

Chapter 6: Mathematics of Buying

6.1) Invoices and Trade Discounts

Manufacturing and Retail businesses make a profit by buying items and then reselling for more than they cost.

Manufacturers:

- Buy raw materials and assemble them into products that they sell to wholesalers

Wholesalers:

- Buy goods from manufactures or other wholesalers and sell them to retailers

Retailers:

- Sell the goods to the consumer

Examples:

- Finish plywood manufacturers in Finland sold wood to wholesalers in USA
- Wholesalers in USA sold aircraft plywood to Gel Boomerangs
- Gel Boomerangs manufactured boomerangs
- Gel Boomerangs sold boomerangs to retailers
- Retailers sold boomerangs to consumers

****Dell's operations span all three categories**

Invoices:

- Record of sales and purchases
- Proof that transaction occurred – very important document for business efficiency and for the audit trail

Purchase invoice:

- For the buyer it records a purchase – usually inventory or supplies → example →

Sales Invoice:

- For the seller is records a sale – Proof that revenue was earned → example →

Purchase Invoice because the customer is Gel Boomerangs. Gel Boomerangs did the buying

Plywood Wholesalers
5543 92nd Ave. S.
Alderwood, CA 92110

Invoice No. 104963

INVOICE

Customer

Name Gel Boomerangs
Address 2124 Kittredge St. PMB 61
City Berkeley State CA ZIP 94704
Phone

Misc

Date 2/28/2003
Order No.
Rep
FOB Destination

| Qty | Description | Unit Price | TOTAL |
|------------------|----------------------------------|------------|-----------|
| 5 | Sheets 10 ply, 5mm, Finish Birch | \$ 90.00 | \$ 450.00 |
| Terms: 1/15,N/45 | | | |

Payment

Select One...

Comments

Name

CC #

Expires

Tax Rate(s)

| | |
|----------|-----------|
| SubTotal | \$ 450.00 |
| Shipping | |
| TOTAL | \$ 450.00 |

Office Use Only

clean example

Sales Invoice because Gel Boomerang's name is at the top of the invoice. Gel Boomerangs did the selling.

Gel Boomerangs
is
seller

Gel Boomerangs
2124 Kittredge St. PMB 61
Berkeley, CA 94704

Invoice No. 4369

INVOICE

Customer

Name Kite Flight
Address 1414 43rd Ave.
City Watermore State MD ZIP 40025
Phone

Misc

Date 2/23/2003
Order No.
Rep
FOB Shipping Point

| Qty | Description | Unit Price | TOTAL |
|------------------|-------------|------------|-----------|
| 15 | Bellens | \$ 10.00 | \$ 150.00 |
| 8 | Duece | \$ 12.50 | \$ 100.00 |
| Terms: 2/10,N/30 | | | |

| | |
|----------|-----------|
| SubTotal | \$ 250.00 |
| Shipping | |
| TOTAL | \$ 250.00 |

Payment

Select One...

Tax Rate(s)

Comments

Name

CC #

Expires

Office Use Only

Our Customers Have Many Happy Returns!

clean example

Plywood Wholesalers
5543 92nd Ave. S.
Alderwood, CA 92110

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| Terms: 1/15, N/45 | | | |
| SubTotal | | | \$ 450.00 |
| Shipping | | | |
| TOTAL | | | \$ 450.00 |

Payment

Select One...

Comments

Name

CC #

Expires

Tax Rate(s)

Office Use Only

$$① 5 * 90 = 450$$

② Cash Discount Date = March 15

③ So if Gel Boomerangs pays before or on March 15, they get cash discount of 1%

④ Due date without receiving cash discount March has 31 days
 $45 - 31 = 14$ days
 April 14 is due date

⑤ Amount to pay if Gel Boomerangs pays on March 10
 $450 - 450 * .01 = 450 - 4.5 = \445.50
 OR
 $450 * (1 - .01) = 450 * .99 = \445.50

Sales Invoice because Gel Boomerang's name is at the top of the invoice. Gel Boomerangs did the selling.

Gel Boomerangs
2124 Kittredge St. PMB 61
Berkeley, CA 94704

Invoice No.

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| Shipping | | | |
| TOTAL | | | \$ 250.00 |

Payment

Select One...

Tax Rate(s)

Comments

Name

CC #

Expires

Office Use Only

Our Customers Have Many Happy Returns!

$$\begin{array}{r} 15 * 10 = \$150 \\ 8 * 12.5 = 100 \\ \hline \text{total} \quad 250 \end{array}$$

- ② Discount date = ① (28-23) = 5 days in Feb. ③ 10 total
④ 10-5 = 5
⑤ Discount Date = March 5.

③ so if Gel Boomerangs receives payment post marked by March 5, they will allow Kite Flight to take cash Discount

④ Due date = 30-5 = 25 → March 25

⑤ Amount Gel Boomerangs will receive from Kite Flight if they pay on March 1 = $250 - 250 * .02 = 250 - 5 = 245$

Math is Fun!

Page 3 of 17

OR

Excel is Fun!

$$250 * (1 - .02) = 250 * .98 = 245$$

1) Complete an invoice

Number of items purchased * price per item = total for that item

Number of items purchased * price per item = total for that item
= Total for invoice

units * price = total
or units * price = total
= total for invoice

15 Bellen Boomerangs * \$10.00 each = 150
8 Duece Boomerangs * \$12.50 each = 100
total \$ 250

From the next section,
the \$10.00 & the \$12.50 are
called "Net Cost"

2) Understand common shipping terms

FOB Shipping Point:

- Free on Board Shipping Point
- Title of goods is transferred to the purchaser when the goods are handed over to the shipper
- Purchaser must pay for shipping

FOB Destination:

- Free on Board Destination
- Title of goods transfers to the purchaser when they receive the goods
- Seller pays for the shipping

FAS:

- Free Alongside Ship
- Term used when goods delivered by a ship
- Sender pays for shipping costs up to the dock

3) Calculate trade discounts

Trade Discount:

- Given to businesses that resell the items
- Example: If Foot Locker sells the shoes for \$150.00, Foot Locker did not pay \$150.00 for the shoes. Foot Locker got a "trade discount" when they bought the shoes. When they bought the shoes they paid "net cost":

Net cost = List price - Trade discount

Formula

Net cost is the number you see on the invoice

Example:

The list price of the shoes is \$150.00. If the trade discount percentage is 25% what is the net cost?

① shoes price = 150
trade Discount = 25% of List price
what is net cost?

② $150 - 150 * .25 = 150 - 37.5 = 112.50$
or

$150 * (1 - .25) = 150 * .75 = 112.50$

③ The net cost was \$112.50

Series (Chain) discounts:

A type of (Trade Discount)

- Hold over from the past
- Each industry does it differently
- Example: discount is written as follows: 20/10
 - A 20% discount is subtracted from the list price, and from this difference, another 10% discount is subtracted

Three methods to calculate series discounts and net cost:

- 1) Discounts separately method
- 2) Compliment method
- 3) Table method

Discounts separately method: (Trade Discount)

Example:

The list price of a circular saw is \$150. If the trade discount 20/10 what is the net cost?

- ① circular saw List Price = ~~150~~
Trade discount = 20/10
What is net cost?

②

$$\begin{array}{r} 150 \\ - 150 * .2 \quad (30) \quad \leftarrow \text{first discount in series} \\ \hline = 120 \end{array}$$

$$\begin{array}{r} 120 \\ - 120 * .1 \quad (12) \quad \leftarrow \text{second discount in series} \\ \hline 108 \end{array}$$

- ③ After the series trade discount of 20/10, the circular saw (with a list of 150) had a net cost of \$108.00.

↑
This is the net cost number that shows up on the invoice. example:

$$\text{Units} * \text{price} = 8 * 108 = \$864.00$$

"wow that is a really nice misspelling"
 Complement method:
 Complement

Compliment method:

Compliment:

- The number that must be added to the discount to get one
- The compliment of a 20% discount is 80% because: $80\% + 20\% = 100\%$ or $.8 + .2 = 1$

The 80% is called the net cost equivalent (percent paid)

Net Cost = List price * net cost equivalent (percent paid)

Formula

Net cost equivalent (percent paid) for a series discount:

Complement of the first single discount * complement of the second single discount

Formula

Example:

Find the net cost equivalent (percent paid) for a 20/10 series discount.

$$(1 - .2) * (1 - .1) = .8 * .9 = .72 = \text{Net cost equivalent or percent paid}$$

compliments: .2 and .8 are compliments
 .1 and .9 are compliments

Example:

The list price of a circular saw is \$150. If the trade discount 20/10 what is the net cost?

$$\left\{ \begin{array}{l} \text{Net cost equivalent} \\ \text{or} \\ \text{\% paid} \end{array} \right\} = (1 - .2) * (1 - .1) = .72$$

Net cost = List Price * Net cost equivalent

$$\downarrow \quad \quad \downarrow \quad \quad \downarrow$$

$$? = 150 * .72$$

$$(\text{Net cost}) = 108$$

Example:

Find the net cost equivalent of 20/10/15

$$(1 - .2) * (1 - .1) * (1 - .15) = .8 * .9 * .85 = .612$$

we don't need to round net cost equivalents.

Table method:

- Table on page 227

6.2) Single Discount Equivalents

(Trade Discounts)

1) Express a series discount as an equivalent single discount

Single discount equivalent = $1 - \text{net cost equivalent (percent paid)}$

Formula

Example:

If a 20/10 series discount is given, find the single discount equivalent.

(1st) $\text{Net cost equivalent} = (1 - .2) * (1 - .1) = .72$

(2nd) $\text{single discount equivalent} = 1 - .72 = .28$

(3rd) The single Trade Discount would be .28

example: to find net cost on \$100 List price

$$\text{Net cost} = 100 - 100 * .28 = 100 - 28 = 72.00$$

2) Find the net cost by multiplying the list price by the complements of the single discounts in a series

(we did this already on previous page)

Example:

The list price for a small compressor motor is \$100.00, if the trade discount is 20/15/5, find the net cost.

(Step 1)

List price = 100

trade discount = 20/15/5

Find net cost

(Step 2)

$$100 * (1 - .2) * (1 - .15) * (1 - .05) =$$

$$100 * .8 * .85 * .95 =$$

$$100 * .646 = \$64.60$$

(Step 3)

The net cost for the compressor motor is \$64.60. This is the net cost that appears on the invoice.

$$\frac{\text{Net cost}}{\left(\frac{\text{Net cost}}{\text{equivalent \% paid}}\right)} = \text{List Price}$$

3) Find the list price given the series discount and the net cost

Net cost = list price x net cost equivalent (percent paid)

Net cost / net cost equivalent (percent paid) = list price

(P/R = B)

$$\frac{P}{R} = B$$

Example:

Series discount is 20/15/5 and the net cost after trade discount is \$64.60. Find the list price.

step 1

Series Trade Discount = 20/15/5

Net cost = 64.60

Find List Price

step 2

$$\frac{P}{R} = B \text{ or } \frac{\text{Net cost}}{\% \text{ paid}} = \left\{ \text{List Price} \right\}$$

$$\frac{64.60}{(1-.2) * (1-.15) * (1-.05)} = \frac{64.60}{.646} = \$100$$

Check: $100 * .646 = 64.60 \checkmark$

step 3

With a series discount of 20/15/5 and a net cost of 64.60, the list price was \$100⁰⁰.

6.3) Cash Discounts: Ordinary Dating Method

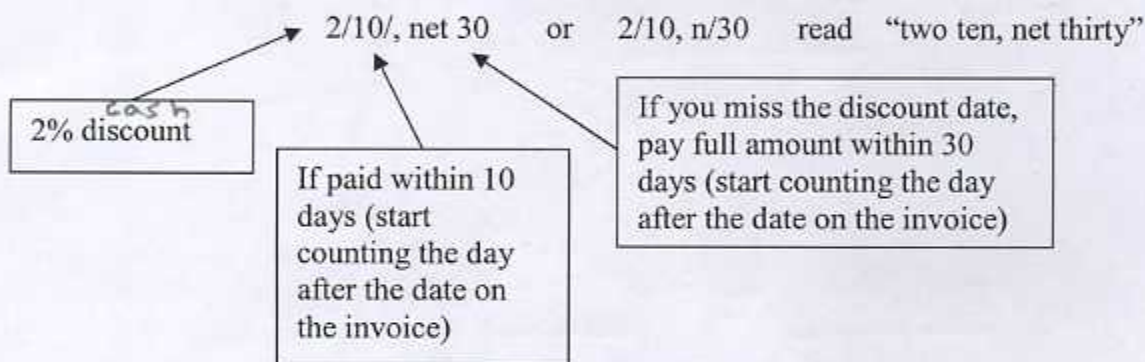
Trade Discounts

- When you purchase to resell

Cash Discounts

- Incentive to pay early
 - “If you pay me by this date, I will give you a discount”
- The business wants to get paid quickly so they have cash to conduct their business
- Is applied to the invoice subtotal for the items only (not the shipping or insurance) “If you pay me by this date, I will give you a discount”
- The business wants to get paid quickly so they have cash to conduct their business
- Net cost = (List price – trade discount) – cash discount

Use the ordinary dating method



If the invoice is paid within the first 10 days, the cash discount is earned

If the invoice is paid between the 11th day and 30th day, no cash discount is earned

Start the day after the invoice date and count forward. Invoice dates are never used as the starting point

Example:

Invoice date is October 20. The terms are 2/5, net 15. What is the due date?

Invoice date = Oct. 20

Cash Discount % = 2% \Rightarrow .02

of days until discount offer expires = 5

with No discount you still must pay within = 15 days

① There are 31 days in Oct.

② $31 - 20 = 11$ days used up in Oct

③ $15 - 11 = 4$ days into Nov.

④ Due date is November 4th date

Example:

Invoice date is October 20. The terms are 2/5, net 15. What date must the invoice be paid by in order to take the discount?

Details

① There are 31 days in Oct.

② 11 days still to go if it is Oct. 20

③ so we just add 5 days to Oct. 20

④ $20 + 5 = 25$

⑤ The due date is Oct. 25

Comprehensive Example:

Invoice date is October 20

The terms are 2/5, net 15

The Invoice total is \$100.00 and the "FOB shipping point" shipping charges are \$8.00

Invoice is paid on October 22

What is the total amount due?

Step 1: Can the cash discount be taken?

$$20 + 5 = 25 \Rightarrow \text{Discount date} = \text{Oct. 25}$$

Because we pay on Oct. 22, before Oct. 25, we CAN take the cash discount

Step 2: How much is the cash discount? (Shipping is not included in calculation)

$$100 * .02 = \$2.00$$

Step 3: Find amount due before considering shipping

$$100 - 2 = \$98$$

Step 4: Add total owed for merchandise and shipping

$$98 + 8 = \$106$$

Use postdating when calculating cash discounts

Sometimes on an invoice you will see a date like this

3/22/2007 AS OF 4/01/2007

Multiple offers for discounts

Invoice date = May 18

Terms = 4/10, 3/25, 1/40, n/60

First cash discount date

$$= 18 + 10 = 28$$

→ May 28

Second cash discount date

$$= 25 - (31 - 18) = 12$$

→ June 12

Third cash discount date

$$= 40 - (31 - 18) = 27$$

→ June 27

Net Payment Date

$$= 60 - (30) - (31 - 18) = 17$$

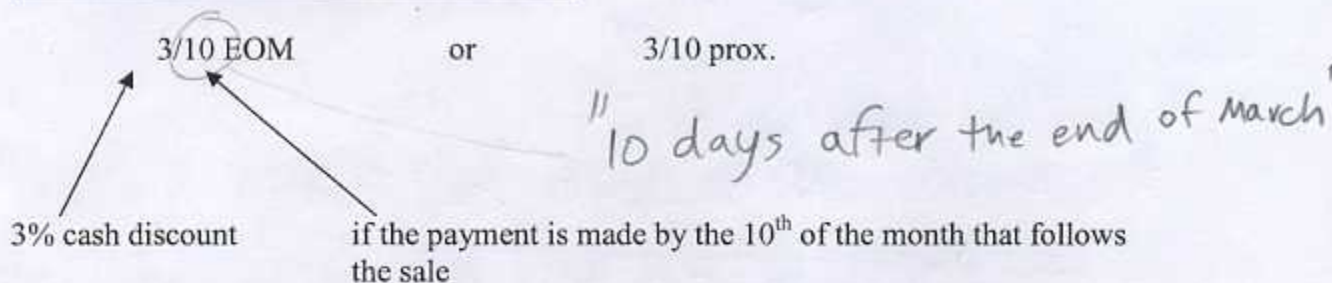
→ July 17

you would count days after April 1st

} depending on what day you pay determines what is cash discount rate is.

6.4) Cash Discounts: Other Dating Methods

Use the end-of-the month dating method



- **If the invoice is dated the 26th to the 31st then you add one extra month *P. 245 good example*
- **If no due date is given, it is assumed to be 20 days after the discount date
- **If due date falls on a Saturday or holiday, the following day becomes the due date

Example:

Invoice from Bay Air has an invoice date of April 6 with terms of 3/20 EOM, what is the discount date and what is the net payment date?

Discount date: May comes after April, so it is May 20

Net payment date: May has 31 days
 $31 - 20 = 11$ days left in May $20 - 11 = 9$

Because there is no net payment date given it is assumed to be 20 days after May 20

so the
Net payment
Date is
JUNE 9

Example:

Find amount paid given the following information:

Invoice total = \$782.00

Invoice date: August 3

Terms: 1/10 prox.

Invoice paid on September 4

→ means same thing as 1/10/EOM

Step 1: find discount date

1/10 prox. means 10 days after end of August. So Discount Date is Sep. 10.

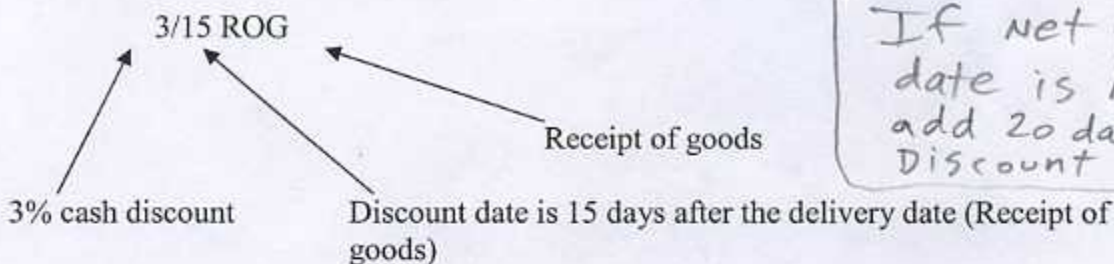
Step 2: Calculate amount owed

$$782 * (1 - .1) = \$703.80$$

We paid before discount date

Use the receipts-of-goods method

**This method is used when the ship time is long



★ If net payment date is Not stated add 20 days to Discount Date

Example:

Oaks Hardware received an invoice dated December 12 with terms of 2/10 ROG. The goods were received on January 2. What are the discount date and the net payment date?

~~Discount date;~~

Invoice Date = Dec. 12

Terms = 2/10 ROG

Received Goods on Jan 2.

Cash discount % = 2% $\Rightarrow .02$

Discount Date

- Start counting after Jan 2.
- 10 days after Jan 2 is Jan 12
- Discount Date is Jan. 12

Net Payment Date

Because Net payment date is Not stated, we Add 20 days to Discount date

$$\begin{array}{r} \text{Jan 12} \\ + 20 \\ \hline 32 \end{array}$$

\Rightarrow But there are only 31 days in January.

$$32 - 31 = 1$$

\Rightarrow Feb 1 is the Net Payment Date



Use the extra dating method

- When extra days are given to take advantage of the discount, above and beyond what is usually given.

2/10 - 50 extra or 2/10 - 50 ex. or 2/10 - 50 x

- Shown as 2/10 - 50 ex. And not 2/60
- Emphasis that it is "extra" given beyond what is usually given.

Example:

Invoice total = \$750.00

Invoice date: August 5

Terms: 3/10-30 x

Invoice paid on September 12

Find the net payment

→ sort of like 3/40

Step 1: find number of days until discount date

$$10 + 30 = 40$$

cash

Step 2: find discount date

cash

① Aug 5

⇒ 31 days in Aug.
- 5

26 days used in Aug.

② $40 - 26 = 14$ ⇒

Sep 14 is the cash Discount Date

Step 3: Find net payment

$$750 * (1 - .03) = \$727.50$$

Determine credit given for partial payment of an invoice

If only partial payment is made on the total amount due, then the offered discount is only applied to the portion of the invoice that is paid.

Example:

- 1) If a 3% discount is given on an invoice total of \$100, only \$97 is paid ($100 \times (1 - .03)$).

IF whole invoice is paid
we only pay \$97 for a \$100 invoice.

- 2) The customer taking the discount is only paying $\$97/\$100 = 97$ cents for every dollar owed.

This is like paying \$.97 for every \$1.00 owed.

So if we only pay part of our invoice we only pay \$.97 for every \$1.00 we owe.

- 3) Formula to determine credit given for partial payment of an invoice:

If we send them \$.97, they must credit our account for \$1.00

why we have to use this formula for partial payment.

Credit toward invoice when partial payments are made

$$= \frac{\text{Partial Payment.}}{(1 - \text{discount given})}$$

← this # is less than 1 and so the resultant quotient will be bigger than the partial payment

Chapter I

Example:

Tom owes \$125 total on his invoice and makes a partial payment of \$50 within the discount period. The discount he is offered is 3%. What is the credit toward his invoice? What is the amount due on his account? What is the cash discount that he earned?

- 1) What is the credit toward his invoice?

$$\frac{50}{(1 - .03)} = 51.546392 \approx \$ 51.55$$

- 2) What is the amount due on his account?

$$125 - 51.55 = \$ 73.45$$

- 3) What is the cash discount that he earned?

$$51.55 - 50 = \$ 1.55$$

(23) Auto Electric offers an oxygen sensor at a list price of \$289, less trade discount of 20/30, what is net cost?

1st List variables and details

Business Name = Auto Electric

Item = Oxygen sensor

List Price = \$289

Trade Discount = 20/30

What is net cost?

2nd Setup & solve

$$\begin{array}{r} \$289 \\ * (1 - .2) \\ * (1 - .3) \end{array}$$

Be careful
of order
of operations

$$\begin{array}{r} \text{or} \\ \$289 \\ * .8 \\ * .7 \\ \hline = \end{array}$$

$$\begin{array}{r} \text{or} \\ \$289 \\ * .56 \\ \hline = \$161.84 \end{array}$$

Trade Discounts
are discounts given to businesses that resell the items

List Price

Price that people pay at store -
Price public pays at the store

Net cost (net price)

$$\begin{array}{r} \text{List Price} \\ - \text{Trade Discount} \\ \hline = \text{Net cost} \end{array}$$

Net cost equivalents
of Series Discounts
DO NOT ROUND!

3rd Write answer in words

Answer With Trade Discounts the oxygen sensor net cost is \$161.84

23 Note

Series Discounts Trick

$$\text{List Price} = \$289$$

$$\text{Trade Discount} = 20/30 \quad \left(\text{This is called a series discount} \right)$$

First Amount

First Amount

$$(289 - 289 * .20) - (289 - 289 * .20) * .30$$

factor out 289

Second amount

$$289 * (1 - .20) - 289 * (1 - .20) * .30$$

factor out $289 * (1 - .20)$

$$289 * (1 - .20) * (1 - .30)$$

$$= 289 * (1 - .20) * (1 - .30) = 289 * .80 * .7$$

$$= \$161.84$$

$$\left\{ \begin{array}{l} \text{Formula for calculating} \\ \text{Net cost} \end{array} \right\} = \left\{ \begin{array}{l} \text{List} \\ \text{Price} \end{array} \right\} * \left(1 - \begin{array}{l} \text{First} \\ \text{Trade} \\ \text{Discount} \end{array} \right) * \left(1 - \begin{array}{l} \text{Second} \\ \text{Trade} \\ \text{Discount} \end{array} \right)$$

28) Find the single discount equivalent to a series discount of 20/10

1st) List variables and details

series discount = 20/10

find single discount equivalent

2nd) set up and solve

$$(1 - .2) * (1 - .1) = .8 * .9 =$$

$$.72 = \text{cost equivalent}$$

$$= 1 - (1 - .2) * (1 - .1) = 1 - .8 * .9$$

$$= 1 - .72 = .28 = \text{single discount equivalent}$$

3rd) write answer in words

Answer The single discount equivalent is .28

- 26) An Invoice from Collier Windows amounting to \$20,250 is dated Oct 6 and offers terms of 3/10, n/30. If the invoice is paid on Oct. 14, what is the amount due?

1st

List variables & details

Invoice total = \$20,250

Invoice Date = Oct 6

Payment Date = Oct. 14

what Amount is due?

$$\text{discount \%} = .03$$

terms = 3 / 10, n / 30

If discount not taken
Must pay within 30 days

3% cash discount on Invoice total if paid within 10 days of Invoice Date

To get 3% discount you must pay within 10 days of Invoice Date

"Net" Amount due if discount not taken within 30 days of Invoice Date

2nd) Set up & solve

1) Discount Date = $6 + 10 = 16 \Rightarrow \text{Oct. 16}$

Invoice Date is never counted

2) Net payment Date =

| | |
|-----------------|----------|
| Oct | 31 |
| - Oct | 6 |
| days in Oct. 25 | |
| | + 5 |
| | = Nov. 5 |

3) Because Oct. 14 is before Oct 16, we can take discount

4) $20,250 \times .03 = 607.50$

5) Amount Due = $20,250 - 607.50 = \$19,642.50$

3rd) Write Answers in words

Answer The Amount due is \$19,642.50