



Disclaimer: It is crucial to not only know these formulas, but to know what they mean. These formulas are the hammer and nails you will use to solve economic problems. Memorizing steps alone will not help you in exams because you may be memorizing how to build a chair and then be asked to build a table.

**General Formulas:**

$TC = FC + VC$	Total Cost is equal to Fixed Cost plus Variable Cost. Fixed costs do not change with increases or decreases in output, such as rent, utilities, etc. Variable costs increase with increases in output and decrease with decreases in output, such as labor costs, raw materials, etc.
$TC = P_K * K + P_L * L$	Total Cost is equal to the Price of Capital multiplied by the amount Capital plus the Price of Labor multiplied by the amount of Labor.
$MC = \frac{\Delta TC}{\Delta Q}$	Marginal Cost is equal to the Change in Total Cost divided by the Change in Quantity. Marginal Cost refers to the cost required produce one more unit of Q.
$MC = \frac{W}{MP_L}$	Marginal Cost is equal to the Wage Rate (Price of Labor) divided by the Marginal Productivity of Labor. This will produce the same answer as the above equation if Labor Costs are the only Variable Costs.
$MC = \frac{dTC}{dQ}$	Marginal Cost is equal to the derivative of Total Cost with respect to Quantity.
$MC_X = \frac{Y}{X} * P_Y$	The Marginal Cost of X is equal to the ratio of Y to X multiplied by the Price of Y. This will determine the monetary cost to produce X if the only other option is producing Y.
$MC_Y = \frac{X}{Y} * P_X$	The Marginal Cost of Y is equal to the ratio of X to Y multiplied by the Price of X. This will determine the monetary cost to produce Y if the only other option is producing X.
$TR = P * Q$	Total Revenue to a firm is equal to the Price of the good sold by the Quantity sold.
$MR = \frac{dTR}{dQ}$	Marginal Revenue is the derivative of Total Revenue with respect to Quantity. Marginal Revenue refers to the Revenue gained from the sale of one more unit of Q.
$T\pi = TR - TC$	Total Profit is Total Revenue minus Total Cost. Profits are the money left over after all costs have been subtracted out.

$ATC = \frac{TC}{Q}$	Average Total Cost is equal to Total Costs divided by Quantity. This figure refers to the cost to produce each unit for a given quantity.
$MP_L = \frac{\Delta Q}{\Delta L}$	The Marginal Productivity of Labor is equal to the Change in Quantity divided by the Change in Labor. It is effectively answering the question how many additional units of Q will be produced for each unit of Labor that is hired.
$\varepsilon = \frac{\frac{\Delta Q}{Q}}{\frac{\Delta P}{P}}$	Price Elasticity is equal to the Change in Quantity over Quantity divided by the Change in Price over Price.
$\varepsilon = \frac{dQ}{dP} * \frac{P}{Q}$	Price Elasticity can also be calculated by multiplying the derivative of Quantity with respect to Price by Price of Quantity. The advantage of this method is that it does not require price and quantity changes to be known.
$Q = L^x * K^y$	A firm's output is equal to the amount of Labor raised to its productivity exponent multiplied by Capital raised to its productivity exponent.
$-\frac{MP_L}{MP_K} = -\frac{P_L}{P_K}$	The optimal ratio of Labor and Capital is calculated by setting the slope of the Isoquant (all combinations of L and K that produce the same output) equal to the slope of the Isocost (all combinations of L and K that have the same total cost). Both slopes are downward sloping and therefore carry a negative sign, but both can be omitted and produce the same result.

When calculating values using Supply and Demand curve figures:

Total Value (TV)	Total Value is the area under the Demand Curve up to the specified quantity. It can also be described as the sum of all marginal values up to the specified quantity.
Total Expenditure (TE)	The Price of the good multiplied by the Quantity purchased. It is the total amount of money spent in order to obtain the given quantity.
Consumer Surplus (CS)	Consumer Surplus is equal to Total Value minus Total Expenditure. Conceptually, it is the value that consumers get that they do not have to pay for.
Total Revenue (TR)	Total Revenue to a firm is the Price of the good multiplied by the Quantity purchased. Assuming no taxes or subsidies involved, this should be exactly equal to Total Expenditure as the amount that firms make is equal to the amount that

	consumers spend.
<b>Total Cost (TC)</b>	Total Cost is the area under the Supply Curve up to the specified quantity. It can also be described as the sum of all marginal costs up to the specified quantity.
<b>Producer Surplus (PS)</b>	Producer Surplus is equal to Total Revenue minus Total Cost. Conceptually, it is the revenues that firms get above and beyond their costs. It is also notated as Total Profit.

**Requirements for Competitive Equilibrium:**

$Q_D = Q_S$	Quantity Demanded = Quantity Supplied (The market is in equilibrium and it clears).
$MC = MR = P$	Firms are profit maximizing; meaning Marginal Cost equals Marginal Revenue (which is equal to the market price to a price-taking firm). For monopolies, the profit maximizing point is still the point where Marginal Cost is equal to Marginal Revenue, but it is not equal to the market price.
$ATC = MR = P$	Profits are equal to zero; meaning Average Total Cost is equal to Marginal Revenue which is equal to the market price. It is important to note that economic profits are not the same as accounting profits. If profits are not equal to zero, firms will either leave or enter the industry until supply is adjusted to drive profits back to zero.