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Ratio, Proportion, Percent and Compound Interest

Yuldoshev Mansur Najmiddin ugli
Academic Lyceum of Tashkent State University of Economics lead math science teacher
mansuryuldoshev212901@mail.ru

Abstract. This article explains the concepts of ratio and proportion and gives detailed information about percent and compound percent.

Key words: ratio, proportion, percentage, complex numbers, arithmetic operations, mathematical properties, etc.

Ratio and Proportion are explained majorly based on fractions. When a fraction is represented in the form of a:b, then it is a ratio whereas a proportion states that two ratios are equal. Here, a and b are any two integers. The ratio and proportion are the two important concepts, and it is the foundation to understand the various concepts in mathematics as well as in science. The definition of ratio and proportion is described here in this section. Both concepts are an important part of Mathematics. In real life also, you may find a lot of examples such as the rate of speed (distance/time) or price (rupees/meter) of a material, etc, where the concept of the ratio is highlighted. Proportion is an equation that defines that the two given ratios are equivalent to each other. For example, the time taken by train to cover 100km per hour is equal to the time taken by it to cover the distance of 500km for 5 hours. Such as 100km/hr = 500km/5hrs. In certain situations, the comparison of two quantities by the method of division is very efficient. We can say that the comparison or simplified form of two quantities of the same kind is referred to as a ratio. This relation gives us how many times one quantity is equal to the other quantity. In simple words, the ratio is the number that can be used to express one quantity as a fraction of the other ones. The two numbers in a ratio can only be compared when they have the same unit. We make use of ratios to compare two things. The sign used to denote a ratio is ‘:’. A ratio can be written as a fraction, say 2/5. We happen to see various comparisons or say ratios in our daily life. Proportion is an equation that defines that the two given ratios are equivalent to each other. In other words, the proportion states the equality of the two fractions or the ratios. In proportion, if two sets of given numbers are increasing or decreasing in the same ratio, then the ratios are said to be directly proportional to each other. For example, the time taken by train to cover 100km per hour is equal to the time taken by it to cover the distance of 500km for 5 hours. Such as 100km/hr = 500km/5hrs. Ratio and proportions are said to be faces of the same coin. When two ratios are equal in value, then they are said to be in proportion. In simple words, it compares two ratios. Proportions are denoted by the symbol ‘::’ or ‘=’. The proportion can be classified into the following categories, such as:

- Direct Proportion
- Inverse Proportion
- Continued Proportion

The direct proportion describes the relationship between two quantities, in which the increases in one quantity, there is an increase in the other quantity also. Similarly, if one quantity decreases, the other quantity also decreases. Hence, if “a” and “b” are two quantities, then the direction proportion is written as a∝b. The inverse proportion describes the relationship between two quantities in which

an increase in one quantity leads to a decrease in the other quantity. Similarly, if there is a decrease in one quantity, there is an increase in the other quantity. Therefore, the inverse proportion of two quantities, say "a" and "b" is represented by $a \propto (1/b)$. The following are the important properties of proportion:

Addendo – If a : b = c : d, then a + c : b + d

Subtrahendo – If a : b = c : d, then a – c : b – d

Dividendo – If a : b = c : d, then a – b : b = c – d : d

Componendo – If a : b = c : d, then a + b : b = c+d : d

Alternendo – If a : b = c : d, then a : c = b: d

Invertendo – If a : b = c : d, then b : a = d : c

Componendo and dividendo – If a : b = c : d, then a + b : a – b = c + d : c – d

Interest is defined as the cost of borrowing money, as in the case of interest charged on a loan balance. Conversely, interest can also be the rate paid for money on deposit, as in the case of a certificate of deposit. Interest can be calculated in two ways: simple interest or compound interest. There can be a big difference in the amount of interest payable on a loan if interest is calculated on a compound basis rather than on a simple basis. On the positive side, the magic of compounding can work to your advantage when it comes to your investments and can be a potent factor in wealth creation. While simple interest and compound interest are basic financial concepts, becoming thoroughly familiar with them may help you make more informed decisions when taking out a loan or investing. Compound Interest = total amount of principal and interest in future (or future value) less the principal amount at present, called present value (PV). PV is the current worth of a future sum of money or stream of cash flows given a specified rate of return. While the total interest payable over the three-year period of this loan is $1,576.25, unlike simple interest, the interest amount is not the same for all three years because compound interest also takes into consideration the accumulated interest of previous periods. Interest payable at the end of each year is shown in the table below.

Year	Opening Balance (P)	Interest at 5% (I)	Closing Balance (P+I)
1	$10,000.00	$500.00	$10,500.00
2	$10,500.00	$525.00	$11,025.00
3	$11,025.00	$551.25	$11,576.25
Total Interest		$1,576.25	

When calculating compound interest, the number of compounding periods makes a significant difference. Generally, the higher the number of compounding periods, the greater the amount of

compound interest. So for every $100 of a loan over a certain period, the amount of interest accrued at 10% annually will be lower than the interest accrued at 5% semiannually, which will, in turn, be lower than the interest accrued at 2.5% quarterly. In the formula for calculating compound interest, the variables "i" and "n" have to be adjusted if the number of compounding periods is more than once a year. That is, within the parentheses, "i" or interest rate has to be divided by "n," the number of compounding periods per year. Outside of the parentheses, "n" has to be multiplied by "t," the total length of the investment. Therefore, for a 10-year loan at 10%, where interest is compounded semiannually (number of compounding periods = 2), i = 5% (i.e., 10% ÷ 2) and n = 20 (i.e., 10 x 2). Compounding can work in your favor when it comes to your investments, but it can also work for you when making loan repayments. For example, making half your mortgage payment twice a month, rather than making the full payment once a month, will end up cutting down your amortization period and saving you a substantial amount of interest. Compounding can work against you if you carry loans with very high rates of interest, like credit card or department store debt. For example, a credit card balance of $25,000 carried at an interest rate of 20%—compounded monthly—would result in a total interest charge of $5,485 over one year or $457 per month.

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