5 Mathematics of Merchandising

**Exercise 5.1**

a. Amount of discount = dL = = $100

Net Price = L – discount = $300 - $100 = $200

c. Amount of Discount = $200 - $150 = $50

Discount rate = 

e. List price = = $100

Net Price = L – discount = $100 - $20 = $80

g. List Price = N + discount = $95.00 + $5.00 = $100.00

Discount rate = 

i. List price =  $240.00

Discount amount = L – N = $240.00 - $120.00 = $120.00

1. Amount of discount = dL =  = $83.00

Net price = L – discount = $249.00 – $83.00 = $166.00

3. Amount of discount = L – N = $127.98 – $106.65 = $21.33

Discount rate, d = 

5. List price = = $1750.00

Net price = List price – Discount = $1750.00 – $612.50 = $1137.50

7. List price = N + Discount = $15.07 + $12.33 = $27.40

Discount rate = = 45.0%

9. List price,  = = $3256.00

Discount = L – N = $3256.00 – $2849.00 = $407.00

11. Net price, N = L(1 – d1)(1 – d2) = $99.00(1 – 0.30)(1 – 0.16667) = $57.75

Discount = L − N = $99.00 − $57.75 = $41.25

13. List price, L = 

Discount = L − N = $149.00 − $93.03 = $55.97

15. Net price, N = L(1 – d) = $135.00 (1 – 0.38) = $83.70

17. List price = = $595.04

Net price = L – Discount = $595.04 – $223.14 = $371.90

19. Substitute L = $34,900 and N = $28,687.80 into N = L(1 – d).

$28,687.80 = $34,900(1 – d)



d = 1 – 0.822 = 0.178 = 17.8%

The dealer receives a 17.8% trade discount.

21. Net price (Niagara) = L(1 – d)

= $72.00 (1 – 0.24)

= $54.72

Net price (Silverwood) = L(1 – d)

$54.72 = $74.50(1 – d)

1 – d = = 0.7345

d(Silverwood) = 1 – 0.7345 = 0.2655 = 26.55%

Silverwood Milk Products should give a discount of 26.55% on its list price of $74.50 per case.

23. Selling price,  = $339,800.00

25. *a.* Net investment, N = L(1 – d) = $5500(1 – 0.055) = $5197.50

*b.* Total amount placed,  = $6800

Commission paid = L – N = $6800 – $6426 = $374.00

27. Substitute d = 0.017 and N = 13,646 into N = L(1 – d).

13,646 = L(1 – 0.017) = 0.983L

L =  = 13,882

The index fell 13,882 – 13,646 = 236 points on the day.

29. Cost for 950 pens = 950 x $1.69(1-7%) = $1493.12

Cost for 1000 pens = 1000 x $1.69(1-7%)(1-5.5%) = $1485.26

Savings = $1493.12 - $1485.26 = $7.86

They could save $7.86 by ordering 1000 pens instead of 950.

31. Two cats for 8 days = 2 x 8 x $55(1-20%)(1-15%)(1-10%) = $538.56

Three dogs for 5 days = 3 x 5 x $55(1-20%)(1-15%) = $561.00

33. *a.* Given: d = 0.0365 and the decline, dL = $26.43 million

 million

Therefore, the second quarter revenue (L) was $724.110 million.

Third-quarter revenue = ($724.110 – $26.43) million = $697.68 million

*b.* Substitute d = 0.045 and N = 8500 into N = L(1 – d).

8500 = L(1 – 0.045) = 0.955L

L = 8901

Number of people leaving = 8901 – 8500 = 401

35. N = L(1 – d1)(1 – d2)

1 – d2 =  = 0.9400

d2 = 1 – 0.9400 = 0.0600 = 6.00%

37. *a.* Service discount = d2L(1 – d1)

= 0.125($3000)(1 – 0.20)

= $300.00

*b.* Advertising and promotion discount = d3L(1 – d1)(1 – d2)

= 0.05($3000)(1 – 0.20)(1 – 0.125)

= $105.00

**Exercise 5.2**

1. A payment of

N = L(1 – d) = $2365(1 – 0.02) = $2317.70

on October 5 will pay the invoice in full.

3. A payment on the 10th day after the invoice date qualifies for the 2% discount.

The payment should be N = L(1 – d) = $815.49(1 – 0.02) = $799.18

5. The 2% discount period ends on June 1.

The 1% discount period ends on June 11.

*a.* The payment qualifies for a 2% discount.

Payment = (Invoice amount)(1 − d) = $5076.64(1 − 0.02) = $4975.11

*b.* The payment qualifies for a 1% discount.

Payment = $5076.64(1 − 0.01) = $5025.87

*c.* Same answer as in part *b*.

7. Payment = (Amount credited)(1 – d) = $1365.00(1 – 0.02) = $1337.70

9. Amount credited =  = $515.46

11. *a.* May 1 falls 15 days after April 16.

The $10,000 payment qualifies for a 2% discount.

Amount credited =  = $10,204.08

Balance owed = $18,976.45 − $10,204.08 = $8772.37

*b.* The May 15 payment qualifies for a 1% discount.

Payment to settle account = $8772.37(1 – 0.01) = $8684.65

13. January 5 is 9 days after December 27.

The $1000 payment qualifies for a 4% discount.

January 16 is 20 days after December 27.

The $800 payment qualifies for a 2% discount.

Total amount credited =  = $1041.67+$816.33 = $1858.00

Balance owed = $2500.00 − $1858.00 = $642.00

15. The $5000 payment on March 29 qualifies for a 1.5% discount.

The $3000 payment on April 7 qualifies for a 0.5% discount.

a. Amount credited for $5000 payment = 

Amount credited for $3000 payment = 

Balance owed = $11,870 − $5076.14 – $3015.08 = $3778.78

*b.* The balance is due 30 days after March 21, that is, on April 20.

17. Amount credited for $3000 payment =  = $3092.78

Balance owed = $6000.00 − $3092.78 = $2907.22

To settle the invoice, Payment = $2907.22(1 – 0.01) = $2878.15

19. The June 20 invoice does not qualify for a cash discount on July 4.

Payment = $485 + $367(1 – 0.015) + $722(1 – 0.015) = $1557.67

21. Total amount credited = 

= $923.08 + $858.59 + $700

= $2481.67

Balance owed = $2856.57 – $2481.67 = $374.90

23. Amount required to settle invoice #535 = $3228.56

Amount required to settle invoice #598 = $2945.31(1 – 0.02) = $2886.40

Amount to be applied to invoice #678 = $10,000.00 – $3228.56 – $2886.40 = $3885.04

Amount credited to invoice #678 =  = $4046.92

Balance owed on invoice #678 = $6217.69 – $4046.92 = $2170.77

Payment on August 15 to settle invoice #678 = $2170.77(1 – 0.02) = $2127.35

25. Let the amount of each payment be represented by *x*. The total amount credited will be

*x* = $2956.60

3.030509*x* = $2956.60

*x* = $975.61

Each of the three payments should be $975.61.

**Concept Questions (Section 5.3)**

1. Both quantities have the same numerator, but the rate of markup on cost has the smaller denominator (since *C<S*). Therefore, the rate of markup on cost is larger than the rate of markup on selling price.

3. Yes. If an item is marked up (*M*) by more than the unit cost (*C*), then

Rate of markup on cost = 100% > 100%

5. No. At the break-even point, there is no profit. The selling price at the break-even point must cover *E* as well as *C*. If an item is sold at cost, the merchant will *lose* *E* per unit sold.

# Exercise 5.3

1. *S = C + M* = $152.50 + $47.45 = $199.95

*a.* Rate of markup on cost = =  = 31.1%

*b.* Rate of markup on selling price =  =  = 23.7%

3. Given: *C* = $16.95; *S* = $34.95

Therefore, *M* = *S − C* = $34.95 − $16.95 = $18.00

Rate of markup on cost = =  = 106.2%

Rate of markup on selling price =  =  = 51.5%

5. Enter the given data in the table model.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  |  | **$** |  | **%** |
| E |  | 0.4C = $12 |  |  |
|   P |  | C = $7.50 |  |  |
| M |  | $ 19.50 |  |  |
|   C |  |  $30 |  |  |
| S |  | $49.50 |  | 100 |

*a.* *S = C + E + P* = $30 + 0.40($30) + 0.25($30) = $49.50

*b.* *M* = *S − C* = $49.50 – $30.00 = $19.50

Rate of markup on cost =  = × 100% = 65.0%

*c.* Rate of markup on selling price =  = × 100% = 39.4%

7. Given: *E =* 0.30*S* ; *P =* 0.20*S* ; *S* = $49.98

*a.* *M* = *E + P* = 0.30($49.98) + 0.20($49.98) = $24.99

Rate of markup on selling price =  = × 100% = 50.0%

*b.* *C* = *S − M* = $49.98 – $24.99 = $24.99

*c.* Rate of markup on cost =  = × 100% = 100.0%

9. Given: *M =* 0.75*C* ; *P =* 0.15*S* ; *C* = $132

Enter the given data in the table model.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  |  | **$** |  | **%** |
| E |  |  |  |  |
|   P |  | 0.15*S* = $34.65 |  |  |
| M |  | 0.75C = $99 |  |  |
|   C |  | $ |  |  |
| S |  | $231 |  | 100 |

*a. M* = 0.75*C* = 0.75($132.00) = $99.00

*S* = *C + M* = $132.00 + $99.00 = $231.00

*b.* Rate of markup on selling price =  = × 100% = 42.9%

*c.* *P* = 0.15*S* = 0.15($231.00) = $34.65

11. Given: *M =* 0.65*S* ; *S* = $4.95

*a.* *C* = *S − M* = *S −* 0.65*S* = 0.35*S* = 0.35($4.95) = $1.73

*b.* Rate of markup on cost =  = × 100% = 185.7%

13. Given: *E =* 0.50*C* ; *P =* 0.30*C* ; *S* = $39.89

*a.* *S* = *C + E* *+ P* = *C* + 0.50*C* + 0.30*C* = 1.80*C*

Therefore, *C* = = $22.16

*b.* *M* = *E* *+ P* = 0.50*C* + 0.30*C* = 0.80*C*

Rate of markup on selling price =  = × 100% = 44.4%

15. Given: *C* = $33.60 per cake; *S* = 16($6.50) = $104 per cake

Then *M* = *S − C* = $104 − $33.60 = $70.40 per cake

Rate of markup on cost = =  = 209.5%

Rate of markup on selling price =  =  = 67.7%

17. *C = N = L*(1 – )(1 – ) = $395(1 – 0.20)(1 – 0.10) = $284.40

*a.* Enter the given information in the table model.

*S = C + E +P* = $284.40 + 59.00 + $40.00 + = $383.40

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  |  | **$** |  | **%** |
| E |  | $59 |  |  |
|   P |  | $40 |  |  |
| M |  | $99 |  |  |
|   C |  | $284.40 |  |  |
| S |  | $383.40 |  | 100 |

*b.* *M = E + P* = $59.00 + $40.00 = $99.00

Rate of markup on cost = = ×100% = 34.8%

*c.* Rate of markup on selling price =  = ×100% = 25.8%

*d.* *S*(break-even) = *C + E* = $284.40 + $59.00 = $343.40

19. Given: *S* = $54.95; *M* = 0.45*C*

*a.* Substitute into *S = C + M*

$54.95 = *C* + 0.45*C*

*C* =  = $37.90

*b.* *M* = *S − C* = $54.95 – $37.90 = $17.05

Rate of markup on selling price = = × 100% = 31.0%

21. Given: *M* = 0.60*S*

Choose any value of *S*, say *S* = $1.00 per head of lettuce.

Then *M* = $0.60 and *C* = $0.40

Rate of markup on cost = = = 150.0%

23. Given: *C* = $15, *M* = 0.90*C*, *E* = 0.20*S*

*S* = *C* + *M* = $15 + 0.90($15) = $28.50

*E* = 0.20*S* = 0.20($28.50) = $5.70

Therefore,

*P = S − C − E* = $28.50 – $15 – $5.70 = $7.80

25. Given: *C = N = L*(1 *–* )(1 – ) = $54(1 – 0.30)(1 – 0.05) = $35.91

*E* = 0.20*S* and *P* = 0.12*S*

Substitute these values into *S = E + P + C* and solve for *S*.

*S* = 0.20*S* + 0.12*S* + $35.91

0.68*S* = $35.91



27. Given: *M* = 0.40*S*, *E* = 0.30*C*, *S* = $495

Therefore, *M* = 0.40($495) = $198

*C = S − M* = $495 − $198 = $297

*P = M − E* = $198 – 0.30($297) = $108.90

**Concept Questions (Section 5.4)**

1. No. The base for the rate of markup on cost is the unit cost *C*. The base for the markdown is the selling price, *S*. Since *C < S*, a 40% markup on cost represents a smaller dollar amount than a 40% markdown from the item’s selling price. A 40% markup on cost followed by a 40% markdown will give a reduced selling price that is *less* than *C.*

# Exercise 5.4

1. Given: *C* = $185, *M* = 0.50*C*, *D* = $60

Enter these values on a markup/markdown table.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  |  | **$** |  | **%** |
| M |  | 0.5C =$92.50 |  | \_\_\_\_ |
|  C |  | $185 |  |  |
| S |  | $277.50 |  | 100 |
| – D |  | – $60 |  | – - 21.6 |
| S(reduced) |  | $217.50 |  |  |

*a. M* = 0.5*C* = 0.5($185) = $92.50

*S = C + M* = $185.00 + $92.50 = $277.50

*b.* Rate of markdown = = ×100% = 21.6%

3. Given: *C* = $24.99; *S* = $49.98; *S*(reduced) = $24.99

Enter these values on a markup/markdown table.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  |  | **$** |  | **%** |
| M |  |  |  |  |
|  C |  | $24.99 |  |  |
| S |  | $49.98 |  | 100 |
| – D |  | - $24.99 |  | – 50 |
| S(reduced) |  | $24.99 |  |  |

*a.* From the upper part of the diagram, *M* = *S* − *C* = $49.98 − $24.99 = $24.99

Rate of markup on cost =  = ×100% = 100.0%

*b.* From the lower part of the diagram, *D = S − S*(reduced) = $49.98 − $24.99 = $24.99

Rate of markdown = = = 50.0%

5. Given: *C* = $19.25; *M* = 0.35*S*, *D* = 0.25*S*

Enter these values on a markup/markdown table.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  |  | **$** |  | **%** |
| M |  |  |  | 35 |
|  C |  | $19.25 |  |  65 |
| S |  | $29.62 |  | 100 |
| – D |  | – $7.41 |  | – 25 |
| S(reduced) |  | $22.21 |  |  |

From the upper part of the diagram, *S = C + M* = $19.25 + 0.35*S*

That is, *S* − 0.35*S* = $19.25

Then  = $29.62

*D* = 0.25*S* = 0.25($29.62) = $7.41

*S*(reduced) = *S − D* = $29.62 – $7.41 = $22.21

7. Given: *C* = $71.50; *S* = $99.95

*a.* *M = S − C* = $99.95 – $71.50 = $28.45

Rate of markup on selling price = ×100% = 28.5%

*b.* Markdown, *D* = $99.95 – $71.50 = $28.45

Rate of markdown = = ×100% = 28.5%

9. Given: *C* = $345; *M* = 0.35*S*; *D* = 0.25*S*

Enter these values on a markup/markdown table.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  |  | **$** |  | **%** |
| M |  |  |  | 35 |
|  C |  | $345 |  |  65 |
| S |  | $530.77 |  | 100 |
| – D |  | – |  | – 25 |
| S(reduced) |  | $398.08 |  |  |

From the upper part of the diagram, *S = C + M* = $345 + 0.35*S*

That is, *S* − 0.35*S* = $345

 = $530.77

Sale price = *S − D* = *S −* 0.25*S* = 0.75($530.77) = $398.08

11. Given: Rate of markdown = 40%; markdown = $102

S =  = $255

S(reduced) = $255 - $102 = $153

13. Given: ; 

*a.* *SD*(reduced) = $64.95(1 – 0.20) = $51.96

C’s discount = $69.95 − $51.96 = $17.99

To match D’s price, C must give a discount rate of = 25.7%

*b.* *SC*(reduced) = $69.95(1 – 0.20) = $55.96

D’s discount = $64.95 − $55.96 = $8.99

To match C’s price, D must give a discount rate of = 13.8%

15. Given: *M* = 0.60*C*; *P* = 0.25*C*

Therefore, *S = C + M* *= C +* 0.60*C* = 1.60*C*

For breakeven, *D* = *P* = 0.25*C*

Rate of markdown = = ×100% = 15.6%

# Exercise 5.5

1. Given: *C* = $37.25; *M* = 0.60*C* = 0.60($37.25) = $22.35;

*S*(reduced) = $41.72;and *E* = 0.20*C* = 0.20($37.25) = $7.45;

Then *S = C + M* = $37.25 + $22.35 = $59.60

*P*(reduced) = *S*(reduced) *− C* − *E* = $41.72 − $37.25 − $7.45 = −$2.98

That is, at the reduced price there was a unit operating loss of $2.98.

3. Given: *S* = $147.00; *C* = $98.00; *D* = 0.20*S*; *E* = 0.15*S*

Then *D* = 0.20*S* = 0.20($147.00) = $29.40

and *E* = 0.15($147.00) = $22.05

Therefore, *S*(reduced) = *S − D* = $147.00 − $29.40 = $117.60

and *P*(reduced) = *S*(reduced) − *C − E* = $117.60 − $98.00 − $22.05 = −$2.45

There is a $2.45 loss on each stick at the reduced price.

5. Given: *L* = $480, *d*1 = 0.40, *d*2 = 0.25, *M* = 1.20*C*; *E* = 0.55*C*; *D* = 0.40*S*;

*a. C = N = L*(1 *–* )(1 – ) = $480(1 − 0.40)(1 − 0.25) = $216.00

*b. M* = 1.20*C* = 1.20($216.00) = $259.20

*c.* *E* = 0.55*C* = 0.55($216.00) = $118.80

*d.* *S = C + M* = $216.00 + $259.20 = $475.20

*e.* *S*(reduced) = *S − D* = $475.20 − 0.40($475.20) = $285.12

*f.* *M*(reduced) = *S*(reduced) *− C* = $285.12 – $216.00= $69.12

At sale price, rate of markup on cost =  = ×100% = 32.0%

*g.* *P*(reduced) = *M*(reduced) *− E* = $69.12 − 0.55($216.00) = −$49.68

That is, a loss of $49.68.

7. Given: *C* = $81; *M* = 0.40*S*; Rate of markdown = 20%

Since *C* = *S − M* = *S −* 0.40*S* = 0.60*S*

Then  = = $135

and *S*(reduced) = $135(1 – 0.20) = $108.00

9. Given: *M* = 0.45*S*; *S* = $140; *M*(reduced) = 0.20*C*

Then *M* = 0.45($140) = $63

and *C* = *S − M* = $140 – $63 = $77

Therefore, *S*(reduced) = *C* + *M*(reduced) = *C* + 0.20*C* = 1.2($77) = $92.40

and Rate of markdown =  =  = 34.0%

11. *C = N = L*(1 – *d*) = $360(1 – 0.25) = $270

*a.* At the break-even point*, D = P* = 0.15*S*

Therefore, to break even,

Rate of markdown = = ×100% = 15.0%

*b.* If *D* = 0.15*S* results in break-even;

then *D* = 0.20*S* will result in a loss of 0.05*S*.

*S = C* *+ E + P* = $270.00 + 0.166667*S* + 0.15*S*

Solving for *S*, we obtain

0.683333*S* = $270.00

*S* = $395.12

Loss per unit = 0.05*S* = 0.05($395.12) = $19.76

13. *C = N = L*(1 *–* )(1 – ) = $30(1 – 0.45)(1 – 0.10) = $14.85

*S = C* *+ E + P* = *C* + 0.5*C +* 0.3*C* = 1.8*C* = 1.8($14.85) = $26.73

If the markdown results in a loss of 0.25*E*, then

*D = P* + 0.25*E* = 0.3*C* + 0.25(0.5*C*) = 0.425*C* = 0.425($14.85) = $6.31

Rate of markdown = = ×100% = 23.6%

15. *C = N = L*(1 *–* )(1 – ) = $72(1 – 0.40)(1 – 0.15) = $36.72

*a.* If *M* = 0.40*S*, then *C* = 0.60*S* (since *S = C + M*)

Therefore, 

*D* = *S − S*(reduced) = $61.20 − $45.90 = $15.30

Rate of markdown = = = 25.0%

*b. P*(reduced) = *S*(reduced) *− C − E* = $45.90 – $36.72 – 0.25($61.20) = – $6.12

That is, a loss of $6.12 per sweater.

*c.* *M*(reduced) = *S*(reduced) *− C* = $45.90 – $36.72 = $9.18

(Reduced) rate of markup on cost =  =×100% = 25.0%

17. Given: C = $665; *D* = 0.20*S*; and *M*(reduced) = 0.30*S*(reduced)

*a.*

*S*(reduced) = *C + M*(reduced) = $665 + 0.3*S*(reduced)

S(reduced) – 0.3S(reduced) = $665

*S*(reduced) = = $950.00

*b.* Also, *S* = *S*(reduced) *+ D* = $950.00 + 0.20*S*

Solving for *S*,

S – 0.2S = $950.00

= $1187.50

19. *C = N = L*(1 *–* )(1 – ) = $2400(1 – 0.30)(1 – 0.15) = $1428.00

Given: *E* = 0.40*C* and *P*(reduced) = 0.25*C* when *D* = 0.20*S*

*a.* *S*(reduced) = *C* + *E* + *P*(reduced) = *C* + 0.4*C* + 0.25*C =* 1.65*C* = 1.65($1428) = $2356.20

Since *S*(reduced) = *S − D*

then $2356.20 = S − 0.20*S* = 0.80*S*

*S* = $2945.25

*b.* At *D* = *S*,

*S*(special) = *S − D = S −* *S* = *S* = ($2945.25) = $1963.50

*P*(special) = *S*(special) *− C − E*

= $1963.50 – *C −* 0.4*C*

*=* $1963.50 *−* 1.4*C*

*=* $1963.50 *−* 1.4($1428)

*=* −$35.70

That is, there was a loss of $35.70 at the special price.

# Review Problems

1.  = L(1 – d) = $196.00(1 – 0.20) = $156.80

 = L(1 – d) = $186.60(1 – ) = $155.50

Source B is $1.30 cheaper.

3. Discount, dL = $136.92

0.28L = $136.92

L = $489.00

N = $489.00 – $136.92 = $352.08

5. Lowest selling price, L =  =  = $338,600

7. *a.* Fee = 0.029($28,476) = $825.80

*b.* dL = $981.71

L =  = $33,852.07

9. *a*. L = = = $289.00

*b*. Discount = $289.00 – $199.16 = $89.84

Equivalent single discount =  = 0.3109 = 31.1%

11. *a.*  = $1195(1 – 0.25)(1 – )(1 – 0.05) = $780.48

*b.* L = = = $720.00

*c.* Using the data from Part *a,*

Discount = $1195.00 – $780.48 = $414.52

Equivalent single discount rate =  = 0.3469 = 34.7%

*d.* Amount of discount for a January order = d3L(1 – )(1 – )

= 0.05($1000)(1 – 0.25)(1 – )

= $34.38

13. *a.* Beginning price, L =  = = $6.94

*b.* Decline in Year 2 = d2L(1 – d1) = 0.60($6.94)(1 – 0.40) = $2.50

15. Given: *M* = 0.55*S* Choose any value of *S*, say *S* = $3.00 per pound.

Then *M* = 0.55($3.00) = $1.65 and *C* = *S − M* = $3.00 − $1.65 = $1.35

Rate of markup on cost = = = 122.2%

17. *a.* Given: *S* = $87.49 and *M* = 0.30*C* *b.* Given: *S* = $87.49 and *M* = 0.30*S*

Substitute into *S = C + M* Substitute into *S = C + M*

$87.49 = *C +* 0.30*C* $87.49 = *C +* 0.30($87.49)

= $67.30 *C* = $61.24

19. *C = N = L*(1 *–* ) = $19.50(1 – 0.4) = $11.70

Given: *E* = and *P* = 0.10*S*

*a.* Substitute into *S = C* *+ E + P*

*S* = $11.70 + *+* 0.10*S*

*S* −  = $11.70

*S* = $20.65

*b.* *M* = *S − C* = $20.65 − $11.70 = $8.95

Rate of markup on cost = = ×100% = 76.5%

*c.* Break-even price = *S – P* = $20.65 – 0.1($20.65) = $18.59

21. Given: *E* = and *P* = 0.20*C*

*a.* Substitute into *S = C* *+ E + P*

*S* = *C* + *+* 0.20*C = *

That is, regular *S* is 153.3% of cost.

*b.* For member purchases, *D* = 0.10*C*

Rate of markdown = = × 100% = 6.5%

23. *C = N = L*(1 *–* )(1 – ) = $30(1 – 0.3)(1 – 0.1) = $18.90

Given: *E* = 0.20*S* and *P* = 0.18*S*

Substitute into *S = C* *+ E + P*

*S* = $18.90 + 0.20*S +* 0.18*S*

*S −* 0.38*S =* $18.90

= $30.48

25. Given: *C* = $492; *D* = 0.30*S*; and *M* = 0.40*S*

*S = C + M* = $492 + 0.40*S*

0.60*S* = $492

= $820

*S*(reduced) = *S − D* = $820 − 0.30($820) = $574.00

27. Given: *S* = $489, *E* = 0.20*C,* and *P* = *C*

*a.* Substitute into *S = C* *+ E + P*

$489 *= C +* 0.20*C +* *C = C*

= $357.80

To break even, *D = P* = *C =* ($357.80) = $59.63

*b.* If *S*(reduced) = *C* = $357.80

then *D* = *S − S*(reduced) = $489 − $357.80 = $131.20

and Rate of markdown = = = 26.8%