%

Illustration 22 In an examination, 42% students failed in Mathematics and 52% failed in Science. If 17% failed in both the subjects, find the percentage of those who passed in both the subjects

Solution: Here $x = 42$, $y = 52$ and $z = 17$

$\therefore$ Percentage of students passing both the subjects.

$= (100 - (x + y - z))$%

$= (100 - (42 + 52 - 17))$% or, 23%

Practice Exercises

Difficulty Level-1 (Based on Memory)

1. The population of a city increases at the rate of 4% per annum. There is an additional annual increase of 1% in the population due to the influx of job seekers. Therefore, the per cent increase in the population after 2 years will be:

(*a*) 10 (*b*) 10.25
(*c*) 10.50 (*d*) 10.75

[Based on MAT, 2004]

2. Three papers were set in an examination and the maximum marks per paper were in the ratio of 1:2:2, respectively. If a student obtained 50% in the first paper, 60% in the second, and 65% in the third, what per cent did he obtain overall?

(*a*) 58.3% (*b*) 66.66%
(*c*) 33.33% (*d*) 60%

3. A recipe gives directions to mix 4 parts of substance *A* with 7 parts of substance *B*. These substances are to be taken by weight, but by mistake they were taken by volume. Find the error in the percentage of the weight of *A* in the mixture, if 117 cm^3 of the substance *A* weighs as much as 151 cm^3 of the substance *B*.

(*a*) 5.05% (*b*) 6.00%
(*c*) 7.05% (*d*) None of these

[Based on MAT, 2003]

4. A manufacturer offers a 20% rebate on the marked price of a product. The retailer offers another 30% rebate on the reduced price. The two reductions are equal to a single reduction of:

(*a*) 50% (*b*) 44%
(*c*) 46% (*d*) 40%

[Based on MAT, 2002]

5. Ram's weight is 140% of Manu's weight. Tanu's weight is 90% of Mahesh's weight. Mahesh weighs twice as much as Manu. What percentage of Ram's weight is Tanu's weight?

(*a*) 64.3% (*b*) 77.8%
(*c*) 90% (*d*) 128.6%

6. If *A*'s salary is 25% higher than *B*'s salary, then how much per cent is *B*'s salary lower than *A*'s?

(*a*) 15% (*b*) 20%
(*c*) 25% (*d*) $33\frac{1}{3}\%$

[Based on MAT, 2001]

7. A businessman's earning increases by 25% in one year but decreases by 4% in the next. After 5 years his total earnings would be ₹72,000. What is his present earning?

(*a*) ₹10,000 (*b*) ₹80,000
(*c*) ₹40,000 (*d*) ₹54,000

8. A reduction of 20% in the price of sugar enables a purchaser to obtain $2\frac{1}{2}$kg more for ₹160. Find the original price per kg of sugar.

(*a*) ₹12 (*b*) ₹15
(*c*) ₹16 (*d*) ₹18

[Based on MAT, 2001]

9. Successive discounts of 20% and 15% are equivalent to a single discount of:

(*a*) 35% (*b*) 32%
(*c*) 17.5% (*d*) 17%

[Based on MAT, 2001]

10. X's salary is increased by 20% On the increase, the tax rate is 10% higher. Find the percentage of increase in the tax liability.

(*a*) 20 (*b*) 22
(*c*) 23 (*d*) Indeterminate

[Based on MAT, 2001]

11. Vishal goes to a shop to buy a radio costing ₹2568. The rate of sales tax is 7% He tells the shopkeeper to reduce the price of the radio to such an extent that he has to pay ₹2568, inclusive of sales tax. Find the reduction needed in the price of the radio.

(*a*) ₹179.76 (*b*) ₹170
(*c*) ₹168 (*d*) ₹169

[Based on MAT, 2001]

12. Sunder purchased an office bag with a price tag of ₹600 in a sale where 25% discount was being offered on the tag price. He was given a further discount of 10% on the amount arrived at after giving usual 25% discount. What was the final amount paid by Sunder?

(*a*) ₹210 (*b*) ₹540
(*c*) ₹405 (*d*) ₹450

[Based on MAT, 2001]

13. A shopkeeper has certain number of eggs of which 5% are found to be broken. He sells 93% of the remainder and still has 266 eggs left. How many eggs did he originally have?

(*a*) 3800 (*b*) 4000
(*c*) 4200 (*d*) None of these

[Based on IIT Joint Main. Ent. Test, 2004]

14. If 3/5 of a number is 23 more than 50% of the same number, then what will be 80% of the number?

(*a*) 92 (*b*) 184

(*c*) 180 (*d*) 186

[Based on IIT Joint Man. Ent. Test, 2004]

15. One kg of tea and one kg of sugar together cost ₹95. If the price of tea falls by 10% and that of sugar rises by 20%, then the price of one kg of each combined comes to ₹90. The original price of tea in ₹per kg is:

(*a*) ₹72 (*b*) ₹55

(*c*) ₹60 (*d*) ₹80

[Based on IIT Joint Man. Ent. Test, 2004]

16. Two numbers are respectively 30% and 40% less than a third number. What is the second number as a percentage of the first?

(*a*) 70% (*b*) 75%

(*c*) $85\frac{5}{7}\%$ (*d*) $116\frac{2}{3}\%$

[Based on Narsee Monjee Inst. of Man. Studies, 2003]

17. If 1 micron = 10,000 angstroms, then 100 angstroms is what per cent of 10 microns?

(*a*) 0.0001% (*b*) 0.001%

(*c*) 0.01% (*d*) 0.1%

[Based on REC Tiruchirapalli, 2003]

18. A man walked diagonally across a square lot. Approx., what was the per cent saved by not walking along the edges?

(*a*) 30 (*b*) 20

(*c*) 33 (*d*) 24

[Based on REC Tiruchirapalli, 2003]

19. If 1/4th of x equals 30% of y which is intern equal to 45% of z, then x as a percentage of z is:

(*a*) 160% (*b*) 170%

(*c*) 180% (*d*) 190%

20. If the numerator of a fraction is increased by 20% and the denominator is diminished by 10%, then the value of the fraction is 16/21. The original fraction is:

(*a*) $\frac{3}{5}$ (*b*) $\frac{4}{7}$

(*c*) $\frac{2}{3}$ (*d*) $\frac{5}{7}$

[Based on FMS (Delhi), 2003]

21. At what percentage above the cost price must an article be marked so as to gain 33% after allowing the customer a discount of 5%?

(*a*) 48% (*b*) 43%

(*c*) 40% (*d*) 38%

[Based on IIFT, 2003]

22. In a group of 20 singers and 40 dancers, 20% of the singers are less than 25 years old and 40% of the entire group are under 25 years. What percentage of dancers are under 25 years?

(*a*) 20% (*b*) 40%

(*c*) 50% (*d*) 60%

[Based on IIFT, 2003]

23. Tom's salary is 125% of Tina's salary. Tito's salary is 80% of Tina's salary. The total of all the three salaries is ₹61,000. What is Tito's salary?

(*a*) ₹16,000 (*b*) ₹16,500

(*c*) ₹15,500 (*d*) ₹15,000

[Based on IIFT, 2003]

24. Mayur weighs twice as much as Shweta. Shweta's weight is 60% of Deepika's weight. Rakesh weighs 50% of Vikas's weight. Vikas weighs 190% of Mayur's weight. Which of these people weighs the least?

(*a*) Mayur (*b*) Deepika

(*c*) Shweta (*d*) Rakesh

[Based on SCMHRD Ent. Exam., 2003]

25. What percentage of numbers from 1 to 70 have squares that end in the digit 1?

(*a*) 20 (*b*) 14

(*c*) 1 (*d*) 21

[Based on SCMHRD Ent. Exam., 2003]

26. If X is increased to 23 from 20, then Y should increase from 100 to:

(*a*) 103 (*b*) 106

(*c*) 109 (*d*) 112

[Based on IMT Ghaziabad, 2002]

27. Salary of an officer increases every year by 20% His salary in the year 2001 was ₹26640. What was his salary in 1999?

(*a*) ₹20000 (*b*) ₹19028

(*c*) ₹18500 (*d*) ₹18840

[Based on IRMA, 2002]

28. In a certain shop, which stocks four types of caps, there are one-third as many red caps as blue and half as many green caps as red caps. There are equal numbers of green caps and yellow caps. If there are 42 blue caps, then what per cent of the total caps in the shop are blue?

(*a*) 70% (*b*) 28%

(*c*) 60% (*d*) 14%

[Based on Narsee Monjee Inst. of Man. Studies, 2002]

29. A bag contains 600 pens of brand A and 1200 pens of brand B. If 12% of brand A pens and 25% of brand B pens are removed, then what is the approximate percentage of total pens removed from the bag?

(*a*) 37% (*b*) 36%

(*c*) 22% (*d*) 18%

[Based on Narsee Monjee Inst. of Man. Studies, 2002]

30. A invested 125% as much money as B. C invested 80% as much money as B. The total of all the three is 61,000. How much did C invest?

(a) 25000 (b) 16000

(c) 20000 (d) 45000

[Based on Narsee Monjee Inst. of Man. Studies, 2002]

31. In a municipal election, there were two candidates. One who got 30% of the votes polled was defeated by 16000 votes. Calculate the total number of votes polled.

(a) 24000 (b) 28000

(c) 30000 (d) 40000

[Based on I.P. Univ., 2002]

32. A person usually spent ₹48 to buy groundnuts for roasting and resale. On one occasion he could buy 1.5 kg of groundnuts less for ₹48 as the price had gone up by 25% What was the earlier price of groundnut per kg?

(a) ₹8 (b) ₹6.40

(c) ₹7.20 (d) None of these

[Based on I.P. Univ., 2002]

33. X, Y and Z shared ₹7400 so that X received 25% more than Y, and Y received 20% more than Z. What amount did Z receive?

(a) ₹3500 (b) ₹3000

(c) ₹2400 (d) ₹2000

[Based on I.P. Univ., 2002]

34. What would be the value of 20% of m as a percentage of p, if 8% of m = 4% of p?

(a) 80% (b) 16%

(c) 10% (d) None of these

[Based on I.P. Univ., 2002]

35. If S is 150% of T, then T is what per cent of $S + T$?

(a) $33\frac{1}{3}\%$ (b) 40%

(c) 75% (d) 80%

[Based on REC Tiruchirapalli, 2002]

36. At a school, 20% of the students are seniors. If all of the seniors attended the school play, and 60% of all the students attended the play, then what per cent of the non-seniors attended the play?

(a) 20% (b) 40%

(c) 50% (d) 100%

[Based on REC Tiruchirapalli, 2002]

37. In an examination a candidate got 30% marks and failed by 30 marks. If the passing marks are 60% of the total marks, then the maximium marks will be:

(a) 450 (b) 600

(c) 300 (d) 100

38. A rainy day occurs once in every 10 days. Half of the rainy days produce rainbows. What per cent of all the days do not produce rainbow?

(a) 95% (b) 10%

(c) 50% (d) 5%

[Based on SNAP, 2007]

39. A rabbit on a controlled diet is fed daily 300 g of a mixture of two foods, food X and food Y. Food X contains 10% protein and food Y contains 15% protein. If the rabbits diet provides exactly 38 g of protein daily, how many grams of food X are in the mixture?

(a) 100 (b) 150

(c) 200 (d) 140

[Based on ATMA, 2008]

40. In an examination paper of 5 questions, 5% of the candidates answered all of them and 5% none. Of the rest, 25% answered only 1 question and 20% answered only 4 questions. If $24\frac{1}{2}\%$ of the entire candidates answered only 2 questions and 200 candidates answered only 3 questions, how many candidates appeared at the examination?

(a) 1000 (b) 800

(c) 600 (d) 400

[Based on ATMA, 2008]

41. The contents of a certain box consist of 14 apples and 23 oranges. How many oranges must be removed from the box so that 70% of the pieces of fruit in the box will be apples?

(a) 12 (b) 6

(c) 17 (d) 36

[Based on ATMA, 2005]

42. Income tax is raised from 4 paise in a rupee but the revenue is increased by 10% only. Find the decrease per cent in the amount taxed.

(a) 12 (b) 14

(c) 16 (d) None of these

[Based on NMAT, 2006]

43. When income tax is 3 paise in a rupee, a person's net income is ₹23700. What will it be when the income tax is raised to 7 paise?

(a) ₹38 (b) ₹2330

(c) ₹3460 (d) None of these

[Based on NMAT, 2006]

44. A clothing supplier stores 800 coats in a warehouse of which 15% are full length coats. If 500 of the shorter length coats are removed from the warehouse, what per cent of the remaining coats is full-length?

(a) 35% (b) 9.37%

(c) 5.62% (d) 40%

[Based on NMAT, 2005]

45. Wheat is now being sold at ₹27 per kg. During last month its cost was ₹24 per kg. Find by how much per cent a family reduces its consumption so as to keep the expenditure fixed?

(*a*) 10.2% (*b*) 12.1%

(*c*) 12.3% (*d*) 11.1%

[Based on SNAP, 2009]

46. The total tractor production in a state is 294000, out of which 150000 are made by Mahindra and Mahindra. Out of every 1000 Mahindra tractors, 98 are red in colour, but only 53% of the total tractor production is red. Find the percentage of non-Mahindra tractors that are red out of total non-Mahindra tractors.

(*a*) 5.025% (*b*) 5.130%

(*c*) 0.6125% (*d*) 6.140%

[Based on MAT (Dec), 2008]

47. In an examination, 40% marks are required to pass. *A* obtains 10% less than the number of marks required to pass. *B* obtains $11\frac{1}{9}$ % less than *A* and *C* obtained $41\frac{3}{17}$ % less than the number of marks obtained by *A* and *B* together. What marks did *C* get?

(*a*) 50 (*b*) 40

(*c*) 35 (*d*) 45

[Based on MAT (Feb), 2011]

48. Mohan spends 40% of his salary on food items, 50% of the remaining on transport, 30% of the remaining, after spending on food and transport, he spends on clothes and saves the balance. If he saves ₹630 every month, what is his monthly salary?

(*a*) ₹1500 (*b*) ₹3000

(*c*) ₹5000 (*d*) ₹6500

[Based on MAT (Feb), 2011]

49. 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

[Based on MAT (Dec), 2010]

50. A man's income is increased by ₹1200 and at the same time, the rate of tax to be paid is reduced from 12% to 10% He now pays the same amount of tax as before. What is his increased income, if 20% of his income is exempted from tax in both cases?

(*a*) ₹6300 (*b*) ₹7200

(*c*) ₹4500 (*d*) ₹6500

[Based on MAT (Dec), 2010]

51. Vellu buys a generator for ₹100000 and rents it. He puts 12.5% of each month's rent aside for upkeep and repairs, pays ₹325 per year as taxes and realizes 5.5% annually on his investment. Find the monthly rent.

(*a*) ₹634.76 (*b*) ₹654.76

(*c*) ₹554.76 (*d*) ₹456.32

[Based on MAT (Dec 2010, May), 2009]

52. A person spends 40% of his salary on his educational expenses. He spends 60% of it in purchasing books and one-half of the remaining in purchasing stationery items. If he saves ₹160 every month, which is one-fourth of the balance after spending over books and stationery items, what is his monthly salary?

(*a*) ₹8000 (*b*) ₹4800

(*c*) ₹9600 (*d*) Data inadequate

[Based on MAT (Feb), 2010]

53. The tax on a commodity is diminished by 10% and its consumption increased by 10% The effect on the revenue derived from it is *K*% change. Find the value of *K*.

(*a*) 1 (*b*) 2

(*c*) –1 (*d*) –2

[Based on MAT (Sept), 2009]

54. A salesman's terms were changed from a flat commission of 5% on all his sales to a fixed salary of ₹1000 plus 2.5% commission on all sales exceeding ₹4000. If his remuneration as per the new scheme was ₹600 more than by the first scheme, what were his sales worth?

(*a*) ₹11000 (*b*) ₹17000

(*c*) ₹16000 (*d*) ₹12000

[Based on MAT (Sept), 2009]

55. If a bucket is 80% full, then it contains 2 litres more water than when it is $66\frac{2}{3}$% full. What is the capacity of the bucket?

(*a*) 10 l (*b*) 15 l

(*c*) $16\frac{2}{3}$ l (*d*) 20 l

[Based on MAT (Sept 2009, Dec), 2007]

56. A salesman averages ₹240 during a normal 40-hour week. During a sale, his rates are increased by 50% What is his commission if he puts in 60 hours during the sale?

(*a*) 390 (*b*) 540

(*c*) 600 (*d*) 640

[Based on MAT, 2000]

57. In an examination, it is required to get 296 of the total maximum aggregate marks to pass. A student gets 259 marks and is declared failed. The difference of marks obtained by the student and that required to pass is 5% What are the maximum aggregate marks a student can get?

(*a*) 690 (*b*) 780

(*c*) 740 (*d*) Cannot be determined

[Based on MAT (May), 2009]

58. 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

[Based on MAT (Feb), 2009]

59. Ram spends 20% of his monthly income on his household expenditure, 15% of the rest on books, 30% of the rest on clothes and saves the rest. On counting, he comes to know that he has finally saved ₹9520. Find his monthly income.

(*a*) ₹15000 (*b*) ₹10000

(*c*) ₹20000 (*d*) None of these

[Based on MAT (Feb), 2009]

60. 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

[Based on MAT (Feb), 2009]

61. There are two candidates Bhiku and Mhatre for an election. Bhiku gets 65% of the total valid votes. If the total votes were 6000, what is the number of valid votes that the other candidate Mhatre gets if 25% of the total votes were declared invalid?

(*a*) 1575 (*b*) 1625

(*c*) 1675 (*d*) 1525

[Based on MAT (Feb), 2009]

62. In a medical certificate by mistake a candidate gave his height as 25% more than actual. In the interview panel, he clarified that his height was 5 ft 5 inches. Find the percentage correction made by the candidate from his stated height to his actual height.

(*a*) 28.56 (*b*) 20

(*c*) 25 (*d*) None of these

[Based on MAT (Feb), 2009]

63. 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 to get at least 50% marks overall?

(*a*) 75% (*b*) 80%

(*c*) 74% (*d*) 84%

[Based on MAT (Dec 2008, Sept), 2007]

64. 7% of the total quantity of wheat is lost in grinding when a country has to import 6 million tonnes, but when only $5\frac{1}{5}\%$ is lost, it can import 3 million tonnes. Find the quantity of wheat grown in the country.

(*a*) 500 million tonnes (*b*) 400 million tonnes

(*c*) 600 million tonnes (*d*) 700 million tonnes

[Based on MAT (Dec), 2008]

65. Water tax is increased by 20% but its consumption is decreased by 20% Then, the increase or decrease in the expenditure of the money is

(*a*) no change (*b*) 5% decrease

(*c*) 4% increase (*d*) 4% decrease

[Based on MAT, 2000]

66. In a co-educational school there are 15 more girls than boys. If the number of girls is increased by 10% and the number of boys is also increased by 16%, there would be nine more girls than boys. What is the number of students in the school?

(*a*) 140 (*b*) 125

(*c*) 265 (*d*) 255

[Based on MAT, 1999]

67. The digit at unit's place of a two-digit number is increased by 100% and the ten's digit of the same number is increased by 50% The new number thus formed is 19 more than the original number. What is the original number?

(*a*) 22 (*b*) 63

(*c*) 44 (*d*) None of these

[Based on MAT, 1999]

68. At a college entrance examination, each candidate is admitted or rejected according to whether he has passed or failed the test. Of the candidates who are really capable, 80% pass the tests and of the incapable, 25% pass the tests. Given that 40% of the candidates are really capable, then the proportion of capable college students is about:

(*a*) 73% (*b*) 70%

(*c*) 68% (*d*) 75%

[Based on MAT (May), 2007]

69. In an examination, there were 2000 candidates, out of which 900 candidates were boys and the rest were girls. If 32% of the boys and 38% of the girls passed, then the total percentage of failed candidates is:

(*a*) 68.5% (*b*) 64.7%

(*c*) 35.3% (*d*) 70%

[Based on MAT (May), 2007]

70. If the price of gold increases by 30%, find by how much the quantity of ornaments must be reduced so that the expenditure may remain the same as before?

(*a*) 30% (*b*) $23\frac{1}{13}\%$

(*c*) $27\frac{2}{13}\%$ (*d*) 19%

[Based on MAT (May), 2007]

71. In a company, there are 75% skilled workers and remaining ones are unskilled. 80% of skilled workers and 20% of unskilled workers are permanent. If number of temporary workers is 126, then what is the number of total workers?

(*a*) 480 (*b*) 510

(*c*) 360 (*d*) 377

[Based on MAT (Dec), 2006]

72. An MBA student gets a fellowship from which he spends 70% on personal expenses and 20% on books, fees, etc. The remaining amount is saved and it amounts to ₹4800 in a year. The value of the monthly fellowship is:

(*a*) ₹3000 (*b*) ₹3500

(*c*) ₹5000 (*d*) ₹4000

[Based on MAT, 1998]

73. Population of a district is 296000 out of which 166000 are males. 50% of the population is literate. If 70% males are literate, then the number of women, who are literate, is:

(*a*) 32200 (*b*) 31800

(*c*) 66400 (*d*) 48000

[Based on MAT (Feb), 2006]

74. Sharma's expenditure and savings are in the ratio of 3:2. Her income increases by 10% Her expenditure also increases by 12% How much per cent does her savings increase?

(*a*) 7% (*b*) 6%

(*c*) 13% (*d*) 11%

[Based on MAT (May), 2010]

75. There are four friends. The average score in unit test of the first three is 15 and that of the last three is 16. If the score of the last friend is 19, then first friend's score is what per cent of average of the last three?

(*a*) $66\frac{2}{3}\%$ (*b*) 300%

(*c*) $33\frac{1}{3}\%$ (*d*) None of these

[Based on MAT (Sept), 2010]

76. A monthly return railway ticket costs 25% more than a single ticket. A week's extension can be had for the former by paying 5% of the monthly ticket's cost. If the money paid for the monthly ticket (with extension) is ₹84, the price of the single ticket is

(*a*) ₹64 (*b*) ₹80

(*c*) ₹48 (*d*) ₹72

[Based on MAT (May), 2007]

77. When the price of an audio system was reduced by 20%, the sale increased by 80% What was the net effect on the sale?

(*a*) 44% increase (*b*) 44% decrease

(*c*) 66% increase (*d*) 60% increase.

[Based on MAT, 1998]

78. If two numbers are respectively 20% and 50% of a third number, what is the percentage of the first number to the second?

(*a*) 10 (*b*) 20

(*c*) 30 (*d*) 40

[Based on MAT, 1998]

79. Given two positive integers x and y with $x < y$. The per cent that x is less than y is

(*a*) $\frac{100(y-x)}{x}$ (*b*) $\frac{100(x-y)}{x}$

(*c*) $\frac{100(y-x)}{y}$ (*d*) $100(y-x)$

[Based on FMS, 2011]

80. The price of petrol is increased by 25% How much percent must a car owner to reduce his consumption of petrol so as not to increase his expenditure on petrol?

(*a*) 50% (*b*) 30%

(*c*) 25% (*d*) 20%

[Based on MAT, 2011]

81. When 5% is lost in grinding wheat, a country has to import 20 million bags to make up for the loss. But when only 2% is lost, it has to import 15 million bags. What is the quantity of wheat, which grows in the country in million bags?

(*a*) $133\frac{1}{3}$ (*b*) 150

(*c*) $106\frac{2}{3}$ (*d*) $166\frac{2}{3}$

[Based on MAT, 2011]

82. In a consumer preferences survey, 20% respondents opted for product *A* whereas 60% opted the product *B*. The remaining individuals were undecided. If the difference between those who opted for product *B* and those who were undecided is 720, how many individuals had been interviewed for the survery?

(*a*) 1440 (*b*) 1800

(*c*) 3600 (*d*) Data inadequate

[Based on MAT, 2012]

83. Gauri went to the stationers and bought items worth ₹25, out of which 30 paise went on sales tax on taxable purchases. If the tax rate was 6%, then what was the cost of the tax-free items?

(*a*) ₹15 (*b*) ₹15.70

(*c*) ₹19.70 (*d*) ₹20

[Based on MAT, 2012]

84. Shyam had three notebooks *X*, *Y* and *Z*. Of these, *X* had 120 pages, *Y* had 10% more and *Z* had 10% less. If he tore out 5%, 10% and 15% of pages in *X*, *Y* and *Z* respectively, then what percent of total pages did he tear out?

(*a*) 8% (*b*) 15%

(*c*) 7% (*d*) None of these

[Based on MAT, 2012]

85. In a class of 90 students, amongst 50% of the students, each student got number of sweets that are 20% of the total number of students and amongst the remaining 50% of the students, each students got number of sweets that are 10% of the total number of students. How many sweets were distributed among 90 students?

(*a*) 960 (*b*) 1015

(*c*) 1215 (*d*) 1620

[Based on MAT, 2012]

86. In a test consisting of 150 questions carrying 1 mark each, Saurabh answered 80% of the first 75 questions correctly. What per cent of the other 75 questions does he need to answer correctly to score 60% overall?

(*a*) 20 (*b*) 40

(*c*) 50 (*d*) 60

[Based on MAT, 2012]

87. Nilam's Mathematics Test had 75 problems, i.e., 10 arithmetic, 30 algebra and 35 geometry problems. Although she answered 70% of the arithmetic, 40% of the algebra and 60% of the geometry problems correctly, she did not pass the test because she got less than 60% of the problems right. How many more questions would she have needed to answer correctly to earn 60% passing grade?

(*a*) 3 (*b*) 5

(*c*) 7 (*d*) 10

[Based on MAT, 2012]

88. 900 kg of mortar consists of 45% sand, 144 kg of lime and the rest cement. What percentage of cement is there in mortar?

(*a*) 27% (*b*) 45%

(*c*) 39% (*d*) 21%

[Based on MAT, 2013]

89. A vendor sells 60% of apples he had and throws away 15% of the remainder. Next day he sells 50% of the remainder and throws away the rest. What per cent of his apples does the vendor throw:

(*a*) 17% (*b*) 23%

(*c*) 42% (*d*) 15%

[Based on MAT, 2013]

90. In a supermarket a 50 g tube of toothpaste costs ₹299 and a 100 g tube costs ₹509. Approximately what percentage do you pay more if you buy two 50 g tubes instead of one 100 g tube?

[Based on MAT, 2013]

(*a*) 20% (*b*) 18%

(*c*) 15% (*d*) 10%

91. In three vessels, each of 100 L capacity, mixture of milk and water is filled. The ratio of milk and water are 4:1, 2:3, 4:3 in the respective vessels. If all three vessels are emptied into a single large vessel, then what will be the ratio of water to milk in the resultant mixture?

(*a*) 43:62

(*b*) 197:214

(*c*) 219:117

(*d*) 179:234

[Based on MAT, 2013]

92. 400 students took the mock test 60% of the boys and 80% of the girls cleared the cut off in the test. If the total percentage of students qualifying is 65%, how many girls appeared in the test?

(*a*) 100 (*b*) 120

(*c*) 150 (*d*) 300

[Based on MAT, 2014]

93. After receiving two successive raises, Ajitha's salary became equal to 15/8 times of her initial salary. By how much per cent was the salary raised the first time if the second raise was twice as high (in per cent) as the first?

(*a*) 15 (*b*) 20

(*c*) 25 (*d*) 30

[Based on MAT, 2014]

94. A person saves 6% of his income. 2 year later, his income shoots up by 15% but his savings remain the same. Find the hike in his expenditure (in approx percent).

(*a*) 13.65% (*b*) 12.45%

(*c*) 14.85% (*d*) 15.95%

[Based on MAT, 2014]

95. A reduction in the price of petrol by 10% enables a motorist to buy 5 gallons more for ₹180. Find the original price of petrol (in ₹ per gallon).

(*a*) 20 (*b*) 30

(*c*) 40 (*d*) 50

[Based on MAT, 2014]

96. In an examination, Raman scored 25 marks less than Rohit. Rohit scored 45 more marks than Sonia. Rohan scored 75 marks which is 10 more than Sonia. Ravi's score is 50 less than, maximum marks of the test. What approximate percentage of marks did Ravi score in the examination, if he gets 34 marks more than Raman?

(*a*) 90 (*b*) 70

(*c*) 80 (*d*) 60

[Based on SNAP, 2013]

97. Mr. Giridhar spends 50% of his monthly income on household items and out of the remaining he spends 50% on transport, 25% on entertainment, 10% on sports

and the remaining amount of ₹900 is saved. What is Mr. Giridhar's monthly income?

(*a*) ₹6000

(*b*) ₹12000

(*c*) ₹9000

(*d*) Cannot be determined

[Based on SNAP, 2013]

98. Last year there were 610 boys in a school. The number decreased by 20 percent this year. How many girls are there in the school if the number of girls is 175 percent of the total number of boys in the school this year?

(*a*) 854 (*b*) 848

(*c*) 798 (*d*) 782

[Based on SNAP, 2013]

99. A country follows a progressive taxation system under which the income tax rates applicable varies for different slabs of income. Total tax is computed by calculating the tax for each slab and adding them up. The rates applicable are as follows:

Annual income			Tax rate
0	–	50,000	0%
50,001	–	60,000	10%
60,001	–	1,50,000	20%
	>	1,50,000	30%

If my income is ₹1,7,000, then what is the tax payable by me?

(*a*) ₹51,000

(*b*) ₹17,000

(*c*) ₹34,000

(*d*) ₹25,000

[Based on SNAP, 2012]

DIFFICULTY LEVEL-2 (BASED ON MEMORY)

1. A person has some amount with him. 25% of it is stolen in a bus, 10% is lost through a hole in the pocket, 50% of remainder is spent on food. He then purchases a book worth ₹26 from the remainder. He walks back home because all his money is over. What was the initial amount?

(*a*) ₹160 (*b*) ₹1,230

(*c*) ₹90 (*d*) ₹80

2. Of the total number of candidates in an examination 40% fail in first subject, of the rest 10% fail in the second and of those that pass in these two subjects, only 75% pass in the remaining subject. The number of unsuccessful candidates exceeds that of the successful ones by 570. What is the total number of candidates?

(*a*) 2,800 (*b*) 8,400

(*c*) 3,000 (*d*) 1,200

3. A man invests ₹1,200 at 10% p.a. At the end of the year he withdraws 30% of total amount and pays ₹24 as transaction fee. At the end of 2nd year he withdraws 30% of the amount and pays ₹93 as transaction fee. What is the balance at the end of the third year?

(*a*) ₹660 (*b*) ₹825

(*c*) ₹500 (*d*) ₹770

4. A family's ratio of savings to expenditure for last month was 2:13. This month, due to unforeseen expenditure, savings fell to 50% of the amount saved last month. Salary of the last month was ₹10,000. This month there was an increase of 15% in the salary. How much did the family spend this month?

(*a*) ₹667 (*b*) ₹11,167

(*c*) ₹10,833 (*d*) ₹9,833

5. 500 kg of ore contained a certain amount of iron. After the first blast furnace process, 200 kg of slag containing 12.5% of iron was removed. The percentage of iron in the remaining ore was found to be 20% more than the percentage in the original ore. How many kg of iron were there in the original 500 kg ore?

(*a*) 212 (*b*) 89.2

(*c*) 85 (*d*) 145

6. If $a > b$, then by what percentage is less then its reciprocal?

(*a*) $100\left(\frac{b}{a^2}-\frac{1}{b}\right)$ (*b*) $100\left(\frac{1}{a}-\frac{a^2}{b}\right)$

(*c*) $100\left(1-\frac{b^2}{a^2}\right)$ (*d*) $100\left(\frac{a^2}{b^2}-1\right)$

7. In a society, there are 100 members. Each of them has been allotted membership number from 1 to 100. They started a business in which the nth member contributed

₹$(10 \times 2^n - 5)$. After one year, 4th member gets ₹62 as his share. Find the total profit in the business after one year.

(*a*) ₹8 $[2^{100} - 26]$ (*b*) ₹4 $[2^{99} - 26]$

(*c*) ₹2 $[2^{100} - 26]$ (*d*) None of these

[Based on FMS (Delhi), 2004]

8. In a school, 60% of the students of Class *X* were boys. 75% of the boys passed the Class *X* exams. 40% of the passed boys got first division. 80% of the total students passed the exam and 50% of the passed students got first division. Which of the following conclusion is not correct?

(*a*) 75% of the failed students are boys.

(*b*) 55% of the first-divisioners are girls.

(*c*) Number of passed girls is more than that of the boys.

(*d*) If *x* students failed, 2*x* got first division.

[Based on FMS (Delhi), 2004]

9. A trader sells soaps in economy packs of four soaps per pack, each pack being charged at the listed price of three soaps. For every set of five such packs bought by a customer, the trader gives him one extra soap as a free gift. If a customer buys 12 economy packs, what is the effective percentage of discount that he gets?

(*a*) 28% (*b*) $28\frac{4}{7}\%$

(*c*) 4% (*d*) $35\frac{5}{7}\%$

10. The normal dosage of a particular medicine is *t* tablets per day for each patient. A hospital's current supply of these tablets will last *p* patients for *d* days. If the recommended dosage increases by 20% and the number of patients decreases by one-third, then for how many days will the hospital's supply last?

(*a*) $\frac{5d}{4}$ (*b*) $\frac{4d}{5}$

(*c*) $\frac{4pt}{5}$ (*d*) None of these

[Based on REC Tiruchirapalli, 2003]

11. In a town, 60% of the adult population is male. *a*% of the adult males and *b*% adult females are educated. The total number of educated adult males and uneducated adult females is equal in number to the total number of uneducated adult males and educated adult females. If *a* and *b* are both integers, which of the following could be the set of values (*a*, *b*)?

(*a*) (20, 30) (*b*) (20, 10)

(*c*) (30, 15) (*d*) (30, 20)

12. A clothing supplier stores 800 coats in a warehouse, of which 15 per cent are full-length-coats. If 500 of the shorter length coats are removed from the warehouse, then what per cent of the remaining coats are full-length?

(*a*) 5.62% (*b*) 34%

(*c*) 40% (*d*) 48%

[Based on REC Tiruchirapalli, 2003]

13. 5% income of *A* is equal to 15% income of *B* and 10% income of *B* is equal to 20% income of *C*. If the income of *C* is ₹2000, then the total income of *A*, *B* and *C* (in ₹) is:

(*a*) 6000 (*b*) 9000

(*c*) 12000 (*d*) 18000

[Based on FMS (Delhi), 2003]

14. Ajay and Vikas are sharing a flat in Delhi, with an arrangement of equally dividing the household expenses. Ajay went to Pune, where a sale was going on and bought batteries for the house, worth ₹150 on 20% discount. But he lost them on his way back and had to buy new ones, after he reached Delhi. How much did he end up spending on the batteries?

(*a*) ₹280 (*b*) ₹195

(*c*) ₹270 (*d*) ₹75

[Based on SCMHRD Ent. Exam., 2003]

Directions (Q 15 to 17): It is given that 5% increase in *X* always means 3% increase in *Y* and 5% increase in *Y* always implies 2.5% increase in *Z*.

15. Relationship between *X* and *Z* could be:

(*a*) $1.05X = 1.025Z$ (*b*) $0.5X = 0.25Z$

(*c*) $25X = 7.5Z$ (*d*) $250X = 213Z$

[Based on IMT Ghaziabad, 2002]

16. If *Y* is increased by 30%, then Z^2 should increase by:

(*a*) 32.25% (*b*) 60%

(*c*) 69% (*d*) 90%

[Based on IMT Ghaziabad, 2002]

17. If *X* is increased from 10 to 15, then *Z* must increase from 30 to:

(*a*) 35 (*b*) 45

(*c*) 60 (*d*) 75

[Based on IMT Ghaziabad, 2002]

18. In a market survey, 20% opted for product A, whereas 60% opted for product B. The remaining individuals were not certain. If the difference between those who opted for product B and those who were uncertain was 720, how many individuals were covered in the survey?

(*a*) 3,600 (*b*) 1,440

(*c*) 1,800 (*d*) Data inadequate

19. If the charges per hour of internet surfing are increased by 25%, then find the percentage decrease in the time period of surfing of a user (a net savvy) who can afford only a 10% increase in expenditure:

(*a*) 22% (*b*) 12%

(*c*) 15% (*d*) 9.09%

20. Lagaan is levied on 60% of the cultivated land. The revenue department collected total ₹3,84,000 through the lagaan from the village of Sukhiya. Sukhiya, a very rich farmer, paid only ₹480 as lagaan. The percentage of total land of Sukhiya in the total cultivated land of the village is:

(*a*) 0.15% (*b*) 15%

(*c*) 0.125% (*d*) None of these

21. The price of cooking oil has increased by 25% The percentage of reduction that a family should effect in the use of cooking oil so as not to increase the expenditure on this account is:

(*a*) 25% (*b*) 30%

(*c*) 20% (*d*) 15%

[Based on FMS (Delhi), 2002]

22. A flat costs ₹10 lakhs. Incidental expenses and taxes amount to ₹36000 a year. What rent per month must the owner receive to earn at least 6 per cent on his investment?

(*a*) ₹6000 (*b*) ₹6500

(*c*) ₹8000 (*d*) ₹8500

[Based on FMS (Delhi), 2002]

23. A businessman charges 20% over cost price. He allows his customers 10% off on their bills for cash payment. His net gain per cent is:

(*a*) 10 (*b*) 8

(*c*) 12 (*d*) 15

[Based on FMS (Delhi), 2002]

24. *X* gets 25% more than *Y* and *Y* gets 20% more than *Z*. The share of *Z* out of a sum of ₹740 is:

(*a*) ₹200 (*b*) ₹300

(*c*) ₹250 (*d*) ₹350

[Based on FMS (Delhi), 2002]

25. In my office there are 30% female employees and 30% of these earn greater than ₹8,000 per month and 80% of male employees earn less than ₹8,000 per month. What is the percentage of employees who earn more than ₹8,000 per month?

(*a*) 30% (*b*) 23%

(*c*) 60% (*d*) Cannot be determined

26. A house-owner was having his house painted. He was advised that he would require 25 kg of paint. Allowing for 15% wastage and assuming that the paint is available in 2 kg cans, what would be the cost of paint purchased, if one can costs ₹16?

(*a*) ₹240 (*b*) ₹180

(*c*) ₹160 (*d*) ₹360

27. On April 1, 2005 my salary increased from ₹10,000 to ₹16,000. Simultaneously the rate of income tax decreased by 37.5% If so the amount of income tax paid by me remains constant, what is the value of income tax I pay.

(*a*) ₹3,000 (*b*) ₹6,000

(*c*) ₹1,600 (*d*) Cannot be determined

28. The price of LPG increases by 20% By what per cent must a family reduce the consumption of LPG, so that the expenditure on gas is the same as before:

(*a*) 83.33 (*b*) 80

(*c*) 20 (*d*) 16.66

[Based on FMS (Delhi), 2006]

29. In a certain water body 50 fish were caught, tagged and released to the same water body. A few days later, 50 fish were caught again, of which 2 were found to have been tagged on previous occasion. If the per cent of tagged fish in the second catch approximates the per cent of tagged fish in the water body, what is the approximate number of fish in the water body?

(*a*) 10000 (*b*) 625

(*c*) 1250 (*d*) 2500

[Based on ATMA, 2008]

30. Of the 50 researchers in a workgroup, 40% will be assigned to team *A* and the remaining 60% to team *B*. However, 70% of the researchers prefer team *A* and 30% prefer team *B*. What is the least possible number of researchers who will not be assigned to the team they prefer?

(*a*) 15 (*b*) 20

(*c*) 35 (*d*) 30

[Based on ATMA, 2005]

31. In a city, 35% of the population is composed of migrants, 20% of whom are from rural area. Of the local population, 48% is female while this figure for rural and urban migrants is 30% and 40% respectively. If the total population of the city is 728400 what is its female population?

(*a*) 509940 (*b*) 349680

(*c*) 324138 (*d*) None of these

[Based on NMAT, 2005]

32. A company received two shipments of ball bearings. In the first shipment, 1% of the ball bearings were defective. In the second shipment, which was twice as large as the first, 4.5% of the ball bearings were defective. If the company received a total of 100 defective ball bearings, how many ball bearings were in the first shipment?

(*a*) 2000 (*b*) 1000

(*c*) 990 (*d*) 3000

[Based on NMAT, 2005]

33. 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 ₹5 lakhs/year. If 50% of the organization's employees earn more than ₹5 lakhs/year, what proportion of the general graduates employed by the organization earn ₹5 lakhs or less?

(*a*) 3/5 (*b*) 7/8

(*c*) 1/2 (*d*) None of these

[Based on XAT, 2010]

34. A survey shows that 61%, 46% and 29% of the people watched '3 idiots', 'Rajneeti' and 'Avtaar' respectively. 25% people watched exactly two of the three movies and 3% watched none. What percentage of people watched all the three movies?

(*a*) 39% (*b*) 11%

(*c*) 14% (*d*) 7%

[Based on IIFT, 2010]

35. Bennett distribution company, a subsidiary of a major cosmetics manufacturer Bavlon, is forecasting the zonal sales for the next year. Zone I with current yearly sales to ₹193.8 lakhs is expected to achieve a sales growth of 7.25%; Zone II with current sales of ₹79.3 lakhs is expected to grow by 8.2% and Zone III with sales of ₹57.5 lakhs is expected to increase sales by 7.15% What is the Bennett's expected sales growth for the next year ?

(*a*) 7.46% (*b*) 7.53%

(*c*) 7.88% (*d*) 7.41%

[Based on IIFT, 2009]

36. In 2006, Raveendra was allotted 650 shares of Sun Systems Ltd in the initiail public offer, at the face value of ₹10 per share. In 2007, Sun Systems declared a bonus at the rate of 3:13. In 2008, the company again declared the bonus at the rate of 2:4. In 2009, the company declared a dividend of 12.5% How much dividend does Raveendra get in 2009 as the percentage of his initial investment?

(*a*) 24.5% (*b*) 23.9%

(*c*) 24.1% (*d*) 23%

[Based on IIFT, 2009]

37. In view of the present global financial crisis, the Finance Minister decided to slash the excise duties to boost demand and propel economic growth. The excise duty on cement was reduced by 30% of its present amount to boost the spending in the infrastructure. What should be the percentage increase in the consumption of cement so that the revenue of the government remains unchanged?

(*a*) $42\frac{5}{7}\%$ (*b*) $42\frac{6}{7}\%$

(*c*) $34\frac{6}{7}\%$ (*d*) $34\frac{5}{7}\%$

[Based on FMS, 2009]

38. In a public school, one-fifth of girls and one-fourth of boys are under 12 year of age. If the total strength of the school is 1000 and number of girls is two-fifths of the total, what part of the total strength of the school is accounted for by those which are 12 year or more of age?

(*a*) 23% (*b*) 45%

(*c*) 55% (*d*) 77%

[Based on FMS (MS), 2006]

39. A 14.4 kg gas cylinder runs for 104 h when the smaller burner on the gas stove is fully opened while it runs for 80 h when the larger burner on the gas stove is fully opened. Which of these values are the closest to the percentage difference in the usage of gas per hour, of the smaller burner over the larger burner?

(*a*) 26.23% (*b*) 30%

(*c*) 32.23% (*d*) 23.07%

[Based on SNAP, 2008]

40. What is the present worth of a house that would worth ₹ 50000 after 3 years if it depreciates at the rate of 10%?

(*a*) ₹35765.74

(*b*) ₹67560.74

(*c*) ₹67655.74

(*d*) ₹68587.10

[Based on CAT, 2009]

41. What percentage of the viewers responded to all three?

(*a*) 10 (*b*) 12

(*c*) 14 (*d*) None of these

[Based on CAT, 2010]

42. Assuming 20% respond to Ahead and Bong, and 16% respond to Bong and Luck, what is the percentage of viewers who watch only Luck?

(*a*) 20 (*b*) 10

(*c*) 16 (*d*) None of these

[Based on CAT, 2010]

43. A piece of paper is in the shape of a right-angled triangle and is cut along a line that is parallel to the hypotenuse, leaving a smaller triangle. There was a 35% reduction in the length of the hypotenuse of the triangle. If the area of the original triangle was 34 cm^2 before the cut, what is the area of the smaller triangle (in cm^2) formed after the cut.

(*a*) 16.565 (*b*) 15.465

(*c*) 16.665 (*d*) 14.365

[Based on CAT, 2013]

44. Fresh grapes contain 90% water by weight while dried grapes contain 20% water by weight. What is the weight of dry grapes available from 20 kg of fresh grapes?

(*a*) 2 kg (*b*) 2.4 kg

(*c*) 2.5 kg (*d*) None of these

[Based on CAT, 1997, 2001]

Directions (Q 45–46): Answer the questions based on the following information.

A company purchases components *A* and *B* from Germany and USA, respectively. *A* and *B* form 30% and 50% of total production cost. Current gain is 20% Due to change in the international scenario, cost of the German mark increased by 30% and that of USA dollar increased by 22% Due to market conditions, the selling price cannot be increased beyond 10%

45. What is the maximum current gain possible?

(*a*) 10% (*b*) 12.5%

(*c*) 0% (*d*) 7.5%

[Based on CAT, 1998]

46. If the USA dollar becomes cheap by 12% over its original cost and the cost of German mark increased by 20%, what will be the gain? (The selling price is not altered)

(*a*) 10% (*b*) 20%

(*c*) 15% (*d*) 7.5%

[Based on CAT, 1998]

47. Suppose that a maximum of 25g salt dissolves in 100 g of water. Any more salt, if added, remains undissolved and a sediment falls at the bottom. Now, water is evaporated from 1 kg of a 4% solution at the rate of 28 g hour. After how long will it start sedimenting, approximately?

(*a*) 29 h (*b*) 31 h

(*c*) 35 h (*d*) 23 h

[Based on MAT, 2013]

48. Out of the total production of iron hematite, 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 hematite was 8000 kg then the quantity of hematite mined in the year is:

(*a*) 400000 kg (*b*) 500000 kg

(*c*) 450000 kg (*d*) 600000 kg

[Based on MAT, 1998]

49. In a medical certificate, by mistake a candidate gave his height as 25% more than actual. In the interview panel, he clarified that his height was 55 ft 5 inches. What is the percentage correction made by the candidate from his stated height to his actual height?

(*a*) 28.56% (*b*) 20%

(*c*) 25% (*d*) None of these

[Based on MAT, 2013]

50. The total tractor population in a State is 294000, out of which 150000 are made by Mahindra and Mahindra. Out of every 1000 Mahindra tractors, 98 are red in colour. But only 5.3% of the total tractor population is red. Find percentage of non-Mahindra tractors that are red.

(*a*) 6.125% (*b*) 5.025%

(*c*) 5.130% (*d*) 6.140%

[Based on MAT, 2013]

Answer Keys

Difficulty Level-1

1. (*b*)	**2.** (*d*)	**3.** (*d*)	**4.** (*b*)	**5.** (*b*)	**6.** (*b*)	**7.** (*c*)	**8.** (*c*)	**9.** (*b*)	**10.** (*b*)	**11.** (*c*)	**12.** (*c*)	**13.** (*b*)
14. (*b*)	**15.** (*d*)	**16.** (*c*)	**17.** (*d*)	**18.** (*a*)	**19.** (*c*)	**20.** (*b*)	**21.** (*c*)	**22.** (*c*)	**23.** (*a*)	**24.** (*c*)	**25.** (*a*)	**26.** (*c*)
27. (*c*)	**28.** (*c*)	**29.** (*c*)	**30.** (*b*)	**31.** (*d*)	**32.** (*b*)	**33.** (*d*)	**34.** (*c*)	**35.** (*b*)	**36.** (*b*)	**37.** (*d*)	**38.** (*a*)	**39.** (*d*)
40. (*b*)	**41.** (*c*)	**42.** (*d*)	**43.** (*d*)	**44.** (*d*)	**45.** (*d*)	**46.** (*c*)	**47.** (*b*)	**48.** (*b*)	**49.** (*c*)	**50.** (*b*)	**51.** (*c*)	**52.** (*a*)
53. (*c*)	**54.** (*d*)	**55.** (*b*)	**56.** (*b*)	**57.** (*c*)	**58.** (*a*)	**59.** (*c*)	**60.** (*a*)	**61.** (*a*)	**62.** (*b*)	**63.** (*c*)	**64.** (*a*)	**65.** (*d*)
66. (*c*)	**67.** (*d*)	**68.** (*c*)	**69.** (*b*)	**70.** (*b*)	**71.** (*c*)	**72.** (*d*)	**73.** (*b*)	**74.** (*a*)	**75.** (*c*)	**76.** (*a*)	**77.** (*a*)	**78.** (*d*)
79. (*c*)	**80.** (*d*)	**81.** (*d*)	**82.** (*b*)	**83.** (*d*)	**84.** (*a*)	**85.** (*c*)	**86.** (*b*)	**87.** (*b*)	**88.** (*c*)	**89.** (*b*)	**90.** (*b*)	**91.** (*a*)
92. (*a*)	**93.** (*d*)	**94.** (*d*)	**95.** (*c*)	**96.** (*b*)	**97.** (*b*)	**98.** (*a*)	**99.** (*d*)					

Difficulty Level-2

1. (*d*)	**2.** (*c*)	**3.** (*a*)	**4.** (*c*)	**5.** (*b*)	**6.** (*c*)	**7.** (*a*)	**8.** (*c*)	**9.** (*a*)	**10.** (*a*)	**11.** (*d*)	**12.** (*c*)	**13.** (*d*)
14. (*b*)	**15.** (*c*)	**16.** (*a*)	**17.** (*a*)	**18.** (*c*)	**19.** (*b*)	**20.** (*d*)	**21.** (*c*)	**22.** (*b*)	**23.** (*b*)	**24.** (*a*)	**25.** (*d*)	**26.** (*a*)
27. (*d*)	**28.** (*d*)	**29.** (*c*)	**30.** (*d*)	**31.** (*c*)	**32.** (*b*)	**33.** (*b*)	**34.** (*d*)	**35.** (*a*)	**36.** (*d*)	**37.** (*b*)	**38.** (*d*)	**39.** (*b*)
40. (*d*)	**41.** (*a*)	**42.** (*d*)	**43.** (*d*)	**44.** (*c*)	**45.** (*a*)	**46.** (*b*)	**47.** (*b*)	**48.** (*a*)	**49.** (*b*)	**50.** (*a*)		

Explanatory Answers

Difficulty Level-1

1. (*b*) $100 \to 105 \to 110.25$, i.e., 10.25%

2. (*d*) Ratio of maximum marks = 1:2:2

Ratio of marks obtained

$$= (0.5 \times 1):(0.6 \times 2):(0.65 \times 2)$$
$$= 0.5:1.2:1.3$$

$\Rightarrow$ Overall percentage

$$= \frac{0.5+1.2+1.3}{1+2+2} \times 100$$
$$= 60\%$$

3. (*d*) Required ratio $= 4V_A d_A : 7V_B d_B$

$$= \frac{4V_A d_A}{d_B} : 7V_B,$$

where d is density of the substance

Given $117d_A = 151d_B$

$$\therefore \quad \frac{d_A}{d_B} = \frac{151}{117}$$

Now with $7V_B$ of substance B, $4V_A$ of substance A is used in place of $4V_A \times \frac{151}{117}$

$$\Rightarrow \quad \%\text{ error} = \frac{34}{117} \times \frac{117}{151} \times 100 \simeq 22\%$$

4. (*b*) $100 - 20\% = 80$

$80 - 30\% = 56$

$\therefore$ Single discount = 44%

5. (*b*) If the weight of Manu is 50 kg then Ram's weight will be 70 kg. So, Mahesh's weight is 100 kg and Tanu's weight is 90 kg. Hence, percentage of Ram's weight to Tanu's weight

$$= \frac{70}{90} \times 100 = 77.8\%$$

6. (*b*) $A = B + 25\%$ of B

$$\Rightarrow \quad A = B + \frac{B}{4} = \frac{5B}{4}$$

$$\Rightarrow \quad B = \frac{4}{5}A = A - \frac{1}{5}A = A - 20\% \text{ of } A.$$

7. (*c*) The businessman's earning after five years

= ₹72,000

Let his earnings be ₹100

After 1st year	$\to$ 125	(25% increase)
After 2nd year	$\to$ 120	(4% decrease)
After 3rd year	$\to$ 150	(25% increase)
After 4th year	$\to$ 144	(4% decrease)
After 5th year	$\to$ 180	(25% increase)

$\therefore$ Earning today $= \frac{100}{180} \times 72,000 =$ ₹40,000

8. (*c*) Let the original price be ₹x per kg

$\therefore$ Reduced price = ₹$\frac{4}{5}x$ per kg

$$\Rightarrow \quad \frac{5}{4x} \times 160 = \frac{160}{x} + 2\frac{1}{2}$$

$$\Rightarrow \quad \frac{200}{x} = \frac{160}{x} + \frac{5}{2}$$

$$\Rightarrow \quad \frac{40}{x} = \frac{5}{2} \Rightarrow x = 16.$$

9. (*b*) $(-20) + (-15) + \frac{(-20) \times (-15)}{100} = \frac{-32}{100}$.

10. (*b*) Let X's salary = ₹100

$\therefore$ Salary after increase = ₹120, i.e., ₹20 is the increase in salary on ₹100.

Let the tax on the original salary was 30%

Hence the tax on the increased salary (₹20) will be 33%, i.e., ₹6.60.

$\therefore$ Increase in tax liability $= \frac{6.60}{30} \times 100 = 22\%$

11. (*c*) Let reduced price of the radio be ₹x.

$\therefore$ x + 7% of x = 2568

$$\Rightarrow \quad 107x = 256800$$

$$\Rightarrow \quad x = 2400$$

$\therefore$ Reduction needed in the price of radio = ₹168.

12. (*c*) $600 - 25\% = 450$

$450 - 10\% = 405$.

13. (*b*) Suppose the shopkeeper had x eggs, originally.

$$\text{No. of broken eggs} = 5\% \text{ of } x = \frac{x}{20}$$

$$\text{Balance} = x - \frac{x}{20} = \frac{19x}{20}$$

$\therefore$ 7% of $\frac{19x}{20} = 266 \Rightarrow x = 4000.$

14. (*b*) Let the number be K

$$\therefore \quad \frac{3}{5}K = \frac{1}{2}K + 23$$

$$\Rightarrow \quad K = 230$$

$\Rightarrow$ 80% of K = 80% of 230 = 184.

15. (*d*) Let C.P. of 1 kg of tea be ₹x and 1 kg of sugar be ₹y.

$$\therefore \quad x + y = 95 \qquad (1)$$

$$\text{Also, } \left(x - \frac{x}{10}\right) + \left(y + \frac{y}{5}\right) = 90$$

$$\Rightarrow \quad 3x + 4y = 300 \qquad (2)$$

From (1) and (2) we, get

$$x = 80, y = 15.$$

16. (*c*) Let the third number be x.

$$\therefore \text{ 1st number} = x - 30\% \text{ of } x = x - \frac{3x}{10} = \frac{7x}{10}$$

$$\text{2nd number} = x - 40\% \text{ of } x = x - \frac{4x}{10} = \frac{6x}{10}$$

Suppose 2nd number = K% of 1st number

$$\therefore \quad \frac{6x}{10} = \frac{K}{100} \times \frac{7x}{10}$$

$$\Rightarrow \quad K = \frac{600}{7} = 85\frac{5}{7}.$$

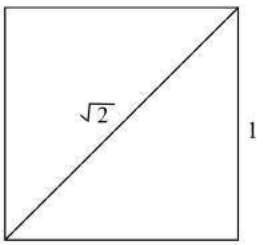
17. (*d*) Let 100 angstroms = x% of 10 microns

$\Rightarrow$ 100 angstroms = x% of 100000 angstroms

$$\Rightarrow \quad x = \frac{100 \times 100}{100000} = \frac{1}{10} = 0.1.$$

18. (*a*) Suppose side of the square = 1 metre

$\therefore$ Diagonal = $\sqrt{2}$ m



Distance saved by not walking along the edges

$$= 2 - \sqrt{2}$$

$$\text{i.e., } \left(\frac{2-\sqrt{2}}{2} \times 100\right)\% \text{ i.e., } 29.3\% \approx 30\%$$

19. (*c*) $0.25x = 0.3y = 0.45z$

$$\text{Now, } \frac{x}{z} \times 100 = \left(\frac{x}{y} \times \frac{y}{z}\right) \times 100$$

$$= \frac{0.3}{0.25} \times \frac{0.45}{0.3} \times 100$$

$$= \frac{9}{5} \times 100 = 180\%$$

20. (b) Let the fraction be $\frac{p}{q}$

$$\therefore \quad \frac{p + 20\% \text{ of } p}{q - 10\% \text{ of } q} = \frac{16}{21}$$

$$\Rightarrow \quad \frac{p + \frac{p}{5}}{q - \frac{q}{10}} = \frac{16}{21}$$

$$\Rightarrow \quad \frac{6p}{5} \times \frac{10}{9q} = \frac{16}{21}$$

$$\Rightarrow \quad \frac{p}{q} = \frac{16}{21} \times \frac{9}{12} = \frac{144}{252} = \frac{4}{7}.$$

21. (*c*) Let the marked price be ₹x

Let the C.P. be ₹y

$$\text{S.P.} = x - 5\% \text{ of } x = \frac{95x}{100} = \frac{19x}{20}$$

$$y + 33\% \text{ of } y = \frac{19x}{20}$$

$$\Rightarrow \quad 7y = 5x$$

$$\Rightarrow \quad x = \frac{7}{5}y = y + \frac{2}{5}y$$

$$= y + 40\% \text{ of } y.$$

22. (*c*) No. of singers = 20

No. of dancers = 40

$\therefore$ 4 singers are less than 25 years old.

24 out of 60 members of the group are less than 25 years old.

$\therefore$ 20 dancers are less than 25 years old, i.e., 50% of the dancers are less than 25 years old.

23. (*a*) Suppose Tito's salary = x,

Tom's salary = y and Tina's salary = z

$$\therefore \quad y = 125\% \text{ of } z = \frac{5z}{4}$$

$$x = 80\% \text{ of } z = \frac{4}{5}z \Rightarrow z = \frac{5}{4}x$$

$$\therefore \quad y = \frac{5z}{4} = \frac{5}{4} \times \frac{5}{4}x = \frac{25}{16}x$$

Also $x + y + z = 61000$

$\Rightarrow x + \frac{25}{16}x + \frac{5}{4}x = 61000$

$\Rightarrow \frac{61x}{16} = 61000$

$\Rightarrow x = 16000$

Also, $y = 25000, z = 20000.$

24. (*c*) Mayur = 2 (Shweta)

Shweta = 60% of Deepika = $\frac{3}{5}$ of Deepika

Rakesh = 50% of Vikas = $\frac{1}{2}$ of Vikas

Vikas = 190% of Mayur = $\frac{19}{10}$ of Mayur

$\therefore M > D, S < D, R < V, V > M$

$\Rightarrow V > M > D > S, V > R$

Rakesh = $\frac{19}{10}$ of Mayur

$\Rightarrow$ Mayur = $\frac{20}{19}$ of Rakesh

Shweta = $\frac{10}{19}$ of Rakesh

$\Rightarrow S < R \Rightarrow R >$ S

$\therefore$ Shweta weighs the least.

25. (*a*) 1, 9, 11, 19, 21, 29, 31, 39, 41, 49, 51, 59, 61, 69:
These numbers have their squares ending in digit 1, i.e., 14 out of 70, i.e., 20%

26. (*c*) X is increased from 20 to 23, i.e., there is 15% increase in X.

$\Rightarrow$ There is 9% increase in Y i.e., Y will increase from 100 to 109.

27. (*c*) Suppose salary in 1999 was ₹x

$\therefore x\left(1 + \frac{20}{100}\right)^2 = 26640$

$\Rightarrow x = \frac{26640 \times 25}{36} =$ ₹18500.

28. (*c*) $R = \frac{1}{3}B, G = \frac{1}{2}R = G = Y$

Since, $B = 42, R = 14, G = 7$ and $Y = 7,$

$\therefore$ Percentage of blue caps = $\frac{42}{70} \times 100 = 60.$

29. (*c*) No. of pens removed

= 12% of 600 + 25% of 1200

= 72 + 300 = 372

$\therefore$ Percentage of total pens removed

$= \frac{372}{1800} \times 100 = 20.67 = 22.$

30. (*b*) A = 125% of B, C = 80% of B

$\Rightarrow A = \frac{5}{4}B, C = \frac{5}{4}B = \frac{4}{5} \times \frac{4}{5}A = \frac{16}{25}A$

$A + B + C = 61000$

$\Rightarrow A + \frac{4}{5}A + \frac{16}{25}A = 61000$

$\Rightarrow A = 25000$

$\therefore B = 20000, C = 16000.$

31. (*d*) Let the total number of votes polled = x

$\therefore$ The winning candidate got 70% of the votes polled

Hence, 40% of $x = 16000 \Rightarrow x = 40000.$

32. (*b*) Let the earlier price of groundnut be ₹ x/kg

$\therefore \frac{48}{x}$ kg of groundnuts could be purchased for ₹48

$\Rightarrow \left(\frac{48}{x} - \frac{3}{2}\right) \times \frac{5x}{4} = 48 \Rightarrow x = 6.40.$

33. (*d*) $X + Y + Z = 7400$ (1)

$X = Y + 25\%$ of $Y = \frac{5Y}{4}$ (2)

$Y = Z + 20\%$ of $Z = \frac{6Z}{5}$ (3)

$\therefore$ Eq. (1) gives

$\frac{5Y}{4} + \frac{6Z}{5} + Z = 7400$

$\Rightarrow \frac{3Z}{2} + \frac{6Z}{5} + Z = 7400$

$\Rightarrow 37Z = 74000 \Rightarrow Z = 2000$

$\therefore Y = 2400, X = 3000.$

34. (*c*) 8% of m = 4% of $p \Rightarrow 2m = p$

$\therefore$ 20% of $m = \frac{m}{5} = \frac{p}{10} = 10\%$ of $p.$

35. (*b*) S = 150% of T

$\Rightarrow S = \frac{150T}{100} \Rightarrow S = \frac{3}{2}T$

$\Rightarrow S + T = \frac{3}{2}T + T = \frac{5T}{2}$

$\Rightarrow T = \frac{2}{5}(S + T)$

= 40% of $(S + T)$.

36. (*b*) Suppose total number of students = 100

$\therefore$ No. of seniors who attended the play = 20

Total number of students who attended the play = 60

$\therefore$ No. of non-seniors who attended the play

= 60 − 20 = 40 i.e., 40%

37. (*d*) Passing marks are $0.6x$

So, $0.3x + 30 = 0.6x$

$\Rightarrow \quad x = 100$

38. (*a*) Rainbow will occur once in 20 days

Rest 19 days will not producer rainbow

$$\% = \frac{19}{20} \times 100 = 95\%$$

39. (*d*) Let there be a gm of food X and $(300 - a)$ g of food Y.

Then, $a \times 10\% + (300 - a)\ 15\% = 38$

$$\Rightarrow \quad \frac{10a}{100} + (33 - a)\frac{15}{100} = 38$$

$$\Rightarrow \quad 10a + 4500 - 15a = 3800$$

$$\Rightarrow \quad -5a = -700$$

$$\therefore \quad a = \frac{700}{5}$$

$= 140$ g of food X

40. (*b*) Suppose that total candidates appeared be x.

Then, number of candidates who answered all

$$= x \times \frac{5}{100}$$

Number of candidates who answered none

$$= x \times \frac{5}{100}$$

$$\therefore \text{ Remaining} = x - 2\left(x \times \frac{5}{100}\right)$$

$$= x - \frac{x}{10} = \frac{9x}{10}$$

Number of candidates answered only 1 question

$$= 25\% \text{ of } \frac{9x}{10} = \frac{25}{100} \times \frac{9x}{10}$$

$$= \frac{9x}{40}$$

Number of candidates answered 4 questions

$$= \frac{9x}{10} \times 20\% = \frac{9x}{50}$$

Candidates who answered 2 questions

$$= \frac{49}{2}\% \text{ of } x = \frac{49}{200}x$$

$$\text{Now } 2\left(x \times \frac{5}{100}\right) + \frac{9x}{40} + \frac{9x}{50} + \frac{49x}{200} + 200 = x$$

By solving this, we get $x = 800$. Number of candidates appeared = 800.

41. (*c*) Total fruit $= 14 + 23 = 37$

$$\text{Again, } \frac{x \times 70}{100} = 14$$

$$x = 20$$

Reduce oranges $= 37 - 20 = 17$

42. (*d*) $4 - x + \frac{4 \times (-x)}{100} = 10$

$$\Rightarrow \quad -x - \frac{4x}{100} = 6$$

$$\Rightarrow \quad -104x = 600$$

$$\Rightarrow \quad x = \frac{-600}{104}\%$$

43. (*d*) $97\% = 23700$

$$\therefore \quad 93\% = \frac{23700}{97} \times 93 = ₹22722.679$$

44. (*d*) Number of full length coast = 15% of 800 = 120

Remaining coats $= 800 - 500 = 300$

$$\therefore \text{ Required percentage} = \frac{120}{300} \times 100\% = 40\%$$

45. (*d*) Let earlier there was consumption of 1 kg wheat

$\therefore$ Expenditure = 24

Now, 27 is price of 1 kg

$\therefore$ 1 is price of $\frac{1}{27}$ kg

$\therefore$ 24 is price of $\frac{24}{27} = \frac{8}{9}$ kg

$\therefore$ Consumption should be reduced by $\frac{1}{9}$ or 11.1%

46. (*c*) Total production of red tractors

$$= 294000 \times 53\% = 15582$$

Number of red tractors of Mahindra make

$$= \frac{150000}{1000} \times 98 = 14700$$

Number of non-Mahindra tractors

$$= 294000 - 150000 = 144000$$

$\therefore$ Number of Mahindra red tractors

$$= 15582 - 14700 = 882$$

Hence, required percentage

$$= \frac{882}{144000} \times 100 = 0.6125\%$$

47. (*b*) Let total marks be 100.

Then, minimum marks to be passed 40.

$$\therefore \text{ A obtained marks} = 40 - 40 \times \frac{10}{100}$$

$= 36$ marks

$\therefore$ B obtained marks $= 36 - \frac{100}{9} \times \frac{36}{100}$

$= 36 - 4$

$= 32$ marks

$\therefore$ C obtained marks

$= (36 + 32) - (36 + 32) \times \frac{700}{17 \times 100}$

$= 68 - 28$

$= 40$ marks.

48. (b) Let monthly salary be ₹x.

According to the given condition,

$\frac{4x}{10} + \frac{6x}{10} \times \frac{50}{100} + \frac{3x}{10} \times \frac{30}{100}$ + saving money $= x$

$\Rightarrow \quad \frac{4x}{10} + \frac{3x}{10} + \frac{9x}{100} + 630 = x$

$\Rightarrow \quad 630 = \frac{100x - 70x - 9x}{100}$

$\Rightarrow \quad 630 = \frac{21x}{100}$

$\Rightarrow \quad x =$ ₹3000

49. (c) Let the price of sugar be ₹x per kg.

$\therefore$ Initial expenditure = ₹$30x$

New expenditure = ₹$33x$

$\therefore$ New monthly consumption

$= \frac{33x}{1.32x} = 25$ kg

50. (b) Let his increased income be x.

$(x - 12000) \times \frac{80}{100} + \frac{12}{100} = x \times \frac{80}{100} \times \frac{10}{100}$

$\Rightarrow \quad 12x - 14400 = 10x$

$\Rightarrow \quad x =$ ₹7200

51. (c) Let his monthly rent be x.

$12x - 12x \times \frac{12.5}{100} - 325 = 100000 \times \frac{5.5}{100}$

$\Rightarrow \quad 12x - 1.5x - 325 = 5500$

$\Rightarrow \quad x = \frac{5500 + 325}{10.5} \approx$ ₹554.76

52. (a) Let his monthly salary be ₹x.

He spends ₹$0.4x$ on educational expenses, ₹$0.24x$ on purchasing books and ₹$0.08x$ on purchasing stationary items.

Remaining amount $= 0.4x - (0.24x + 0.08x)$

$=$ ₹$0.08x$

Also, $\frac{1}{4} \times 0.08x = 160$

$\therefore \quad x = \frac{160 \times 4}{0.08} =$ ₹8000

53. (c) Using, formula $K\% = -x + y - \frac{xy}{100}$

$= -10 + 10 - \frac{10 \times 10}{100} = -1\%$

54. (d) Let his sales were x.

Then,

$1000 + \frac{2.5}{1000}(x - 4000) = \frac{5}{100}x + 600$

$\Rightarrow \quad 100000 + 2.5x - 10000 = 5x + 60000$

$\Rightarrow \quad 2.5x = 30000$

$\Rightarrow \quad x =$ ₹12000

55. (b) Let the capacity of bucket be x L.

Then, $0.80x = 0.667x + 2$

$\Rightarrow \quad x = \frac{2}{0.133} = 15$ L

56. (b) In normal time rate $= \frac{240}{40} =$ ₹6 per hour

During sale rates are increased by 50% i.e.,

Rates 40-hour week $= 240 + 50\%$ of 240

$=$ ₹360

$\therefore$ Rate per hour $= \frac{360}{40} =$ ₹9 per hour

Now, according to the question,

Required commission $= 9 \times 60 =$ ₹540

57. (c) Let the maximum marks be x.

Then, $296 - 259 = 5\%$ of x

$\Rightarrow \quad \frac{5}{100}x = 37$

$\Rightarrow \quad x = 740$

58. (a) Marks obtained by Sushant = 1080

Marks obtained by Mohit

$= 1.2 \times 1080 = 1296$

Marks obtained by Rajesh $= \frac{1296}{0.9} = 1440$

So, percentage of marks obtained by Rajesh

$= \frac{1440}{2000} \times 100 = 72\%$

59. (c) Let Ram's monthly income be x.

Total savings $= x \times \frac{80}{100} \times \frac{85}{100} \times \frac{70}{100}$

$\Rightarrow \quad x = 9520 \times \frac{100}{80} \times \frac{100}{85} \times \frac{100}{70}$

$=$ ₹20000

60. (*a*) Let the quantity of haematite mined be x kg.

Then, $x \times \frac{80}{100} \times \frac{25}{100} = 80000$

$\Rightarrow \quad x = 80000 \times \frac{100}{80} \times \frac{100}{25}$

$= 400000$ kg

61. (*a*) Total number of votes = 6000

Total number of valid votes

$= 6000 \times 0.75 = 4500$

Total valid votes that Bhiku gets

$= 4500 \times 0.65 = 2925$

Total valid voted that Mhatre gets

$= 4500 - 2925 = 1575$

62. (*b*) Required percentage correction

$$= \frac{1.25 - 1}{1.25} \times 100 = 20\%$$

Note: This question can be solved, even if his height is not given because there is no need of his height.

63. (*c*) Required marks i.e., 50% of (180 + 150) = 165

Marks scored in first paper = 54

Marks required to be scored in second paper = 111

$\therefore$ Required percentage $= \frac{111}{150} \times 100 = 74\%$

64. (*a*) Difference in quantity (percentage) lost

$= 7\% - 5.2\% = 1.8\%$

Let the total quantity of wheat grown be x million tonnes.

Then,

$1.8\%\ x = (6 + 3)$

$\Rightarrow \qquad x = \frac{9 \times 100}{1.8} = 500$ million tonnes

65. (*d*) Suppose water tax = ₹x

Consumption of water = y litres

$\therefore$ Original expenditure on water = ₹xy

Increased water tax = ₹(x + 20% of x)

$$= ₹\frac{6}{5}x$$

Decreased consumption of water

$$= y - 20\% \text{ of } y = \frac{4}{5}y \text{ litre}$$

$\therefore$ New expenditure on water

$$= ₹\frac{6}{5}x \times \frac{4}{5}y = ₹\frac{24}{25}xy$$

$\therefore$ Decrease in expenditure on water

$$= ₹\left(xy - \frac{24}{25}xy\right) = ₹\frac{1}{25}xy$$

Hence, percentage decrease

$$= \frac{\frac{1}{25}xy}{xy} \times 100 = \frac{100}{25} = 4\%$$

Quicker Method: If the value is first increased by x% and then decreased by y% then there is $\left(x - y - \frac{xy}{100}\right)\%$ increase or decrease, according to the +ve or –ve sign respectively.

Here, $x = 20\%$ and $y = 20\%$

$\therefore \quad \%$ effect $= 20 - 20 - \frac{20 \times 20}{100} = -4$

Thus, there is 4% decrease in the expenditure of the money.

66. (*c*) $\qquad G = B + 15 \qquad (1)$

G + 10% of $G = B$ + 16% of B + 9

i.e., $\qquad \frac{11G}{10} = \frac{116B}{100} + 9$

i.e., $110G - 116B = 900 \qquad (2)$

Using (2) in (1), we get

$B = 125,\ G = 140$

$\therefore$ Total number of students $= B + G = 265$.

67. (*d*) Let the original number be $10x + y$

Here unit's digit is y.

According to the question, unit's digit of new number

$= y$ + 100% of $y = 3y$

Ten's digit of new number

$= 10x$ + 50% of $10x = 15x$

Now, $15x + 3y - 10x - y = 19$

or, $\qquad 5x + 2y = 19$

By trial and error method, we have $x = 3$ and $y = 2$

Since $\qquad 5 \times 3 + 2 \times 2 = 19$

$\therefore$ Original number $= 10 \times 3 + 2 = 32$

68. (*c*) Suppose there are 100 candidates for entrance.

$\therefore$ No. of capable candidates = 40

and no. of incapable candidates

$= 100 - 40 = 60$

Now, no. of capable candidates who pass the test

$= 80\%$ of $40 = 32$

No. of incapable candidates who pass the test

$= 25\%$ of $60 = 15$

(Since these successful candidates become college students.)

Thus, there are $32 + 15 = 47$ colleges students in all, of which 32 are capable.

Hence, proportion of capable college students

$$= \frac{32}{47} \times 100 \approx 68\%$$

69. (*b*) Total candidates = 2000

No. of boys = 900

No. of girls = 1100

No. of students who passed

$$= \frac{32 \times 900}{100} + \frac{38 \times 1100}{100}$$

$$= 288 + 418 = 706$$

No. of students who failed = $2000 - 706 = 1294$

$$\text{Required percentage} = \frac{1294}{2000} \times 100 = 64.7\ \%$$

70. (*b*) Required per cent decrease

$$= \frac{30}{130} \times 100 = \frac{300}{13} = 23\frac{1}{13}\%$$

71. (*c*) Let the total number of workers be 100.

Number of skilled workers = 75% of 100 = 75

Number of unskilled workers = $100 - 75 = 25$

Number of permanent workers = 80% of 75 + 20% of 25

$$= \frac{80}{100} \times 75 + \frac{20}{100} \times 25$$

$$= 60 + 5 = 65$$

Number of temporary workers = $100 - 65 = 35$

The number of temporary workers are 35, then total workers = 100

$\Rightarrow$ Number of total workers when number of temporary workers is 126

$$= \frac{100}{35} \times 126 = 360.$$

72. (*d*) Suppose monthly fellowship

$= ₹100$

Amount spent on monthly expenses

$= ₹70$

Amount spent on books

$= ₹20$

$\therefore$ Monthly amount saved

$= ₹100 - (70 + 20) = ₹10$

Actual yearly savings

$= ₹4800$

Actual monthly savings

$$= ₹\frac{4800}{12} = ₹400$$

If the amount saved is ₹10, monthly fellowship

$= ₹100$

$\therefore$ If the amount saved is ₹400 monthly fellowship

$$= ₹\frac{100}{10} \times 400 = ₹4000.$$

73. (*b*) Number of literate women

$$= 296000 \times \frac{50}{100} - 166000 \times \frac{70}{100}$$

$$= 148000 - 116200$$

$$= 31800$$

74. (*a*) Let initial expenditure and savings be $3x$ and $2x$ respectively.

So, initial income= $3x + 2x = 5x$

New income = $5.5x$

New expenditure = $3x \times 1.12 = 3.36x$

New savings = $5.5x - 3.36x = 2.14x$

Percentage increase in savings

$$= \frac{2.14x - 2x}{2x} \times 100 = 7\%$$

75. (*c*) Total score of first three friends = $15 \times 3 = 45$

and total score of last three friends = $16 \times 3 = 48$

$\therefore$ Total score of four friends = $45 + 19 = 64$

$\therefore$ Score of first friend = $64 - 48 = 16$

$\therefore$ Required percentage = $\frac{16}{48} \times 100\% = 33\frac{1}{3}\%$

76. (*a*) Required price of the single ticket

$$= \frac{84}{105} \times \frac{100}{1} \times \frac{100}{125} = 84 \times \frac{100}{105} \times \frac{100}{125} = ₹64$$

77. (*a*) Suppose original price = ₹100

Reduction = 20%

$\therefore$ Reduced price = $₹100 \times \frac{100 - 20}{100}$

$$= ₹100 \times \frac{80}{100} = ₹80$$

Increased in sale = 80%

$\therefore$ Increased sale = ₹80 $\times \frac{100+80}{180}$

$= ₹80 \times \frac{180}{100}$

$= ₹144$

Net increase in sale = ₹144 – ₹100

= ₹44 on ₹100

= 44%

78. (*d*) Suppose the numbers are x, y and z.

$\therefore \quad x = 20\%$ of z, $y = 50\%$ of z

$\therefore \quad x = \frac{2}{5}y \Rightarrow y = \frac{1}{2}z$

$\Rightarrow \quad x = \frac{2}{5}y \Rightarrow \frac{x}{2} = \frac{y}{5} = K$

$\Rightarrow \quad x = 2K, y = 5K$

$\therefore$ Percentage of x to y is

$$\frac{2K}{5K} \times 100 = 40$$

79. (*c*) Given, $x < y$

The per cent by which x is less than y

$$= \frac{y-x}{y} \times 100$$

80. (*d*) $r = 25\%$

Required reduction of petrol $= \frac{r}{100+r} \times 100\%$

$= \frac{25}{125} \times 100\% = 20\%$

81. (d) Let X million be the required quantity of wheat bags.

Then, given,

95% of $x + 20 = 98\%$ of $x + 15$

$\Rightarrow$ 3% of $x = 5$

$\Rightarrow \quad x = \frac{5}{3} \times 100 = \frac{500}{3} = 166\frac{2}{3}$

82. (*b*) If number of individuals be X, then

60% of x – 20% of x = 720

$\Rightarrow$ 40% of x = 720

$\Rightarrow \quad x = \frac{720}{40} \times 100 = 1800$

83. (*d*) Let cost of the tax free items be x

Then 6% of x = 30 paise

$\Rightarrow x = \frac{30}{6} \times 100$ paise = 500 paise = ₹5

$\therefore$ Cost of tax free items is 25 – 5 = ₹20

84. (*a*) Number of pages in notebook $X = 120$

Number of pages in notebook $Y = 110\%$ of $120 = 132$

Number of pages in notebook $Z = 90\%$ of $120 = 108$

Total number of pages in all the notebooks = 120+ 132+ 108 = 360

Number of pages torn by Shyam

in notebook X = 5% of 120 = 6

in notebook Y = 10% of 132 = 13.2

in notebook Z = 15% of 108 = 10.8

Total number of pages torn = 6 + 13.2 + 10.8 = 30

$\therefore$ Required percentage $= \frac{30}{360} \times 100\% \simeq 8\%$

85. (*c*) Total number of students = 90

Now, each of 50% of students get 20% of the total number of students i.e., 20% of 90 = 18

Also, each of remaining 50% of students get 10% of the total number of students i.e., 10% of 90 = 9

Hence, total number of sweets distributed

$= 45 \times 18 + 45 \times 9$

$= 45 \times (18 + 9)$

$= 45 \times 27$

$= 1215.$

86. (*b*) Let Saurabh should answer x% of 75 questions.

Then, 80% of 75 + x% of 75 = 60% of 150

$80 \times 75 + x \times 75 = 60 \times 150$

$\Rightarrow \quad 80 + x = 60 \times 2$

$\Rightarrow \quad 80 + x = 120$

$\Rightarrow \quad x = 40$

87. (*b*) Number of questions Nilam did

= 70% of 10 + 40% of 30 + 60% of 35 = 7 + 12 + 21 = 40

To get 60%, Nilam should have done = 60% of 75 = 45

Hence, she would have solved 5 more questions correctly.

88. (*c*) Content of sand = 45% of 900 kg

$= \frac{45 \times 900}{100} = 450$ kg

Content of cement $= 900 - (405 + 144)$

$= 900 - 549 = 351$

$\therefore$ Required percentage $= \frac{351}{900} \times 100\%$

$= 39\%$

89. (*b*) Let the total number of apples be 100, the vendor sold 60%, then per centage of apples remained

$= (100 - 60) = 40\%$

Now, 40% of $100 = \frac{40 \times 100}{100} = 40$

He throws 15 % of the remaining apples

$= 15\%$ of $40 = \frac{15 \times 40}{100} = 6$

Apples left with vendor = 40−6 = 34

On 2nd day, he sold 50% of apples and throws the remaining.

$\therefore$ 50% of $34 = \frac{50 \times 34}{100} = 17$

$\therefore$ Total apples which the vendor throws $= (17 + 6)$

$= 23$

Therefore, required percentage $= \frac{23 \times 100}{100} = 23\%$

90. (*b*) Cost, when two 50 g toothpastes are purchased

$= 2 \times 299 =$ ₹598

Cost, when one 100 g toothpaste is purchased = ₹ 509

Then, required percentage

$\frac{598 - 509}{509} \times 100\%$

$= \frac{89}{509} \times 100\% = 17.48 \approx 18\%$

91. (*a*) Amount of water in 1st vessel

$$= \frac{1}{5} \times 100 = 20\,\text{L}$$

$\therefore$ Amount of milk in1st vessel

$$= \frac{4}{5} \times 100 = 80\,\text{L}$$

Similarly, amount of water in 2nd vessel

$$= \frac{3}{5} \times 100 = 60\,\text{L}$$

Amount of milk in 2nd vessel

$$= \frac{2}{5} \times 100 = 40\,\text{L}$$

Amount of water in 3rd vessel

$$= \frac{3}{7} \times 100 = \frac{300}{7}$$

Amount of milk in 3rd vessel

$$= \frac{4}{7} \times 100 = \frac{400}{7}$$

$\therefore$ Required ratio

$$= \frac{20 + 60 + \frac{300}{7}}{80 + 40 + \frac{400}{7}}$$

$$= \frac{\frac{140 + 420 + 300}{7}}{\frac{560 + 280 + 400}{7}}$$

$$= \frac{860}{1240} = \frac{43}{62}$$

92. (a) Total number of students qualifying the test

$= \frac{400 \times 65}{100} = 260$

Let number of girls = x

and number of boys = $(400 - x)$

Now, cut off cleared by girls $= \frac{x \times 80}{100} = \frac{4x}{5}$

and cut off cleared by boys

$\frac{(400 - x) \times 60}{100} = \frac{1200 - 3x}{5}$

Now, $\frac{4x}{5} + \frac{1200 - 3x}{5} = 260$

$\Rightarrow \frac{4x + 1200 - 3x}{5} = 260$

$\Rightarrow x + 1200 = 1300$

$\Rightarrow x = 1300 - 1200 = 100$

$\therefore x = 100$

Hence, one hundred girls appeared in the test.

93. (*d*) Let Ajitha's initial salary = ₹100

Now, after raises the salary $= 100 \times \frac{15}{8} = ₹\frac{375}{2}$

So, Raises in the salary $= \frac{375}{2} - 100 = ₹\frac{175}{2}$

Let, first raise in salary = x%

and second raise in salary = $2x$%

$\therefore x + 2x = \frac{175}{2}$

$\Rightarrow 3x = \frac{175}{2} \Rightarrow x = \frac{175}{2 \times 3} = \frac{175}{6}$

$\Rightarrow x = 29.16667 \approx 30\%$

$\therefore x = 30\%$ (approx)

94. (*d*) Let, the person's income = ₹100

and savings = 6% of ₹100 = ₹6

$\therefore$ Expenditure = 100 − 6 = ₹94

2 yr later, his income = 100 + 15% of 100

= 100 + 15 = ₹115

Now, savings = ₹6

$\therefore$ Expenditure = 115 −6 = ₹109

So, percentage hike in expenditure $= \frac{109 - 94}{94} \times 100\%$

$= \frac{15}{94} \times 100\%$

$= 15.95\%$

95. (*c*) Let original price of petrol = ₹ x per gallon

After deduction, price of petrol $= ₹x \times \frac{90}{100} = ₹\frac{9x}{10}$

We are given:

$$\frac{1800}{\frac{9x}{10}} - \frac{1800}{x} = 5$$

$$\Rightarrow \quad \frac{2000}{x} - \frac{1800}{x} = 5 \quad \Rightarrow \quad \frac{200}{x} = 5$$

$$\Rightarrow \quad x = \frac{200}{5}$$

$$\therefore \quad x = \text{`}40$$

Hence, original price of petrol = ₹40 per gallon

96. (b) Rohan's marks = 75

Sonia's marks = 65

Rohit's marks = 65 + 45 = 110

Raman's marks = 110 − 25 = 85

Ravi got marks = 85 + 34 = 119

Total maximum marks = 119 + 50 + 169

Percentage of Ravi's marks $= \frac{119}{169} \times 100\% = 70.4\%$

= 70%

97. (b) Let total monthly income of Mr. Girdhar be ₹x.

We are given,

$$x \times \frac{50}{100} \times \frac{15}{100} = 900$$

$$x = ₹1200$$

Hence, monthly income of Mr. Giridhar = ₹12000.

98. (a) No. of boys, last year = 610

20% of 610 = 122

No. of boys, current year = 610 − 122 = 488

No. of girls = 175% of 488

$$= \frac{175 \times 488}{100} = 854 \text{ girls}$$

99. (d) Total income can be divided as,

₹170,000 = 50,000 + 10,000 + 90,000 + 20,000

∴ Total tax payable on ₹170000.= 50,000 × 0% + 10000 × 10% + 90,000 × 20% + 20,000 × 30% = 1000 + 18000 + 6000= ₹25000

DIFFICULTY LEVEL-2

1. (*d*) Let total money be ₹X

Then, $X = 0.25X + 0.1X + 0.5\,[1 - 0.25 - 0.1]\,X + 26$

$\Rightarrow \quad X = ₹80$

2. (*c*) Let the total number of students = X

Number of students failing in first subject = 40% of X

Number of students failing in second subject

= 10% of rest = 10% (60%) of X = 6% of X

Therefore, total number of students failing in both the subjects

$$= (40 + 6)\% \text{ of } X = 46\% \text{ of } X \qquad (1)$$

Therefore, students passing in two subjects

$$= 54\% \text{ of } X$$

The students passing in remaining subject

$$= 75\% \,(54\% \text{ of } X) = \frac{81}{2}\% \text{ of } X$$

Hence students failing in remaining subject

$$= \left(54 - \frac{81}{2}\right)\% \text{ of } X = \frac{27}{2}\% \text{ of } X \qquad (2)$$

Therefore, total number of students failing in all the subjects equation (1) + (2)

$$= \left(46 + \frac{27}{2}\right)\% X = \frac{119}{2}\% \text{ of } X$$

Number of students failing − Number of students passing = 570 (Given)

i.e., $\left(\frac{119}{2} - \frac{81}{2}\right)\%$ of $X = 570 \Rightarrow 19\%$ of $X = 570$

$$\Rightarrow \quad \text{Thus, } X = \frac{570 \times 100}{19} = 3000$$

Hence, the total number of students are 3,000

3. (*a*) The man invests ₹1,200 at 10% p.a.

At the end of 1st year the amount = ₹1,320

Withdrawal $\frac{30}{100} \times 1320 + 24 = ₹420$

Amount at the end of second year

$$= 900 \times 1.1 = ₹990$$

$$\text{Withdrawal} = \frac{30}{100} \times 990 + 93 = ₹390$$

∴ Amount at the end of 3 years

$$= 600 \times 1.1 = ₹660$$

4. (*c*) When expressed as a fraction, savings last month were $\frac{2}{15}$ of the salary. Reduced this month by 50% savings are $\frac{1}{15}$ of last month's salary, which is ₹667. New salary is ₹11,500. Expenditure this month is 11,500 − ₹667 = ₹10,833.

5. (b) Let the amount of iron be x kg

$$\therefore\ 1.2\left(\frac{x}{500}\right)=\left(\frac{x-25}{300}\right)\Rightarrow 3.6x=5x-125$$

or $\quad 1.4x=125$

$\therefore\quad x=89.28$ kg

6. (c) Here the difference $=\dfrac{a}{b}-\dfrac{b}{a}=\dfrac{a^2-b^2}{ab}$

Now, $\quad \dfrac{b}{a}<\dfrac{a}{b}$ by $\left(\dfrac{\dfrac{a^2-b^2}{ab}}{\dfrac{a}{b}}\times 100\right)\%$

$$=\frac{a^2-b^2}{a^2}\times 100=100\left(1-\frac{b^2}{a^2}\right)$$

7. (a) nth member contributed ₹$(10\times 2^n-5)$

$\Rightarrow$ 1st member contributed ₹15

2nd member contributed ₹35

3rd member contributed ₹75

4th member contributed ₹155

And so on.

Since 4th member gets ₹62 as his share in the profit, therefore we conlcude that 40% profit is earned by each member.

$\therefore$ Total profit earned

$=40\%$ of $[15+35+75+\ldots+$ upto 100 terms$]$

$=2\,[3+7+15+31+\ldots+$ upto 100 terms$]$

$=2\,[(4+8+16+32+\ldots+$ upto 100 terms$]$

$=8\,[(1+2+4+8+\ldots+$ upto 100 terms$)-25]$

$$=8\left[\left(\frac{2^{100}-1}{2-1}\right)-25\right]$$

$=8\,(2^{100}-1-25)$

$=8\,(2^{100}-26)$.

8. (c) Total no. of students $=K$, say

$$\therefore\quad \text{No. of boys}=\frac{3}{5}K$$

$$\text{No. of boys who passed}=75\%\text{ of }\frac{3}{5}K=\frac{9}{20}K$$

No. of boys who got 1st Division

$$=40\%\text{ of }\frac{9}{20}K=\frac{9}{50}K$$

$$\text{No. of students passed}=\frac{4}{5}K$$

No. of students who get 1st division

$$=\frac{2}{5}K$$

$$\text{No. of girls passed}=\frac{4}{5}K-\frac{9}{20}K=\frac{7K}{20}$$

No. of girls who got 1st division

$$=\frac{2}{5}K-\frac{9}{50}K=\frac{11K}{50}$$

$$\text{No. of girls failed}=\frac{2K}{5}-\frac{7K}{20}=\frac{K}{20}.$$

9. (a) Number of packs bought by customer $=12$

Number of gift soaps received

$$=\text{Integer part of }\left(\frac{12}{5}\right)=2$$

Total number of soaps received by the customer

$$=(4\times 12)+2=50$$

Total money paid by the customer $=12\times 3\times s$, where s is the listed sale price of each soap

For 50 soaps, the listed sale price $=50s$

Actual amount paid is $36s$

Hence, discount is $14s$

$$\text{Discount percentage}=\left(\frac{14s}{50s}\right)\times 100=28\%$$

10. (a) $\dfrac{ptd}{(t+20\%\text{ of }t)\left(p-\dfrac{p}{3}\right)}=\dfrac{ptd}{\dfrac{6t}{5}\times\dfrac{2p}{3}}=\dfrac{5}{4}d.$

11. (d) Let total adult population of town $=T$

$\Rightarrow$ Adult population that is male $=0.6T$

Adult population that is female $=0.4T$

$a\%$ of adult male population and $b\%$ of adult female population is educated.

Given, educated adult males + uneducated adult females = Sum of uneducated adult males + Educated adult females

$$\Rightarrow\quad 0.6T\times\frac{a}{100}+0.4T\times\frac{(100-b)}{100}$$

$$=\frac{0.6T(100-a)}{100}+\frac{0.4Tb}{100}$$

$\Rightarrow\quad 3a-2b=50$

Only choice (d) satisfies the above equation.

12. (c) 120 coats for full length. 500 shorter length coats are removed.

$\therefore$ Percentage of full length coats out of the remaining 300 coats

$$=\frac{120}{300}\times 100=40.$$

13. (*d*) 5% of $A = 15\%$ of $B \Rightarrow 5A = 15B \Rightarrow A = 3B$

10% of $B = 20\%$ of $C \Rightarrow 10B = 20C \Rightarrow B = 2C$

If $C = 2000$, then $B = 4000$

$\therefore\ A = 12000$

Hence, the total income of A, B and $C = 18000$.

14. (*b*) Expenditure by Ajay on batteries

$$= 80\% \text{ of } 150 + \frac{150}{2}$$

$$= 120 + 75 = ₹195.$$

15. (*c*) 5% increase in $X \Rightarrow 3\%$ increase in Y

5% increase in $Y \Rightarrow 2.5\%$ increase in Z

$\therefore$ 3% increase in $Y \Rightarrow 1.5\%$ increase in Z

$\therefore$ 5% increase in X

$\Rightarrow$ 1.5% increase in Z i.e., $5X = 1.5Z$

$\Rightarrow$ $25X = 7.5Z$.

16. (*a*) 30% of increase in Y

$\Rightarrow$ 15% of increase in Z i.e., 32.25% increase in Z^2.

17. (*a*) X is increased from 10 to 15, i.e., there is 50% increase in X.

$\therefore$ There must be 15% increase in Z, i.e., Z must increase from 30 to 34.5, i.e., 35 approx.

18. (*c*) Percentage of those who were not certain

$$= 100 - (20 + 60) = 20\%$$

Now, let the number of persons involved in the survey be x

Then $x \times 60\% - x \times 20\% = 720$

$\Rightarrow$ $x \times 40\% = 720$

$\therefore$ $x = 1{,}800$

19. (*b*) Time $\times$ Rate = Total charges

$1 \times 1 = 1$

$x \times 1.25 = 1.1$

$$\therefore \quad x = \frac{1.1}{1.25} \times 100 = 88\%$$

Thus, decrease in time = 12%

20. (*d*) $$\text{Total land of Sukhiya} = \frac{480\,x}{0.6} = 800x$$

$\therefore$ Cultivated land of village $= 384000x$

$$\therefore \text{ Required percentage} = \frac{800\,x}{384000} \times 100$$

$$= 0.20833$$

21. (*c*) Let the price of the cooking oil

$= ₹100$/unit

Let the family consumes 100 units

$\therefore$ Total expenditure on this account $= ₹10000$

If the price becomes ₹125 and the family consumes, say x units, then the total expenditure will become ₹$125x$.

In order that after increase in price, the total expenditure of the family remains unaffected, therefore

$$125x = 10000 \Rightarrow x = 80$$

$\therefore$ Reduction in consumption of units

$= 20$, i.e., 20%

22. (*c*) $$\frac{6\% \text{ of } 1000000}{12} = ₹5000/\text{month}$$

Incidental Expenses + Taxes = ₹3000/month

Total Rent per month = ₹8000.

23. (*b*) $100 + 20\% = 120$

$120 - 10\% = 108$

$\therefore$ Gain $\% = 8$.

24. (*a*) $$X = Y + 25\% \text{ of } Y = \frac{5Y}{4}$$

$$Y = Z + 20\% \text{ of } Z = \frac{6Z}{5}$$

$$\therefore \quad 4X = 5Y = 6Z \Rightarrow \frac{X}{15} = \frac{Y}{12} = \frac{Z}{10}$$

i.e., X, Y, Z share their profit in the ratio 15:12:10.

$$\therefore \quad Z\text{'s share} = \frac{10}{37} \times 740 = ₹200.$$

25. (*d*) Cannot be determined. We do not know whether there are some male employees who have exactly ₹8,000 per month as their salary or not.

26. (*a*) Let the quantity of paint purchased be x kg

then $(x - 15\% \text{ of } x) = 25$

$\Rightarrow$ $x = 29.41$ or 30 kg

So, he must purchase 15 cans

Total cost $= (16 \times 15) = ₹240$

27. (*d*) Since we do not have sufficient data. Further any value is possible as the required income tax.

28. (*d*) $$\text{Required } \% = \left(\frac{P}{100+P} \times 100\right)\%$$

$$= \left(\frac{20}{120} \times 100\right)\% = 16.66\%$$

29. (*c*) Let the number of fish be x then,

$$\frac{50 \times 100}{x} = \frac{48 \times 100}{(x - 50)}$$

$$\Rightarrow \quad \frac{50}{x} = \frac{48}{x - 50}$$

$\Rightarrow$ $50x - 2500 = 48x$

$\Rightarrow$ $50x - 48x = 2500$

$\Rightarrow$ $2x = 2500$

$\therefore$ $x = 1250$

30. (*d*) Number of researchers prefer team A

$$50 \times \frac{70}{100} = 35$$

Researchers assigned to $A = 50 \times \frac{40}{100} = 20$

Difference= 15

Prefer team $B = 50 \times \frac{30}{100} = 15$

Assigned to $B = 50 \times \frac{60}{100} = 30$

Difference= 15

Hence, least possible number of researchers who will not be assigned to the team they prefer = 15 + 15 = 30

31. (*c*) Total migrants population $= \frac{35}{100} \times 728400 = 254940$

Local population $= \frac{65}{100} \times 728400 = 473460$

Total rural migrants $= \frac{20}{100} \times 254940 = 50988$

Total urban migrants $= \frac{80}{100} \times 254940 = 203952$

$\therefore$ Population of females

$$= \frac{48}{100} \times 473460 + \frac{30}{100} \times 50988 + \frac{40}{100} \times 203952$$

$$= 227260.8 + 15296.4 + 81580.8 = 324138$$

32. (*b*) Let company received x ball bearing in first shipment and $2x$ ball bearing in 2nd shipment.

$\therefore$ 1% of x + 4.5% of $2x = 100$

$$\Rightarrow \quad \frac{x}{100} + \frac{9x}{100} = 100$$

$$\Rightarrow \quad x = 1000$$

33. (*b*) Let there are 100 employees in Sun Metals.

$\therefore$ General graduates = 40 and engineers = 60

No. of engineers having salary more than 5 lakhs/year

$$= \left[60 \times \frac{75}{100}\right] = 45$$

No. of employees having salary more than 5 lakhs/year

$$= 50$$

$\therefore$ No of general graduates having salary less than 5 lakhs/year = 35.

This is 7/8th of the number of general graduates.

34. (*d*) We know that,

Exactly 1 + 2 Exactly 2 + 3 Exactly 3

$$= 61 + 46 + 29$$

$$= 136\% \qquad (1)$$

Exactly 1 + Exactly 2 + Exactly 3

$$= 100 - 3 = 97\% \qquad (2)$$

Adding Eqs. (1) and (2),

Exactly 2 + 2 Exactly 3 = 39

Exactly 2 = 25

$\Rightarrow$ 25 + 2 Exactly 3 = 39

Exactly 3 = 7%

So, 7% of people watched all the movies.

35. (*a*) Total growth in sales

$= (193.8 \times 7.25\%) + (79.3 \times 8.2\%) + (57.5 \times 7.19\%)$

$= 14.05 + 6.5 + 4.11 = 24.66$

Total sales from all the zones = 330.6

$\therefore$ Overall percentage growth

$$= \frac{24.66}{330.6} \times 100 = 7.46\%$$

36. (*d*) Bonus share of Sun Systems Limited received by Raveendra in 2007 $= 650 \times \frac{3}{13} = 150$ and in 2008 it is $800 \times \frac{1}{2} = 400$

Hence, in 2009, when bonus share were announced he has 550 shares additionally.

$\therefore$ Percentage $= \frac{1200 \times 12.5}{650} \times 100 = 23\%$

37. (*b*) Let earlier ₹100 was cost of 1 kg cement.

Now it is ₹70.

Now ₹70 for 1 kg cement.

$\therefore$ ₹1 for $\frac{1}{70}$ kg cement.

$\therefore$ ₹100 for $\frac{100}{70}$ kg cement.

$\therefore$ Increased cement $= \frac{100}{70} - 1 = \frac{30}{70}$

$\therefore$ Percentage increase $= \frac{30}{70} \times 100 = 42\frac{6}{7}\%$

38. (*d*) Number of girls $= \frac{2}{5} \times 1000 = 400$

Boys = 600

According to question,

$$\frac{1}{5}\times 400+\frac{1}{4}\times 600 = 230$$

$\therefore$ 12 year above = 1000 – 230 = 770

$$\therefore \text{ Percentage} = \frac{770}{1000}\times 100 = 77\%$$

39. (*b*) Smaller burner burns for 24 more hours.

$$\therefore \text{ Percentage difference} = \frac{24}{80}\times 100 = 30\%$$

40. (d) The value of the house after 3 years will be ₹. 50000

At present, its worth is,

$$\frac{50000}{\left(1-\frac{10}{100}\right)} = \frac{50000}{(0.9)^3}$$

≈₹ 68587.

41. (a) The % of respondents who watch all 3 channels

$$= \frac{[30+20+85-20-(100-5)]}{2} = 10$$

42. (d) Those watching *L* and *B* only (= 16 − 10) = 6, while thosewatching *A* and *B* only (= 20 −10) = 10.

Those watching *L* and *A* only (20 − 6 −10) = 4.

Those watching *L* 20 − (6 + 10 +4) = 0, which is not among the choices given.

43. (d) As the length of hypotenuse is decreased by 35%, the total reduction in the area of the triangle is

$$\left(2n-\frac{n^2}{100}\right)\% \quad (\text{here, } n = 35\%)$$

$$= \left[2\times 35-\frac{(35)^2}{100}\right]\%$$

$$= (70-12.25)\% = 57.75\%$$

Therefore, the new triangle will have area equal to (100 – 57.75)% of the area of the bigger triangle, i.e., 42.25% of 34

$$= \frac{42.25\times 34}{100} = 14.365 \text{ cm}^2$$

44. (c) Let *x* kg of dry grapes be obtained

Then, solid part in fresh grapes = solid part in dry grapes

i.e., $0.10\times 20 = 0.8\times x \Rightarrow x = 2.5$ kg.

45. (a) Let the cost of component *A* and *B* be ₹30 and 50, respectively.

Then cost of production = ₹(30 + 50 + 20), where ₹20 contributes to the other expenses, assuming total production cost ₹100.

Since, profit is 20% Hence, selling price = ₹120.

Now, new cost price of component *A* = ₹39

New cost price of component *B* = ₹61

New production cost (other expenses do not change)

= (39 + 61 + 20) = ₹120

Since, new SP = 120 × 1.1 = 132

$$\therefore \text{ New profit\%} = \frac{132-120}{120}\times 100 = 10.$$

46. (b) New cost of component *A* = 30 × 1.2 = ₹36

New cost of component *B* = 50 × 0.88 = ₹44

New production cost = ₹(36 + 44 + 20) = ₹100

New selling price is same.

Hence, profit = 120 − 10 = 20 or 20%

47. (b) Amount of salt in given solution $= 1000\times\frac{4}{100} = 40$ g

$\therefore$ Minimum amount of water required after which sedimentation starts

$$= \frac{40}{25}\times 100 = 160 \text{ g}$$

$\therefore$ Minimum 840 g needs to evaporated.

Time required to evaporate 840 g of water $= \frac{840}{28} = 30$ hrs

$\therefore$ After 31 h the given solution starts sedimenting.

48. (a) Let the total production of hematite be *x* kg

Amount of ore gets wasted = 20% of *x*

Remaining amount = 80% of *x*

$$\text{Amount of pure iron obtained} = \frac{25}{100}\times\frac{80}{100}\times x$$

$$= \frac{1}{5}x \text{ kg}$$

We are given,

Amount of pure iron obtained in a year = 80000 kg

$$\therefore \frac{1}{5}x = 80000$$

or $x = 400000$kg

49. (*b*) Let the actual height be *x* ft.

Then, height given in medical certificate = 125*x* ft

$$\text{Therefore, per cent correction} = \frac{1.25x-x}{1.25}\times 100$$

$$= \frac{0.25}{1.25}\times 100 = 20\%$$

50. (*a*) Total tractor population in state = 294000

Tractor manufactured by Mahindra and Mahindra = 150000

Out of every 1000 Mahindra tractor 98 are red.

$\therefore$ Number of mahindra tractors that are red

$= \frac{98}{1000} \times 150000 = 14700$

Total number of red tractors $= 294000 \times \frac{53}{100} = 15582$

Number of non-Mahindra tractors that are red

$= 15582 - 14700$

$= 882$

$\therefore$ Percentage of non-Mahindra tractor that are red

$= \frac{882}{(294000 - 150000)} \times 100\%$

$= \frac{882}{144000} \times 100\%$

$= \frac{882}{144}\%$

$= 6.125\%$