Trade Discounts, Cash Discounts, Markup, and Markdown

LEARNING OBJECTIVES

CHAPTER

Upon completing this chapter, you will be able to do the following:

- Solve problems involving trade discounts.
- Calculate equivalent single rates of discount for a discount series.
- 3 Apply methods of cash discount.
- Solve problems involving markup based on either cost or selling price.
- 6 Solve problems involving markdown.
- Solve integrated problems involving discounts, markup, and markdown.



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In a business, traditional accounting profit is calculated by subtracting costs and expenses from sales revenue for a specified period. Determining a suitable selling price for each product or service is crucial for long-term sustainability. Some firms use a *cost plus* methodology, marking up the cost of each product or service by a certain percentage that is large enough to cover expenses and still leave a respectable profit. Other organizations select their desired profit percentages first, and then work backwards to set their prices.

Suppose you were operating a bicycle shop and selling adult mountain bikes that cost \$200 each from your supplier. Using a cost plus approach you might add a 20% markup to the cost of bikes sold in the shop in order to cover your additional expenses and make a profit. In this case, you would charge your customers \$240 for the bikes, and your resulting profit **percentage** would be $40/240 = 16^{2}/3\%$. If, however, you wanted to price the bikes in order to earn 20% profit, you would have to charge your customers **\$250 for the same bicycles (\$50/\$250 = 20%)**.

INTRODUCTION

Th *supply chain* defi es the channels or stages that a product passes through as it is converted from a raw material to a fin shed product purchased by the consumer. Figure 6.1 outlines this process.

A Supply Chain



By the time the product is purchased by the consumer, the raw materials have been converted by the manufacturer, distributed through the wholesaler, and offered for sale by the retailer. In some supply chains, the distributor and wholesaler are separated. In other supply chains, the manufacturer also serves as the wholesaler. Within the supply chain, all of the channels must make a profit on the product to remain in business.

Each channel applies a *markup* above its cost to buy the merchandise, which increases the price of the product. Sometimes a manufacturer or supplier sets a *list price* and then offers a *trade discount* or a *series of trade discounts* from that price to sell more product or to promote the product within the supply chain. Also, any of the channels within the supply chain may offer a *cash discount* to encourage prompt payment for the product. When the product is sold to the consumer, the regular selling price may be *marked down* or *discounted* to a sale price in response to competitors' prices or other economic conditions.

Price, cost, and expenses of a product determine the profit for that product. Understanding the relationships between these variables is crucial in maintaining a successful business. In this chapter, we will learn how to calculate the cost of products if trade discounts are offered within the supply chain, as well as how to calculate the amount of cash to be paid when cash discounts are offered for early payment. We will also learn how to calculate price and profit when the cost is marked up, as well as the discounted price and resulting profit or loss when a product is offered "on sale."





6.1 DETERMINING COST WITH TRADE DISCOUNTS A. Computing discount amounts, discount rate, net price, and list price

The supply chain is made up of manufacturers, distributors, wholesalers, and retailers. Merchandise is usually bought and sold among the members of the chain on credit terms. The prices quoted to other members often involve trade discounts. A **trade discount** is a reduction of a **list price** or **manufacturer's suggested retail price** (**MSRP**) and is usually stated as a percent of the list price or MSRP.

Trade discounts are used by manufacturers, distributors, and wholesalers as pricing tools for several reasons, such as to

- (a) determine different prices for different levels of the supply chain;
- (b) communicate changes in prices;
- (c) enable changes in prices.

When computing a trade discount, keep in mind that the **rate of discount** is based on the list price.

$$\begin{array}{c} \text{AMOUNT} \\ \text{OF DISCOUNT} \end{array} = \begin{array}{c} \text{RATE OF} \\ \text{DISCOUNT} \end{array} \times \begin{array}{c} \text{LIST} \\ \text{PRICE} \end{array} \\ \hline \text{A} = d \times \text{L or A} = d\text{L} \end{array}$$
Formula 6.1

When the amount of the discount and the discount rate are known, the list price can be determined. Rearrange Formula 6.1 to determine the list price.

LIST PRICE =
$$\frac{\text{AMOUNT OF DISCOUNT}}{\text{RATE OF DISCOUNT}}$$

$$L = \frac{A}{d}$$

Since the rate of trade discount is based on the list price, computing a rate of discount involves comparing the amount of discount to the list price. Rearrange Formula 6.1 to determine the rate of trade discount.

$$RATE OF DISCOUNT = \frac{AMOUNT OF DISCOUNT}{LIST PRICE}$$
$$d = \frac{A}{L}$$

А

L

d

POINTERS AND PITFALLS

This diagram is a useful aid in remembering the various forms of the amount of discount formula A = dL. Variables on the same line are multiplied together. Variables on different lines are divided.

For example, in solving for *d*, note that A is above the L. Therefore, d = A/L. Similarly, L = A/d. Th **net price** is the remainder when the amount of discount is subtracted from the list price. The net price is the price to the supplier, and becomes the cost to the purchaser.



To compute the amount of the discount and the net price when the list price and discount rate are known, fi st apply Formula 6.1 to determine the amount of the trade discount, and then apply Formula 6.2 to calculate the net price.

EXAMPLE 6.1A	An item listed at \$80.00 is subject to a trade discount of 25%.				
	Compute				
	(i) the amount of discount;				
	(ii) the net price.				
SOLUTION	(i) Amount of trade discount = Rate of discount \times List price				
	= (0.25)(80.00) = \$20.00				
	(ii) Net price = List price $-$ Trade discount				
	= 80.00 - 20.00 = \$60.00				

EXAMPLE 6.1B	The 30% discount on a tennis racket amounts to \$89.70. Compute (i) the list price; (ii) the net price.		
SOLUTION	(i) List price = $\frac{\text{Amount of discount}}{\text{Rate of discount}} = \frac{89.70}{0.3} = 299.00 (ii) Net price = List price - Amount of discount = 299.00 - 89.70 = \$209.30		

EXAMPLE 6.1C	 Find the rate of discount for (i) snowboards listed at \$280.00 less a discount of \$67.20; (ii) snow-sport helmets listed at \$129.99 whose net price is \$84.49; (iii) goalie pads whose net price is \$368.99 after a discount of \$81.00.
SOLUTION	(i) Rate of discount = $\frac{\text{Amount of discount}}{\text{List Price}} = \frac{67.20}{280.00} = 0.24 = 24.00\%$
	(ii) Since Net price = List price – Amount of discount (Formula 6.2), Amount of discount = List price – Net price = $129.99 - 84.49 = 45.50 Rate of discount = $\frac{\text{Amount of discount}}{\text{List price}} = \frac{45.50}{129.99} = 0.350027 = 35.00\%$

(iii) Since Net price = List price - Amount of discount (Formula 6.2), List price = Net price + Amount of discount = 368.99 + 81.00 = \$449.99Rate of discount = $\frac{\text{Amount of discount}}{\text{List price}} = \frac{81.00}{449.99} = 0.180004 = 18.00\%$

B. The net price factor approach

Instead of computing the amount of discount and then deducting this amount from the list price, the net price can be found by using the more efficient net factor approach developed in the following illustration.

Referring back to Example 6.1A, the solution can be restated as follows:

List price	\$80.00
Less trade discount 25% of 80.00	20.00
Net price	\$60.00

Since the discount is given as a percent of the list price, the three dollar values may be stated as percents of list price:

List price	\$80.00	\longrightarrow	100% of list price
Less trade discount	20.00		25% of list price
Net price	\$60.00	>	75% of list price

Note: The resulting "75%" is called the **net price factor** or **net factor** (in abbreviated form **NPF**) and is obtained by deducting the 25% discount from 100%.

 $\frac{\text{NET PRICE}}{\text{FACTOR (NPF)}} = 100\% - \% \text{ discount}$

The resulting relationship between net price and list price may be stated generally.

NET PRICE = LIST PRICE $\times \frac{\text{NET PRICE}}{\text{Factor (NPF)}}$

These relationships can be restated in algebraic terms:

Convert the % discount into its decimal equivalent represented by *d*, and express 100% by its decimal equivalent, 1.

Net price factor = 1 - d

Let the list price be represented by L, and let the net price be represented by N.

N = L(1 - d)

------ Formula 6.3

Another way to derive the net price formula is to substitute Formula 6.1 into Formula 6.2 and then collect the similar terms. If we substitute Amount of discount, A = dL, into N = L - A, we obtain N = L - dL. Since L is a common factor, we can rewrite the formula as N = L(1 - d).

EXAMPLE 6.1D

Find the net price for

- (i) list price \$36.00 less 15%;
- (ii) list price \$86.85 less $33\frac{1}{3}$ %.

SOLUTION	(i) Net price = List price × Net price factor using Formula 6.3 = $(36.00)(1 - 0.15)$ = $(36.00)(0.85)$ = \$30.60
	(ii) Net price = $(86.85)(1 - 0.3)$ = $(86.85)(0.\dot{6})$ = \$57.90* rounded
EXAMPLE 6.1E	A manufacturer can cover its cost and make a reasonable profit if it sells an article for \$63.70. At what price should the article be listed so that a discount of 30% can be allowed?
SOLUTION	Let the list price be represented by \$L. Net price = List price × Net price factor 63.70 = L (0.7) $L = \frac{63.70}{0.7} = \91.00 The article should be listed at \$91.

C. Discount series

A manufacturer may offer two or more **discounts** to different members of the supply chain. If a list price is subject to two or more discounts, these discounts are called a **discount series**. For example, a chain member closest to the consumer might be offered additional discounts if there are fewer chain members who must make a profit on an item. If the manufacturer wants to encourage large-volume orders or early orders of seasonal items, it may offer additional discounts. For example, a manufacturer might offer a retailer a 5% discount on orders over 1000 items and an additional discount of 6% for ordering Christmas items in April. It may also offer additional discounts to compensate for advertising, promotion, and service costs handled by supply chain members.

When computing the net price, the discounts making up the discount series are applied to the list price successively. The net price resulting from the fi st discount becomes the list price for the second discount; the net price resulting from the second discount becomes the list price for the third discount; and so on. In fact, fi ding the net price when a list price is subject to a discount series consists of solving as many discount problems as there are discounts in the discount series.

EXAMPLE 6.1F

SOL

An item listed at \$150.00 is subject to the discount series 20%, 10%, and 5%. Determine the net price.

UTION	List price	\$150.00 Problem 1
	Less first discount 20% of 150.00	30.00
	Net price after first discount	\$120.00 Problem 2
	Less second discount 10% of 120.00	<u>12.00</u>
	Net price after second discount	\$108.00 Problem 3
	Less third discount 5% of 108.00	<u>5.40</u>
	Net price	\$102.60

Because the solution to Example 6.1F consists of three problems involving a simple discount, the net price factor approach can be used to solve it or any problem involving a series of discounts.



The fi al net price of \$102.60 is obtained from

$$= L (1 - 0.20)(1 - 0.10)(1 - 0.05)$$

$$= 150 (0.80)(0.90)(0.95)$$

= Original list price \times NPF for 20% \times NPF for 10% \times NPF for 5%

These relationships can be restated in algebraic terms:

Let the net price be represented by N, the original list price by L, the fi st rate of discount by d_1 , the second rate of discount by d_2 , the third rate of discount by d_3 , and the last rate of discount by d_n .

Then Formula 6.4 can be shown as

NET PRICE = $L(1 - d_1)(1 - d_2)(1 - d_3) \dots (1 - d_n)$ Formula 6.4

D. Single equivalent rates of discount

For every discount series, a single equivalent rate of discount exists.

single equivalent rate of discount for a discount series = 1 - npf for the discount series = 1 - $[(1 - d_1)(1 - d_2)(1 - d_3) \dots (1 - d_n)]$ Formula 6.5

EXAMPLE 6.1G

A manufacturer sells kayaks to dealers at a list price of \$2100.00 less 40%, 10%, and 5%. Determine the

- (i) net price;
- (ii) amount of discount;
- (iii) single equivalent rate of discount.

SOLUTION	(i) Net price = List price \times NPF = (2100)(1 = 0.40)(1 = 0.10)(1 = 0.05)
	= (2100)(1 - 0.40)(1 - 0.10)(1 - 0.05) $= (2100)(0.60)(0.90)(0.95)$
	= (2100)(0.00)(0.90)(0.93) = \$1077.30 — using Formula 6.4
	(ii) Amount of discount = List price $-$ Net price
	= 2100.00 - 1077.30
	= \$1022.70
	(iii) Single equivalent rate of discount = $1 - [(1 - 0.40)(1 - 0.10)(1 - 0.05)]$
	= 1 - [(0.60)(0.90)(0.95)]
	= 1 - 0.513
	= 0.487
	= 48.7% ———— using Formula 6.5
	Note: Taking off a single discount of 48 7% has the same effect as using the discount

Note: Taking off a single discount of 48.7% has the *same* effect as using the discount series 40%, 10%, and 5%. That is, the single discount of 48.7% is equivalent to the discount series 40%, 10%, and 5%.

Caution: The sum of the discounts in the series, 40% + 10% + 5% or 55%, is not equivalent to the single discount.

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The single equivalent rate of discount is not simply the sum of the individual discounts. Proper application of Formula 6.5 will always result in a single equivalent discount rate that is less than the sum of the individual discounts. You can use this fact to check whether the single equivalent discount rate you calculate is reasonable.

> An alternative way you can fi d the single equivalent rate of discount is by choosing a suitable list price, such as \$100, and computing fi st the amount of discount and then the rate of discount. Remember to carry the decimals until the end.

EXAMPLE 6.1H	Determine the amount of discount for a \$100.00 list price subject to the discount series 40% 12 5% $8\frac{1}{2}\%$ and 2%
SOLUTION	Net price = List price \times NPF
	= 100 [(1 - 0.40)(1 - 0.125)(1 - 0.083)(1 - 0.02)] = 100 [(0.60)(0.875)(0.916)(0.98)] = 47.1625 carry the decimals
	Amount of discount = List price - Net price = $100 - 47.1625$ = 52.8375
	Rate of discount = Amount of discount/List price = $52.8375/100$ = 0.528375
	The single equivalent rate of discount is 52.84%.
	Check
	Single equivalent rate of discount = $1 - [(1 - 0.40)(1 - 0.125)(1 - 0.083)(1 - 0.02)]$ = $1 - [(0.60)(0.875)(0.916)(0.98)]$ = $1 - 0.471625$ = 0.528375

My Math Lab

EXAMPLE 6.11	A retail kiosk has listed a pair of sunglasses for \$136 less 30%. A department store in the shopping mall lists the same model for \$126 less 20%, less an additional 15%. What additional rate of discount must the kiosk give to meet the department store price?
SOLUTION	Kiosk net price = 136.00(0.7)\$95.20Department store price = 126.00(0.8)(0.85) $\frac{85.68}{\$ 9.52}$ Additional discount needed $\frac{9.52}{95.20} = 0.1 = 10\%$
EXAMPLE 6.1J	Redden Distributors bought a shipment of laptops at a net price of \$477.36 each, after discounts of 15%, 10%, and 4%. What is the list price?
SOLUTION	Let the list price be \$L. The net price is \$477.36using Formula 6.4 N = L(1 - 0.15)(1 - 0.10)(1 - 0.04) 477.36 = L(0.85)(0.9)(0.96) $L = \frac{477.36}{(0.85)(0.9)(0.96)} = 650.00 The laptops are listed at \$650.00.

EXERCISE 6.1

- An item with a list price of \$125.64 is offered at a discount of 37.5%. What is the net price?
 Reference Example 6.1A
- **2.** An item with a list price of \$49.98 is offered at a discount of $16\frac{2}{3}$ %. What is the net price?
- 3. A 17.5% discount on a flat-screen TV amounts to \$560. What is the list price? Reference Example 6.1B
- **4.** Golf World sells a set of golf clubs for \$762.50 below the suggested retail price. Golf World claims that this represents a 62.5% discount. What is the suggested retail price (or list price)?
- **5.** A $16\frac{2}{3}$ % discount allowed on a flash drive amounted to \$14.82. What was the net price?
- **6.** A store advertises a discount of \$44.75 on a pair of running shoes. If the discount is 25%, for how much were the running shoes sold?
- 7. The net price of a pair of hockey skates after a discount of $16\frac{2}{3}\%$ is \$355. What is the list price?
- **8.** The net price of an article is \$63.31. What is the suggested retail price (the list price) if a discount of 35% was allowed?
- 9. A mountain bike listed for \$975 is sold for \$820. What rate of discount was allowed? Reference Example 6.1C
- **10.** A home theatre system listed at \$1136 has a net price of \$760. What is the rate of discount?
- **11.** An infrared barbeque grill was originally listed at \$769.99. The price was first discounted to \$550.54, followed by a fi al discounted price of \$449.79. What was the single equivalent rate of discount at the fi al price?

- 12. In the original online ad, a speciality coffeemaker was listed at a price of \$399.99. To promote business to a retailer, the appliance was offered at "\$120 off" if five or more items were purchased at the same time. If a buyer purchased within three days, a further \$42 discount off the price was allowed. Compute the net price and the single equivalent rate of discount if a buyer took advantage of both offers.
- 13. Compute the equivalent single rate of discount for each of the following discount series.(a) 30%, 12.5%
 - **(b)** $33\frac{1}{3}\%$, 20%, and 3%
- **14.** Determine the equivalent single rate of discount for each of the following series of discounts.
 - (a) $16\frac{2}{3}\%$, 7.5%
 - **(b)** 25%, $8\frac{1}{3}$ %, and 2%
- 15. A camera is listed for \$599 less 30%, 20%, and 5%.
 - (a) What is the net price?
 - (b) What is the total amount of discount allowed?
 - (c) What is the exact single rate of discount that was allowed? Reference Example 6.1G
- 16. A mobile phone is listed for \$174 less $16\frac{2}{3}$ %, 10%, and 8%.
 - (a) What is the net price?
 - (b) What is the total amount of discount allowed?
 - (c) What is the exact single rate of discount that was allowed?
- 17. A home gym is listed for \$786.20 less 36%, 10%, and 2%.
 - (a) What is the net price?
 - (b) What is the total amount of discount allowed?
 - (c) What is the exact single rate of discount that was allowed?
- **18.** A racing bike is listed for \$1293.44 less $18\frac{1}{3}$ %, $9\frac{1}{9}$ %, and 3%.
 - (a) What is the net price?
 - (b) What is the total amount of discount allowed?
 - (c) What is the exact single rate of discount that was allowed?
- **19.** An item listed by a wholesaler for \$750 less 20%, 5%, and 2% is reduced at a clearance sale to \$474.81. What additional rate of discount was offered? Reference Example 6.11
- **20.** An offic desk listed at \$440 less 25% and 15% is offered at a further reduced price of \$274.89. What additional rate of discount was offered?
- **21.** An electronic game listed at \$180 less 30%, 12.5%, and 5% is offered at a further reduced price of \$99.50. What additional rate of discount was offered?
- **22.** A computer listed at \$1260 less $33\frac{1}{3}\%$ and $16\frac{2}{3}\%$ is offered at a clearance price of \$682.50. What additional rate of discount was offered?
- **23.** Arrow Manufacturing offers discounts of 25%, 12.5%, and 4% on a line of products. For how much should an item be listed if it is to be sold for \$113.40?
- **24.** What is the list price of an article that is subject to discounts of $33\frac{1}{3}$ %, 10%, and 2% if the net price is \$564.48?
- **25.** A distributor lists an item for \$85 less 20%. To improve lagging sales, the net price of the item is reduced to \$57.80. What additional rate of discount does the distributor offer?
- **26.** A hat is listed for \$66 less 40%. The net price of the hat is further reduced to \$35.64. What additional rate of discount is offered?
- 27. Galaxy Jewellers sells diamond necklaces for \$299 less 25%. Brilliants Jewellers offers the same necklace for \$350 less 35% and 10%. What additional rate of discount must Galaxy offer to meet the competitor's price?

28. Polar Bay Wines advertises California Juice listed at \$125 per bucket at a discount of 24%. A nearby competitor offers the same type of juice for \$87.40 per bucket. What additional rate of discount must Polar Bay Wines give to meet the competitor's price?

6.2 PAYMENT TERMS AND CASH DISCOUNTS A. Basic concepts

Among each other, manufacturers, distributors, wholesalers, and retailers usually sell goods on credit rather than for cash. An invoice for the goods is sent, and the seller specifies **payment terms** on the invoice. These payment terms indicate when the invoice amount is due for payment and how much is to be paid. The business selling the goods can offer a **cash discount** to encourage prompt payment. This discount reduces the amount to be paid, and is based on the original amount of the invoice, the discount rate, and the timing of the payment or payments.

All payment terms have three things in common:

- 1. The **rate of discount** is stated as a percent of the net amount of the invoice. The net amount of the invoice is the amount after trade discounts are deducted.
- **2.** The **discount period** is stated, indicating the time period when the cash discount can be applied.
- **3.** The **credit period** is stated, indicating the time period when the invoice must be paid.

The invoice sample in Figure 6.3 is set up for a business in Ontario, where the HST rate is 13% (as of July 1, 2010). The payment terms indicate that the invoice amount is due within 30 days. If the invoice is paid in full by May 12, 2015, an additional 2% cash discount will apply.

If payment is not made during the stated discount period, the net amount of the invoice is to be paid by the end of the credit period. The end of the credit period is called the *due date*, and is either stipulated by the payment terms or implied by the prevailing business practice. If payment is not made by the due date, the account is considered overdue and may be subject to a late payment fee or interest charges.

Cash discounts are offered in a variety of ways:

- (a) The most commonly used method is **ordinary dating**, whereby payment terms are based on the invoice date.
- (b) Occasionally, **end-of-month dating**, or E.O.M. dating, is used. End-of-month payment terms shift the invoice date to the last day of the month, so that a discount period or credit period starts after the end of the current month.
- (c) When the abbreviation R.O.G. (receipt of goods) appears in the terms of payment, the discount and credit periods start the day after the merchandise has been received. **Receipt-of-goods dating** is used when the transportation of the goods takes a long time, possibly due to the distance the goods are being shipped.

Regardless of when the discount and credit periods begin, the mathematics of working with cash discounts is similar to that used in working with trade discounts.

Figure 6.3 A Sample Sales Invoice

				I	nvoice #: 227
old to: pokes and W 550 Avenue I oronto, Ontar vate: May 2, 2 erms: 2/10, n	/heels Road io M5M 3Z8 2015 /30				
Product Description	Product Number	Quantity	List Price	Discount	Net amount
Evolution Series 4U Lock	ES-4	25	\$34.99	25%	\$656.06
H-Bar Mount for Series 4U	ES-4H	20	\$14.99	20%, 5%	\$227.85
			Sh	Invoice ipping and Ha 13%	Total: \$883.9 andling: \$35.0 6HST: \$119.4

POINTERS AND PITFALLS

To count the number of days in the discount period, the invoice date is considered "Day 0." For example, if an invoice is dated July 5th with credit terms 2/10, n/30, then July 6th is counted as "Day 1," July 7th as "Day 2," and so on. Payments received up to, and including, July 15th ("Day 10") are entitled to a 2% discount. The balance of the invoice is due on August 4th ("Day 30").

B. Ordinary dating

The most frequently used method of offering a cash discount is ordinary dating, and the most commonly used payment terms are 2/10, n/30 (read "two ten, net thirty").

Th s payment term means that if payment is made *within* 10 days of the date of the invoice, a discount of 2% may be deducted from the net amount of the invoice. Otherwise, payment of the net amount of the invoice is due within 30 days. (See Figure 6.4.)



Figure 6.4 Interpretation of Payment Terms

EXAMPLE 6.2A

Determine the payment needed to settle an invoice with a net amount of \$950, dated September 22, terms 2/10, n/30, if the invoice is paid

- (i) on October 10;
- (ii) on October 1.

Figure 6.5 Discount and Credit Periods—Example 6.2A, Ordinary Dating



SOLUTION

The terms of the invoice indicate a credit period of 30 days and state that a 2% discount may be deducted from the invoice net amount of \$950 if the invoice is paid within 10 days of the invoice date of September 22. The applicable time periods and dates are shown in Figure 6.5.

Ten days after September 22 is October 2. The discount period ends October 2.

- (i) Payment on October 10 is beyond the last day for taking the discount. The discount cannot be taken. The full amount of the invoice of \$950 must be paid.
- (ii) October 1 is within the discount period; the 2% discount can be taken.

Amount paid = Net amount -2% of the net amount

$$= 950.00 - 0.02(950.00)$$

$$= 950.00 - 19.00$$

Alternatively: Using the net price factor approach (Formula 6.3),

Amount paid = Net amount \times NPF for a 2% discount

= (950.00)(1 - 0.02)

= (950.00)(0.98)

= \$931.00

EXAMPLE 6.2B

An invoice for \$752.84 dated March 25, terms 5/10, 2/30, n/60, is paid in full on April 20. What is the total amount paid to settle the account? (See Figure 6.6.)

Figure 6.6 Discount and Credit Periods—Example 6.2B, Ordinary Dating



C. End-of-the-month dating

End-of-the-month dating is refl cted in an invoice with the abbreviation E.O.M., as in 2/10, n/30 E.O.M. The E.O.M. abbreviation has the effect of shifting the invoice date to the last day of the month. This would indicate that the 2% discount may be taken within the first 10 days of the next month.

Commonly, in end-of-the-month dating, the credit period (such as n/30) is not stated. In our example, "2/10, n/30 E.O.M." would be written "2/10 E.O.M." In this case,

it is understood that the end of the credit period (the due date) is *twenty* days after the last day for taking the discount.

EXAMPLE 6.2D An invoice for \$1233.95 dated July 16, terms 2/10 E.O.M., is paid on August 10. What is the amount paid?

The abbreviation E.O.M. means that the invoice is to be treated as if the invoice date were July 31. Therefore, the last day for taking the discount is August 10.





Amount paid = 1233.95(0.98) = \$1209.27

D. Receipt-of-goods dating

When the abbreviation R.O.G. (*receipt of goods*) appears in the terms of payment, as in 2/10, n/30 R.O.G., the last day for taking the discount is the stipulated number of days after the date the merchandise is received, rather than the invoice date. This method of offering a cash discount is used when the transportation of the goods takes a long time, as in the case of long-distance overland shipments by rail or truck, or shipments by boat.

EXAMPLE 6.2E Hansa Import Distributors has received an invoice of \$8465.00 dated May 10, terms 3/10, n/30 R.O.G., for a shipment of clocks that arrived on July 15. What is the last day for taking the cash discount and how much is to be paid if the discount is taken?

SOLUTION

SOLUTION

The last day for taking the discount is ten days after receipt of the shipment, that is, July 25.

Figure 6.8 Discount and Credit Periods—Example 6.2E, Receipt-of-Goods Dating



E. Partial payments and additional problems

The problem of a cash discount for a **partial payment** arises when a business pays *part* of an invoice within the discount period. In such cases, the purchaser is entitled to the cash discount on the partial amount paid. Each time a partial payment is made, separate the invoice into different parts, and then determine whether the discount applies to each individual part.

EXAMPLE 6.2F

Royal Roads University has received an invoice of \$2780 dated August 28, terms 2/10. What payment must be made on September 5 to reduce the debt

- (i) by \$1000?
- (ii) to \$1000?

SOLUTION

The last day for taking the cash discount is September 7. Since the payment on September 5 is within the discount period, the discount of 2% may be taken off he partial payment.

(i) Reduce debt by \$1000



Reducing the debt *by* \$1000 requires paying \$1000 less the discount. The cash amount paid is \$980. Even though less than \$1000 has been paid, the debt still owing has been reduced by \$1000. This amount is subtracted from the balance to determine the amount owing after the payment. The balance of the debt still owing is now \$1780.

(ii) Reduce debt to \$1000



Reducing the debt *to* \$1000 requires separating the debt into two parts, the fi st debt being \$1780. The discount is then applied to that amount. The amount paid is \$1744.40. The balance of the debt still owing in this case is now \$1000.

EXAMPLE 6.2G	Applewood Supplies received a payment of \$807.50 from Main Street Service on October 7 on an invoice of \$2231.75 dated September 28, terms 5/10.(i) For how much should Applewood credit Main Street Service's account for the payment?
	(ii) How much does Main Street Service still owe on the invoice?
SOLUTION	The payment is within the discount period. Main Street Service is entitled to the 5% discount on the partial payment. The amount of \$807.50 represents a partial payment already reduced by 5%.



EXERCISE 6.2

- 1. Canadian Wheel received an invoice dated May 13 with terms 2/10, n/30. The amount stated on the invoice was \$2499.
 - (a) What is the last day for taking the cash discount?
 - (b) What is the amount due if the invoice is paid on the last day for taking the discount? Reference Example 6.2A
- 2. An invoice was received for \$6200 dated June 21 with terms 2/10, n/30.
 - (a) What is the last day for taking the cash discount?
 - (b) What is the amount due if the invoice is paid on the last day for taking the discount?

- **3.** Triton Company received an invoice for \$842 dated March 9 with terms 5/10, 2/20, n/60.
 - (a) If the invoice is paid on March 19, how much is to be paid?
 - (b) If the invoice is paid on March 27, how much is to be paid?
 - (c) If the invoice is paid on April 3, how much is to be paid?

Reference Example 6.2B

- **4.** Manual Company received an invoice for \$2412 dated January 22 with terms 3/15, 1/30, n/60.
 - (a) If the invoice is paid on January 31, how much is to be paid?
 - (b) If the invoice is paid on February 20, how much is to be paid?
 - (c) If the invoice is paid on March 22, how much is to be paid?
- **5.** What amount must be remitted if invoices dated July 25 for \$929, August 10 for \$763, and August 29 for \$864, all with terms 3/20, n/40, are paid together on August 30?
- **6.** The following invoices, all with terms 5/10, 2/30, n/60, were paid together on May 15. Invoice No. 234 dated March 30 is for \$394.45; Invoice No. 356 dated April 15 is for \$595.50; and Invoice No. 788 dated May 10 is for \$865.20. What amount was remitted?
- 7. An invoice for \$5275 dated November 12, terms 4/10, n/30, was received on November 14. What payment must be made on November 20 to reduce the debt to \$3000?
- **8.** What amount will reduce the amount due on an invoice of \$1940 by \$740 if the terms of the invoice are 5/10, n/30 and the payment was made during the discount period?
- **9.** Santucci Appliances received an invoice dated August 12 with terms 3/10 E.O.M. for the items listed below:
 - 5 GE refrigerators at \$980 each less 25% and 5%;
 - 4 Inglis dishwashers at \$696 each less $16\frac{2}{3}$ %, 12.5%, and 4%.
 - (a) What is the last day for taking the cash discount?
 - (b) What is the amount due if the invoice is paid on the last day for taking the discount?
 - (c) What is the amount of the cash discount if a partial payment is made such that a balance of \$2000 remains outstanding on the invoice?
- Import Exclusives Ltd. received an invoice dated May 20 from Dansk Specialties of Copenhagen with terms 5/20 R.O.G. for

100 teak trays at \$34.30 each;

25 teak icebuckets at \$63.60 each;

40 teak salad bowls at \$54.50 each.

- All items are subject to trade discounts of $33\frac{1}{3}\%$, $7\frac{1}{2}\%$, and 5%.
- (a) If the shipment was received on June 28, what is the last day of the discount period?
- (b) What is the amount due if the invoice is paid in full on July 15?
- (c) If a partial payment only is made on the last day of the discount period, what amount is due to reduce the outstanding balance to \$2500?
- **11.** Sheridan Service received an invoice dated September 25 from Wolfedale Automotive. The invoice amount was \$2540.95, and the payment terms were 3/10, 1/20,

n/30. Sheridan Service made a payment on October 5 to reduce the balance due by \$1200, made a second payment on October 15 to reduce the balance to \$600, and paid the remaining balance on October 25.

- (a) How much did Sheridan Service pay on October 5?
- (b) How much did it pay on October 15?
- (c) What was the amount of the final payment on October 25?

Reference Example 6.2F

- **12.** The Ski Shop received an invoice for \$9600 dated August 11, terms 5/10, 2/30, n/90, for a shipment of skis. The Ski Shop made two partial payments.
 - (a) How much was paid on August 20 to reduce the unpaid balance to \$7000?
 - (b) How much was paid on September 10 to reduce the outstanding balance by \$3000?
 - (c) What is the remaining balance on September 10?
- **13.** Jelinek Sports received a cheque for \$1867.25 in partial payment of an invoice owed by The Ski Shop. The invoice was for \$5325 with terms 3/20 E.O.M. dated September 15, and the cheque was received on October 18.
 - (a) By how much should Jelinek Sports credit the account of The Ski Shop?
 - (b) How much does The Ski Shop still owe Jelinek?
- 14. Darrigo Grape received an invoice for \$13 780 dated September 28, terms 5/20 R.O.G., from Nappa Vineyards for a carload of grape juice received October 20. Darrigo made a partial payment of \$5966 on November 8.
 - (a) By how much did Darrigo reduce the amount due on the invoice?
 - (b) How much does Darrigo still owe?
- **15.** Highway One Gas sells gas for vehicles at \$1.12 per litre. Louis purchases 50 litres of gas for his car. He pays for the purchase in cash, paying a total of \$54.04.
 - (a) How much did he save by paying cash?
 - (b) What was the rate of discount on the cash purchase?
- **16.** Deals on Wheels advertises a vehicle at \$26 465. Marina buys the vehicle, paying \$24 877.10 in cash.
 - (a) How much did she save by paying cash?
 - (b) What was the rate of discount on the cash purchase?



The primary purpose of operating a business is to generate profits. Businesses engaged in merchandising generate profits through their buying and selling activities. The amount of profit depends on many factors, one of which is the pricing of goods. The selling price must cover

- 1. the cost of buying the goods;
- 2. the operating expenses (or overhead) of the business;
- **3.** the profit required by the owner to stay in business.

```
SELLING PRICE = COST OF BUYING + EXPENSES + PROFIT
```

```
S = C + E + P Formula 6.6
```

EXAMPLE 6.3A	Audio World buys outdoor speakers at a cost of \$84.00 each. Operating expenses of the business are 25% of cost and the owner requires a profit of 10% of cost. For how much should Audio World sell these speakers?
SOLUTION	Selling price = Cost of buying + Expenses + Profit = $84.00 + 25\%$ of $84.00 + 10\%$ of 84.00 = $84.00 + 0.25(84.00) + 0.10(84.00)$ = $84.00 + 21.00 + 8.40$ = $$113.40$
	Audio World should sell the speakers for \$113.40 to cover the cost of buying, the operating expenses, and the required profit.

Formula 6.6 can then be rearranged, so that the selling price less the cost equals expenses plus profit.

```
Selling price = cost of buying + expenses + profit

S - C = E + P
```

In Example 6.3A, the selling price is \$113.40 while the cost is \$84.00. The difference between selling price and cost = 113.40 - 84.00 = \$29.40. This difference covers operating expenses of \$21.00 and a profit of \$8.40 and is known as the **markup**, **margin**, or **gross profit**.

MARKUP = EXPENSES + PROFIT		
M = E + P		Formula 6.7

Using this relationship between markup, expenses, and profit, the relationship stated in Formula 6.6 becomes

SELLING PRICE	= cost of buying $+$ markup	
S = C + M		– Formula 6.8

Figure 6.9 illustrates the relationships among cost of buying (C), markup (M), operating expenses (E), profit (P), and selling price (S) established in Formulas 6.6, 6.7, and 6.8.

Figure 6.9



M = \$190.00

M = \$75.00

Overhead E = 40% of regular sellin = 0.4(295.00) = \$118.00	ng price $E = 40\%$ of regular selling price = 0.4(295.00) = \$118.00
Profit	Profit
E + P = M	E + P = M
118.00 + P = 190.00	118.00 + P = 75.00
P = \$72.00	P = - \$43.00
(iii) Profit from sale of 60 pairs	
at regular selling price $= 60$	(72.00) \$4320.00
Profit from sale of 40 pairs	
during clearance sale $= 40($	-43.00) -1720.00
Tota	l profit \$2600.00

A POINTERS AND PITFALLS

It is helpful to organize markup questions in a diagram. S is composed of C and M, or of C, E, and P. Often E and P are expressed as a percentage of C or of S. Enter the values you know (or can calculate) into one of the following diagrams and then solve for the unknown values.



B. Rate of markup

A markup may be stated in one of two ways:

- 1. as a percent of cost; or
- **2.** as a percent of selling price.

The method used is usually determined by the way in which a business keeps its records. Since most manufacturers keep their records in terms of cost, they usually calculate markup as a percent of cost. Since most department stores and other retailers keep their records in terms of selling price, they usually calculate markup as a percent of selling price.

Computing the rate of markup involves comparing the amount of markup to a base amount. Depending on the method used, the base amount is either the cost or the selling price. Since the two methods produce different results, great care must be taken to note whether the markup is based on the cost or on the selling price.



				2
EXAMPLE 6.3D	Compute (a) the mis markup based on co the following:	ssing value (cost, selling st, and (c) the rate of m	; price, or markup), (b) th arkup based on selling pr	e rate of ice for each of
	(i) cost, \$60; sell	ing price, \$75		
	(ii) cost, \$48; mai	rkup, \$16		
	(iii) selling price.	\$88: markup, \$33		
	(iv) cost \$9 more	400, manup, 400		
	$(1v)$ cost, $\varphi 0$, mark	¢24 μ 1 μ φ10		
	(v) selling price, s	\$24; markup, \$18		
SOLUTION	(a)	(b)	(c)	
		Rate of Markup	Rate of Markup	
	Missing Value	Based on Cost	Based on Selling Price	
	(i) Markup = 75 - 60	$\frac{15}{60} = 0.25 = 25\%$	$\frac{15}{75} = 0.2 = 20\%$	
	= \$13 (ii) Selling price $= 48 + 16$ $= 54	$\frac{16}{48} = \frac{1}{3} = 33\frac{1}{3}\%$	$\frac{16}{64} = 0.25 = 25\%$	
	- \$64 (iii) Cost = 88 - 33 = \$55	$\frac{33}{55} = 0.6 = 60\%$	$\frac{33}{88} = 0.375 = 37.5\%$	
	(iv) Selling price = $8 + 8$ = $$16$	$\frac{8}{8} = 1 = 100\%$	$\frac{8}{16} = 0.5 = 50\%$	
	(v) Cost = 24 - 18 = \$6	$\frac{18}{6} = 3 = 300\%$	$\frac{18}{24} = 0.75 = 75\%$	

C. Finding the cost or the selling price

When the rate of markup is given and either the cost or the selling price is known, the missing value can be found using Formula 6.8.

SELLING PRICE = COST + MARKUP

S = C + M

When using this formula, pay special attention to the base of the markup; that is, whether it is based on cost or based on selling price.

EXAMPLE 6.3E	What is the selling price of an article costing \$72.00 if the markup is		
	(i) 40% of cost?(ii) 40% of the selling price?		
SOLUTION	(i) $S = C + M$ using Formula 6.8 S = C + 40% of C replacing M by 40% of C is the crucial S = 72.00 + 0.4(72.00) step in the solution S = 72.00 + 28.80 S = 100.80 When the markup is 40% based on cost, the selling price is \$100.80.		

(ii) S = C + M S = C + 40% of S S = 72.00 + 0.4S S - 0.4S = 72.00 0.6S = 72.00 $S = \frac{72.00}{0.6}$ S = 120.00

When the markup is 40% based on selling price, the selling price is \$120.00.

POINTERS AND PITFALLS

In problems of this type, replace M by X% of C or X% of S before using specific numbers. This approach is used in the preceding problem and in the following worked examples.

EXAMPLE 6.3F	What is the cost of an article selling for \$65.00 if the markup is(i) 30% of selling price?(ii) 30% of cost?
SOLUTION	(i) $C + M = S$ C + 30% of S = S replace M by 30% of S C + 0.3(65.00) = 65.00 C + 19.50 = 65.00 C = 65.00 - 19.50 C = 45.50
	When the markup is 30% based on selling price, the cost is \$45.50.
	(ii) $C + M = S$ C + 30% of C = S replace M by 30% of C C + 0.3C = 65.00 1.3C = 65.00 $C = \frac{65.00}{1.3}$ C = 50.00 If the markup is 30% based on cost, the cost is \$50.00.
EXAMPLE 6.3G	The Beaver Ski Shop sells ski vests for \$98.00. The markup based on cost is 75%.(i) What did the Beaver Ski Shop pay for each vest?(ii) What is the rate of markup based on the selling price?
SOLUTION	(i) $C + M = S$ C + 75% of $C = SC + 0.75C = 98.001.75C = 98.00C = 56.00The Beaver Ski Shop paid $56.00 for each yest.$

(ii) Rate of markup based on selling price
$$= \frac{\text{Markup}}{\text{Selling price}}$$
$$= \frac{98.00 - 56.00}{98.00}$$
$$= \frac{42.00}{98.00} = 0.428571 = 42.86\%$$

EXAMPLE 6.3H	Main Street Service bought four Michelin tires from a wholesaler for \$343.00 and sold the tires at a markup of 30% of the selling price.		
	(i) For how much were the tires sold?		
	(ii) What is the rate of markup based on cost?		
SOLUTION	(i) $S = C + M$ S = C + 30% of S S = 343.00 + 0.3S 0.7S = 343.00 S = 490.00		
	Main Street Service sold the tires for \$490.00.		
	(ii) Rate of markup based on cost = $\frac{\text{Markup}}{\text{Cost}}$		
	$=\frac{490.00-343.00}{343.00}$		
	$=\frac{147.00}{343.00}=0.428571=42.86\%$		

EXAMPLE 6.31	The markup, or gross profit, on each of two separate articles is \$25.80. If the rate of markup for Article A is 40% of cost while the rate of markup for Article B is 40% of the selling price, determine the cost and the selling price of each.
SOLUTION	For Article A Markup (or gross profit) = 40% of cost 25.80 = 0.4C C = 64.50
	The cost of Article A is 64.50 . The selling price is $64.50 + 25.80 = 90.30$.
	For Article B Markup (or gross profit) = 40% of selling price 25.80 = 0.4S S = 64.50
	The selling price of Article B is \$64.50. The cost is $64.50 - 25.80 = 38.70 .

EXERCISE 6.3

MyMathLab

- 1. Giuseppe's buys supplies to make pizzas for \$4. Operating expenses of the business are 110% of the cost and the profit made is 130% of cost. What is the regular selling price of each pizza?
- **2.** Neptune Dive Shop sells snorkelling equipment for \$50. The shop's cost is \$25 and the operation expenses are 30% of the regular selling price. How much profit will the shop make on each sale?
- **3.** Mi Casa imports pottery from Mexico. Its operation expenses are 260% of the cost of buying and the profit is 110% of the cost of buying. Th s business sells a vase for \$14.10. What is the cost for each piece?
- **4.** Peninsula Hardware buys cabinet doors for \$25 less 40%, 10%, and 4%. The store's overhead expenses are 35% of cost and the required profit is 15% of cost. For how much should the cabinet doors be sold?
- **5.** A merchant buys an item listed at \$96 less $33\frac{1}{3}\%$ from a distributor. Overhead is 32% of cost and profit is 27.5% of cost. For how much should the item be retailed?
- **6.** Tennis racquets were purchased for \$55 less 40% (for purchasing more than 100 items), and less a further 25% (for purchasing the racquets in October). They were sold for \$54.45.
 - (a) What is the markup as a percent of cost?
 - (b) What is the markup as a percent of selling price?
- 7. A dealer bought computers for \$1240 less 50% and 10%. They were sold for \$1395.
 - (a) What was the markup as a percent of cost?
 - (b) What was the markup as a percent of selling price?
- **8.** The Bargain Bookstore marks up books by \$3.42 per book. The store's markup is 15% of cost.
 - (a) For how much did the bookstore buy each book?
 - (b) What is the selling price of each book?
 - (c) What is the rate of markup, based on the selling price?
- **9.** An appliance store sells electric kettles at a markup of 18% of the selling price. The store's margin on a particular model is \$6.57.
 - (a) For how much does the store sell the kettles?
 - (b) What was the cost of the kettles to the store?
 - (c) What is the rate of markup based on cost?
- **10.** At Town Lighting, a light fix ure is sold at a price of \$382.20, including a markup of 40% of cost.
 - (a) What is the cost of the item?
 - (b) What is the rate of markup based on the selling price?
- **11.** Sheridan Service sells oil at a markup of 40% of the selling price. If Sheridan paid \$0.99 per litre of oil,
 - (a) what is the selling price per litre?
 - (b) what is the rate of markup based on cost?

- **12.** Skis & Boards purchased gloves for \$20.28 per pair. The gloves are marked up 48% of the selling price.
 - (a) For how much does Skis & Boards sell a pair of gloves?
 - (b) What is the rate of markup based on cost?
- **13.** Neal's Photographic Supplies sells a Pentax camera for \$444.98. The markup is 90% of cost.
 - (a) How much does the store pay for this camera?
 - (b) What is the rate of markup based on selling price?
- 14. The Cookery buys sets of cookware for \$45 and marks them up at $33\frac{1}{3}\%$ of cost.
 - (a) What is the selling price of the cookware sets?
 - (b) What is the rate of markup based on selling price?
- **15.** The Leather Factory buys bags for \$84 and marks them up at 40% of selling price
 - (a) What is the selling price of the bags?
 - (b) What is the rate of markup based on cost?
- 16. Four-packs of energy drinks are purchased for \$3.24. The store's markup based on selling price is $16\frac{2}{3}\%$.
 - (a) What is the cost of the four-packs?
 - (b) What is the rate of markup based on cost?
- 17. It's About Time sells clocks for \$23.10. The store's markup based on cost is 37.5%.
 - (a) What is the cost of the clocks?
 - (b) What is the rate of markup based on selling price?
- 18. A car accessory is sold for \$42.90. The store's markup based on cost is 50%.
 - (a) What is the cost of the car accessory?
 - (b) What is the rate of markup based on selling price?

6.4 MARKDOWN A. Pricing strategies

Pricing strategies can be based on internal or external influences. Setting a price based on the business' "internal" factors involves examining the actual costs and expenses, as well as a desired profit level. Consideration of the relationship stated in Formula 6.6, Selling price = Cost + Expenses + Profit (or S = C + E + P), is essential in determining how large a markup is needed to cover overhead expenses and a reasonable profi.

The cost of buying an article plus the overhead represents the **total cost** of the article.

COST OF BUYING + EXPENSES = TOTAL COST

If an article is sold at a price that *equals* the total cost, the business makes no profit, nor does it suffer a loss. This price occurs at the break-even point and is discussed in Chapter 5. Any business, of course, prefers to sell at a price that is at least the **break-even price**. 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 item, the business suffers an absolute loss.

Often, pricing decisions are determined by actions of competitors or consumers, changes to economic conditions that affect interest rates and income available for purchases, or other "external" market factors. In response to market changes, marking down selling prices may be required to maintain profit levels.

B. Concepts and calculations

After the price to the retailer has been marked up to determine the regular selling price, the retailer may discount the regular selling price to offer the goods to the consumer at a lower sale price. The reduction from the regular selling price is called a **markdown**. The purpose of a markdown may be for promoting sales, matching competitors' prices, or clearing out inventories that are discontinued or seasonal.

In the merchandising industry, a wide variety of terms are used to identify the price to be reduced, such as regular selling price, selling price, list price, marked price, price tag, or ticket price. The reduced price can be referred to as the sale price or clearance price. The many terms can cause confusion. In this text, we use **regular selling price**, S, to describe the price to be reduced and **sale price** to describe the reduced price.



Using these standardized terms, a markdown can be calculated as the difference between the regular selling price and the sale price.

SALE PRICE = REGULAR SELLING PRICE - MARKDOWN

Th *markdown rate* or *discount rate* is the relationship between the amount of the markdown and the regular selling price, and is stated as a percent of the regular selling price.

MARKDOWN RATE =
$$\frac{\text{MARKDOWN}}{\text{REGULAR SELLING PRICE}} = \frac{\text{MD}}{\text{S}} \times 100$$
 ----- Formula 6.11

Since the markdown is a percent of the regular selling price, the net price factor approach used with discounts is applicable (see Formula 6.3).

sale price = regul ar selling price
$$\times$$
 npf
sale price = s(1 - % markd own)

When an article is sold at the sale price, the resulting profit, called the realized profit, can be determined using a variation of Formula 6.6, S - C - E = P. The regular selling price, S, would be replaced with the sale price. If the sale price of an article does not cover the total cost, the cost of buying, and the overhead expense, the result is a loss.



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POINTERS AND PITFALLS

You may notice that this relationship aligns with income statements used in accounting, in which the selling price or sale price represents revenue for units sold. Once the cost of buying those items and any expenses are subtracted from revenue, the result is either a profit or a loss on the income statement.

EXAMPLE 6.4A The Cook Nook paid \$115.24 for a set of dishes. Expenses are 18% of selling price and the required profit is 15% of selling price. During an inventory sale, the set of dishes was marked down 30%. (i) What was the regular selling price? (ii) What was the sale price? (iii) What was the operating profit or loss? SOLUTION (i) Selling price = Cost + Expenses + ProfitS = C + 18% of S + 15% of SS = C + 0.18S + 0.15SS = 115.24 + 0.33S0.67S = 115.24 $S = \frac{115.24}{0.67} = \172.00 The regular selling price is \$172.00. (ii) Sale price = Regular selling price - Markdown = S - 30% of S = S - 0.3S= 0.7S= 0.7(172.00)= \$120.40 The sale price (or revenue) is \$120.40. (iii) Total cost = Cost of buying + Expenses= C + 18 of S= 115.24 + 0.18(172.00)= 115.24 + 30.96= \$146.20 Profit = Revenue - Total cost= 120.40 - 146.20= -\$25.80 The dishes were sold at an operating loss of \$25.80. **EXAMPLE 6.4B** Lund Sporting Goods sold a bicycle regularly priced at \$195.00 for \$144.30. (i) What is the amount of markdown? (ii) What is the rate of markdown? SOLUTION The regular selling price, S, is \$195.00. The sale price is \$144.30. (i) Markdown = Regular selling price - Sale price = 195.00 - 144.30

	(ii) Rate of markdown = $\frac{\text{Markdown}}{\text{Regular selling price}}$ using Formula 6.11 = $\frac{50.70}{195.00}$ = 0.26 = 26%
EXAMPLE 6.4C	 During its annual Midnight Madness Sale, The Ski Shop sold a pair of ski boots, regularly priced at \$245.00, at a discount of 40%. The boots cost \$96.00 and expenses are 26% of the regular selling price. (i) For how much were the ski boots sold? (ii) What was the total cost of the ski boots? (iii) What operating profit or loss was made on the sale?
SOLUTION	The regular selling price, S, is \$245.00. (i) Sale price = $S \times NPF$ = 245.00 × 0.6 = \$147.00 (ii) Total cost = Cost of buying + Expenses = 96.00 + 0.26(245.00) = 96.00 + 63.70 = \$159.70 (iii) Profit = Sale price - Total cost = 147.00 - 159.70 = -\$12.70 (a loss) Since the total cost was higher than the revenue received from the sale of the ski boots, The Ski Shop had an operating loss of \$12.70.
EXAMPLE 6.4D	 The Winemaker sells Okanagan concentrate for \$22.50. The store's overhead expenses are 50% of cost and the owners require a profit of 30% of cost. (i) For how much does The Winemaker buy the concentrate? (ii) What is the price needed to cover all of the costs and expenses? (iii) What is the highest rate of markdown at which the store will still break even? (iv) What is the highest rate of discount that can be advertised without incurring an absolute loss?
SOLUTION	The regular selling price, S, is \$22.50. (i) $S = C + E + P$ S = C + 50% of $C + 30%$ of $CS = C + 0.5C + 0.3C22.50 = 1.8CC = \frac{22.50}{1.80} = $12.50The Winemaker buys the concentrate for $12.50.(ii) Total cost = C + 50% of C= 1.5C= 1.5(12.50)= 18.75

The price needed to cover costs and expenses is \$18.75.

(iii) To break even, the maximum markdown is 22.50 - 18.75 = \$3.75.

Rate of markdown $= \frac{3.75}{22.50} = 0.1\dot{6} = 16.\dot{6}\%$

The highest rate of markdown to break even is 16.67%. (*rounded)

(iv) The lowest price at which the concentrate can be offered for sale without incurring an absolute loss is the cost at which the concentrate was purchased; that is, \$12.50. The maximum amount of discount is 22.50 - 12.50 = \$10.00.

Rate of discount $=\frac{10.00}{22.50}=0.\dot{4}=44.\dot{4}\%$

The maximum rate of discount that can be advertised without incurring an absolute loss is 44.44%. (* rounded)

EXERCISE 6.4

- 1. The Music Store paid \$14.95 for a DVD. Expenses are 21% of regular selling price and the required profit is 11% of regular selling price. During an inventory sale, the DVD was marked down 20%.
 - (a) What was the regular selling price?
 - (b) What was the sale price?
 - (c) What was the operating profit or loss?

Reference Example 6.4A

MyMathLab

- **2.** A retail store paid \$44 for a microwave oven. Expenses are 27% of regular selling price and the required profit is 18% of regular selling price. During an inventory sale, the microwave was marked down 40%.
 - (a) What was the regular selling price?
 - (b) What was the sale price?
 - (c) What was the operating profit or loss?
- **3.** A sports drink was offered for sale at \$1.99 at West Store. At East Store, the regular selling price of a similar sports drink was \$2.49. What rate of markdown would East Store have to offer to sell the drink at the same price as West Store? Reference Example 6.4B
- **4.** An eyeglass company sells frames for \$279. If the company wanted to offer the lower price of \$239, what rate of markdown would it have to offer?
- **5.** A seminar was advertised at a price of \$125 per person. If the tickets were purchased at least two weeks in advance, the price would be lowered to \$105 per person. What rate of markdown has been offered?
- **6.** A seven-day Mexican cruise was advertised at a price of \$1299 per person based on double occupancy. If the cruise was booked two months in advance, the price would be lowered to \$935 per person. What rate of markdown has been offered?
- 7. Luigi's Restaurant offered a "buy one get one half off" sale for the midweek period. The "one half off" referred to the lesser-priced dinner. A customer ordered a steak dinner, with a regular price of \$19, and a chicken dinner, with a regular price of \$14.
 - (a) What was the overall markdown at which the dinners were sold?
 - (b) What was the overall rate of markdown at which the dinners were sold?

- **8.** A lakeside resort offered a midweek package at \$199 per night for two people. The package included accommodation in a one-bedroom suite, which regularly sold for \$225; and breakfast for two, regularly priced at \$12 per person.
 - (a) What was the markdown at which the packages were sold?
 - (b) What was the rate of markdown at which the packages were sold?
- **9.** Par Putters Company sells golf balls for \$29 per dozen. The store's overhead expenses are 43% of cost and the owners require a profit of 20% of cost.
 - (a) For how much does Par Putters Company buy the golf balls?
 - (b) What is the price needed to cover all of the costs and expenses?
 - (c) What is the highest rate of markdown at which the store will still break even?
 - (d) What is the highest rate of discount that can be advertised without incurring an absolute loss? Reference Example 6.4D
- Get-Aways Company sells sightseeing tours of the Ottawa Valley for C\$3849 per person. Overhead expenses for the company are 31% of cost and the target profit is 17% of cost.
 - (a) How much does Get-Aways Company pay for the tours?
 - (b) What is the lowest price they can offer while still covering all of the costs and expenses?
 - (c) What is the highest rate of markdown at which the company will still break even?

6.5 INTEGRATED PROBLEMS

Decisions involving discounts, markups, and markdowns are faced by business owners and managers on a regular basis. To achieve desired profits, prices must be set carefully. With each complex situation, a series of calculations are needed, with one calculation often building upon another. To achieve an overall solution, the steps to that solution must be defi ed and the costs and prices calculated.

EXAMPLE 6.5A	Rocky Sports purchased ski bindings for \$57.75 that were marked up 45% of the regular selling price. The store's overhead expenses were 28% of the regular selling price. When the binding was discontinued, it was marked down 40%. What was the sale price of the binding? How much was the operating profit or loss as a result of the sale?
SOLUTION	Consider the given information step by step. First, the regular selling price must be calculated. Next, the sale price can be calculated, and finally, the profit or loss can be calculated.
STEP 1	Since the sale price is based on a markdown from the regular selling price, S, the first step is to determine the regular selling price, S. S = C + M $S = C + 45% of S$ $S = 57.75 + 0.45S$ $0.55S = 57.75$ $S = 105.00 The regular selling price is \$105.00.

s.	TEP 2	Based on the regular selling price, S, determine the sale price. Sale price = Regular selling price - Markdown Sale price = $105.00 - 40\%$ of 105.00 Sale price = $105.00 - 42.00$ Sale price = $$63.00$
		Alternatively: Sale price = Regular selling price \times NPF Sale price = 105.00 \times 0.6 Sale price = \$63.00
		The sale price is \$63.00.
S .	TEP 3	Based on the sale price, determine the profit or loss. Profit(loss) = Sale price - Cost of buying - Expenses P = 63.00 - 57.75 - 0.28(105.00) P = 63.00 - 57.75 - 29.40 P = -\$24.15
		With the sale price, the operating loss was \$24.15.
		In some industries, businesses incorporate a third price into their pricing stra

In some industries, businesses incorporate a third price into their pricing strategy. In this case, the marked price or sticker price is set so that an ongoing discount is deducted to determine the regular selling price. Even though the merchandise is marked with a price, it is seldom sold at that price. When a discount is offered on a regular basis, the discounted price becomes the regular selling price. In addition, the business can apply a markdown to the marked price to determine a sale price. The resulting sale price may be higher or lower than the regular selling price.

EXAMPLE 6.5B	The Cheetah, a fast, sporty, and efficient new vehicle, has just been introduced by Canadian Motors. The local dealer, Andretti's, purchased one of the cars at a list price of \$27 685.00 less 30%. Andretti's sets a marked price on all vehicles so that it can offer a regular advertised discount of 10% and maintain a markup of 45% of the cost. During its annual sale, instead of the usual discount, a different markdown was offered by advertising the car at \$25 995.00. Determine the cost, the regular selling price, the original marked price, and the sale markdown rate.
SOLUTION	The step-by-step calculations are as follows: determine cost, regular selling price, original marked price, and then the sale markdown rate.
STEP 1	Determine the cost, C, (or purchase price) to the dealer. Cost = Manufacturer's list price \times NPF C = (27 685.00)(0.70) = \$19 379.50 The cost, C, to the business is \$19 379.50.
STEP 2	Determine the regular selling price, S, required to maintain the markup based on cost. S = C + Markup S = C + 45% of C S = C + 0.45C $S = 1.45(19\ 379.50)$ $S = 28\ 100.275$ The regular selling price, S, is \$28\ 100.28. (* rounded)

STEP 3	Determine the original marked price to allow a 10% discount. Let the marked price be MP. MP - Discount = Regular selling price MP - 10% of MP = Regular selling price MP - 0.1MP = 28 100.28 0.9MP = 28 100.28 MP = $\frac{28 100.28}{0.9} = 31 222.53$ The marked price is \$31 222.53. (* rounded)
STEP 4	Determine the sale markdown rate. Markdown = Marked price - Sale price = 31 222.53 - 25 995.00 = \$5 227.53 Markdown rate = $\frac{\text{Markdown}}{\text{Marked price}} = \frac{5227.53}{31222.53} = 0.167428 = 16.74 (* rounded)$
	The markdown is \$5227.53, which is 16.74% of the marked price.
EXAMPLE 6.5C	Big Sound Electronics purchased equipment from the manufacturer at a cost of \$960.00 less 30% and 15%. According to Big Sound's pricing strategy, all merchandise is marked at a price that allows an ongoing discount of 20% and maintains a profit of 15% of regular selling price. Overhead is 25% of regular selling price. During its annual Boxing Week sale, the usual discount of 20% was replaced by a markdown of 45% on selected models. What operating profit or loss was made during the Boxing Week sale?
SOLUTION	Step-by-step calculations needed: determine cost, regular selling price, marked price, sale price, then profit or loss.
STEP 1	Determine the cost, C, (or purchase price) to the store. Cost = Manufacturer's list price \times NPF C = (960.00)(0.70)(0.85) = \$571.20
	The cost, C, to the store is \$571.20.
STEP 2	Determine the regular selling price, S. Let the regular selling price be S. S = C + E + P S = C + 25% of S + 15% of S S = C + 0.25S + 0.15S S = 571.20 + 0.40S 0.60S = 571.20 $S = \frac{571.20}{0.6} = 952.00
	The regular selling price, S, is \$952.00.
STEP 3	Determine the original marked price to allow a 20% discount. Let the marked price be MP. MP - Discount = Regular selling price MP - 20% of MP = 952.00

	MP - 0.2MP = 952.00 0.8MP = 952.00 $MP = \frac{952.00}{0.8} = \1190.00 The marked price is \\$1190.00
STEP 4	Determine the Boxing Week sale price. Boxing Week sale price = Marked price - Markdown = $1190.00 - 45\%$ of 1190.00 = $1190.00 - 0.45(1190.00)$ = $\$654.50$
STEP 5	The sale price is \$654.50. Determine the profit or loss. Profit = Sale price - Cost of buying - Expenses = 654.50 - 571.20 - 0.25(952.00) = 654.50 - 809.20 = (\$154.70) The merchandise was sold at an operating loss of \$154.70.
EXAMPLE 6.5D	Magder's Furniture Emporium bought a dining room suite that must be regularly sold for \$5250.00 to cover the cost, overhead expenses of 50% of the cost, and a normal net profit of 25% of the cost. The suite is marked at a price so that the store can allow a 20% discount and still receive the required regular selling price. When the suite remained unsold, the store owner decided to mark the suite down for an inventory clearance sale. To arrive at the rate of markdown, the owner decided that the store's profit would have to be no less than 10% of the normal net profit and that part of the markdown would be covered by reducing the commission paid to the salesperson. The normal commission (which accounts for 40% of the overhead) was reduced by $33\frac{1}{3}$ %. What is the maximum rate of markdown that can be advertised instead of the usual 20%? The steps required: determine the cost, the normal and required net profits, the normal overhead expense, and the commissions. From these results, the inventory clearance price can be calculated. Determine the marked price and, using the inven- tory clearance price, calculate the amount of markdown from the marked price. Then calculate the rate of markdown.
STEP 1	Determine the cost, C. Let the regular selling price be S. S = C + E + B

the regular selling price be S. S = C + E + P S = C + 50% of C + 25% of C S = C + 0.5C + 0.25C 5250.00 = 1.75C $C = \frac{5250.00}{1.75} = \3000.00

STEP 2	Determine the required profit. Normal net profit = 25% of cost = $0.25(3000.00)$ = \$750.00 Required net profit = 10% of normal net profit = $0.1(750.00)$ = \$75.00
STEP 3	Determine the amount of overhead expense to be recovered. Normal overhead expense = 50% of cost = 0.5(3000.00) = \$1500.00 Normal commission = 40% of normal overhead expense = 0.4(1500.00) = \$600.00 Reduction in commission = $33\frac{1}{3}$ % of normal commission = $33\frac{1}{3}$ % (600.00) = \$200.00
	Overhead expense to be recovered = $1500.00 - 200.00 = 1300.00
STEP 4	Determine the inventory clearance price. Inventory clearance price = $Cost + Reduced overhead + Reduced profit$ = $3000.00 + 1300.00 + 75.00$ = $$4375.00$
STEP 5	Determine the marked price, MP. Let the marked price be MP. Marked price - Discount = Regular selling price MP - 20% of MP = 5250.00 MP - 0.2MP = 5250.00 0.8MP = 5250.00 MP = $\frac{5250.00}{0.8} = 6562.50
STEP 6	Determine the amount of markdown. Markdown = Marked price - Inventory clearance price = 6562.50 - 4375.00 = \$2187.50
STEP 7	Determine the rate of markdown. Rate of markdown = $\frac{\text{Amount of markdown}}{\text{Marked price}}$ = $\frac{2187.50}{6562.50}$ = 0.3% = 33.3% Instead of the usual 20%, the store can advertise a markdown of 33.33%. (* rounded)

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EXERCISE 6.5

Answer each of the following questions.

- **1.** A hand-held telephone set that cost a dealer \$240 less 55% and 25% is marked up 230% of cost. The dealer overhead expenses are 25% of the regular selling price. For a sales promotion, the telephone sets were reduced 40%.
 - (a) What is the regular selling price?
 - (b) What is the sale price?
 - (c) At the sale price, what profit or loss was realized? Reference Example 6.5A
- **2.** A gas barbecue cost a retailer \$420 less 33¹/₃%, 20%, and 5%. It carries a regular selling price on its price tag at a markup of 60% of the regular selling price. During the end-of-season sale, the barbecue is marked down 45%.
 - (a) What is the end-of-season sale price?
 - (b) What rate of markup based on cost will be realized during the sale?
- **3.** The Stereo Shop sold a radio regularly priced at \$125 for \$75. The cost of the radio was \$120 less 33¹/₃% and 15%. The store's overhead expense is 12% of the regular selling price.
 - (a) What was the rate of markdown at which the radio was sold?
 - (b) What was the operating profit or loss?
 - (c) What rate of markup based on cost was realized?
 - (d) What was the rate of markup based on the sale price?
- **4.** An automatic dishwasher cost a dealer \$620 less 37½% and 4%. It is regularly priced at \$558. The dealer's overhead expense is 15% of the regular selling price and the dishwasher was cleared out for \$432.45.
 - (a) What was the rate of markdown at which the dishwasher was sold?
 - (b) What is the regular markup based on selling price?
 - (c) What was the operating profit or loss?
 - (d) What rate of markup based on cost was realized?
- **5.** A hardware store paid \$33.45 for a set of cookware. Overhead expense is 15% of the regular selling price and profit is 10% of the regular selling price. During a clearance sale, the set was sold at a markdown of 15%. What was the operating profit or loss on the sale?
- **6.** Aldo's Shoes bought a shipment of 200 pairs of women's shoes for \$42 per pair. The store sold 120 pairs at the regular selling price of \$125 per pair, 60 pairs at a clear-ance sale at a discount of 40%, and the remaining pairs during an inventory sale at a price that equals cost plus overhead (i.e., a break-even price). The store's overhead is 50% of cost.
 - (a) What was the price at which the shoes were sold during the clearance sale?
 - (b) What was the selling price during the inventory sale?
 - (c) What was the total profit realized on the shipment?
 - (d) What was the average rate of markup based on cost that was realized on the shipment?
- 7. The Pottery bought 600 pans auctioned off for \$4950. This means that each pan has the same cost. On inspection, the pans were classified as normal quality, seconds, or substandard. The 360 normal-quality pans were sold at a markup of 80% of cost, the 190 pans classified as seconds were sold at a markup of 20% of cost, and the remaining pans classified as substandard were sold at 20% below their cost.

- (a) What was the unit price at which each of the three classifications was sold?
- (**b**) If overhead is 33¹/₃% of cost, what was the amount of profit realized on the purchase?
- (c) What was the average rate of markup based on the selling price at which the pans were sold?
- 8. A clothing store buys shorts for \$24 less 40% for buying over 50 pairs, and less a further 16²/₃% for buying last season's style. The shorts are marked up to cover overhead expenses of 25% of cost and a profit of 33¹/₃% of cost.
 - (a) What is the regular selling price of the shorts?
 - (b) What is the maximum amount of markdown to break even?
 - (c) What is the rate of markdown if the shorts are sold at the break-even price?
- **9.** Furniture City bought chairs for \$75 less 33¹/₃%, 20%, and 10%. The store's overhead is 75% of cost and net profit is 25% of cost.
 - (a) What is the regular selling price of the chairs?
 - (b) At what price can the chairs be put on sale so that the store incurs an operating loss of no more than 33¹/₃% of the overhead?
 - (c) What is the maximum rate of markdown at which the chairs can be offered for sale in part (b)?
- **10.** Bargain City clothing store purchased raincoats for \$36.75. The store requires a markup of 30% of the sale price. What regular selling price should be marked on the raincoats if the store wants to offer a 25% discount without reducing its markup?
- **11.** A jewellery store paid \$36.40 for a watch. Store expenses are 24% of regular selling price and the normal net profit is 20% of regular selling price. During a Special Bargain Day Sale, the watch was sold at a discount of 30%. What operating profit or loss was realized on the sale?
- **12.** The Outdoor Shop buys tents for \$264 less 25% for buying more than 20 tents. The store operates on a markup of 33¹/₃% of the sale price and advertises that all merchandise is sold at a discount of 20% of the regular selling price. What is the regular selling price of the tents?
- 13. Sky Sales Inc. purchased portable communication devices listed at \$198 less 60% and 16%%. Expenses are 45% of the regular selling price and net profit is 25% of the regular selling price. According to the company's pricing strategy, the merchandise is marked with a price so that it could advertise a 37.5% discount while still maintaining its usual markup. During the annual inventory sale, the unsold equipment was marked down 55% of the marked price. What operating profit or loss was realized on the devices sold during the sale?
- 14. Lund's Pro Shop purchased sets of golf clubs for \$500 less 40% and 16³/₃%. Expenses are 20% of the regular selling price and the required profit is 17.5% of the regular selling price. The store decided to place a marked price on the clubs so that it could offer a 36% discount without affecting its margin. At the end of the season, the unsold sets were advertised at a discount of 54% of the new regular selling price. What operating profit or loss was realized on the sets sold at the end of the season?
- **15.** Big Boy Appliances bought self-cleaning ovens for \$900 less 33¹/₃% and 5%. Expenses are 15% of the regular selling price and profit is 9% of the regular selling price. For competitive reasons, the store marks all merchandise with a price so that a discount of 25% can be advertised without affecting the margin. To promote sales, the ovens were marked down 40%. What operating profit or loss did the store make on the ovens sold during the sales promotion?

16. Blue Lake Marina sells a make of cruiser for \$16 800. This regular selling price covers overhead of 15% of cost and a normal net profit of 10% of cost. The cruisers were marked with a price so that the marina can offer a 20% discount while still maintaining its regular gross profit. At the end of the boating season, the cruiser was marked down. The marina made 25% of its usual profit and reduced the usual commission paid to the sales personnel by 33¹/₃%. The normal commission accounts for 50% of the normal overhead. What was the rate of markdown?



BUSINESS MATH NEWS BOX

Iululemon athletica inc. Announces Fourth Quarter and Full Year Fiscal 2011 Results

lululemon athletica, a high-end retail chain dedicated to yoga and fitness apparel, has experienced record growth over the past eight years, expanding from US\$18 million in annual sales in 2003 to US\$1.0 billion in 2011.

Founded and headquartered in Vancouver, British Columbia, in 1998 by Chip Wilson, lululemon manufactures and sells technical athletic wear aimed primarily at active men and women who are willing to pay premium prices for workout gear. These high prices have allowed the retailer to maintain a gross margin annually above 50% since 2003, earning 56.3% in fourth quarter 2011.

Although the initial goal was to have only one store, lululemon athletica ended the fourth quarter of 2011 with 174 stores, compared with 137 a year before. Stores are located mostly in major cities in Canada, the United States, and Australia, and in Hong Kong. lululemon's huge sales growth can be largely attributed to the company's store expansion.

To reach even more customers, lululemon launched a successful e-commerce operation on its company website in 2009. After posting its best-ever fi st quarter, lululemon said that its priorities were to grow existing stores and to invest more in its thriving online division.

The company offers regular-priced in-store products online. It also offers discounted men's and women's athletic wear under its "we made too much" clearance link.

The following items were recently discounted on the lululemon website:

Women's Wunder Under Pant: \$69.00 CAD (was \$88.00)

Women's Get Started Jacket: \$49 CAD (was \$118.00)

Men's Cardio SS Tech Top: \$24.00 CAD (was \$58.00)

Men's Performance Jacket: \$44.00 CAD (was \$88.00)

Source: lululemon athletica inc., "lululemon athletica inc. Announces Fourth Quarter and Full Year Fiscal 2011 Results," press release, **www.lululemon.com**, retrieved April 30, 2012; Hollie Shaw, "Lululemon Triples Profits as Sales Soar Past Estimates," Times Colonist, June 11, 2010.

QUESTIONS

- 1. lululemon athletica inc. reported that its net revenue for fourth quarter 2011 increased 51.4% from US\$245.4 million in the fourth quarter of fiscal 2010. Calculate the net revenue for fourth quarter 2011 (rounded to the nearest hundred thousand dollars).
- **2.** Revenue from the direct-to-consumer channel, including e-commerce and phone sales, reached US\$50.1 million for fourth quarter 2011. Calculate direct-to-consumer revenue as a percentage of total revenue for the period.
- **3.** Calculate the rate of discount for each of the four clearance items listed under the "we made too much" link (rounded to 2 decimal places).
- **4.** Assuming lululemon's overhead is 30% of the regular selling price, and that the cost of the Women's Wonder Under Pant is \$36, determine
 - (a) the markup, the overhead, and the profit for this item sold at the regular selling price;
 - (b) the markup, the overhead, and the profit for this item sold at the clearance price.

MyMathLab Visit MyMathLab to practice any of this chapter's exercises highlighted in green as often as you want. The guided solutions help you find an answer step by step. You'll find a personalized study plan and additional interactive resources to help you master Business Math!

REVIEW EXERCISE

- 1. LO1 A toolbox is listed for \$56 less 25%, 20%, and 5%.
 - (a) What is the net price of the toolbox?
 - (b) What is the amount of discount?
 - (c) What is the single rate of discount that was allowed?
- 2. LO① Compute the rate of discount allowed on a lawnmower that lists for \$168 and is sold for \$105.
- 3. LO2 Determine the single rate of discount equivalent to the discount series 35%, 12%, and 5%.
- 4. LO① A 40% discount allowed on an article amounts to \$1.44. What is the net price?
- 5. LO① Baton Supplies has been selling skateboard decks for \$112 less 15%. What additional discount percent must the company offer to meet a competitor's price of \$80.92?
- 6. LO① A freezer was sold during a clearance sale for \$387.50. If the freezer was sold at a discount of 16³/₃%, what was the list price?
- 7. LO1 The net price of a snow shovel is \$20.40 after discounts of 20% and 15%. What is the list price?
- 8. LOO On May 18, an invoice dated May 17 for \$4000 less 20% and 15%, terms 5/10 E.O.M., was received by Aldo Distributors.
 - (a) What is the last day of the discount period?
 - (b) What is the amount due if the invoice is paid within the discount period?
- **9.** LO③ Air Yukon received a shipment of plastic trays on September 2. The invoice amounting to \$25 630 was dated August 15, terms 2/10, n/30 R.O.G. What is the last day for taking the cash discount and how much is to be paid if the discount is taken?
- 10. LO③ What amount must be remitted if the following invoices, all with terms 5/10, 2/30, n/60, are paid together on December 8? Invoice No. 312 dated November 2 for \$923.00 Invoice No. 429 dated November 14 for \$784.00 Invoice No. 563 dated November 30 for \$873.00
- 11. LO③ Delta Furnishings received an invoice dated May 10 for a shipment of goods received June 21. The invoice was for \$8400.00 less 33¹/₃% and 12¹/₂% with terms 3/20, R.O.G. How much must Delta pay on July 9 to reduce its debt

(a) by \$2000?

(**b**) to \$2000?

- 12. LO③ The Peel Trading Company received an invoice dated September 20 for \$16 000 less 25% and 20%, terms 5/10, 2/30, n/60. Peel made a payment on September 30 to reduce the debt to \$5000 and a payment on October 20 to reduce the debt by \$3000.
 - (a) What amount must Peel remit to pay the balance of the debt at the end of the credit period?
 - (b) What is the total amount paid by Peel?
- 13. LO③ Emco Ltd. received an invoice dated May 5 for \$4000 less 15% and 7½%, terms 3/15 E.O.M. A cheque for \$1595.65 was mailed by Emco on June 15 as part payment of the invoice.
 - (a) By how much did Emco reduce the amount due on the invoice?
 - (b) How much does Emco still owe?
- 14. LO④ Homeward Hardware buys cat litter for \$6 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 markup included in the selling price?
 - (c) What is the rate of markup based on selling price?
 - (d) What is the rate of markup based on cost?
 - (e) What is the break-even price?
 - (f) What operating profit or loss is made if a bag is sold for \$6?
- **15.** LO4 A retail store realizes a markup of \$31.50 if it sells an article at a markup 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 based on cost?
 - (d) If overhead expense is 28% of cost, what is the total cost?
 - (e) If the article is sold at a markdown of 24%, what is the operating profit or loss?
- **16.** LO4 Using a markup of 35% of cost, a store priced a book at \$8.91.
 - (a) What was the cost of the book?
 - (b) What is the markup as a percent of selling price?

- 17. LO4 A bicycle helmet costing \$54.25 was marked up to realize a markup of 30% of the regular selling price.
 - (a) What was the regular selling price?
 - (b) What was the markup as a percent of cost?
- 18. LO④ A bedroom suite that cost a dealer \$1800 less 37.5% and 18% carries a price tag with a regular selling price at a markup of 120% of cost. For quick sale, the bedroom suite was marked down 40%.
 - (a) What was the sale price?
 - (b) What rate of markup based on cost was realized?
- **19.** LOO Gino's purchased men's suits for \$195 less 33¹/₃%. The store operates at a normal markup of 35% of regular selling price. The owner marks all merchandise with prices so that the store can offer a 16²/₃% discount while maintaining the same gross profit. What is the marked price?
- 20. LO④ An appliance store sold GE coffeemakers for \$22.95 during a promotional sale. The store bought the coffeemakers for \$36 less 40% and 15%. Overhead is 25% of the regular selling price.
 - (a) If the store's markup is 40% of the regular selling price, what was the rate of markdown?
 - (**b**) What operating profit or loss was made during the sale?
 - (c) What rate of markup based on cost was realized?
- **21. LOG** Billington's buys shirts for \$21 less 25% and 20%. The shirts are priced at a regular selling price to cover expenses of 20% of regular selling price and a profit of 17% of regular 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 markup was realized based on cost?
- 22. L0⁽⁵⁾ A jewellery store paid a unit price of \$250 less 40%, 16²/₃%, and 8% for a shipment of designer watches. The store's overhead is 65% of cost and the normal profit is 55% of cost.
 - (a) What is the regular selling price of the watches?
 - (b) What must the sale price be for the store to break even?
 - (c) What is the rate of markdown to sell the watches at the break-even price?
- **23.** LOG Sight and Sound bought large-screen colour TV sets for \$1080.00 less 33¹/₃% and 8¹/₃%. Overhead

is 18% of regular selling price and required profit is 15¹/₃% of regular selling price. The TV sets were marked at a price so that the store was able to advertise a discount of 25% while still maintaining its margin. To clear the inventory, the remaining TV sets were marked down 37¹/₂%.

- (a) What operating profit or loss is realized at the clearance price?
- (**b**) What is the realized rate of markup based on cost?
- **24.** LO① Ward Fitness lists a treadmill at \$1860 less 33¹/₃% and 15%. To meet competition, Ward wants to reduce its net price to \$922.25. What additional percent discount must Ward allow?
- **25.** LOG South Side Appliances bought bread makers for \$180 less 40%, 165%%, and 10%. The store's overhead is 45% of regular selling price and the profit required is 21¼% of the regular selling price. During a year-end inventory clearance sale, the store marked down the bread makers by 30%.
 - (a) What was the regular selling price?
 - (b) What is the sale price?
 - (c) What is the profit or loss during the clearance sale?
- 26. LO⁽³⁾ A merchant realizes a markup of \$42 by selling an item at a markup of 37.5% of cost. The merchant's overhead expenses are 17.5% of the regular selling price. At a promotional sale, the item was reduced in price to \$121.66.
 - (a) What is the regular selling price?
 - (b) What is the rate of markup based on the regular selling price?
 - (c) What is the rate of markdown?
 - (d) What is the profit or loss during the promotional sale?
- 27. LO④ The Knit Shoppe bought 250 sweaters for \$3100; 50 sweaters were sold at a markup of 150% of cost and 120 sweaters at a markup of 75% of cost; 60 of the sweaters were sold during a clearance sale for \$15 each; and the remaining sweaters were disposed of at 20% below cost. Assume all sweaters had the same cost.
 - (a) What was the amount of markup realized on the purchase?
 - (**b**) What was the percent markup realized based on cost?
 - (c) What was the gross profit realized based on selling price?

SELF-TEST

- 1. Determine the net price of an article listed at \$590 less 37.5%, 12.5%, and 8¹/₃%.
- **2.** What rate of discount has been allowed if an item that lists for \$270 is sold for \$168.75?
- **3.** Compute the single discount percent equivalent to the discount series 40%, 10%, and 8¹/₃%.
- **4.** Discount Electronics lists an article for \$1020 less 25% and 15%. A competitor carries the same article for \$927 less 25%. What further discount (correct to the nearest $\frac{1}{10}$ of 1%) must the competitor allow so that its net price is the same as Discount's?
- 5. What amount must be remitted if the following invoices, all with terms 4/10, 2/30, n/60, are paid on May 10?
 \$850 less 20% and 10% dated March 21
 \$960 less 30 and 16³/₃% dated April 10

\$1040 less 33¹/₃%, 25%, and 5% dated April 30

- **6.** An invoice for \$3200, dated March 20, terms 3/10 E.O.M., was received March 23. What payment must be made on April 10 to reduce the debt to \$1200?
- 7. On January 15, Sheridan Service received a shipment with an invoice dated January 14, terms 4/10 E.O.M., for \$2592. On February 9, Sheridan Service mailed a cheque for \$1392 in partial payment of the invoice. By how much did Sheridan Service reduce its debt?
- **8.** What is the regular selling price of an item purchased for \$1270 if the markup is 20% of the regular selling price?
- **9.** The regular selling price of merchandise sold in a store includes a markup of 40% based on the regular selling price. During a sale, an item that cost the store \$180 was marked down 20%. For how much was the item sold?
- **10.** An item that cost the dealer \$350 less 35% and 12.5% carries a regular selling price on the tag at a markup of 150% of cost. For quick sale, the item was reduced 30%. What was the sale price?
- 11. An article cost \$900 and sold for \$2520. What was the percent markup based on cost?
- **12.** Find the cost of an item sold for \$1904 to realize a markup of 40% based on cost.
- 13. A markup of \$90 is made on a sale. If the markup was 45% based on selling price, what was the cost?
- 14. A surf shop reduces the price of a paddle board for quick sale from \$1560 to \$1195. Compute the markdown correct to the nearest $\frac{1}{100}$ of 1%.
- **15.** A retailer buys an appliance for \$1480 less 25% and 15%. The store prices the merchandise at a regular selling price to cover expenses of 40% of the regular selling price and a net profit of 10% of the regular selling price. During a clearance sale, the appliance was sold at a markdown of 45%. What was the operating profit or loss?
- **16.** Discount Electronics buys stereos for \$830 less 37.5% and 12.5%. Expenses are 20% of cost and the required profit is 15% of the regular selling price. All merchandise is marked with a price so that the store can advertise a discount of 30% while still maintaining its regular markup. During the annual clearance sale, the new regular selling price of unsold items is marked down 50%. What operating profit or loss does the store make on items sold during the sale?

CHALLENGE PROBLEMS

- 1. Rose Bowl Florists buys and sells roses only by the complete dozen. The owner buys 12 dozen fresh roses daily for \$117. He knows that 10% of the roses will wilt before they can be sold. What price per dozen must Rose Bowl Florists charge for its saleable roses to realize a 55% markup based on selling price?
- **2.** A merchant bought some goods at a discount of 25% of the list price. She wants to mark them at a regular price so that she can give a discount of 20% of the marked price and still make a markup of 25% of the selling price.
 - (a) At what percent of the list price should she mark the regular selling price of the goods?
 - (b) Suppose the merchant decides she must make a markup of 25% of the cost price. At what percent of the regular selling price should she mark the price of the goods?
- **3.** On April 13, a stereo store received a new sound system with a list price of \$2500 from the manufacturer. The stereo store received a trade discount of 25%. The invoice, with terms 2/10, n/30, arrived on the same day as the sound system. The owner of the store marked up the sound system by 60% of the invoice amount (before cash discount) to cover overhead and profits. The owner paid the invoice on April 20. How much extra profit will be made on the sale, as a percent of the regular selling price, due to the early payment of the invoice?

CASE STUDY

Focusing on Prices

Edward's Electronics is a small electronics store selling a variety of electronics equipment. It has a small but progressive camera department. Since Edward's does not sell very many cameras during the year, it only has a small number in stock. Edward's has just ordered six of the new digital cameras from Nikon. Edward's owner has been told that the cost of each camera will be \$170, with terms 2/15, n/30. The manufacturer's suggested retail price (MSRP) of each camera is \$400. Edward's owner calculates that the overhead is 15% of the MSRP and that the desired profit is 18% of the MSRP.

Sears has a large camera shop in its store in the mall in the same town. It has ordered 70 of the same cameras from Nikon. Sears has been offered both a cash discount and a quantity discount off the list price of \$170. The cash discount is 3/20, n/45, while the quantity discount is 3.5%. Sears estimates its overhead is 25% of the MSRP and it would like to make a profit of 35% of the MSRP.

QUESTIONS

- 1. What is the cost per camera (ignoring taxes) for Edward's Electronics and for Sears?
- **2.** For each store, what is the minimum selling price required to cover cost, overhead, and desired profits?
- **3.** If Edward's and Sears sell the camera at the MSRP, how much extra profit will each store make
 - (a) in dollars?
 - (b) as a percent of MSRP?
- **4.** What rate of a markdown from MSRP can Edward's offer to cover its overhead and make its originally intended profit?

SUMMARY OF FORMULAS

Formula 6.1

AMOUNT OF RATE OF = $\frac{1}{\text{DISCOUNT}}$ \times LIST PRICE DISCOUNT or A = dLFormula 6.2 NET PRICE = LIST PRICE - AMOUNT OF DISCOUNT or N = L - ANET PRICE FACTOR (NPF) = (1 - d)where d = rate of discount in decimal form Formula 6.3 $NET PRICE = LIST PRICE \times \frac{NET PRICE}{FACTOR (NPF)}$ of discount or N = L(1 - d)NPF FOR A DISCOUNT SERIES = $(1 - d_1)(1 - d_2)(1 - d_3) \dots (1 - d_n)$ Formula 6.4 $\begin{array}{l} \text{NET PRICE} = \text{LIST PRICE} \times \\ \begin{array}{c} \text{NET PRICE FACTOR FOR} \\ \text{THE DISCOUNT SERIES} \end{array}$ Finding the net amount directly when a list price is subject to a series of discounts NET PRICE = $L(1 - d_1)(1 - d_2)(1 - d_3) \dots (1 - d_n)$ Formula 6.5 SINGLE EQUIVALENT RATE OF DISCOUNT

FOR A DISCOUNT SERIES = 1 - NPF FOR THE DISCOUNT SERIES $= 1 - [(1 - d_1)(1 - d_2)(1 - d_3) \dots (1 - d_n)]$

Formula 6.6

 $\frac{\text{Selling}}{\text{ecost of buying} + \text{expenses} + \text{profit}}$ PRICE or S = C + E + P

Formula 6.7

MARKUP = EXPENSES + PROFITor M = E + P

Formula 6.8

SELLING PRICE = COST OF BUYING + MARKUPor

S = C + M

Finding the amount of discount when the list price is known

Finding the net amount when the amount of discount is known

Finding the net amount directly without computing the amount

Finding the single rate of discount that has the same effect as a given series of discounts

Basic relationship between selling price, cost of buying, operating expenses (or overhead), and profit

Basic relationship between markup, cost of buying, operating expenses (or overhead), and profit

Formula 6.9

 $\frac{\text{RATE OF MARKUP}}{\text{BASED ON COST}} = \frac{\text{MARKUP}}{\text{COST}} = \frac{\text{M}}{\text{C}} \times 100$

Formula 6.10

RATE OF MARKUP BASED ON = $\frac{MARKUP}{SELLING PRICE} = \frac{M}{S} \times 100$ SELLING PRICE

Formula 6.11

 $\frac{\text{MARKDOWN}}{\text{RATE}} = \frac{\text{MARKDOWN}}{\text{REGULAR SELLING PRICE}} = \frac{\text{MD}}{\text{S}} \times 100$

GLOSSARY

Break-even price the price equals total cost, resulting in zero profit (*p. 227*)

Cash discount a reduction in the amount of an invoice, usually to encourage prompt payment of the invoice (*p. 211*)

Credit period the time period at the end of which an invoice has to be paid (*p. 211*)

Discount a reduction from the original price (*p. 206*)

Discount period the time period during which a cash discount applies (*p. 211*)

Discount series two or more discounts taken off a l st price in succession (*p. 206*)

End-of-month dating (E.O.M.) payment terms based on the last day of the month in which the invoice is dated (*p. 211*)

Gross profit see Markup

List price price printed in a catalogue or in a list of prices (*p. 203*)

Manufacturer's suggested retail price (MSRP) catalogue or list price that is reduced by a trade discount *(p. 203)*

Margin see Markup

Markdown a reduction in the price of an article sold to the consumer (*p. 228*)

Markup the difference between the cost of merchandise and the selling price (*p. 220*) Finding the rate of markup as a percent of cost

Finding the rate of markup as a percent of selling price

Net factor see Net price factor (NPF)

Net price the difference between a list price and the amount of discount (*p. 204*)

Net price factor (NPF) the difference between 100% and a percent discount—the net price expressed as a fraction of the list price (*p. 205*)

Ordinary dating payment terms based on the date of an invoice (*p. 211*)

Partial payment part payment of an invoice (*p. 216*)

Payment terms a statement of the conditions under which a cash discount may be taken (*p. 211*)

Rate of discount a reduction in price expressed as a percent of the original price (*pp. 203, 211*)

Receipt-of-goods dating (R.O.G.) payment terms based on the date the merchandise is received (*p. 211*)

Regular selling price the price of an article sold to the consumer before any markdown is applied (*p. 228*)

Sale price the price of an article sold to the consumer after a markdown has been applied (*p. 228*)

Single equivalent rate of discount the single rate of discount that has the same effect as a specific eries of discounts (*p. 207*)

Total cost the cost at which merchandise is purchased plus the overhead (*p. 227*)

Trade discount a reduction of a catalogue or list price (*p.* 203)