

# CMA Formulas

## CMA Exam Part One



Hi, future CMA!

My name is Stephanie Ng, and I am here to help you pass the CMA exam. Contained herein, you'll find formulas, along with our exclusive detailed explanations for each one.



But before we get too far, I'd like to share my background with you. I am a published CPA Exam Guide Author, Accounting Today and Going Concern contributing writer, CFO, Institute of Management Accountants (IMA) webinar presenter, and publisher of the website **I Pass the CMA Exam**.

You'll want to commit these formulas to memory and understand how to apply them to complex problems on the CMA exam. Therefore, make sure you understand what the formula is for, how it works mathematically (e.g., if the numerator goes up, what happens to the denominator?), and the implications of each formula.

And be sure to read through until the end -- there's a special offer that I'm happy to share with you, future CMA!

To your success,  
Stephanie Ng

# 1 Basic EPS Calculation

**ALT NAME:** Net income per share

**CALCULATION:**  $(\text{Net income} - \text{Preferred Dividends}) \div \text{Weighted average number of common shares outstanding}$

## COMPONENTS

- **Net Income (Loss):** The amount of profit or loss after expenses and losses are subtracted from revenues and gains.
- **Preferred Dividends:** A dividend that is accrued and paid on a company's preferred shares.
- **Weighted Average Number of Common Shares:** The number of shares of a company calculated after adjusting for changes in the share capital over a reporting period. Generally, it can be easily calculated using the following formula:  $(\text{Beginning Outstanding Shares} + \text{Ending Outstanding Shares}) \div 2$

## DESCRIPTION

Earnings per share is a measure of how much profit a company has generated for each outstanding share of its common stock. Because preferred dividends are meant for preferred shareholders and not common shareholders, this is why preferred dividends are subtracted from net income when calculating basic earnings per share.

Using earnings per share as a measurement of a company's health has its limitations because companies can buy back their own shares, which increases the amount of earnings per share. Stock buybacks reduce the shares outstanding without increasing the net income; this allows companies to manipulate the earnings per share to make it seem like they are doing better than they actually are.

Additionally, the earnings per share calculation does not consider two other important factors: a company's outstanding debt, and the capital needed to generate the earnings in question.

# 1 Basic EPS Calculation

## HIGH/LOW ANALYSIS

If a company has a high earnings per share, the company has more money available to reinvest in the business or distribute to stockholders in the form of dividend payments.

Also, a higher earnings per share ratio will often make the stock price of a company rise.

Conversely, a low earning per share could indicate that the company is experiencing trouble with profitability and could reduce the future stock price.

# 2 Cash Flow Calculation

**ALT NAME:** N/A

**CALCULATION:** Cash from Operating Activities +/- Cash from Investing Activities +/- Cash Provided from Financing Activities = Net Increase (Decrease) in cash and cash equivalents during the year

## COMPONENTS

- **Operating Activities:** Functions of a business directly related to the day-to-day operations used to provide its goods and/or services to the market; generally, activities related to net income.
  - **Examples of Cash Inflows:**
    - Sales of goods or services
    - Interest received from loans
    - Dividends received from investments
  - **Examples of Cash Outflows:**
    - Merchandise purchased from suppliers
    - Materials used to manufacture products
    - Income tax expense
    - Interest expense
    - Payroll expense
- **Investing Activities:** Functions of a business related to buying and selling longer-term assets and other investments; generally associated with long-term balance sheet items.
  - **Examples of Cash Inflows:**
    - Sale of long-term investments (e.g., bonds and other company's stock)
    - Sale of property, plant, and equipment
    - Collection of principle for loans made to other entities
  - **Examples of Cash Outflows:**
    - Purchase of long-term investments (e.g., bonds and other company's stock)
    - Purchase of property, plant, and equipment
    - Loans made to other entities

# 2 Cash Flow Calculation

- **Financing Activities:** Functions of a business involving creditors or investors used to fund company operation; generally, activities related to noncurrent liabilities (not due for settlement within one year) and stockholders' equity.
  - **Examples of Cash Inflows:**
    - Issuance of notes
    - Issuance of bonds
    - Issuance of common stock
  - **Examples of Cash Outflows:**
    - Dividends paid to stockholders
    - Payment to redeem long-term debt or reacquire capital stock.
    - Purchase of treasury stock

## DESCRIPTION

First and foremost, it is essential to note that cash flow isn't the same as profit. Simply put, the cash flow calculation exists to help track the movement of money in and out of a business. The amount of available cash dictates how a company makes many significant business decisions, including whether or not to expand, develop new products, buy back stock, pay dividends, or reduce debt.

Cash flow is also indicative of a company's liquidity, flexibility, and overall financial performance. When cash flow is positive, a company's liquid assets increase, enabling it to settle debts, reinvest in its business, return money to shareholders, or pay expenses.

If a company has a lower level of liquidity due to profits being tied up in accounts receivable and inventory or spending too much on capital expenditures, then there is a chance the company may fail.

However, a large amount of cash available doesn't always mean that a company will be successful since the money could have been acquired by taking on an unsustainable debt level.

# 3 Declining Balance and Double Declining Balance Depreciation Calculation

**ALT NAME:** N/A

**CALCULATION:** Current Book Value x Accelerated Depreciation % Rate = Annual Depreciation Expense

## COMPONENTS

- **Current Book Value:** The value at which a company carries an asset on its balance sheet. It is calculated by subtracting accumulated depreciation from the cost of an asset.
- **Accelerated Depreciation % Rate:** Straight-Line Depreciation Rate x Specific Percentage (e.g., 150% or 200%)
- **Straight-Line Depreciation Rate:**  $1 \div \text{Useful Life of the Asset}$
- **Annual Depreciation Expense:** The portion of a depreciable asset deemed to have been consumed or expired during a specific accounting period.

## DESCRIPTION

The declining balance method is a form of accelerated depreciation that utilizes a percentage of the straight-line depreciation rate to calculate depreciation expense. Commonly, the straight-line rate will be applied at a 150% or 200% accelerated depreciation rate.

Unlike other depreciation methods, the salvage value is not deducted from the asset's cost under this method. The accelerated depreciation rate is applied to the book value of the asset at the beginning of the period, and the book value of the asset decreases year by year. When the book value of the asset is reduced to its salvage, no more depreciation is applied.

Like other accelerated depreciation methods, larger amounts of depreciation are expensed during the earlier years of an asset's useful life, and smaller amounts are expensed in later years. The declining balance method is more effective for recording depreciation of assets that quickly lose their value, such as computer equipment and other technology products, instead of assets that do not lose their value quickly, such as factory equipment and machinery.

# 3 Declining Balance and Double Declining Balance Depreciation Calculation

## DECLINING BALANCE METHOD

**EXAMPLE** A car rental company purchases a new vehicle for \$35,000. The company expects the vehicle to last for 5 years, after which the vehicle will be sold for a salvage value of \$5,000. The 5-year life of the vehicle is depreciated at 150% of the normal rate. Calculate depreciation expense over the life of the asset using the declining balance method of depreciation.

1. **Calculate the Straight-Line Depreciation Rate:**  $1 \div 5$  (Useful Life of the Asset) = 20%
2. **Accelerated Depreciation Rate:** 20% Straight – Line Depreciation Rate x 1.5 (150% acceleration) = 30%
3. **\$35,000 Year 1 Book Value x 30% Accelerated Depreciation Rate = \$10,500 Depreciation Expense**

There is a variation of the declining balance method called the Variable Declining Balance method that handles the final year of depreciation in a slightly different way. The book value of the equipment at the beginning of year 5 is \$8,403, of which 30% is \$2,521.

If this depreciation is used, the book value of the equipment at the end of year 5 will be \$5,882 (\$8,403 – \$2,521), which is more than the salvage value.

Under the Variable Declining Balance method, the asset is fully depreciated to the salvage value over its useful life, so the depreciation expense in year 5 would be \$3,403 (\$8,403 – \$5,000).

## DOUBLE DECLINING BALANCE METHOD

**EXAMPLE** A car rental company purchases a new vehicle for \$35,000. The company expects the vehicle to last for 5 years, after which the vehicle will be sold for a salvage value of \$5,000. Calculate depreciation expense over the life of the asset using the double-declining method of depreciation.

1. **Calculate the Straight-Line Depreciation Rate:**  $1 \div 5$  (Useful Life of the Asset) = 20%
2. **Accelerated Depreciation Rate:** 20% Straight – Line Depreciation Rate x 2 (200% acceleration) = 40%
3. **\$35,000 Year 1 Book Value x 40% Accelerated Depreciation Rate = \$14,000 Depreciation Expense**

The book value of the equipment at the beginning of year 4 is \$7,560, of which 40% is \$3,024. If this depreciation is used, the book value of the equipment at the end of year 4 will be \$4,536 (\$7,560 – \$3,024), which is less than the salvage value.

As stated earlier, the asset is depreciated only to its salvage value under the declining balance method. Therefore, the depreciation in year 4 is calculated as follows:

\$7,560 Book value (Beg. Year 4) – \$5,000 Salvage value = \$2,560 Year 4 Depreciation Expense



# 4 Depreciable Base Calculation

**ALT NAME:** N/A

**CALCULATION:** Acquisition Cost of Asset – Salvage Value of Asset = Depreciable Base

## COMPONENTS

- **Acquisition Cost of Asset:** The purchase price of an asset plus the cost incurred to put the asset into service. Additional costs may include sales tax, customs duties, freight charges, installation fees, and testing costs.
- **Salvage Value of Asset:** The estimated resale value of an asset at the end of its useful life.
- **Depreciable Base:** The value of the asset to be written off over time.

## DESCRIPTION

Typically, the computation of the depreciable base is the first step used to calculate depreciation expense regardless of the chosen method of depreciation. The depreciable base represents the asset's value that must be allocated as an expense based on the useful life of the asset or estimated production capability.

It should be noted that some companies use assets and scrap them as opposed to reselling them at a salvage value; in these instances, the depreciable base of the asset is the same as its cost.

Also, the value of a company's assets is stated in terms of original cost on the balance sheet. The depreciable base is only used during the calculation of depreciation expense.

# 5 Gross Profit Calculation

**ALT NAME:** Gross margin, Sales profit, Gross income

**CALCULATION:** Revenue – Cost of Goods Sold = Gross Profit

## COMPONENTS

- **Revenue:** Income generated from sales of goods or services associated with the primary operations before any costs or expenses are deducted.
- **Cost of Goods Sold:** The accumulated total of all costs used to create a product or service that has been sold.
- **Gross Profit:** The profit a company makes after deducting the costs associated with making and selling its products or the costs associated with providing its services.

## DESCRIPTION

The gross profit figure can be used to assess a company's efficiency at using its labor and supplies in producing goods or services. However, it is essential to note that the metric only considers variable costs, such as materials and direct labor. These expenses vary based on the output level while excluding fixed costs, such as rent and insurance, that are the same amount regardless of output level.

By reviewing the gross margin, management and investors can analyze how profitable an organization's core business activities or products are without considering the indirect costs.

One of the most useful purposes for calculating gross profit is to use the metric to further calculate the gross profit margin:

**Gross Profit Margin = Gross Profit ÷ Total Revenues**

The gross profit margin is a popular metric among analysts and management because it allows for a better comparison with competitors within the same industry or sector. Also, it indicates how much gross profit a company is earning for every dollar of revenue.

Companies with high gross profit margins generally have more efficient processes and more effective operations, and they are a safer long-term investment than their competitors. Typically, an organization's gross profit margin should be stable over time; substantial fluctuations could indicate several issues, including declines in business, mismanagement of resources, or fraud.

# 6 Net Realizable Value (NRV) Calculation

**ALT NAME:** Cash realizable value

**CALCULATION:** Expected Selling Price – Total Production and Selling Costs = **NRV for Inventory**

## COMPONENTS

- **Expected Selling Price:** The value of an asset that can be realized upon the sale of the asset.
- **Total Production and Selling Costs:** The estimate of costs associated with either the completion, sale, or disposal of the asset in question.
- **Net Realizable Value:** The selling price of an asset minus the costs associated with the completion, sale, or disposal of the asset.

**CALCULATION:** Accounts Receivable Balance – Allowance for Doubtful Accounts = **NRV for A/R**

## COMPONENTS

- **Accounts Receivable Balance:** The amount of money owed to a company by its debtors.
- **Allowance for Doubtful Accounts:** The dollar amount of invoices that the company labels bad debt (uncollectible).
- **Net Realizable Value:** The amount of money owed to a company by its debtors less the estimated value of bad debt.

# 6 Net Realizable Value (NRV) Calculation

## DESCRIPTION

Net realizable value is commonly associated with accounts receivable and inventory, which are both initially recorded at cost. In some instances, the company will collect less than the cost; when this occurs, the company must report the asset at the lower of cost or the net realizable value (NRV).

Generally Accepted Accounting Principles (GAAP) dictate that companies should not overstate the value of assets that can increase profits and mislead investors. Because the calculation of NRV will always be lower than the market value of an asset, the metric can help prevent the overstatement of the assets' valuation.

In relation to accounts receivable, the balance is converted to cash when customers pay outstanding invoices. Still, the balance must be adjusted for clients who don't make payment by subtracting the allowance of doubtful accounts from the expected balance to be received.

# 7 Straight-line Depreciation Calculation

**ALT NAME:** Straight Line Basis

**CALCULATION:**  $\text{Depreciable Base} \div \text{Useful Life of the Asset} = \text{Annual Depreciation Expense}$

## COMPONENTS

- **Depreciable Base:** The value of the asset to be written off over time.
- **Useful Life of the Asset:** The period of time for which the asset will be economically feasible for use in a business.
- **Annual Depreciation Expense:** The portion of a depreciable asset deemed to have been consumed or expired during a specific accounting period.

## DESCRIPTION

Straight-line depreciation is the most commonly used and easiest to compute method for calculating depreciation because it results in the same depreciation expense for every accounting period. As a result, the asset's carrying amount on the balance sheet reduces by the same amount every accounting period.

In some cases, the straight-line depreciation method does not accurately reflect the asset's usage and may not be the best method depending on the specific asset. For example, computers may not be efficiently depreciated using the straight-line depreciation method due to rapid technological advancements.

The obsolescence of older technology should cause a computer to accumulate larger depreciation expenses in its useful early life and smaller depreciation expense in later periods of its useful life.

**EXAMPLE** A car rental company purchases a new vehicle for \$35,000. The company expects the vehicle to last for 5 years, after which the vehicle will be sold for a salvage value of \$5,000. Calculate depreciation expense over the life of the asset using the straight-line method of depreciation.

1. **Calculate the Depreciable Base:**  $\$35,000 \text{ (Cost of Asset)} - \$5,000 \text{ (Salvage Value of Asset)} = \$30,000 \text{ Depreciable Base}$
2.  $\$30,000 \text{ (Depreciable Base)} \div 5 \text{ (number of years of useful life)} = \$6,000 \text{ (Annual depreciation expense)}$

# 8 Sum-of-the-Years'-Digits Depreciation Calculation

**ALT NAME:** SYD Method

**CALCULATION:** (Remaining Useful Life of the Asset ÷ Sum of the years' digits) x Depreciable Base

## COMPONENTS

- **Remaining Useful Life of the Asset:** The remainder of the period of time for which the asset will be economically feasible for use in a business.
- **Sum-of-the-Years' digits:** The sum of remaining asset life every year in the asset's useful life.
- **Depreciable Base:** The value of the asset to be written off over time.
- **Annual Depreciation Expense:** The portion of a depreciable asset deemed to have been consumed or expired during a specific accounting period.

## DESCRIPTION

The sum-of-the-year' digits depreciation method is an accelerated method of depreciation, which means that a higher amount of depreciation expense is charged in the early years of an asset's useful life since this is when the asset is most productive.

One problem with this and other accelerated depreciation methods is that it artificially reduces the business's reported profit over the near term. The outcome is excessively low profits in the near term, followed by excessively high profits in later accounting periods.

### EXAMPLE

A car rental company purchases a new vehicle for \$35,000. The company expects the vehicle to last for 5 years, after which the vehicle will be sold for a salvage value of \$5,000. Calculate depreciation expense over the life of the asset using the Sum-of-the-Years' Digits method of depreciation.

1. **Calculate the Depreciable Base:** \$35,000 (Cost of Asset) – \$5,000 (Salvage Value of Asset) = \$30,000 Depreciable Base
2. **Remaining Useful Life of the Asset: 5 years (Year 1);** 4 years (Year 2); 3 years (Year 3); 2 years (Year 4); and 1 year (Year 5)
3. **Sum-of-the-Years' digits:** 5 + 4 + 3 + 2 + 1 = 15 years
4. **Depreciation Factor:** 5/15 x \$30,000 Depreciable Base = \$10,000 Depreciation Expense (Year 1)

# 9 Units-of-Output Depreciation Calculation

**ALT NAME:** Units of Production; Units of Activity

**CALCULATION:**  $(\text{Depreciable Base} \div \text{Estimated Production Capability}) \times \text{Units Per Year} = \text{Annual Depreciation Expense}$

## COMPONENTS

- **Depreciable Base:** The value of the asset to be written off over time.
- **Estimate Production Capability:** The total number of hours of usage of an asset or the total number of units to be produced by an asset over its useful life.
- **Units Per Year:** The actual number of units produced or numbers of hours of usage by an asset for an accounting period.
- **Annual Depreciation Expense:** The portion of a depreciable asset deemed to have been consumed or expired during a specific accounting period.

## DESCRIPTION

The direct relationship between asset usage and expense in the units-of-output method makes it the most accurate depreciation method. While most depreciation methods base depreciation expense on the passage of time, the units-of-output method is unique because the amount of depreciation expense is directly proportional to the amount of asset usage in the accounting period.

As a result, the amount of depreciation expense could be higher or lower, depending on whether there was more or less asset usage during that period. Under this method, depreciation begins when an asset begins to produce units and ends when the unit's cost is fully recovered, or the unit has produced all units within its estimated production capacity, whichever comes first.

Typically, this depreciation method is reserved for more expensive assets because it requires that the company track asset usage, resulting in additional costs. Another limiting factor for this method is that one must be able to estimate the total usage over the life of an asset for this process to be applicable.

## 9 Units-of-Output Depreciation Calculation

The units-of-output method is most commonly utilized for internal bookkeeping within manufacturing businesses because it can help present a more accurate depiction of profits and losses.

For manufacturing companies, for which production varies based on consumer demand, the cost of machinery can be allocated throughout the years based on how much the asset has been used.

**EXAMPLE** A car rental company purchases a new vehicle for \$35,000 with an estimated capacity to be driven 200,000 miles during its 5-year life. Miles driven for each of the five years are as follows: Year 1: 75,000 miles; year 2: 50,000 miles; year 3: 30,000; year 4: 25,000 miles; year 5: 20,000 miles. The expected salvage value of the vehicle is \$5,000. Calculate depreciation expense over the life of the asset using the Units-of-Output method of depreciation.

1. **Calculate the Depreciable Base:**  $\$35,000$  (Cost of Asset) –  $\$5,000$  (Salvage Value of Asset) =  $\$30,000$  Depreciable Base
2. **Calculate Cost Per Unit:**  $\$30,000$  (Depreciable Base)  $\div$  200,000 miles =  $\$0.15$  per mile
3. **Calculate Annual Depreciation Expense:**  $\$0.15$  per mile  $\times$  75,000 miles (Year 1) =  $\$11,250$



# 10 Weighted-Average Cost Method of Inventory Calculation

**ALT NAME:** N/A

**CALCULATION:**  $\text{Cost of Goods Available for Sale} \div \text{Number of Units Available for Sale} = \text{Weighted Average Cost per Unit}$

## COMPONENTS:

- **Cost of Goods Available for Sale:** The beginning value of inventory plus the cost of goods purchased in the accounting period.
- **Number of Units Available for Sale:** The total number of units in inventory, or the number of units a company can sell.
- **Weighted Average Cost per Unit:** The figure used to determine the cost of goods sold and ending inventory amounts at the end of an accounting period.

## DESCRIPTION

The weighted-average cost method of inventory valuation uses a weighted average to determine the amounts for cost of goods sold and ending inventory as opposed to both LIFO and FIFO, which focus on the timing and order of when goods are added to inventory.

Two common situations in which the weighted average cost method is utilized are when inventory items are intermixed to a point where it is impossible to assign a specific cost to an individual unit, and a company's accounting system isn't advanced enough to track LIFO or FIFO.

Because tracking inventory is not necessary for the weighted-average cost method, it is considered the simplest way to track inventory. There are, however, some disadvantages associated with this method when inventory prices vary by a large amount.

Weighted-average cost assumes that all units are identical, which may not always be the case due to product upgrades or additional features of newer batches. Ideally, a company will make up for any loss from selling the most expensive units when selling the less expensive units. Still, if there is a decline in sales, inventory may be discontinued without ever recovering the losses associated with the sale of the expensive units.

# 11 Net Income Equation

**ALT NAME:** Net Profit, Net Earnings, the Bottom Line

**CALCULATION:** Revenues + Gains – Expenses – Losses = Income (Loss)

**COMPONENTS:**

- **Revenues:** Income generated from sales of goods or services associated with the main operations before any costs or expenses are deducted.
- **Gains:** Any economic benefit that is outside the normal operations of a business. Common examples include the excess of money or fair value when an asset is sold or exchanged for more than its purchase price.
- **Expenses:** Costs incurred to generate revenue. Common examples include the cost of goods sold, operating expenses, sales, general, and administrative expenses, and amortization/depreciation expense.
- **Losses:** A decrease in net income outside the normal operations of the business. Common examples include the sale of an asset for less than its carrying value, the write-down of assets, or a loss from lawsuits.
- **Net Income (Loss):** The amount of profit or loss after expenses and losses are subtracted from revenues and gains.

# 11 Net Income Equation

## DESCRIPTION

Net income is one of the most critical indicators of a company's financial health as it measures the profit earned (or money lost) over a period of time. Shareholders follow net income very closely as it impacts many financial ratios and determines the amount of dividend that will be paid to stockholders.

It is important to note that net income is not always a reliable figure since management may manipulate the rules of accrual basis accounting to modify income levels to achieve bonus payments or meet the pressures of analyst expectations. Inversely, net income can be artificially reduced to avoid income tax payments.

## HIGH/LOW ANALYSIS:

- A higher net income could result from an increase in sales volume, an increase in the sales price, or an increase in investment income. A decrease in expenses, such as cost of goods sold and sales, general, and administrative expenses, will also result in an increased level of net income.
- Conversely, a decrease in revenue caused by reduced sales prices or low sales volume can result in less, or negative, net income. Likewise, an increase in the cost of goods sold and other sales, general, and administrative expenses will cause net income to decrease.

# 12 Cost of Goods Sold (COGS) Calculation

**ALT NAME:** Cost of Sales, Cost of Services

**CALCULATION:** Beginning Inventory + Purchases during the period  
– Ending Inventory = COGS

**COMPONENTS:**

- **Beginning Inventory:** The value of goods that a company has for its use or sale at the start of an inventory accounting period.
- **Purchases During the Period:** The value of goods purchased during the period.
- **Ending Inventory:** The value of goods that a company has on hand at the end of the reporting period.
- **Cost of Goods Sold:** The accumulated total of all costs used to create a product or service that has been sold.

**TIP** To determine if an expense should be classified as a cost of goods sold, consider whether or not the expense is the result of the initiation of a sale.

## DESCRIPTION

Cost of goods sold is an indication of operational efficiency, and an organization should aim to keep the metric as low as possible. An organization's understanding of its cost of goods sold is vital because it allows the organization to set prices that result in a healthy profit margin and aids the organization in determining when to increase prices for a particular product.

The classification of expenses as cost of goods sold is dependent on the type of business entity. For example, a manufacturing entity's cost of goods sold would generally include direct labor, materials, and overhead used to create products. In contrast, a wholesale entity's cost of goods sold would likely be merchandise that was purchased from a manufacturer.

# 12 Cost of Goods Sold (COGS) Calculation

The cost of goods sold figure is also susceptible to fraudulent manipulation to alter the reported level of profits. Common methods to manipulate cost of goods sold include incorrectly counting the inventory quantity on hand, allocating more overhead than actually exists to inventory, and performing an incorrect period-end cutoff.

## HIGH/LOW ANALYSIS

The inventory costing methodology used by an organization to calculate the cost of ending inventory can significantly impact the measure of cost of goods sold.

1. **First in, first out method (FIFO):** Assumes that the first inventory added is the first inventory used. When prices are increasing in an inflationary environment, lower-cost goods are used first, resulting in a lower cost of goods sold and higher net income.
2. **Last in, first out method (LIFO):** Assumes that the last inventory added is the first inventory used. When prices are increasing, higher-cost goods are used first, resulting in a higher cost of goods sold and lower net income.
3. **Average method:** Uses the average price of all the goods in stock, regardless of purchase date. This method keeps the cost of goods sold at a more balanced level than the FIFO and LIFO methods because it prevents cost of goods sold from being highly impacted by extreme costs of one or more purchases.

# 13 Retained Earnings Calculation

**ALT NAME:** Earned Surplus, Retained Capital, Accumulated Earnings

**CALCULATION:** Beginning Retained Earnings + Net Income (Loss) During Period – Dividends Paid During Period = Retained Earnings

## COMPONENTS:

- **Beginning Retained Earnings:** The amount of retained earnings from the previous accounting period.
- **Net Income (Loss) During Period:** The amount of profit or loss after expenses and losses are subtracted from revenues and gains from the current period.
- **Dividends Paid During Period:** The portion of a company's earnings paid to investors during the period.
- **Retained Earnings:** The profits that a company has earned to date, less any dividends or other distributions paid to investors.

## DESCRIPTION

Retained earnings is the profit amount of a business that has not been distributed to investors and are retained by the business to, among other things, invest in working capital or pay down outstanding liabilities.

It is important to note that retained earnings does not represent surplus cash or the amount of cash left over after the distribution of dividends. Instead, it explains what a company did with its profits. Since all profits and losses flow through retained earnings, the balance is constantly changing because any income statement activity will directly impact the net income part of the retained earnings calculation.

Growing industries and industries that rely on large amounts of capital tend to retain more of their earnings to invest in more assets needed to operate the business; it is also common for older companies to report higher retained earnings than similar younger companies due to the amount of earnings accumulated over time.

# 14 Measurement of Inventory at Lower of Cost or Market (LCM) Calculation

**ALT NAME:** NA

**TERMS:**

- **Upper Limit (Ceiling):** Net Realizable Value (NRV) of Inventory
- **Replacement Cost of Inventory**
- **Lower Limit (Floor):** Net Realizable Value (NRV) – Normal Profit Margin on the Inventory

**COMPONENTS:**

- **Net Realizable Value (NRV):** The expected selling price of an item minus any selling costs or costs to complete the item.
- **Replacement Cost:** The market value of an item; may be expressed in the form of purchase cost or manufacturing cost.

**Determining Current Market Value using Net Realizable Value (NRV)**

- When replacement cost is lower than the market floor, the current market value from the LCM rule is the market floor.
- When replacement cost falls between the market floor and market ceiling, the current market value from the LCM rule is replacement cost.
- When replacement cost is higher than the market ceiling, the current market value from the LCM rule is the market ceiling.

# 14 Measurement of Inventory at Lower of Cost or Market (LCM) Calculation

## DESCRIPTION

The lower of cost or market (LCM) is an accounting rule used to value inventory. The LCM rule dictates that a business must record the cost of inventory at whichever cost is lower: (a) the historical cost or (b) its current market value.

Typically, the LCM valuation method is used when inventory has deteriorated, or become obsolete, or market prices have declined. Since the passage of time can bring about the aforementioned conditions, the rule is more likely to be applicable when a business has held inventory for a long time. For this older inventory, GAAP requires an annual test to adjust the balance to the lower of cost or market. The test is required so that losses on inventory are matched with earnings for the same period. This prevents the reporting of inflated earnings for the same period discounted inventory items are sold.

The current market value in LCM is the current replacement cost not exceeding the ceiling of net realizable value (NRV) and not below the floor of NRV adjusted for a normal profit margin (NRV – normal profit margin).

At the end of the fiscal year, the remaining inventory items are compared to the current market value. If the current market value is less than the historical cost, the items are adjusted down to the current market price to account for the lost value. However, if the current market value is greater than the historical cost, the items remain at historical cost.



# 15 Warranty Liability Calculation

**ALT NAME:** NA

**CALCULATION:** Sales Forecast x Percentage of Historical Warranty Cost based on Sales

**COMPONENTS:**

- **Sales Forecast:** The projection of achievable sales revenue based on historical sales data and an analysis of market surveys and trends.
- **Percentage of Historical Warranty Cost based on Sales:** The percentage of revenues used to pay for warrantied repairs and replacements from historical periods.

**DESCRIPTION**

If a company issues a warranty on a product it sells, the company must record a liability to reflect the estimated costs of repairing or replacing the item under warranty.

The estimated warranty liability should be recorded in the same period as the sale, and the warranty liability account is reduced as the company pays for warrantied repairs.

Typically, a company will compare historical sales and warranty claim data to forecast the amount of future sales and warranty expense; if historical data is not available, the company will use industry averages.

Depending on the warranty's length, the warranty liability account may need to be split between the current (payable within a year) and long-term (not payable for over a year) liability sections of the balance sheet.

The initial recording of accrued warranty liability should be a debit to the warranty expense account and a credit to the accrued warranty liability account; redemption of a warranty would result in a debit to the accrued warranty liability account and a credit to the inventory/cash account.

Companies with a minimal history of warranty expenditures may choose not to record a liability in advance of actual warranty expense since the forecast would be that warranty expense is immaterial. The concept of warranty liability is least common for service companies since it is more difficult to determine what qualifies as a warranty liability, as most services are customized.

# 16 Asset Carrying Value Calculation

**ALT NAME:** Book Value, Carrying Amount

## **CALCULATIONS:**

- Original Cost – Accumulated Depreciation – Asset Impairment  
(Physical Assets)
- Original Cost – Amortization Expense – Asset Impairment  
(Intangible Assets)

## **COMPONENTS:**

- **Original Cost:** The total price paid to acquire an asset initially.
- **Accumulated Depreciation:** The total amount of an asset's cost that has been charged to depreciation expense since the asset was placed into service.
- **Amortization Expense:** The write-off of an intangible asset over its expected period of use, which reflects consumption of an asset.
- **Asset Impairment:** A permanent reduction in the value of a company's asset, typically a fixed asset.

## **DESCRIPTION**

An asset's carrying value represents the original amount reflected on the company's balance sheet, minus the accumulated depreciation of the asset and any asset impairments.

For physical assets, such as computers and machinery, the carrying value can be computed by subtracting accumulated depreciation from the asset's original cost.

Similarly, the carrying value of patents and other intellectual property can be calculated by subtracting amortization expense from the asset's original cost.

Upon acquisition of an asset, its carrying value is exactly the same as its purchase price. Because the original cost can be traced to a purchase document, such as a receipt, accounting guidelines dictate that the original cost should be used to record assets on the balance sheet instead of market value.

# 17 Fair Value of an Asset Calculation

**ALT NAME:** NA

## DESCRIPTION

Fair value represents the actual value of an asset that is agreed upon by both the seller and the buyer, hence the usage of the term fair.

A product sold due to liquidation is not eligible for a fair value assessment, but products sold or traded in the market where they belong or in normal conditions are eligible.

There are multiple ways to calculate fair value depending on the product. Some of the sources used to calculate fair value are market prices quoted from a stock exchange (market approach), the estimated cost to replace an asset taking into account adjustments for obsolescence (cost approach), and the discounted cash flow method (income approach).

# 18 Interest Expense Calculation for Amortizing a Premium or Discount on Bonds

**ALT NAME:** NA

**CALCULATION:** Carrying Value of Bonds at Beginning of Period x Effective – Interest Rate

## COMPONENTS:

- **Carrying Value of Bonds at Beginning of Period:** The face amount minus any unamortized discounts or plus any unamortized premium, also known as book value.
- **Effective-Interest Rate:** The interest rate that is actually earned or paid on an investment due to the result of compounding over a given time period.

## DESCRIPTION

The face value of a bond is the amount paid to the owner at maturity.

If bonds sell for less than face value, then they sell at a discount.

When a bond is sold at a discount, the amount of the discount must be amortized to interest expense over the bond's life. Because the debit amount in the Discount on Bonds Payable account will be transferred to the Interest Expense account, the amortization will cause each period's interest expense to be greater than the amount of interest paid during each of the years that the bond is outstanding.

The preferred method for amortizing this discount is the effective interest rate method. Under this method, the amount of interest expense in a given accounting period will correlate with the amount of a bond's book value at the beginning of the accounting period. As a result, as a bond's book value increases, the amount of interest expense will increase.

# 18 Interest Expense Calculation for Amortizing a Premium or Discount on Bonds

If bonds sell for more than face value, then they sell at a premium. When a bond is sold at a premium, the amount of the bond premium must be amortized to interest expense over the bond's life.

As a result, the credit balance in the Premium on Bonds Payable account will be transferred to the Interest Expense account, reducing the interest expense in each of the accounting periods that the bond is outstanding.

The preferred method for amortizing this premium is the effective interest rate method. Under this method, the amount of interest expense in a given accounting period will correlate with the amount of a bond's book value. When a bond's book value decreases, the amount of interest expense will decrease.

# 19 Simple Linear Regression Analysis Calculation

**CALCULATION:**  $y = bx + a$

**COMPONENTS:**

- **y** = The value being forecast (dependent variable)
- **b** = The slope of the regression line
- **x** = The value of the independent variable
- **a** = The value of y (dependent variable) if the value of x (independent variable) is 0

**DESCRIPTION**

Linear regression models are used to show or predict the relationship between two variables.

Simple linear regression analysis is a statistical tool used to quantify the relationship between one independent variable and one dependent variable based on past experience.

The variable that is being predicted is the dependent variable, and the variable used to predict the dependent variable is called the independent variable.

In simple linear regression analysis, a straight line approximates the relationship between the independent and dependent variables.

It is important to note that regression analysis can establish a correlation between two variables, but correlation does not prove causation.

# 20 Calculation for Average Annual Growth Rate (AAGR)

**CALCULATION:**  $(\text{Growth Rate in Period A} + \text{Growth Rate in Period B} + \dots + \text{Growth Rate in Period n}) \div \text{Number of Periods}$

## COMPONENTS:

- **Growth Rate:** The amount by which a variable increases over a given period of time as a percentage of its previous value; calculated as  $\frac{(\text{Ending Value} - \text{Beginning Value})}{\text{Beginning Value}}$ .
- **Number of Periods:** The number of accounting periods for which there is a separate value for growth rate.

## DESCRIPTION

The average annual growth rate (AAGR) is the average increase in the value of an individual investment or asset over the period of a year.

The periods used to calculate the AAGR should all be of equal length for the result to be accurate.

Also, AAGR can be calculated for any investment but will not consider any information about an investment's risk level caused by price volatility.

This metric helps examine the long-term trends associated with various investments and can help a company make business decisions based on the amount of the return.

It is important to note that AAGR can sometimes be misleading because it does not account for the effects of compounding between periods.

Therefore, a separate metric known as the compounded annual growth rate (CAGR) takes compounding into consideration when calculating the annual growth rate.

# 21 Static Budget Calculation

**CALCULATION:** Budgeted Quantity (BQ) x Budgeted Price (BP) = Static Budget Amount

**COMPONENTS:**

- **Budgeted Quantity (BQ):** The estimated number of units to be manufactured during the accounting period.
- **Budgeted Price (BP):** The estimated selling price for one manufactured unit during the accounting period.
- **Static Budget:** An amount representing the estimated number of units manufactured at the estimated selling price for the accounting period.



# 22 Actual Results Calculation for the Static Budget

**CALCULATION:** Actual Quantity (AQ) x Actual Price (AP) = Actual Results

**COMPONENTS:**

- **Actual Quantity (AQ):** The actual number of units manufactured during the accounting period.
- **Actual Price (AP):** The actual selling price for one manufactured unit during the accounting period.
- **Actual Results:** An amount representing the actual number of units manufactured at the actual selling price for the accounting period.

# 23 Flexible Budget Calculation

**ALT NAME:** Variable Budget

**CALCULATION:** Actual Quantity (AQ) x Budgeted Price (BP) = Flexible Budget

**COMPONENTS:**

- **Actual Quantity (AQ):** The actual number of units manufactured during the accounting period.
- **Budgeted Price (BP):** The estimated selling price for one manufactured unit during the accounting period.
- **Flexible Budget:** An amount representing the actual number of units manufactured at the estimated selling price for the accounting period.

# 24 Flexible Budget Variance Calculation

**CALCULATION:** Flexible Budget Amount (AQ x BP) – Actual Results (AQ x AP) = Flexible Budget Variance

## COMPONENTS:

- **Flexible Budget Amount:** Actual Quantity (AQ) x Budgeted Price (BP)
- **Actual Results for Static Budget:** Actual Quantity (AQ) x Actual Price (AP)
- **Flexible Budget Variance:** The difference between the actual and estimated selling price for the actual number of units manufactured during the accounting period.

## DESCRIPTION

In contrast to a static budget, a flexible budget adjusts in response to changes in volume or activity. In a business environment where costs are closely related to the level of business activity, the budget will flex because it will include a variable rate per unit of activity instead of one fixed total amount.

The flexible budget also provides a more accurate method to track managers' performance because the budget is redistributed based on actual activity levels and should remain fairly precise regardless of the level of activity. One disadvantage of flexible budgeting is that it can be difficult to formulate because many costs are not fully variable, requiring a fixed cost component to be incorporated into the budget formula. Depending on the company's size, there may not be enough resources to devote a large amount of time to developing the budget formulas.

# 24 Flexible Budget Variance Calculation

Furthermore, a limitation of the flexible budget is the inability to compare budgeted revenues to actual revenues because the two numbers are the same. The purpose of this method is to compare actual and budgeted expenses, not revenues, so there is no way to know whether actual revenues were above or below the estimated amount.

A flexible budget variance is the difference between the amounts listed in a flexible budget and actual results. Because the amounts in a flexible budget variance are both based on the same level of activity, the variances are much more relevant than those calculated using the static budget.

If the amount of actual revenue is recorded in the flexible budget, any variance will be strictly between budgeted and actual expenses. If actual expenses are less than the flexible budget amount of expenses, the variance is favorable (increased profits); conversely, if the actual expenses are more than the flexible budget amount of expenses, the variance is unfavorable (decreased profits).

Similarly, if the actual number of units sold has been recorded in the flexible budget, then the variances could be between both standard and actual revenue per unit and budgeted and actual expenses. Generally, the flexible budget variance should be smaller than the static budget variance since the unit volume or revenue level is adjusted to match actual results. However, an unusually large flexible budget variance may indicate that the budget formulas need to be modified.

# 25 Sales-Volume Variance Calculation

**ALT NAME:** Sales Quantity Variance

**CALCULATION:** Static Budget Amount (BQ x BP) – Flexible Budget Amount (AQ x BP) = Sales-Volume Variance

## COMPONENTS:

- **Static Budget Amount:** Budgeted Quantity (BQ) x Budgeted Price (BP)
- **Flexible Budget Amount:** Actual Quantity (AQ) x Budgeted Price (BP)
- **Sales-Volume Variance:** The difference between the actual and estimated number of units manufactured during the accounting period at the estimated selling price.

## DESCRIPTION

The sales-volume variance is used to measure the change in profit due to the difference between actual and budgeted sales quantity. The variance measures the amount of revenue earned when the product is sold based on actual sales volume compared to the amount of revenue a company expected to bring in based on projected sales volume.

A favorable sales-volume variance indicates that the actual quantity of units sold was more than the budgeted quantity of units sold; thus, actual revenues are higher than budgeted revenues, which typically leads to higher profit.

On the contrary, an unfavorable sales-volume variance indicates that the actual quantity of units sold is less than the budgeted quantity of units sold; thus, actual revenues are lower than budgeted revenues, which typically leads to lower profits.

Some of the possible causes of a favorable sales-volume variance include a decrease in product prices, a reduction in competition, and inaccurate budgeting. An unfavorable sales-volume variance can be caused by any of the following:

1. **An increase in competition**
2. **An increase in product prices**
3. **A decrease in product demand**
4. **A governmental restriction on exports**
5. **Inaccurate budgeting**

# 26 Directs Material Price Variance Calculation

**ALT NAME:** Direct Material Spending/Rate Variance

**CALCULATION:** Actual Cost of Direct Materials (AP x AQ) – Actual Quantity of Direct Materials at Standard Price (SP x AQ) = Direct Materials Price Variance

**COMPONENTS:**

- **Actual Cost of Direct Materials:** Actual Price (AP) x Actual Quantity (AQ)
- **Actual Quantity of Direct Materials at Standard Price:** Standard Price (SP) x Actual Quantity (AQ)
- **Direct Materials Price Variance:** The difference between the actual amount spent on direct materials purchased and the amount that would have been spent had the material been purchased at the standard price (standard prices are estimated and are used for budgeting).

**DESCRIPTION**

The direct materials price variance is used to monitor the costs incurred to produce goods and determine the purchasing department's efficiency in obtaining direct material at a low cost. Keeping in mind the current market prices and anticipated changes in material costs in the near future, companies set standard amounts for direct materials prices.

However, several factors can cause the actual price of materials to deviate from the standard price significantly. As a result, a business may have to pay more or less than what was considered normal when the standard amounts were set.

# 26 Directs Material Price Variance Calculation

If the actual price paid for materials is more than the standard price, an unfavorable materials price variance occurs. Some of the reasons for an unfavorable variance include an overall hike in the market price of materials, the purchase of materials of higher quality than the standard, an increase in the bargaining power of suppliers, the loss of purchase discounts due to smaller order sizes, and inefficient purchasing by the procurement staff.

Conversely, if the actual price paid for materials is less than the standard price, a favorable materials price variance occurs. The basis for a favorable variance may include an overall decrease in the market price level, the purchase of materials of lower quality than the standard, better price negotiation by the procurement staff, implementation of improved procurement practices (e.g., soliciting price quotes from multiple suppliers), and purchase discounts on large orders.

In some situations, a favorable direct materials price variance needs to be analyzed in conjunction with the direct materials quantity variance calculation to determine if the outcome is good. For example, a purchasing department may purchase low-quality raw material to generate a favorable direct materials price variance that could be offset by an unfavorable direct materials quantity variance due to waste of low-quality direct material.

Typically, the purchasing department is responsible for the direct materials price variance because it has control over the selection of suppliers and the acquisition of materials.

# 27 Direct Materials Quantity Variance Calculation

**ALT NAME:** Direct Material Usage/Efficiency Variance

**CALCULATION:** Actual Quantity of Direct Materials at Standard Price (AQ x SP) – Standard Quantity of Direct Materials at Standard Price (SQ x SP) = Direct Materials Quantity Variance

**COMPONENTS:**

- **Actual Quantity of Direct Materials at Standard Price:** Actual Quantity (AQ) x Standard Price (SP)
- **Standard Quantity of Direct Materials Allowed:** Standard Quantity (SQ) x Standard Price (SP)
- **Direct Materials Quantity Variance:** The difference between the actual number of materials used in the production process and the amount that was expected to be used, multiplied by the standard price.

**DESCRIPTION**

Direct materials quantity variance is used to determine a production department's efficiency in converting raw materials into finished goods. The main way to improve efficiency for this production stage is to reduce the amount of raw material waste.

If the actual quantity of direct materials used is less than the standard quantity, the variance is favorable because the company could save money on materials. A few contributing factors of a favorable direct materials quantity variance are reduced spoilage due to higher quality materials, advanced employee training about the efficient use of materials, and improved maintenance of production equipment that reduces material waste.



# 27 Direct Materials Quantity Variance Calculation

Although a favorable variance typically suggests that workers were efficient in using raw materials, the figure may also indicate that the production department is producing lower quality products due to trying to reduce the total cost of materials.

Contrarily, if the actual quantity of direct materials used is greater than the standard quantity, the variance is unfavorable since the company used excessive materials to produce its output. Unfavorable direct material variances are commonly caused by increased demand for materials leading to higher prices, a materials shortage due to the shutdown of a key supplier, ineffective price negotiation by the purchasing agent, inexperienced workers, outdated or malfunctioning equipment, and the purchase of substandard raw materials.

Typically, the production department is responsible for the direct materials quantity variance because of its direct control over material usage.

# 28 Direct Labor Price Variance Calculation

**ALT NAME:** Direct Labor Rate Variance

**CALCULATION:** Actual Cost of Direct Labor (AR x AH) – Actual Hours of Direct Labor at Standard Rate (SR x AH) = Direct Labor Price Variance

## COMPONENTS:

- **Actual Cost of Direct Labor:** Actual Rate (AR) x Actual Hours Worked (AH)
- **Actual Hours of Direct Labor at Standard Rate:** Standard Rate (SR) x Actual Hours Worked (AH)
- **Direct Labor Price Variance:** The difference between the actual cost of direct labor and the standard cost of direct labor for the number of hours worked.

## DESCRIPTION

The direct labor price variance is used to gauge the human resources department's performance in negotiating lower wage rates with employees and labor unions. An unfavorable direct labor price variance indicates higher labor costs incurred during a period compared to standard costs.

Possible reasons for an unfavorable variance include an increase in the national minimum wage rate, hiring more skilling labor than anticipated in the standard, inefficient hiring by the HR department, and effective negotiations by labor unions.

On the other hand, a favorable direct labor price variance implies cost-efficient employment of direct labor by the company. Some explanations for the favorable variance could include hiring more un-skilled or semi-skilled labor, a decrease in the overall wage rates in the market due to an increase in the supply of labor, and an

# 28 Direct Labor Price Variance Calculation

inappropriately high setting of the standard cost of direct labor due to inaccurate planning.

In some cases, a favorable direct labor variance may not be positive. In certain circumstances, when low-skilled workers are recruited at a lower wage rate, the direct labor price variance will be favorable. Still, these workers will be inefficient, resulting in an unfavorable direct labor efficiency variance. As a result, the direct labor price variance should be analyzed in conjunction with the direct labor efficiency variance to understand these variances in their totality.

Typically, production supervisors bear responsibility for labor price variances because these differences usually arise because of how labor is used.

# 29 Direct Labor Efficiency Variance

**ALT NAME:** Direct Labor Quantity Variance

**CALCULATION:** Actual Hours of Direct Labor at Standard Rate (SR x AH) – Standard Cost of Direct Labor (SR x SH) = Direct Labor Efficiency Variance

**COMPONENTS:**

- **Actual Hours of Direct Labor at Standard Rate:** Standard Rate (SR) x Actual Hours Worked (AH)
- **Standard Cost of Direct Labor:** Standard Rate (SR) x Total Standard Hours (SR)
- **Direct Labor Efficiency Variance:** The difference between the actual number of hours used to manufacture a certain number of units and the number of hours allowed by standards to manufacture that number of units multiplied by the standard direct labor rate.

**DESCRIPTION**

The direct labor efficiency variance is calculated in order to measure the performance of a production department in utilizing the abilities of its workers.

A favorable labor efficiency variance signifies better productivity of direct labor during the period as indicated by an excessive amount of estimated standard direct labor hours compared to the actual direct labor hours used. Influences on the favorable variance may include hiring higher-skilled labor, the workforce's training in improved production techniques, the use of better quality raw materials that are easier to handle, and achieving a faster learning curve than anticipated in the standard.

# 29 Direct Labor Efficiency Variance

On the other hand, unfavorable variances represent lower productivity of direct labor during a period compared to the standard, which means that more direct labor hours were used than actually needed. Explanations for the unfavorable labor efficiency variance include the hiring of lower-skilled labor than the standard, a lower learning curve achieved during the period than anticipated in the standard, a decrease in staff morale and motivation, and increased idle time incurred during a period due to disruption or stoppage of activities.

Also, the direct labor efficiency variance should be analyzed in combination with the direct labor price variance because the possibility exists that an unfavorable direct labor efficiency variance is the result of recruiting low skilled workers.

Typically, the manager in charge of production is considered responsible for the labor efficiency variance. Still, in some cases, the purchasing manager could be held responsible if the acquisition of poor materials resulted in excessive labor processing time.




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