

07. A man spent  $\frac{1}{2}$  of his money and then lost  $\frac{1}{4}$  of the remainder. He was left with Tk. 3,600. How much did he start with? [Sonal Bank Ltd, Officer-2018 + Uttara Bank Ltd, PO-2021]

Sol. Let, he has Tk. x

After spending he has =  $\frac{x}{2}$

After losing he has =  $\frac{x}{2} - \left(\frac{x}{2} \times \frac{1}{4}\right)$

$$= \frac{x}{2} - \frac{x}{8} = \frac{4x-x}{8} = \frac{3x}{8}$$

$$\text{Here, } \frac{3x}{8} = 3600 \Rightarrow x = 3600 \times \frac{8}{3} = 9600 \text{ (Ans)}$$

08. Equal amounts of water were poured into two empty jars of different capacities, which made one jar  $\frac{1}{4}$  full and the other jar  $\frac{1}{3}$  full. If the water in the jar with the lesser capacity is then poured into the jar with the greater capacity, what fraction of the larger jar will be filled with water? [Probashi Kallyan Bank, SO-2021]

Sol. Let, x liters of water was poured in each jar

Jar I is  $\frac{1}{4}$  full, so its capacity = 4x liters

Jar II is  $\frac{1}{3}$  full, so its capacity = 3x liters

As jar II is with lesser capacity, So now the x liter from Jar II is poured to Jar I

Total water in jar I = 2x litres

$$\text{The fraction of Jar I} = \frac{2x}{4x} = \frac{1}{2}$$

Hence Jar I is filled with  $\frac{1}{2}$  fraction Ans:

09. After being dropped a certain ball always bounces back to  $\frac{2}{5}$  of the height of its previous bounce.

After the first bounce it reaches a height of 125 inches. How high (In inches) will it reach after its fourth bounce? [Sonal Bank, (SO)-2018 + NRB Commercial Bank, TAO-2021]

Sol. As per question, 1st bounce = 125 inches

$$\text{2nd bounce} = \frac{2}{5} \times 125 = 50,$$

$$\text{3rd Bounce} = \frac{2}{5} \times 50 = 20$$

$$\text{4th bounce} = \frac{2}{5} \times 20 = 8 \text{ inches Ans:}$$

10. A collection of books went on sale and  $\frac{2}{3}$  of them was sold for Tk 2.30 each. If none of the 36 remaining books were sold, what was the total amount received for the books that were sold? [Uttarba Bank Ltd. (PO)-2021]

Sol. Unsold Book =  $1 - \frac{2}{3} = \frac{1}{3}$  Part

Now value of  $\frac{1}{3}$  part = 36

$$1 \text{ value of 1 part} = 36 \times 3$$

$$\therefore \text{value of } \frac{2}{3} \text{ part} = \frac{36 \times 3 \times 2}{3} = 72$$

$$\therefore \text{Selling price of book} = 72 \times 2.30 = \text{Tk. } 165.6 \text{ (Ans)}$$

## Lecture-2 : Percentage (Written)

### Teacher's Work

01. Every year Mr. Kalam saves Tk. 5400 which is 15 percent of his annual income. Mr. Rahim spends Tk. 2800 a month which is 87.5 percent of his monthly income. Who is earning more? [BB AD Written Exam 2022]
02. In an election, 30% of the voters voted for candidate A; whereas 60% of the remaining voted for candidate B. The remaining voters did not vote. If the difference between those who voted for candidate A and those who did not vote was 1200, how many individuals were eligible for casting vote in the election? [Janata Bank (EO)-2017]
03. In a country, 60% of the male citizen and 70% of the female citizen are eligible to vote. 70% of male citizens eligible to vote voted, and 60% of the female citizens eligible to vote voted. What fraction of the citizens voted during the election?

04. Mr. Akbar is a potato seller in a local bazaar, when he brings potatoes from the village market to his shop in the town; he has to pay a minimum of Tk. 100 toll up to total sale of Tk. 1,000. For any amount of sale above Tk. 1,000, he has to pay an additional toll of 7.5% on the incremental amount. If the total amount of toll paid was Tk. 257.50 then what was his total sales proceeds from the potatoes? [Basic Bank (AM)-2013]
05. Kabir spends 80% of his income. His income is increased by 50% and he increases his expenditure by 25%. Calculate the percentage of his increased amount of savings. [Bangladesh Shipping Corporation (AO)-2018]
06. Mr. Karim gave 40% of the money he had, to his wife. He also gave 20% of the remaining amount to each of his three sons. Half of the amount now left was spent on miscellaneous items and the remaining amount of Tk. 12,000 was deposited in the bank. How much did Mr. Karim have initially? [Somobai Bank (Off)-2015, Meghna Bank-(MTO) - 2017 & Janata Bank-(EO)-2018]

07. The price of a shirt and a pant together is Tk. 1,300. If the price of the shirt increases by 5% and that of the pant by 10%, it costs Tk. 1,405 to buy those two things. Find the respective price of a shirt and a pant. [BHBFC (SO)-2017]
08. If sugar price reduced  $6\frac{1}{4}\%$  then one can buy 1 kg more sugar at Tk. 120. Find the rate of original and reduced price. [Janata Bank (Cash)-2015]
09. A man works for certain hours. If his hourly payment increases by 20%, what percent of working hours he may reduce so that total income remains unchanged? [Basic Bank- (AM)- 2018]
10. Recently Kamal's hourly wage has been increased by 10%. Before this increase, Kamal's total weekly wage was Tk. 137. If his weekly working hours were to decrease by 10% from last week's total working hours, what would be the change, if any, in Kamal's total weekly wage? [BB (AD)-2009]
11. In an organization 30% of all employees live over 10 miles away from the place of work & 60% of worker who live over 10 miles use company transport. If 40% of employees of the company use company transport, what percent of the employees live 10 miles or less from work and use company transport? [BB (Off)-2001, Eastern Bank (NITO)- 2007]
12. In a tournament, a player has a record of 40% wins, out of the number of games he has played so far which in turn is  $\frac{2}{5}$  of the total number of games he plays. What is the maximum percentage of the remaining games that the palyer can lose and still win 50% of all the games played?

### Illustrative Questions

01. The monthly income of a person was Tk. 13500 and his monthly expenditure was Tk. 9000. Next year, his income increased by 14% and his expenditure by 7%. Find the percentage increase in his savings.

Sol. Increased income = 114% of Tk 13500

$$= \text{Tk.} \left( \frac{114}{100} \times 13500 \right) = \text{Tk } 15390.$$

Increased expenditure = 107% of Tk 9000

$$= \text{Tk} \left( \frac{107}{100} \times 9000 \right) = 9630.$$

Increased savings = Tk (15390-9630) = Tk. 5760.

Original savings = Tk (13500-9000) = Tk. 4500.

$\therefore$  Savings increase = Tk (5760-4500) = Tk 1260.

$\therefore$  Increase % in savings =  $\left( \frac{1260}{4500} \times 100 \right) \% = 28\%$ .

Ans: 28%

02. Salesperson A's compensation for any week is Tk. 360 plus 6 percent of the portion of A's total sales above Tk 1000 for that week. Salesperson B's compensation for any week is 8 percent of B's total sales for that week. For what amount of total weekly sales would both salespersons earn the same compensation?

Sol. Let the required weekly sales be Tk x.  
Then, A's compensation = Tk [360 + 6% of (x-1000)] =  $\frac{8}{100}x$

B's compensation = 8% of Tk. x

So,  $360 + 6\%$  of  $(x-1000) = 8\%$  of x

$$\Rightarrow 360 + \frac{6}{100}(x-1000) = \frac{8}{100}x$$

$$\Rightarrow 360 + \frac{3}{50}x - 60 = \frac{2}{25}x$$

$$\Rightarrow \frac{x}{50} = 300 \therefore x = 15000.$$

Hence, required weekly sales = Tk 15000. (Ans)

03. A man buys a house for Tk. 5 lakh and rents it. He puts  $12\frac{1}{2}\%$  of each month's rent aside for repairs, pays Tk. 1660 as annual taxes and realizes 10% on his investment thereafter. Find the monthly rent of the house.

Sol. Let the annual rent of the house be Tk. x. Then,

$$X - \left( 12\frac{1}{2}\% \text{ of } x + 1660 \right) = 10\% \text{ of } 5,00,000$$

$$\Rightarrow x - \left( \frac{25}{2} \times \frac{1}{100} \times x + 1660 \right) = 50,000$$

$$\Rightarrow \frac{7x}{8} - 1660 = 50,000$$

$$\Rightarrow \frac{7x}{8} = 51,660$$

$$\Rightarrow x = 59,040.$$

Hence, monthly rent = Tk.  $\left( \frac{59040}{12} \right) = \text{Tk } 4,920.$

04. In an election between two candidates, 75% of the voters cast their votes, out of which 2% of the votes were declared invalid. A candidate got 926 votes which were 75% of the total valid votes. Find the total number of votes enrolled in the election.

Sol. Let the total number of votes enrolled by x. Then,  
Number of votes cast = 75% of x. Valid votes = 98% of (75% of x).

$$\therefore 75\% \text{ of } [98\% \text{ of } (75\% \text{ of } x)] = 9261$$

$$\Leftrightarrow \left( \frac{75}{100} \times \frac{98}{100} \times \frac{75}{100} \times x \right) = 9261$$

$$\Leftrightarrow x = \frac{9261 \times 100 \times 100 \times 100}{75 \times 98 \times 75}$$

$$\therefore x = 16800. \text{ (Ans)}$$

05. Shobha's Mathematic 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 she would have needed to answer correctly to earn a 60% passing grade?

Sol. Number of questions attempted correctly = (70% of 10 + 40% of 30 + 60% of 35)  
= (7 + 12 + 21) = 40.

Questions to be answered correctly for 60% grade = 60% of 75 = 45.

∴ Required number of questions = (45 - 40) = 5. (Ans)

06. If 50% of (x - y) = 30% of (x + y), then what percent of x is y?

Sol. 50% of (x - y) = 30% of (x + y)

$$\Leftrightarrow \frac{50}{100}(x-y) = \frac{30}{100}(x+y) \Leftrightarrow 5(x-y) = 3(x+y)$$

$$\Leftrightarrow 2x = 8y \Leftrightarrow x = 4y.$$

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

$$= \left(\frac{y}{4y} \times 100\right)\% = 25\% \text{ Ans: } 25\%$$

07. Mr. Jones gave 40% of the money he had, to his wife. He also gave 20% of the remaining amount to each of his three sons. Half of the amount now left was spent on miscellaneous items and the remaining amount of tk 12,000 was deposited in the bank. How much money did Mr. Jones have initially?

Sol. Let, Mr. Jones initially had Tk 1,00,000 with him.

$$\text{Money given to wife} = \text{Tk } \frac{40}{100}x = \text{Tk } \frac{2x}{5}.$$

$$\therefore \text{Remainign balance} = \text{Tk } \left(x - \frac{2x}{5}\right) = \text{Tk } \frac{3x}{5}.$$

$$\text{Money given to 3 sons} = \text{Tk } \left(3 \times \frac{20}{100} \times \frac{3x}{5}\right) = \text{Tk } \frac{9x}{25}.$$

$$\therefore \text{Remainign balance} = \text{Tk } \left(\frac{3x}{5} - \frac{9x}{25}\right) = \text{Tk } \frac{6x}{25}.$$

$$\text{Amount deposited in bank} = \text{Tk } \left(\frac{1}{2} \times \frac{6x}{25}\right) = \text{Tk } \frac{3x}{25}.$$

$$\therefore \frac{3x}{25} = 12000$$

$$\Leftrightarrow x = \left(\frac{12000 \times 25}{3}\right) = 1,00,000.$$

So, Mr. Jones initially had Tk 1,00,000 with him.

Ans: Tk 1,00,000

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

Sol. Let the maximum marks be x. Then,

$$(30\% \text{ of } x) + 10 = (40\% \text{ of } x) - 15$$

$$\Rightarrow \frac{30}{100}x + 10 = \frac{40}{100}x - 15$$

$$\Rightarrow \frac{10x}{100} = 25 \Rightarrow x = 250.$$

$$\therefore \text{Passing marks} = (30\% \text{ of } 250) + 10 = \left(\frac{30}{100} \times 250\right)$$

$$+ 10 = 85. \text{ (Ans)}$$

09. If  $z = \frac{x^2}{y}$  and x, y are both increased in value by 10%, find the percentage change in the value of z.

Sol. Let X, Y and Z represent the changed values of x, y and z respectively.

$$\text{Then, } X = 110\% \text{ of } x = \frac{11x}{10}; Y = 110\% \text{ of } y = \frac{11y}{10}$$

$$\therefore Z = \frac{X^2}{Y} = \frac{\left(\frac{11x}{10}\right)^2}{\frac{11y}{10}} = \frac{121x^2}{100} \times \frac{10}{11y} = \frac{11x^2}{10y} = \frac{11}{10} \times \frac{x^2}{y} = \frac{11}{10} Z$$

$$\text{Increase in the value of } z = \left(\frac{11z}{10} - z\right) = \frac{z}{10}.$$

$$\therefore \text{Increase}\% = \left(\frac{z}{10} \times \frac{1}{z} \times 100\right)\% = 10\%. \text{ Ans: } 10\%$$

10. In a tournament, a player has a record of 40% wins, out of the number of games he has played so far which in turn is  $\frac{2}{5}$  of the total number of games he plays. What is the maximum percentage of the remaining games that the palyer can lose and still win 50% of all the games played?

Sol. Let the total number of games played be x.

$$\text{Number of games already played} = 40\% \text{ of } x = \frac{2x}{5}.$$

$$\text{Games already lost} = 60\% \text{ of } \frac{2x}{5} = \frac{6x}{25}.$$

$$\text{Number of games that the player can lose} = 50\% \text{ of } x = \frac{x}{2}.$$

$$\therefore \text{Number of games that the player can still lose} = \left(\frac{x}{2} - \frac{6x}{25}\right) = \frac{13x}{50}.$$

$$\text{Remaining games to be played} = \left(x - \frac{2x}{5}\right) = \frac{3x}{5}.$$

$$\therefore \text{Required percentage} = \left(\frac{13x}{50} \times \frac{5}{3x} \times 100\right)\% = 43.3\%.$$

Ans: 43.3%

11. A man's working hours a day were increased by 20% and his wages per hour were increased by 15%. By how much percent was his dayly earning increased?

Sol. Let the original number of working hours a day be x and original wages per hour be Tk y.

Then, original daily earning = Tk (xy).

$$\text{Increased working hours} = 120\% \text{ of } x = \frac{6x}{5}.$$

$$\text{Increased wages per hour} = 115\% \text{ of Tk } y = \text{Tk } \frac{23y}{20}.$$

$$\text{New daily earning} = \text{Tk } \left(\frac{6x}{5} \times \frac{23y}{20}\right) = \text{Tk } \left(\frac{69xy}{50}\right).$$

$$\text{Increase in daily earning} = \text{Tk } \left(\frac{69xy}{50} - xy\right)$$

$$= \text{Tk } \left(\frac{19xy}{50}\right)$$

$$\therefore \text{Increase}\% = \left(\frac{19xy}{50} \times \frac{1}{xy} \times 100\right)\% = 38\%.$$

Ans: 38%

12. Due to a reduction of  $6\frac{1}{4}\%$  in the price of sugar, a man is able to buy 1 kg more for Tk 120. Find the original and reduced rate of sugar.

Sol. Let original rate be Tk.  $x$  per kg.

$$\text{Reduced rate} = \text{Tk} \left(100 - \frac{25}{4}\right)\% \text{ of } x = \frac{375}{4} \times \frac{1}{100} \times x$$

$$= \text{Tk} \frac{15x}{16} \text{ per kg}$$

$$\text{ATQ, } \frac{120}{\frac{15x}{16}} - \frac{120}{x} = 1 \Leftrightarrow \frac{128}{x} - \frac{120}{x} = 1 \therefore x = 8.$$

So, original rate = Tk 8 per kg.

$$\text{Reduced rate} = \text{Tk} \left(\frac{15}{16} \times 8\right) \text{ per kg} = \text{Tk } 7.50 \text{ per kg.}$$

Ans: Tk 8 & Tk 7.50 per kg.

### Students' work

01. A part time employee whose hourly wage was increased by 25% decided to reduce the number of hours worked per week so that the employees' total weekly income would remain unchanged. By what percent should the number of hours worked be reduced? [ICB-2011] **20%**
02. When price of sugar was raised by 25%, a person cut off his sugar consumption in such a way that his expenditure on sugar was unchanged. By what percentage the person reduced sugar consumption? [AB Bank (PO)-1993 (Written) + [IFIC Bank (PO)-2008- (Written)] **20%**
03. The sum of the pay of two officers is Tk. 24,000 per month. If the pay of one officer is decreased by 9% and the pay of the second is increased by 17%, their pays become equal. Find the pay of each officer. [BB (AD)-2006] **Tk.13,500 & Tk. 10,500**
04. When the price of TV set was increased by 30%, the number of TV sets sold decreased by 20%. What is the effect on sales in percentage? (BHFBC (SO)-2007) **4% Increase**
05. In a group of people solicited by a charity, 30% contributed Tk. 400 each, 45% contributed Tk. 200 each and the rest contributed Tk. 20 each. If the charity received a total of Tk. 3000 from the people who contributed Tk. 20 then how much was contributed by the entire group? [ICB (Officer)-2011] [Dhaka Bank (MTO)-2011] **Tk. 1,29,000**
06. A man wages and interest from his investment Tk. 5,000. If he invests double and the wages increased 50% then total amount is Tk. 8000. What is his actual income in terms of wages and interest? [SEBL (PO) & BKB-(SO)-2017] **Tk. 4,000 & Tk 1,000**
07. A businessman before closing his shop, counted the money kept in the cash box and found there were X number 50 paisa coin, X number of Tk. 1 notes, X number of Tk. 2 notes and X number of Tk. 5 notes. Apart from this there is nothing in the box. The next day when he opened the shop he finds that the cash box had been stolen. As he was insured, he got Tk. 1,615 which is 95% of the stolen money from the insurance company. How many Tk. 2 notes were in the box? (BASIC Bank (AM)- 2012) **200**
08. Malek spends 75% of his income. His income is increased by 20% and he increases his expenditure by 10%. Calculate the percentage of his increased amount of saving. [Basic Bank (AO) - 2009] **50%**
09. In a company there are 75% skilled workers and remaining 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? [examveda.com] **360**
10. You can now buy 4 meters of more cloth with the Tk. 800 because of a reduction in price by 20%. Calculate the original price and current price of per meter of cloth. [RBL (SO)-2000] **Tk. 50 and Tk 40**
11. Due to an increase of 30% in the price of eggs, 3 eggs less are available for Tk. 7.80. The present rate of eggs per dozen is? **Tk. 9.36**
12. A scored 30% marks and failed by 15 marks. B scored 40% marks and obtained 35 marks more than those required to pass. The pass percentage is? **33%**
13. When the price of TV set was increased by 30%, the number of TV sets sold decreased by 20%. What is the effect on sales in percentage? **4%**
14. The population of a city is 35000. On an increase of 6% in the number of men and an increase of 4% in the number of women, the population would become 36760. What was the number of women initially? **1700**
15. 10% of the votes did not cast their vote in election between two candidates. 10% of the votes polled were found invalid. The successful candidates got 54% of the valid votes and won by a majority of 1,620 votes. Find the number of voters enrolled on the voter's list? **25000**
16. Abir's monthly salary is equal to 30% of zahir's monthly salary or 20% of sohel's monthly salary. If the sum of sohels and zahirs income is tk 50000, what is the monthly salary of abir? **Tk 6000**
17. A owns 40% of tee stock in ABC Company. B owns 15,000 shares. C owns all the shares not owned by A or B. How many shares of stock does A own if C has 25% more shares than A? **Tk. 60,000**
18. A school has raised 75% of the amount it needs for a new building by receiving an average donation of Tk. 60 from the people already solicited. The people already solicited represent 60% of the people the college will ask for donations. If the college is to raise exactly the amount needed for the new building-how much must the remaining people donate per person? **Tk. 30**
19. The sum of the pay of two officers is Taka 24,000 per month. If the pay of one officer is decrease by 9% and the pay of the second is increased by 17%, there pays become equal. Find the pay of each officer. **Tk. 10,500**