



Mathematics: Arithmetic

Lecture 05

Overview

- ◆ Profit Loss
- ◆ Interest
- ◆ Set

Next Lecture

- ◆ Ratio
- ◆ Proportion
- ◆ Mixture

Name:

Batch:

IBA Regular Batch

Reach Us

Panthapath : 01972-277 866

Mouchak : 01999-017 011

Mirpur : 01970-985 421

Chattogram : 01970-985 420



www.capstonebd.com



Capstone Education

Math Lecture Sheet: 05

Profit-Loss

Terms:

The following terms may be encountered in profit and loss problems –

- i. The cost price of an article is the price paid by a person who wishes to sell it again.
- ii. The list price or marked price is the price at which the article is listed or marked to be sold.
- iii. There may be a discount or series of discount on the list price.
- iv. The selling price or sales price is the price at which the article is finally sold.
- v. The selling is greater than the cost price, there has been a profit.
- vi. If the selling price is lower than the cost price, there has been a loss.
- vii. A percentage profit or loss is based on the cost price [if not mentioned anything] or on the selling price [if mentioned]

Basic concepts:

1. One can greater a profit only if selling price > cost price.

2. One greater a loss when selling price < cost price.

3. Profit = Selling price – Cost price.

$$\% \text{ profit} = \left(\frac{SP - CP}{CP} \right) \times 100\%$$

4. Loss = Cost price – Selling price.

$$\% \text{ Loss} = \left(\frac{CP - SP}{CP} \right) \times 100\%$$

5. If there is a profit of P%,

$$\text{Selling price, } SP = \left(\frac{100 + P}{100} \right) \times CP$$

6. If there is a loss of L%,

$$\text{Selling price, } SP = \left(\frac{100 - L}{100} \right) \times CP$$

7. If there is a profit of P%,

$$\text{Cost price, CP} = \left(\frac{100}{100+P} \right) \times SP$$

8. If there is a loss of L%,

$$\text{Cost price, CP} = \left(\frac{100}{100-L} \right) \times SP$$

9. When two articles are sold at the same price such that there is a profit p% on one article and a loss of p% on the other, the net result of the transaction is loss.

$$\text{Loss\%} = \frac{(\text{common profit or loss})^2}{100} = \frac{p^2}{100}$$

10. If cost price of x things is equal to the selling price of y things, the profit percentage = $\frac{(x-y)}{y} \times 100\%$

Example:

01. A discount dealer claims to sell his goods at cost price, but he uses a weight of 900 gm for 1 kg weight. Find his gain percent.

Solution: The goods cost the dealers 90 per kg. So if he sells for tk. 100, it will cost him tk. 90.

Gain on tk. 90 = tk. (100 - 90) = tk. 10

Gain on tk. 1 = tk. $\frac{10}{90}$

Gain on tk. 100 = tk. $\left(\frac{10 \times 10}{90} \right) = \text{tk. } \frac{100}{9}$

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

02. Two items are sold for tk. 200. The first one is sold at 20% profit and second one at 20% loss. What is the % loss or gain?

Solution: here, profit = loss

\therefore % loss = $\frac{20^2}{100} \% = 4\%$

03. The cost price of 18 articles is equal to the selling price of 15 articles. The gain percent is-

Solution: Gain percentage = $\frac{18-15}{15} \times 100 = \frac{3}{15} \times 100 = 20\%$

Interest

Simple interest:

The formula –

$$\text{Simple interest, } I = \frac{P \times R \times t}{100}$$

P = principal (original amount)

R = Rate of interest (in %)

t = Time period

Example: A man borrowed tk. 15000 at the rate of 24% simple interest and to clear the debt after 6 years, much he has to return:

Solution: Using the basic formula:

$$\text{Simple interest, } I = \frac{PRt}{100}$$

Here, P = tk. 15000; R = 24%; t = 6 years

$$\therefore I = \frac{15000 \times 24 \times 6}{100} = \text{tk. } 21600$$

$$\therefore \text{Total repayment} = \text{Interest} + \text{Principal} = (21600 + 15000) = \text{tk. } 36600$$

Compound interest:

The formula,

Amount due at the end of the time period is given by –

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

P = Principal (original amount)

R = Rate of interest (in %)

t = Time period (yearly, half-yearly etc.)

$$\therefore \text{Interest would be, } I = A - P$$

Notes:

If interest is not compounded yearly, then –

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

A = Future value

P = Principal (original amount)

r = Annual nominal interest rate

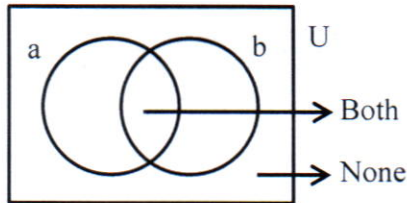
n = Number of times the interest is compounded per year

t = Number of years for which the money is borrowed

Set

Two overlapping sets:

$$\therefore U = a + b - \text{both} + \text{none}$$



Here, U = whole space

None = empty space

a = circle a

b = circle b

Both = common space between a & b

Example: In a class of 78 students 41 are taking French, 22 are taking German. Of the students taking French or German, 9 are taking both courses. How many students are not enrolled in either courses?

- A. 6 B. 1.5 C. 24 D. 33 E. 30

Solution: Here, U = 78

$$A = 41$$

$$B = 22$$

$$\text{Both} = 9$$

$$\text{None} = ? \text{ [Let, } x]$$

$$\therefore U = A + B - \text{both} + \text{none}$$

$$78 = 41 + 22 - 9 + x$$

$$\therefore x = 24$$

Answer: C

Three overlapping sets:

$$U = A + B + C - \text{both} + \text{triplled} + \text{none}$$

Here, U = whole space

None = empty space

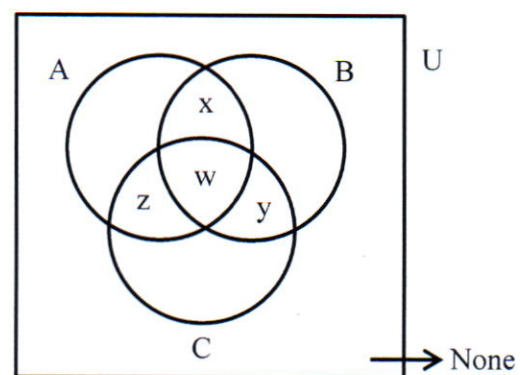
Both = common space between sets

Tripled = common space among A, B & C

A = circle A

B = circle B

C = circle C



$$x + y + z = \text{both} \ \& \ w = \text{triplled}$$

Example: In a survey at an airport, 55 travelers said that last year they had been to India, 53 to Nepal and 79 to Bhutan, 18 had been to India and Nepal, 17 to India and Bhutan and 25 to Nepal and Bhutan, while 10 had to all three countries. How many travelers took part?

- A. 120 B. 137 C. 173 D. 237 E. None of these

Solution: $U = x$ (Let)

A = 55

B = 53

C = 79

Both = $18 + 17 + 25 = 60$

None = 0

Tripled = 10

$\therefore x = 55 + 53 + 79 - 60 + 10 + 0$

$\therefore x = 137$

Answer: B. 137

Practice Test

1. By selling an article for tk. 100, a man gain tk. 15. Then his gain % is:
A. 15% B. $12\frac{2}{3}\%$ C. $17\frac{11}{17}\%$ D. $17\frac{1}{4}\%$ E. $19\frac{11}{17}\%$
2. If selling price is doubles, the profit tripled, find the profit percent?
A. 66.5% B. 300% C. 200% D. 100% E. 120%
3. A retailer buys a radio from the wholesaler for tk. 80. He then marks up the price by 25% and sales at a discount of 10%. What is his profit on the radio?
A. 8 B. 6 C. 4 D. 10 E. 12
4. The profit earned by selling an article for tk. 832 is equal to the loss incurred when the same article is sold for tk. 448. What should be the sale price for making 50% profit?
A. 860 B. 1060 C. 1020 D. 920 E. None of these
5. A dress on sale in a shop is marked at tk. Z. During the discount sale its price is reduced by 15%. Staffs are allowed a further 10% reduction on the discounted price. If a staff member buys the dress what will she have to pay in terms of Z?
A. 0.75Z B. 0.76Z C. 0.765Z D. 0.77Z E. None of these
6. A shopkeeper marks an article at such a price that after allowing a discount of 30% on the tag price (including tax) he marks a profit of 40%. If the tag price of the article including tax is tk. 460, then the cost price of that article is: [BBA 09-10]
A. 232 B. 260 C. 230 D. 330 E. None of these
7. Zulfikar sells a tape-recorder to Mizan at a loss of 10% and Mizan sells it to Shihab at a loss of 20%. If Shihab pays tk. 1440 for it, at what price did Zulfikar buy?
A. 3000 B. 2500 C. 2200 D. 2000 E. None of these
8. An investor made a profit of tk. 420 plus 30% of the amount originally paid for a stock. If the cost of the stock was originally tk. 2800 what percent of the cost was the total profit? [June 2015]
A. 35 B. 50 C. 45 D. 30 E. None of these

9. By selling an article at 80% of its marked price, a merchant makes a loss of 12%. What will be the profit/loss made by the merchant if he sells the article at 95% of its marked price? [Dec'15]

- A. 5% profit B. 1% loss C. 5.5% profit D. 4.5% profit E. None of these

10. A trader cheats both his supplier and customer by using faulty weights. When he buys from the supplier, he takes 10% more than the indicated weight. When he sells to his customer, he gives the customer a weight such that 10% that is added to the weight, the weight claimed by the trader is obtained. If he charges the cost price of the weight that he claims, find his profit percentage?

- A. 20% B. 21% C. 21.33% D. 22.109% E. 23%

11. A man purchased equal number of bananas at two different rates, one at the rate of 8 tk. per dozen and the other at the rate of 10 tk. per dozen. After that, he sold those bananas at an average rate of 11 tk. dozen and thus made a profit of 100 tk. How many dozen of banana did he purchase altogether?

- A. 60 B. 50 C. 55 D. 45 E. None of these

12. At a certain bookstore, the regular price of each book is 20 percent less than its list price. If during a sale the price of each book at the store was 15 percent less than its regular price, then the price of a book during the sale was what percent less than its list price? [Dec'16]

- A. 30% B. 32% C. 40% D. 42% E. None of these

13. Arif sold 100 pens of which 50 are red and 50 are black, at tk. 48 per pen. he made a profit of 20% on the black pens and made a loss of 20% on the red pens. What was the net gain on this sale in tk.? [June'17]

- A. 0 B. -50 C. -100 D. -200 E. None of these

14. Babu made a profit of 20% by selling a product. If he had purchased that product for 10% less and sold it at a profit of 40%, he would have received tk. 24 more. What was his original selling in taka? [Dec'2017]

- A. 400 B. 480 C. 520 D. 600 E. None of these

15. X sells a product to Y and makes a profit of 25%. Y sells it to Z at a loss of 20%. If Z buys it for tk. 140, what is X's purchase price?

- A. 200 B. 140 C. 175 D. 250 E. None of these

16. A retailer sells perfumes at a 10% discount. If a perfume cost him \$75 and he wants to make a profit of no less than twenty percent on the cost (after the discount) what is the minimum tag price he needs to put on a perfume?

- A. 90 B. 100 C. 120 D. 140 E. 150

17. An electronics store purchased a CD player at a wholesale price of 60\$ and then sold it at a 40 percent discount off the original retail price. If the store made a 25 percent profit on the whole price of the CD player, what was the store's profit as percent of the original retail price?

- A. 10% B. 12% C. 15% D. 18% E. 20%

18. A salesperson bought an item for tk. X and marked it up by 50%. However, he could not sell the item during the first quarter and thus, decided to provide a discount of 20% on the marked up price. As the item remained unsold in the second quarter as well, he started to charge 70% of the discounted value. What is the latest sales price of the item in term of its buying price? [June 2018]

- A. 60X B. 84X C. 96X D. 105X E. None of these

19. If a deposit of tk. 750 earns simple interest at 8% per annum and that of tk. 1250 earns the same at 6% per annum, what is the average rate of interest (in %) earned on the total deposit?

- A. 5.33 B. 5.67 C. 6.33 D. 6.75 E. 7.5

20. The sum of principle interest of a certain amount of money would be tk. 460 after 3 years from now and tk. 500 after 5 year from. What is the total interest rate?

- A. 3% B. 5% C. 10% D. 12% E. 15%

21. Tk 2000 is deposited in a savings account which pays 6% annual interest compounded semi-annually. To the nearest tk, how much is in the account at the end of the year?

- A. 6423 B. 6356 C. 6122 D. 6247 E. 6365

22. Abahoni and Mohamedan clubs consists of 200 and 270 members respectively. If the total member of the two clubs is 420 then how many members belong to both clubs?

- A. 30 B. 40 C. 50 D. 60 E. None of these

23. Of the 65 families in a locality, 45 have children and 10 have retired individual as members, Of the families, 8 have both children and retired individuals as members. How many of the families have neither children nor retired individuals as member?

- A. 15 B. 25 C. 18 D. 28 E. None of these

24. In a group of civil, mechanical and electrical engineers, all but 20 are civil engineers, all but 15 are mechanical engineers, and all but 25 are electrical engineers. How many of them are electrical engineers? [December 2017]

- A. 5 B. 10 C. 15 D. 20 E. None of these

25. In a class, a certain number of students opted to participate in a cultural competition comprising of 3 items- music, recitation and drama. Of these students, 53% showed interest for music and 35% showed interest for recitation. If 8% of the students of the whole class showed interest for dram, what percent of the students did not participate in the cultural program? [December 2016]

- A. 12% B. 16.33% C. 25% D. 33.33% E. None of these

Home Task

1. A milkman purchases the milk at tk. x per liter and sells it at tk. $2x$ per liters. Still he mixes 2 liters water with every 6 liters of pure milk. What is the profit percentage?
A. 116% B. 133.33% C. 150% D. 166.66% E. 100%
2. A trader buys some goods for tk. 150. If the overhead expenses be 12% of cost price, then at what price should it be sold to earn 10% profit?
A. 187.80 B. 185.80 C. 184.80 D. 188.80 E. 186.80
3. A man buys an article for 10% less than its value and sells it for 10% more than its value. His gain or loss percent is:
A. no profit, no loss B. 20% profit C. less than 20% profit
D. more than 20% profit E. None of these
4. In a certain store, the profit is 320% of the cost. If the cost increased by 25% but the selling price remain constant, approximately what percentage of the selling price is the profit?
A. 30% B. 100% C. 250% D. 70% E. 77%
5. A fruit salad is made by mixing 3 kgs of mango costing tk. 120 per kg and 2 kgs of papaya costing tk. 100 per kg and 2 kgs of grapes costing tk. 140 per kg. At what price (in tk.) per kg should the mixture be sold to make a profit of 25 percent?
A. 125 B. 130 C. 140 D. 150 E. 175
6. A wholesaler sells goods to a retailer at a profit of 20%. The retailer sells to customer, who pays 80% more than the cost of the wholesaler. What is the retailer's profit?
A. 40% B. 50% C. 60% D. 70% E. 30%
7. A number of people were asked whether they liked drinks of orange, lemon or grape flavor. The responses are as follows-
85 liked orange, 45 liked orange and lemon, 65 liked grapes, 40 liked lemon and grape, 90 liked lemon, 30 liked orange and grape, 15 liked all the three and 25 liked none. Find the member of people who liked only orange -
[June 2018]
A. 5 B. 25 C. 55 D. 70 E. None of these
8. In the above problem how many people were interviewed?
[June 2018]
A. 120 B. 125 C. 140 D. 155 E. None of these
9. A makes an article for tk. 120 and sells it to B at a profit of 25%. B sells it to C who sells for tk. 198 making a profit of 10%. What profit did B make?
A. 25% B. 20% C. 16.66% D. 15% E. None of these
10. A man sold his watch at a loss of 5%. had he sold it for tk. 56.25 more he would have gained 10%. What was the cost of the watch?
A. 260 B. 275 C. 280 D. 375 E. None of these

11. Two chairs have been sold, each for tk. 3600. On one 20% profit has been earned and on the other 20% loss has been incurred, what is the total profit or loss?
- A. profit of tk. 100 B. loss of tk. 120 C. loss of tk. 300
D. profit of tk. 300 E. None of these
12. A seller gave 5% discount on the tag price of a book and made a profit of 25% on cost. If the cost of the book was tk. 380, what was the tag price in tk.?
- A. 400 B. 450 C. 480 D. 500 E. None of these
13. The sales price of an item including the sales tax is tk. 616. The tax rate is 10% If the shopkeeper made a profit of 12%, what was cost price of the item in tk.?
- A. 500 B. 515 C. 550 D. 575 E. None of these
14. A man sold an article for tk. 56 cost him tk. x. If he had gained x% his outlay, what was his cost?
- A. tk. 45 B. tk. 35 C. tk. 40 D. tk. 50 E. tk. 28
15. A man sells an article at a profit of 25%. If he had bought it 20% less and sold it for tk. 10.50 less, he would have gained 30%, find the cost of the article?
- A. 40 B. 30 C. 50 D. 60 E. None of these
16. A customer came to a shop and asked the shop manager to give a discount of 20% on listed price of pen. Moreover, for 10 pens purchased he wanted two pens free of cost. The manager agreed to the customers demand because he could still make a profit of 20% on cost price. If the cost price of a pen is x, what was the list price of the pen? [BBA 14-15]
- A. $1.75x$ B. $1.8x$ C. $19x$ D. $2x$ E. None of these
17. The price of the jewel, passing through three hands, rises on the whole by 65%. If the first and the second sellers earn 20% and 25% profit respectively, find the percentage profit earned by the third seller.
- A. 12% B. 30% C. 40% D. 15% E. 10%
18. A shopkeeper sold an article for tk. 450 at a discount of 10% on the labeled price. He would have earned a profit of 25%, had there been no discount. What was the profit earned in percentage, at the discounted price? [June 2015]
- A. 10 B. 12 C. 12.5 D. 20 E. None of these
19. Bashir bought an ordinary mobile and a cover for tk. 2000. Malek bought a smart phone and the same cover for tk. 2000 more than Bashir had paid. The price of the cover was one tenth of the combined cost of the two mobiles. What was the cost of the ordinary mobile? [BBA 14-15]
- A. tk. 1000 B. tk. 1200 C. tk. 1500 D. tk. 1600 E. None of these

20. The profit on sale of 100 pencils is equal to the selling price of 20 pencils. What is the profit margin in percentage?

- A. 20 B. 25 C. 33.33 D. 50 E. 2.5

21. Rakib was planning on depositing a certain amount of money each month into a bank. He then decided not to make any contribution during May and June. To make the same annual contribution that he had originally planned, by what percent should he increase his monthly deposits?

- A. 16.66% B. 20% C. 25.33% D. 30% E. 33.33%

22. Annie invested a certain sum of money in a bank that paid simple interest. The amount grew to tk. 240 at the end of 2 years. She waited for another 3 years and got a final amount of tk. 300. What was the principle amount that she invested at the beginning?

- A. 200 B. 150 C. 210 D. 175 E. None of these

23. In 4 years tk. 6000 amounts to tk. 8000. In what time at the same rate will tk. 525 amount to tk. 700?

- A. 2 years B. 3 years C. 4 years D. 5 years E. None of these

24. A sum of money is borrowed and paid back in two annual installments of tk. 882 each allowing 5% compound interest. The sum borrowed was:

- A. tk. 1620 B. tk. 1680 C. tk. 1640 D. tk. 1700 E. None of these

25. The members of a club participate in at least one game. Twenty of them play football, 10 play cricket, 12 play hockey. Three of them play cricket only, 4 of them play both cricket and football but not hockey, 2 of them participate all games. How many people play both cricket and hockey but not football?

- A. 1 B. 2 C. 3 D. 0 E. None of these