Appendix. PERCENT AND THEIR APPLICATIONS

The answers to the tasks and examples will often be inaccurate numbers; however, when typing answers we will usually use the equality sign at the accuracy of an error. A reader is warned that very often answers are rounded to the unit.

1. Percent formulas

Definition *Let X be some quantity. P percent ($P\%$) of a quantity X we call the quantity* $\frac{P}{100}X$.

Example Assume that $X = 20$. Then 70% of X be equal to $\frac{70}{100}20 = 14$.

In what follows with percent $P\%$ related ratio we set by $p := \frac{P}{100}$. Moreover this ratio usually we call "percent." For example $0.2X$ we read 20% of X.

DefinitionLet X, Y be some quantities. Then the ratio

$$\frac{X}{Y} = p$$

we call *the main ratio of the percent.* The relation

$$X = pY$$

we call *the main equality of the percent.* The last equality we read "X is equal to $p100\%$ of Y."

X we call *percentage* of a new quantity;
$Y-$ base of the relation;
$p-$ rate of the relation.

We separate some problems related with the percent.

The first situation.

The quantities X, Y are known. How much percent of the quantity Y is equal to X?

Example New price of the product is Y=90. Old price was X=60 . How much percent of new price is equal the old price. How much percent of the old price is equal the new price?

Considering the first problem we compare the old price to the new price. It means, that Y is base and $X-$ percentage. Then ratio is equal to:

$$p = \frac{X}{Y} = \frac{60}{90} \approx 0.66$$

Thus, the old price equals $\approx 66\%$ to the new price.

Considering the second problem we have that X is base and Y is percentage. Then

$$p = \frac{Y}{X} = \frac{90}{60} \approx 1.5.$$

It means that new price equals 150% to old price.

The second situation.

The quantity X is known. Find $P\%$ of the quantity X.

Example Assume that $X = 200$. Find 250% of X.

Applying the main equality of percent we obtain, that new quantity X equals to

$$Y = pX = 2.5 \cdot 200 = 500.$$

The third situation.

The the quantity U, is known. Find the quantity Y which $P\%$ is equal to $Q\%$ of the quantity U.

Example Find quantity U, which 75% is equal to 150% of the quantity $Y = 200$.

We have

$$\frac{75}{100}U = \frac{150}{100}200.$$

The last equality yields the relation:

$$U = \frac{150}{75}200 = 400.$$

Example Find price, which 70% is equal to 30% of the price 120. Using main percent equality we arrive at the equality $0.7X = 0.3 \cdot 120$. From the last we obtain X= 60 .

The fourth situation.

The quantity X is known. Assume that this quantity increase (decrease) $P\%$. Find new value of the quantity.

Suppose that the quantity increase in $P\%$. Then the new quantity X_1 we obtain from relation:

$$X_1 = X + \frac{P}{100}X = (1 + \frac{P}{100})X = (1 + p)X$$

In a similar manner if Y decreases in $P\%$ then we deduce, that

$$Y_1 = (1 - \frac{P}{100})Y = (1 - p)Y.$$

Example A special consumer index has increased 70% during the last 5 years. Find value of the index. What was it 5 years ago, if the index is now 510.

We have $510 = 1.7 \cdot X$. Then $X = 300$.

Example After reduction of 30% of the market price, an article sold for 140 . What was the initial market price?

Applying the reduction formula we obtain:

$(1 - 0.3)X = 140$. Then $X = 200$.

We generalize this problem. Assume that X once increases in $P_1\%$, next time increases in $P_2\%$, and so on $k-$th time increases in $P_k\%$. We have

$$X_1 = (1 + p_1)X, \;\; X_2 = (1 + p_2)X_1 = (1 + p_1)(1 + p_2)X, \dots,$$

$$X_{k-1} = (1 + p_1)(1 + p_2)\dots(1 + p_{k-1})X.$$

Then for next step we have

$$X_k = (X_{k-1} + p_k X_{k-1}) = (1 + p_k)X_{k-1} = (1 + p_1)(1 + p_2)\dots(1 + p_k)X.$$

Here X_1 is the value of the quantity after the first increase, etc. X_k is the value of the quantity after kth increase.

Example Suppose that a price X of the share company A in one week changes in such a manner: twice increases 5% and 8%. Find how much percent changes share price.

Using general formula of changes we obtain

$$X_3 = 1.05 \cdot 1.08X \approx 1.134.$$

Thus, the price of the share increases in $\approx 13.4\%$.

Suppose, that $p_1 = p_2 = \ldots p_k = p$. Then the new value of the quantity after $k-$th increase is such:

$$X_k = (1+p)^k X.$$

An analogous formulas can be obtained when we consider decreasing of the quantity X. Suppose, that the first time quantity decrease in $Q_1\%$ et.ce. in kth -decrease $Q_k\%$. Then value of the X after k decreasing X_k are such:

$$X_k = (1-q_1)(1-q_2)\ldots(1-q_k)X,$$

here as above $q_1 = Q_1/100, \ldots, q_k = Q_k/100$.

Suppose, that $q_1 = q_2 = \ldots q_k = q$. Then the new value of the quantity after kth changes is such:

$$X_k = (1-q)^k X.$$

We generalize this problem. Assume that the quantity was increased k times in percent $P_1, \ldots, P_k$, and decreased in percent $Q_1, \ldots, Q_l$. We note, that the order of decrease and increase is not important. Then the value X_{k+l} of the original quantity X after $k+l$ changes

$$X_{k+l} := (1+p_1)\ldots(1+p_k)(1-q_1)\ldots(1-q_l)X. \tag{2}$$

Example Assume that the prices of petrol monthly changes in such a manner: the first month increases 20% in the second and third - 10% ir 25% respectively, and in the fourth month decreases 25%. How much does price change in percent during the four months?

Applying the last formula we obtain $X_4 \approx 1.2 \cdot 1.1 \cdot 1.25 \cdot 0.75 \cdot X$. Thus price changes by 5.6%.

2. Actual value

We consider the following problem. How changes the rate if the both percent and base changes?

Consider the relation

$$r = \frac{X}{Y}.$$

Suppose that percent and base changes in such manner: $X_1 = (1+p)X$ and $Y_1 = (1+q)Y$, here X_1 ir Y_1 are new values of the initial quantities X and Y, and quantities p, q positive or negative (it depend increases or decreases quantities). Consider the relation

$$r_1 = \frac{X_1}{Y_1} = \frac{(1+p)X}{(1+q)Y}.$$

The new quantity r_1 and initial quantity r is related by equality:

$$r_1 = (\frac{1+p}{1+q})r = \Big(1 + \frac{p-q}{1+q}\Big)r.$$

It's clear, that if percent and base changes in same value, then ratio stay the same. In that follows the relation

$$a := \frac{q-p}{1+q}$$

we call an actual changes of the magnitude X to magnitude Y, then X changes in $P\%$ and Y changes in $Q\%$.

Example Suppose that the wage X in one year increase 20%, and the inflation Y in this year was 14%. Find an actual increases of the wage after this year. We have, that

$$\frac{1.2 - 1.15}{1.15} \approx 0.04.$$

Thus actual wage increases in 4% .

Example Suppose that in the three years wage increases in 10%, fourth increases in 15% and fifth year increases in 5%. Three years was deflation 3% fourth year inflation 2% and fifth the inflation was 5% . Find actual increase of the wage in this four year. We have

$1 + p = 1.1^3 \cdot 1.15 \cdot 1.05 \approx 1.60, \quad 1 + q = 0.97^3 \cdot 1.02 \cdot 1.05 \approx 0.98$. Thus $p = 0.6$ and $q = -0.02$. Then actual increase of the wage is

$$\frac{p-q}{1+q} \approx \frac{0.6 + 0.02}{0.98} \approx 0.63,$$

or increase $\approx 63\%$.

3. Application percent in commercial. Cash discount

Definition A *trade discount is a reduction of a list price and is usually stated as a percent of the list price.*

Trade discount is used as pricing tools for such reasons:

1) to facilitate the establishment of price differentials for different groups of customers;

2) to facilitate the communication of changes in price;

3) to reduce the cost of making changes in price;

4) to stimulate to use more goods.

Denote by $D-$ amount of the discount, $d-$ rate of the discount, $S-$ list price and $SN-$ net price

Then

$$SN = S - D, \quad D = dS.$$

Net price we call discounted list price. It is clear, that net price and list price are related by equality:

$$SN = (1-d)S.$$

The difference $1 - d =: n$ is called *net cost factor*.

Examples Am item listed at 100 is subject to trade discount of 30%. Then the amount of discount $D = 0.3 \cdot 100 = 30$ and net price $SN = 100 - 30 =$ 70.

Suppose that a list price is subject to more then one discount. In this case the net price resulting from the first discount becomes the list price for the second discount and so on. This situation was discussed (formula (2)).

Example Suppose that price 15000 is subject to the discount series 20%, 10% and 5%. Find the net price.

Using decreasing formula (2) we have

$$SN = (1 - 0.2)(1 - 0.1)(1 - 0.05)1500 = 1026.$$

Thus net price N= 102.6, amount of the discount D=1500-1026= 476.

For any discount series a single equivalent rate of discount exists which may by found by choosing a suitable list price and finding the first amount of discount and the rate of discount.

Suppose that given discount series $d_1, \ldots, d_k$. Find the single equivalent d rate of discount for the given discount series.

Thus we have that

$$1 - d = (1 - d_1)(1 - d_2) \ldots (1 - d_k).$$

Then *single equivalent rate d* of discount equals

$$d = 1 - (1 - d_1)(1 - d_2) \ldots (1 - d_k).$$

Example Find the single equivalent rate d of discount for the given discount series $25\%, 20\%, 10\%$.

$$d = 1 - (1 - 0.25)(1 - 0.2) \ldots (1 - 0.1) = 0.46.$$

Thus single equivalent discount rate is 0.46.

It means, that the same net price from list price can be expressed by single discount of 46% or for the discount series $25\%, 20\%, 10\%$.

Example A manufacture can cover his cost and make a reasonable profit if he sells an article for 63.70. At what should the article be listed so that a discount of 30% can be allowed?

Thus we have that net cost factor $n = 0.7$. Then we have that $SN = nP$ or $63.70 = 0.7S$. It follows that S= 91.

Sales of goods among wholesalers, distributors and retailers are usually on credit rather than for cash.

Definition The *cash discount* is a deferred reduction, a sales discount for the seller and a purchase discount for the buyer.

We consider the following three most commonly used methods:

1) Ordinary dating;

2) End-of-the-month (proximo) dating;

3) Receipt-of-goods dating.

The method and size of cash discount are specified on the invoice by the terms of payment. For all methods, all payment terms have two things in common:

a) The cash discount is stated as a percent of the net amount (face value) of the invoice;

b) The time period during which the cash discount may be taken is stipulated.

Suppose, that payment is not made during the stipulated discount period, then the net amount of the invoice is to be paid by the due date which is either stipulated by the term of payment, or implies by the prevailing business practice. If payment is not made by the due date the account is overdue and may be subject to late payment charges.

1 Ordinary dating This method of offering a cash discount is defined by payment terms $D_1/m_1, D_2/m_2, \dots D_k/m_k, n/M$; here D_i- discount percent, m_i- number of the days then a discount of indicated percent D_i may be taken, n/M(read net Mdays). Days begin count following the end of the day shown in the invoice date.

Example Determine the payment needed to settle an invoice of 90000 dated September 22, terms $5/10, n/30$; if the invoice is paid in

a) on October 10;

b) on October 1.

The term of invoice indicate that a 5% discount may be taken off the invoice amount of N=90000 if the invoice is paid within ten days of the invoice date September 22. It is clear that the discount period ends on October 2. Thus payment on October 10 may not be taken. In this case the full net amount of the invoice 90000 must be paid.

Second case, October 1 is within the discount period, therefore the 5% discount may be paid. This new net value (amount paid)

$SN_1 = SN - 0.05SN = 0.95SN =$ 85500.

Example An invoice for 75284 dated March 25, is paid in April 20, and invoice for 100000 dated April 25, is paid on May 3. The terms for both invoices are 5/10, 2/30, $n/60$;. What is the amount paid?

Under definitions of terms follows that

a) a 5% discount may be taken within ten days of the invoice date if paid by April 4, for second invoices a 5% discount may be taken within ten days of the invoice date if paid by May 5.

b) a 2% discount may be taken within 30 days of the invoice date if paid after April 4, but no later than April 24, for second invoices a 2% discount may be taken within 30 days of the invoice date if paid after May 5, but no later than May 25.

c) The net amount is due within 60 days of the invoice date if advantage is not taken of the cash discount offered.

Thus we have that the 5% cash discount is allowed for the payment (SN_2) on May 3 and the 2% discount is allowed for the payment (SN_1) on April 20.

It is easy to obtain, that $SN_1 =$ 73778 and $SN_2 =$ 95000.

2). End-of-the-month dating (E.O.M)

This method is based on such an idea: the discount may be taken within the stipulated number of days following the end of the month shown in the invoice date. This method is similar to the ordinary data method, the difference is on shifting the invoice date to the last day of the month.

In either case the final date for paying the net amount of the invoice is usually not indicated but commonly understood to be **t**wenty days after the last day for taking the discount.

Technically terms is written by $D_1/m_1, \ \dots D_k/m_k \ E.O.M;$

Example An invoice for 50000 dated July 13, terms 10/20 $E.O.M$; is paid on August 18. What is the amount paid?

As was said above, the abbreviation $E.O.M$means that the invoice is to be treated as if the invoice date were July 31 and the last day for taking the discount is August 20. Therefore new net amount (payment) $SN_1 = 0.9SN =$ 4500.

3). Receipt-of-goods dating (R.O.G)

We talk about method which is related with logistic problems. This methods of offering a cash discount is used when the transportation of the goods involves a longer period of time in the case of long-distance overland shipments by rail, truck or boat.

Terms of payment technically can be written by $D_1/m_1, \ \dots D_k/m_k, n/M, \ R.O.G;$.

Examples A.B. distributors has received an invoice of 10000 dated June 10, terms 5/ $10, n/30, R.O.G.$, for a shipment of clocks which arrived on August 15. What is the last day for taking the cash discount and how much is to be paid if the discount is to be taken?

The last day taking the discount is ten days after receipt of the shipment, that is, August 25. Then new net amount

$SN_1 =$ 95000.

4. Application percent in market

The main purpose of a business is to generate profits. Businesses engaged in merchandise generate profit through their buying and selling activities. The amount of profit depends on many factors. Now we talk about one of this factor- *pricing of goods.*

The selling price must consists from:

1) the cost of buying the goods;

2) the operating expenses of the business (administration);

3) the profit necessary to stay in business.

Denote by

$S-$ **selling price;**

$C-$ **cost of buying;**

$E-$ **expenses of business or overhead;**

$P-$ **profit .**

A selling price consists of three components:

$$S = C + E + P.$$

Denote by M the difference between selling price and cost which we call as *margin.* Thus

$$M = S - C, \quad \text{or,} \quad M = E + P.$$

Using margin denote the selling price we can express as

$$S = C + M.$$

Example A.B. company buys a battery for 84 each. Operating expenses of the business are 25% of cost and the owner requires a profit of 10% of cost. For how much should the batteries be sold?

We have

$$S = C + E + P = 84 + 0.25 \cdot 84 + 0.1 \cdot 84 = 113.40.$$

Thus batteries should be sold for 113.40 to cover the cost of buying, the operating expenses and the required profit.

Example A.B. company bought two types of computers. Model 1 cost 4200 and sells for 5650, model 2 cost 7800 and sells for 9500. Business overhead is 24% of cost. For each model determine:

1) the margin M;
2) the overhead E;
3) the profit P;

At first we consider model 1 situation. We have 1)

$$C + M = S,\ 4200 + M = 5650,\quad M = 1450.$$

2)

$$E = 0.24 \cdot 4200 = 1008.$$

3)

$$P = M - E = 1450 - 1008 = 442.$$

Using analogous arguments we consider model 2. We have
1) $M = 1700$; 2) $E = 1872$; 3) $P = -172$.
We obtain, that profit on model 1 is 442 and on model 2 is a loss of 172.

A margin we can define in two ways:
1) as a percent of cost;
2) as a percent of selling price.

It is clear, that these two methods produce different results, which depends on the initial method we use. Thus we must pay attention to whether the margin is based on the cost or on the selling price. The margin is called *markup* if the margin is based on cost and the margin is called *markon* if it is based on selling price. Denote margin rates based on mentioned bases. By r_c we denote rate of margin based on cost and by r_s we denote rate of margin based on selling price. Therefore

$$r_c = \frac{M}{C}, \quad \text{and} \quad r_s = \frac{M}{S}.$$

The ratio

$$r_p = \frac{P}{S}$$

is called *profit ratio*.

Example Compute a) the missing value (cost, selling price, margin), b) the rate of markup, and c) the rate of markon, for each of the following:

1) cost, 6000, selling price, 7500.
2) cost, 4800, margin, 1600.
3) selling price 8800, margin 3300.
4) cost, 800, margin 800.
5) selling price, 2400, margin 1800.

Number	$Missing\, value$	$Rate\, of\ markup$	$Rate\, of\ markon$
1)	$M = 7500 - 6000 = 1500$	$\frac{15}{60} = 0.25; 25\%$	$\frac{15}{75} = 0.2; 20\%$
2)	$S = 4800 + 1600 = 6400$	$\frac{16}{48} = \frac{1}{3}; 33\frac{1}{3}\%$	$\frac{16}{64} = 0.25; 25\%$
3)	$C = 8800 - 3300 = 5500$	$\frac{33}{55} = 0.6; 60\%$	$\frac{33}{88} = 0.75; 37.5\%$
4)	$S = 800 + 800 = 1600$	$\frac{8}{8} = 1; 100\%$	$\frac{8}{16} = 0.5; 50\%$
5)	$C = 2400 - 1800 = 600$	$\frac{18}{6} = 3; 300\%$	$\frac{18}{24} = 0.75; 75\%$

Example What is the cost of an article selling 6500 if margin is
1) 30% of selling price;
2) 30% of cost.
1) We have $C + M = S$. Applying the initial conditions we have:

$$C + 0.3 \cdot 6500 = 6500, \quad \text{and} \quad C = 4500.$$

In case 2) we have

$$C + 0.3 \cdot C = 6500, \quad \text{and} \quad C = 5000.$$

Example Margin on each of the two articles is 2580. Suppose that the rate of markup of article A is 40% and the margin is 40% of selling price for article B. Determine the cost and the selling price each.

For article A we have that $2580 = 0.4C$. Then $C = 6450$. Further, the selling price is $S = 6450 + 2580 = 9030$.

For article B we have that markon $M = 0.4S$, and $2580 = 0.4S$. Then $S = 6450$. Then the cost $C = 6450 - 2580 = 3870$.

A reduction in the price of an article we call a *markdown*. Markdowns are used for sales promotions, meeting competitor's price, clearing out seasonal merchandise and selling off discounted items.

Suppose that as above $SN-$ reduced price; $S-$ price to be reduced, $MD-$ markdown. Then

$$SN = S - MD.$$

It is clear, that MD is percent of the S in the last formula above appears net cost factor $n = 1 - d$, here $d-$ discount factor. Thus $MD = dS$. Then

$$SN = (1 - d)S = nS.$$

Markdown depends on selling price components- cost, overhead, profit. The relationship should be used as a guide in considering the effect of markdown decisions on the operating results of a business.

The total handling cost of he article consists from the cost of buying an article plus overhead. Thus

$$CT = C + E,$$

here $E-$ overhead.

It is clear, that if an article is sold at a price which equals the total cost the business makes no profit nor does it suffer a lost. If the price is insufficient to recover the total cost, the business will suffer an operating loss. If the price does not even cover the cost of buying, the business suffers an absolute loss. To determine the profit or loss we introduce the relation:

$$P = S - CT.$$

If $P < 0$ we have that business gains an operating loss, if $P > 0$ then business makes the loss.

Selling price, when profit $P = 0$, is called *break-even price.* In break-even price meet two values

$$S = CT.$$

Above considered pricing of the item not involve added value taxes (AVT). Almost all states have this special taxes. In cases when items are pricing with this tax, then selling price of the item is such:

$$ST = (1 + p)(CT + P),$$

here ST regular price with AVT, p percent of the taxes. In Lithuania $p = 0,21$. Then each item earns the following amount of the money in state budget:

$$T = \frac{p}{1+p} ST.$$

Example A.B. company sold bicycles regularly priced at 195 for 144.30.

1) What is the amount of markdown?

2) what is the rate of markdown?

1)

$$MD = S - SN = 195 - 144.30 = 50.70.$$

2)

$$r_m = \frac{MD}{S} = \frac{50.70}{195} = 0.26, \ 26\%.$$

Example During annual Sale the Ski Shop sold a pair of ski boots, regularly priced at 245 , at a discount of 40%. The boots cost 96 and expenses are 26% of regular selling price.

1) For how much were the ski boots sold?

2) What was their total handling cost?

3) What operating profit or loss was made on the sale?

1) Sale price $S = 0.6 \cdot 245 = 147$

2) $CT = C + E = 96 + 0.26 \cdot 245 =$ 159.70.

3) $P = R - CT = 147 - 159.70 =$- 12.70 (loss).

Example The juicemaker sells concentrate for 2250. The store's overhead (E) is 50% of cost and the owners require a profit of 30% of cost.

1) For how much does the juicemaker buy the concentrate?

2) What is the break-even price?

3) What is the highest rate of markdown at which the store will stil break-even?

4) What is the highest rate of markdown at which the store will still break even?

1) Using the equality $S = C + E + P$ we deduce that

$S = C + 0.5C + 0.3C$, or $2250 = 1.8C$ It follows that C= 1250.

Thus juicemaker bought the concentrate for 1250.

2) We have $CT = C + E = C + 0.5C =$ 1875. To break-even, the concentrate must be sold for 1875.

3) To break-even the maximum markdown is MD=2250-1875= 375. The rate of markdown is $\frac{375}{2250} = 16\frac{2}{3}\%$.

4) The lowest price at which the concentrate can be offered for sale without incurring an absolute loss is the cost at which concentrate was bought, that is 1250 and maximum amount of discount is $D = 2250 - 1250 = 1000$. Rate of discount is $d = \frac{1000}{2250} = 0.44,\ 44\frac{4}{9}\%$.

Self-control exercises

1. A salesman receives a commission of $16\frac{2}{3}\%$ on all sales. How much must his weakly sales be so that he will make a commission of 720 per week?

Ans: 4320

2. A commercial building is insured under a fire policy whose face value is 80% of the building's appraised value. The annual insurance premium is $\frac{3}{8}\%$ and the premium for one year amounts to 675.

1) What is the face value of the policy?

2) What is the appraised value of the building?

Ans: 1) 180000; 2) 225000.

3. A merchant bought an article for 7.92 . For how much did the article sell if he sold the article at an increase of $83\frac{1}{3}\%$?

Ans: 14.52

4. A.B. be have been selling wheelbarrows for 11200 less 15%. What additional discount percent must offered to meet a competitor's price of 80.92?

Ans: 15%

5. An invoice for 527500 dated November 12, terms $4/10 E.O.M.$, was received on November 14. What payment must be made on December 10 to reduce the debt to 300000.

Ans. 218400

6. A.B. received an invoice dated September 25 from C.D.. The invoice amount was 254095 and the payment terms are $3/10,\ 1/20, n/30;$. A.B. made payment on October 5 to reduce the balance due by 120000, a second payment on October 15 to reduce the balance to 60000 and paid the remaining balance on October 30.

1) How much did A.B. pay on October 5?

2) How much was paid on October 15?

c) What was the amount of the final payment on October 30?

Ans. 1) 116400; 2) 73354; 3) 60000.

7. A.B. received a cheque for 186725 in partial payment of an invoice owed by the B.C. The invoice was for 532500 with terms $3/20 E.O.M.;$, dated September 15 and cheque was received on October 18.

1) With how much should A.B. credit the account of the C.B?

2) How much does the C.B. still owe to A.B?

Ans. 1) 192500; 2) 340000.

8. What amount must be remitted if the following invoices, all terms $5/10,\ 2/30, n/60;$, are paid together on October 8.

Invoice No.3 dated September 2 for 92300;

Invoice No.4 dated September 14 for 78400;

Invoice No.5 dated September 30 for 87300.

Ans. 1) 252067.

9. Using a margin of 35% of cost, a store priced an item at 891.

1) What was the cost of the item;

2) What is the margin as a percent of selling price ?

Ans. 1) 660; 2) 25.9% .

10. A bedroom suite which cost a dealer 1800 less $37.5\%, 18\%$ carries a price tag at a markup of 120%. For quick sale the bedroom suite was marked down 40%.

1) What was the sale price?

2) What rate of markup was realized?

Ans. 1) 1217.70; 2) 32% .

11. A.B. buy men's shirts for 21 less $25\%, 20\%$. The shirts are priced to cover expenses of 20% of selling price and a profit of 17% of selling price. For a special weekend sales shirts were marked down 20%.

a) What was the operating profit or loss on the shirt sold during the weekend sale?

b) What rate of margin was realized based on the sales price?

Ans. 1) - 0.6; 2) 21.25% .

12. Baton Construction Supplies have been selling wheelbarrows for 112.00 less 15%. What additional discount percent must the company offer to meet a competitors price of 80.92?

Ans: 15%

13.A freezer was sold during a clearance sale for 387.50. If the freezer was sold at a discount of $16\frac{2}{3}\%$, what was the list price?

Ans: 465.00

14. Delta Furnishings received an invoice dated May 10 for a shipment of goods received June 21. The invoice was for 8400.00 less $33\frac{1}{3}\%$, $12\frac{1}{2}\%$ with terms 3/20 R.O.G. How much must Delta pay on July 9 to reduce their debt?

(a) by 2000.00

(b) to 2000.00?

Ans: (a) 1940.00, (b) 2813.00

15.Home Hardware buys cat litter for 6.00 less 20% per bag. The store's overhead is 45% of cost and the owner requires a profit of 20% of cost.

(a) For how much should the bags be sold?

(b) What is the amount of margin included in the selling price?

(c) What is the rate of markon?

(d) What is the rate of markup?

(f) What operating profit or loss is made if a bag is sold for 6.00 ?

Ans: (a) 7.92 (b) 3.12 (c) 39.4% (d) 65% (e) 6.96 (f) - 0.96

16. A merchant realizes a gross profit of 31.50 if he sells an article at a margin of 35% of the selling price.

(a) What is the regular selling price?

(b) What is the cost?

(c) What is the rate of markup?

(d) If overhead is 28% of cost what is the break-even price?

(e) If the article is sold at a markdown of 24% what is the operating profit or loss?

Ans: (a) 90.00 (b) 58.50 (c) 53.85% (d) 74.88 (e) - 6.48

17. An appliance store sold G.E. coffee perculators for 22.95 during a promotional sale. The store bought the peculators for 36.00 and is 25% of regular selling price.

(a) If the store's margin is 40% of selling price what was the rate of markdown?

(b) What operating profit or loss was made during the sale?

(c) What rate of markup was realized?

Ans: (a) 25% (b) 3.06 (c) 25%

18. A.B. buy men's shirts for 21.00 less 25%, 20%. The shirts are priced to cover expenses of 20% of selling price and a profit of 17% of selling price. For a special weekend sale shirts were marked down 20%.

(a) What was the operating profit or loss on the shirts sold during the weekend sale? (b) What rate of margin was realized based on the sales price?

Ans: (a) - 0.60 (b) 21.25%

Homework exercises

1. Of a company's 1200 employees 2.5% did not report to work last week. How many employees were absent?

2. 7 percent of X is equal to 12 percent of Y. How much percent X is more then Y. How much percent Y less then X.

3. The price of a new car in the first year is reduce at 30 percent in the second and the third year the price is reduced in 25 percent annually and later 15 percent annually. What percent will the price of the car be after 10 years.

4. Director's wage is 140 percent more than the manager and worker's wage is 30 percent less than the managers wage. How much difference between the director's wage from the manager's and worker's wages sum. What is the difference between the manager's and the worker's wages sum from the director's wage.

5. The first time the price increased by 40 percent and later decreased by 40 percent? What percent must the new price be changed to be 80 percent more than 90 percent of the initial price?

6. Would a discount of 40% followed by a 15% discount be the same as a single discount of 55%. Which would be to the advantage of the employee.

7. A property purchased for 82000 is now appraised at 178500. What is the percent gained in the value of the property?

8. Sales in May increased $16\frac{2}{3}\%$ over April sales and sales in June decreased in $16\frac{2}{3}\%$ over May sales. How much did sales change the end of April to the end of June?

9. A.B. be have been selling wheelbarrows for 140 less 15%. What additional discount percent must offered to meet a competitor's price of 80.92?

10. What amount must be remitted if invoices dated July 25 for 82900, August 10 for 26300 and August 29 for 36400, all with terms $3/15, E.O.M.$; are paid together on September 12?

11. A.B. received an invoice dated September 25 from C.D.. The invoice amount was 2540950 and the payment terms are $3/10,\ 1/20, n/30;$. A.B. made payment on October 5 to reduce the balance due by 1200000, a second payment on October 15 to reduce the balance to 600000 and paid the remaining balance on October 30.

1) How much did A.B. pay on October 5?

2) How much was paid on October 15?

c) What was the amount of the final payment on October 30?

12. A.B. received a cheque for 186725 in partial payment of an invoice owed by the B.C. The invoice was for 532500 with terms $3/20 E.O.M.;$, dated September 15 and cheque was received on October 18.

1) With how much should A.B. credit the account of the C.B?

2) How much does the C.B. still owe to A.B?

13. What amount must be remitted if the following invoices, all terms $5/10,\ 2/30, n/60;$, are paid together on October 8.

Invoice No.3 dated September 2 for 92300;

Invoice No.4 dated September 14 for 78400;

Invoice No.5 dated September 30 for 87300.

14. Using a margin of 35% of cost, a store priced an item at 1200.

1) What was the cost of the item;

2) What is the margin as a percent of selling price ?

15. A bedroom suite which cost a dealer 1800 less $37.5\%, 18\%$ carries a price tag at a markup of 120%. For quick sale the bedroom suite was marked down 40%.

1) What was the sale price?

2) What rate of markup was realized?

16. A.B. buy men's shirts for 21 less $25\%, 20\%$. The shirts are priced to cover expenses of 20% of selling price and a profit of 17% of selling price. For a special weekend sales shirts were marked down 20%.

a) What was the operating profit or loss on the shirt sold during the weekend sale?

b) What rate of margin was realized based on the sales price?

17. Delta Furnishings received an invoice dated May 10 for a shipment of goods received June 21. The invoice was for 8400.00 less $33\frac{1}{3}\%$, $12\frac{1}{2}\%$ with terms 3/20 R.O.G. How much must Delta pay on July 9 to reduce their debt?

(a) by 2200

(b) to 2200?

18.Home Hardware buys cat litter for 6.5 less 20% per bag. The store's overhead is 45% of cost and the owner requires a profit of 25% of cost.

(a) For how much should the bags be sold?

(b) What is the amount of margin included in the selling price?

(c) What is the rate of markon?

(d) What is the rate of markup?

(e) What is the break-even price?

(f) What operating profit or loss is made if a bag is sold for 6.75 ?

19. A merchant realizes a gross profit of 50 if he sells an article at a margin of 35% of the selling price.

(a) What is the regular selling price?

(b) What is the cost?

(c) What is the rate of markup?

(d) If overhead is 28% of cost what is the break-even price?

(e) If the article is sold at a markdown of 24% what is the operating profit or loss?

20. A jewellery store paid a unit price of 350 less 40%, $16\frac{2}{3}$%, 8% for a shipment of watches. The store's overhead is 65% of cost and the normal profit is 55% of cost.

(a) What is regular selling price of the watches?

(b) What is the selling price for the store to break even?

(c) What is the rate of markdown to sell the watches at the break-even price?

21. West End Appliances bought food-mixers for 280 less 40%, $16\frac{2}{3}$%, 10%. The store's overhead is 45% of selling price and profit required is $21\frac{1}{4}$% of selling price.

(a) What is the break-even price?

(b) What is the maximum rate of markdown that the store may offer to break even?

(c) What is the rate of markup which is realized if the foodmixers are sold at the break-even price?

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