

Math 1010: Solutions to Practice Questions for Unit #3

1. Best Buy Entertainment can obtain Panasonic DVD players for \$134 each less a trade discount of 35%. A comparable Samsung model is available for \$127 less a trade discount of 30%. Which DVD player has the lower net cost? How much lower?

$$\begin{aligned}\text{Cost for Panasonic} \\ N &= L(1 - d) \\ &= 134(1 - 0.35) \\ &= 134(0.65) \\ &= \$87.10\end{aligned}$$

$$\begin{aligned}\text{Cost for Samsung} \\ N &= L(1 - d) \\ &= 127(1 - 0.30) \\ &= 127(0.70) \\ &= \$88.90\end{aligned}$$

The Panasonic DVD player has a lower net cost and is cheaper by \$1.80 (\$88.90-\$87.10).

2. After a trade discount of 27.5%, a jeweller can obtain 0.50 carat Empress Cut, F Colour Canadian Polar Bear diamonds for \$2,138.75. What is the dollar value of the trade discount?

Begin with the formula.
Substitute known values and simplify.

$$\begin{aligned}N &= L(1 - d) \\ 2,138.75 &= L(1 - 0.275) \\ 2,138.75 &= L(0.725) \\ L &= \frac{2,138.75}{0.725} \\ &= \$2,950.00\end{aligned}$$

Calculate the dollar value of the trade discount.

$$\begin{aligned}A &= L - N \\ &= 2,950 - 2,138.75 \\ &= \$811.25\end{aligned}$$

3. Green Thumb Nursery sells junipers to the gardening departments of local grocery stores and building supply stores. The net price per tree is \$27.06 after a trade discount of \$22.14. What rate of trade discount is the nursery giving to retailers?

Calculate list price
Calculate trade discount rate

$$\begin{aligned}\$27.06 + \$22.14 &= \$49.20 \\ \frac{\$22.14}{\$49.20} \times 100\% &= 45\%\end{aligned}$$

4. A 36% discount on custom draperies at Window World is equivalent to savings of \$450. What are the net and list prices of the custom order?

Calculate list price

$$A = dL$$

$$450 = 0.36L$$

$$L = \frac{450}{0.36}$$

$$L = \$1,250$$

Calculate net price (price after discount)

$$N = L - A$$

$$= 1,250 - 450$$

$$= \$800$$

5. Silvia received an invoice in the amount of \$5,445 dated March 23 with terms 3/10, 1 ½ /20, n/60. What payment of April 13 will settle the invoice?

Day 0 – March 23

Day 10 – April 2 (3% discount)

Day 20 – April 12 (1.5% discount)

April 13, there is NO discount. Hence, the amount required to settle the invoice is **\$5445**

6. The terms of payment on an invoice for \$2,835.49 are 2/15, n/45. The balance owed after a payment within the discount period is \$1,135.49. What was the amount of the payment?

The balance is the amount left after the payment that was made within the discount period. We need to find out how much was credited (L)

$$L = \$2,835.49 - \$1,135.49$$

$$= \$1,700$$

The pre-payment was made when there was a 2% discount. We know the amount that was credited (L), but need to find the actual payment (N).

$$N = L(1 - d)$$

$$= \$1,700(1 - 0.02)$$

$$= 1,700(0.98)$$

$$= \$1,666.00$$

7. Conestoga Contractors has two invoices from PaveAll: one dated March 23 for \$234.75 and one dated April 5 for \$840. PaveAll's terms are 2/10, 1/20, n/30. How much should Conestoga Contractor's send in to pay off both invoices on April 10?

Amount	Day 0	Day 10 (2%)	Day 20 (1%)
\$234.75	March 23	April 2	April 12
\$840	April 5	April 15	April 25

Paid on April 10: First bill discount 1% (0.01), Second bill discount 2% (0.02)

$$\begin{aligned}N &= 234(1 - 0.01) + 840(1 - 0.02) \\&= 234.75(0.99) + 840(0.98) \\&= 232.40 + 823.20 \\&= \$1,055.60\end{aligned}$$

8. Mayfair distributors sent Bed 'n Bath an invoice dated December 23 for \$5,344.90 with terms 2/10, 1/20, n/30. What is the balance on the account after a payment of \$3,000 on January 3? What additional payment on January 11 will settle the invoice?

Day 0 – December 23

Day 10 – January 2 (2% discount)

Day 20 – January 12 (1% discount)

Payment: \$3,000 on January 3 made in the 1% discount period

$$\begin{aligned}N &= L(1 - d) \\3000 &= L(1 - 0.01) \\3000 &= L(0.99) \\L &= \frac{3000}{0.99} \\&= \$3,030.30\end{aligned}$$

The amount that is credited to the account is \$3,030.30

$$\text{Balance} = \$5,344.90 - \$3,030.30 = \$2,314.60$$

January 11 is still within the 1% discount period

$$N = L(1 - d)$$

$$N = 2,314.60(1 - 0.01)$$

$$N = 2,314.60(0.99)$$

$$N = \$2,291.45$$

Payment on January 11 = \$2,291.45

9. An invoice for \$2,956.60 dated February 2 has terms 2/15, 1/30, n/90. What three equal payments made on February 17, March 2, and May 2 will settle the invoice?

Day 0 – February 2

Day 15 – February 17 (2% discount)

Day 30 – March 4 (1% discount)

February 17 – 2% discount

March 2 – 1% discount

May 2 – 0 discount.

Payments are equal. Let the payment amount = N. To find out the **value** credited to the account, L, we rearrange the $N = L(1 - d)$ to $L = \frac{N}{1-d}$

We can set up our equation:

$$\$2,956.60 = \text{value of payment 1} + \text{value of payment 2} + \text{payment 3}$$

Substitute known values.

$$2,956.60 = \frac{N}{1 - 0.02} + \frac{N}{1 - .01} + N$$

$$2,956.60 = \frac{N}{0.98} + \frac{N}{0.99} + N$$

Recall, when we had $\frac{x}{n} = \frac{1}{n}x$ we could evaluate the fraction. For example, $\frac{x}{2} = 0.50x$

$$2,956.60 = 1.0204N + 1.0101N + N$$

Simplify our equation in the same way.

Collect like terms

Divide both sides by 3.0305

$$2,956.60 = 3.0305N$$

$$N = \frac{2,956.60}{3.0305}$$

$$= \$975.61$$

Each payment will be \$975.61

10. Given a cost of \$41.50, a selling price of \$63 and overhead expenses that are 20% of selling price, what is the:

- Operating profit
- Rate of markup on cost
- Rate of markup on selling price

Calculate expenses

$$E = 0.20S$$

$$= 0.20(63)$$

$$= \$12.60$$

To calculate profit (question a), we need to find M

$$M = E + P$$

$$P = M - E$$

We know the selling price and cost, so we can calculate markup

$$S = M + C$$

$$M = S - C$$

$$= 63 - 41.50$$

$$= \$21.50$$

Calculate for operating profit (question a), substituting known values.

$$P = M - E$$

$$= 21.50 - 12.60$$

$$= \$8.90$$

The same steps can be followed to **complete the table**.

E	12.60	$0.20 \times S = 0.2 \times 63$
+P	8.90	$21.50 - 12.60$
=M	21.50	$63 - 41.50$
+C	41.50	
=S	63	

Calculate rate of markup on cost (question b)

$$\frac{\$21.50}{\$41.50} \times 100 = 51.81\%$$

Calculate rate of markup on selling price (question c)

$$\frac{\$21.50}{\$63.00} \times 100 = 34.13\%$$

11. Twelfth Street Service buys batteries at a cost of \$84 each. Operating expenses are 25% of cost and the owner requires a profit of 10% of cost. What is the selling price of each battery?

$$C = \$84$$

$$E = 0.25C = 0.25(84) = \$21$$

$$P = 0.10C = 0.10(84) = \$8.40$$

Calculate the selling price

$$\begin{aligned} S &= M + C \\ &= (P + E) + C \\ &= 8.40 + 21 + 84 \\ &= \$113.40 \end{aligned}$$

12. Island Business bought two types of electronic calculators for resale. The Number Cruncher costs \$42 and sells for \$56.50. The Math Boss costs \$78 and sells for \$95. Business overhead expenses are 24% of cost. For each model, determine the rate of markup on selling price, the dollar amount of the overhead expenses and the dollar amount of the profit.

Table Method:

1. Fill in known values (C and S)
2. Solve for E using value for C.
3. Solve for M.
4. Solve for P using values for M and E.

	Number Cruncher	Math Boss
E	$E = 0.24C$ $= 0.24(42.00)$ $= \mathbf{\$10.08}$	$E = 0.24C$ $= 0.24(78.00)$ $= \mathbf{\$18.72}$
+P	$P = M - E$ $= 14.50 - 10.08$	$P = M - E$ $= 17.00 - 18.72$

	= \$4.42	= -\$1.72
=M	$M = S - C$ $= 56.50 - 42.00$ $= \$14.50$	$M = S - C$ $= 95 - 78$ $= \$17.00$
+C	\$42.00	\$78
=S	\$56.50	\$95
Rate of Markup on Selling	$\frac{M}{S} \times 100 = \frac{14.50}{56.50} \times 100 = \mathbf{25.66\%}$	$\frac{M}{S} \times 100 = \frac{17}{95} \times 100 = \mathbf{17.89\%}$

13. What is the selling price of an item costing \$72 if the markup is:

- 40% of cost?
- 40% of selling price?

- a. M = 40% of cost, $M = 0.40C$
 $C = 72$

$$S = M + C$$

$$S = 0.40C + C$$

$$S = 1.40C$$

$$S = 1.40(72)$$

$$S = \mathbf{\$100.80}$$

- b. M = 40% of S, $M = 0.40S$
 $C = 72$

Substitute known values

$$S = M + C$$

$$S = 0.40S + C$$

$$S = 0.40S + 72$$

Isolate S by subtracting 0.40S from both sides and simplify

$$S - 0.40S = 0.40S - 0.40S + 72$$

$$0.60S = 72$$

Solve for S

$$S = \frac{72}{0.60}$$

$$= \mathbf{\$120}$$

Table method to solve for S.

- Fill in known values.
 - Cost as per cent of selling price can be calculated ($100 - 40 = 60$)
- Solve for S using proportions

	\$	% of S
M		40%
+ C	\$72	60%
= S	$\frac{72}{S} = \frac{60}{100}$ $7200 = 60S$ $S = \$120$	100%

14. What is the cost of an item that sells for \$65 if the markup is:

- 30% of cost?
- 30% of selling price?

a. $M = 30\%$ of C , $M = 0.30C$

$$S = 65$$

$$S = C + M$$

$$S = C + 0.30C$$

$$65 = 1.30C$$

$$C = \frac{65}{1.30}$$

$$C = \$50$$

b. $M = 30\%$ of S , $M = 0.30S$

$$S = 65$$

$$M = 0.30S = 0.30(65) = \$19.50$$

$$S = M + C$$

$$C = S - M$$

$$C = 65 - 19.50$$

$$C = \$45.50$$

15. The Beaver Ski Shoppe sells ski vests for \$98. The rate of markup on cost is 75%.

- What did Beaver Ski Shoppe pay for each vest?
- What is the rate of markup on selling price?

$$S = \$98$$

$$\frac{M}{C} = 75\% = 0.75, \text{ thus, } M = 0.75C$$

To calculate cost of each vest using Table Method:

1. Fill in known values
 - a. Selling price as per cent of cost can be calculated (75+100=175%)
2. Solve for C using proportions
3. Calculate M using values for C and S (M+C=S or M=S-C)

	\$	% of cost
M	98-56=\$42	75%
+C	$\frac{C}{98} = \frac{100}{175}$ $175C = 9800$ $C = \$56$	100%
=S	98	100+75=175%

To calculate cost of each vest using Algebraic Method:

Calculate cost

$$\begin{aligned}
 S &= C + M \\
 S &= C + 0.75C \\
 98 &= 1.75C \\
 C &= \frac{98}{1.75} \\
 C &= \$56
 \end{aligned}$$

To calculate the rate of markup on selling cost, we need to calculate the markup.

$$\begin{aligned}
 M &= 0.75C \\
 &= 0.75(56) \\
 &= \$42
 \end{aligned}$$

Rate of markup on selling cost

$$\begin{aligned}
 &\frac{M}{S} \times 100 \\
 &= \frac{42}{98} \times 100 \\
 &= 42.86\%
 \end{aligned}$$

16. The rate of markup on cost on a flat screen monitor that sells for \$780 is 75%. What is the monitor's cost to the retailer and the rate of markup on selling price?

$$M/C = 75\%, M = 0.75C$$

$$S = \$780$$

$$S = M + C$$

$$780 = 0.75C + C$$

$$780 = 1.75C$$

$$C = \frac{780}{1.75}$$

$$C = \$445.71$$

To calculate the rate of markup, find M: $M = 0.75C = 0.75(445.71) = \334.28

$$\frac{M}{S} \times 100$$

$$= \frac{334.28}{780} \times 100$$

$$= 42.86\%$$

17. Digital Devices sets its retail prices on computers, monitors and printers to generate a 30% rate of markup on selling price. Overhead expenses normally work out to be 30% of cost. What is the operating profit on a monitor that costs \$345?

$$M/S = 30\% = 0.30, \text{ so } M = 0.30S$$

$$E = 30\%C = 0.30C = 0.30(345) = \$103.50$$

$$C = \$345$$

We need to find M so we can find P.

Algebraic Method:

Use formula for selling price

$$S = M + C$$

$$S = 0.30S + C$$

$$S = 0.30S + 345$$

$$S - 0.30S = 345$$

With S, we can now solve for M

Solve for P

$$\begin{aligned}
 0.70S &= 345 \\
 S &= \frac{345}{0.70} \\
 S &= \$492.86 \\
 M &= 0.30S \\
 &= 0.30(492.86) \\
 &= \$147.86 \\
 M &= E + P \\
 P &= M - E \\
 P &= \$147.86 - 103.50 \\
 &= \mathbf{\$44.36}
 \end{aligned}$$

Table Method:

1. Fill in known values.
 - a. Cost is 70% of sales (100-30=70)
 - b. E=30% of cost= 0.30(345)=\$103.50
2. Solve for S using proportions.
3. Solve for M: M+C=S (or S-C=M)
4. Solve for P: P+E=M (or M-E=P)

	\$	% of Sales
P	\$147.86-103.50= \$44.36	
+E	\$103.50	
=M	492.86-345=\$147.86	30% of sales
+C	\$345	+70%
=S	$ \begin{aligned} \frac{345}{S} &= \frac{70}{100} \\ S &= \frac{34500}{70} \\ &= \$492.86 \end{aligned} $	=100%

18. The sign on a rack of sport coats reads: "All prices already marked down 30%." What is the regular price of a coat that sells for \$196.49?

$$Sr = S(1 - r_m)$$

$$\$196.49 = S(1 - 0.30)$$

$$\$196.49 = S(0.70)$$

$$S = \frac{196.49}{0.70}$$

$$S = \$280.70$$

19. Poles Apart obtains Nitro TI snowboards at a cost of \$345 and marks them up by 35% of the selling price. For its Annual Spring Sale, Poles Apart marks down prices by 25%. What is the reduced selling price for the Nitro TI snowboards?

$$C = \$345$$

$$\text{Markup} = 35\% \text{ of } S = 0.35S$$

$$R_m = 25\%$$

Table Method:

1. Fill in known values
 - a. Per cent of cost as per cent of selling price can be filled in (100-35=65%)
 - b. Per cent of reduced selling price as per cent of selling price can be filled in (100-25=75%)
2. Calculate S_r using proportions. *Can also solve for S using the proportions, then S_r

	\$	% of Selling Price
M		35%
+ C	\$345	65%
= S		100%
- D		25%
= S_r	$\frac{345}{S_r} = \frac{65}{75}$ $S_r = \frac{25,875}{65}$ $S_r = \$398.08$	75%

Algebraic Method:

Calculate the selling price (S)

$$\begin{aligned}
 S &= M + C \\
 S &= 0.35S + 345 \\
 S - 0.35S &= 0.35S - 0.35S + 345 \\
 0.65S &= 345 \\
 S &= \frac{345}{0.65} \\
 S &= \$530.77
 \end{aligned}$$

Calculate the discount in dollars. We know that the rate of markdown is 25% of selling price ($R_m = 25\%S = 0.25S$)
Calculate the reduced selling price.

$$\begin{aligned} D &= R_m S \\ &= 0.25(530.77) \\ &= \$132.29 \\ S_r &= S - D \\ &= 530.77 - 132.69 \\ &= \$398.08 \end{aligned}$$

20. Get-Away Vacations sells sightseeing tours for the Ottawa Valley for \$3,849 per person. Overhead expenses for the company are 31% of the selling price and the target profit is 17% of the selling price. What is the cost of the tour to Get-Away Vacations? What is the lowest price they can offer and still cover all costs and expenses? What is the highest rate of markdown at which the company will still break even?

$$S = \$3,849$$

$$E = 31\% \text{ of } S = 0.31S = 0.31(3,849) = \$1,193.19$$

$$\text{Target } P = 17\% \text{ of } S = 0.17S = 0.17(3,849) = \$654.33$$

What is the cost of tour (C)?

Substitute known values
Simplify and solve for C.

$$\begin{aligned} S &= C + M \\ S &= C + E + P \\ 3,849 &= C + 1,193.19 + 654.33 \\ 3,849 &= C + 1,847.52 \\ C &= 3,849 - 1,847.52 \\ &= \$2,001.48 \end{aligned}$$

What is the minimum price to cover cost and expenses? This means that Markup = Expenses ($P=0$).

$$S = C + E$$

$$S = 2001.48 + 1193.19$$

$$S = \$3,194.67$$

What is the rate of markdown at breakeven ($P=0$)

We need to determine D.

Substitute known values

$$\begin{aligned} r_m &= \frac{D}{S} \times 100 \\ D &= S - S_r \\ &= 3,849 - 3,194.67 \\ &= \$654.33 \\ r_m &= \frac{654.33}{3849} \times 100 \\ &= 17\% \end{aligned}$$

21. A bedroom suite costs Town & Country Furniture \$5,000 less 30% and 15%. The normal rate of markup on cost is 90%. The suite is marked down 30% in a Mid-Summer Sale. What is the reduced selling price for the suite?

$$C = \$5,000(1 - 30\%)(1 - 15\%) = 5,000(1 - .30)(1 - .15) = 5,000(0.70)(0.85) = \$2,975$$

$$M/C = 90\%, \text{ therefore, } M = 0.90C = 0.90(2,975) = \$2,677.50$$

$$r_m = 30\% = 0.30$$

Before we can find S_r we need to find S .

$$\begin{aligned} S &= C + M \\ &= 2,975 + 2,677.50 \\ &= \$5,662.50 \end{aligned}$$

Calculate S_r

$$\begin{aligned} S_r &= S(1 - r_m) \\ &= S(1 - 0.30) \\ &= 5,662.50(0.70) \\ &= \$3,956.75 \end{aligned}$$

22. A lawn mower retails for \$349. The dealer's overhead is 25% of cost and normal operating profit is 16 2/3% of cost. What is the largest amount of markdown that will allow the dealer to breakeven? What rate of markdown will price the lawn mower at cost?

$$S = \$349$$

$$E = 0.25C$$

$$P = 0.1667C$$

Algebraic Method to calculate largest amount of discount for dealer to break even

Calculate the cost to the dealer

$$\begin{aligned} S &= C + M \\ S &= C + (E + P) \\ 349 &= C + 0.25C + 0.1667C \\ 349 &= 1.4167C \\ C &= \frac{349}{1.4167} \\ C &= \$246.35 \end{aligned}$$

For the dealer to breakeven: $M_r = E$

$$\begin{aligned} M_r &= E \\ &= 0.25C \\ &= 0.25(246.35) \end{aligned}$$

Calculate the reduced selling price	$= \$61.59$ $S_r = C + M_r$ $= 246.35 + 61.59$ $= \$307.94$
Calculate largest amount of discount for the dealer to break even	$D = S - S_r$ $= 349 - 307.94$ $= \$41.06$

Table Method to calculate largest amount of discount for dealer to break even

1. Fill in known values.
 - a. Rate of markup at cost ($E+P=M$, so $25+16.67=41.67\%$)
 - b. Rate of selling price at cost ($M+C=S$, so $41.67+100=141.67\%$)
2. Solve for C using proportions
3. Solve for E using C ($E=0.25C$)
4. Reduced Selling is now C + E ($P=0$)
5. Solve for D ($D=S-S_r$)

	\$	% of Cost
E	$E=0.25(246.35)$ $E=\$61.59$	25%
+ P	0	16.67%
= M		$25\%+16.67\%=41.67\%$
+ C	$\frac{C}{349} = \frac{100}{141.67}$ $C = \$246.35$	100%
= S	\$349	$41.67\%+100\%=141.67\%$
- D	$\$349-\$307.94=\$41.06$	
= S_r	$\$246.35+\$61.59=\$307.94$	

Rate of markdown, where $S_r = C$

$$D = 349 - 246.35 = \$102.65$$

$$r_m = \frac{D}{S} \times 100$$

$$= \frac{102.65}{349} \times 100$$

$$= 29.41\%$$

23. Central Ski and Cycle purchased 50 pairs of ski boots for \$360 per pair less 33 1/3% and 10%. The regular rate of markup on selling price of the boots is 40%. The store's overhead is 22% of the selling price. During a January Clearance Sale, the price was reduced to \$270 per pair. What was the rate of markdown for the sale? What was the profit or loss on each pair of boots at the reduced price? At the reduced price, what was the rate of markup on cost?

Information given:

- 50 pairs, \$360 less 33.33% and 10%
- $M/S=40\%$, $M=0.40S$
- $E=22\%$ of S , $E=0.22S$
- $S_r=270$

Calculate the cost of each pair of ski boots.

$$\begin{aligned} C &= 360(1 - 0.3333333)(1 - 0.10) \\ &= 360(0.6666667)(0.90) \\ &= \$216.00 \end{aligned}$$

Calculate the selling price.

$$\begin{aligned} S &= C + M \\ S &= 216 + 0.40S \\ S - 0.40S &= 216 + 0.40S - 0.40S \\ 0.60S &= 216 \\ S &= \$360 \end{aligned}$$

Find r_m by finding the discount amount

$$\begin{aligned} D &= S - S_r \\ &= 360 - 270 \\ &= \$90 \end{aligned}$$

Calculate the rate of markdown

$$\begin{aligned} r_m &= \frac{D}{S} \times 100 \\ &= \frac{90}{360} \times 100 \\ &= 25\% \end{aligned}$$

Calculate the profit or loss when a pair of boots is sold for \$270. Start by calculating the expense.

$$E = 0.22S = 0.22(360) = \$79.20$$

To find out if we make a profit or loss at S_r , find the profit at M_r . Find M_r .

$$\begin{aligned} \text{Recall that } C &= \$216 \\ M_r &= S_r - C \\ &= 270 - 216 \\ &= \$54 \end{aligned}$$

Calculate P (profit or loss)

$$\begin{aligned} M_r &= E + P \\ 54 &= 79.20 + P \\ P &= 54 - 79.20 \end{aligned}$$

$$= -\$25.20$$

There is a loss of \$25.20 at the sale price.

At the reduced price (\$270), what was the **rate** of markup ($M_r = \$54$) on cost (\$216)?

$$\frac{M_r}{C} \times 100$$

$$= \frac{54}{216} \times 100$$

$$= 25\%$$