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Percentages and Complex Numbers

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ABSTRACT

This article describes in detail about percentages and complex numbers, which are one of the pillars of mathematics, as well as detailed examples and problems.

The subject studied in mathematics education should not be limited only to mathematics. Based on the topic, it is appropriate to give various questions aimed at forming the student's competencies. The result of solving a problem that has only mathematical content is that the student acquires mathematical knowledge and develops skills in relation to the subject being studied. But giving problems related to life processes will not only improve their mathematical knowledge, but also their ability to apply it in life. He learns to apply the elements of this topic in a life situation and to look for the right solution. A percentage of a given number is said to be one hundredth of it and is denoted by %. For example, 1% of a number p represents a fraction. There are usually 4 types of interest examples:

1) find the percentage of the number; for example, find p% i x of the number a.
2) find the number according to the percentage; for example, p % of a number is equal to P.
3) find the percentage ratio of two numbers;
4) on compound interest.

A percentage is a portion of a whole expressed as a number between 0 and 100 rather than as a fraction. All of something is 100 percent, half of it is fifty percent, none of something is zero percent. To determine a percentage, you divide the portion of the whole by the whole itself and multiply by 100. So if you just ate two pieces of an eight-piece pie, and you want to know what percentage of the pie you consumed, you' d first divide 2 by 8 which equals .25. Then multiply .25 times 100 and get 25 percent. A percentage can also mean a portion of something but only when it has to do with numbers. When you buy furniture, the salesman gets a percentage of what you spend. The word 'percentage' is very familiar to us as it is used regularly in the media to describe anything from changes in the interest rate, to the number of people taking holidays abroad, to the success rate of the latest medical procedures or exam results. Percentages are a

useful way of making comparisons, apart from being used to calculate the many taxes that we pay such as VAT, income tax, domestic fuel tax and insurance tax, to name but a few. So percentages are very much part of our lives. But what does percentage actually mean? Now 'per cent' means 'out of 100'; and 'out of', in mathematical language, means 'divide by'. So if you score 85% (using the symbol '%' for percentage) on a test then, if there were a possible 100 marks altogether, you would have achieved 85 marks.

First, write the information as a fraction. You gained 18 out of 20 marks, so the fraction is 18 20. Since a percentage requires a denominator of 100, we can turn 18 20 into a fraction out of 100 by multiplying both numerator and denominator by 5:

$$\frac{18}{20} = \frac{18 \times 5}{20 \times 5} = \frac{90}{100} = 90\%.$$

Since we are multiplying both the numerator and the denominator by 5, we are not changing the value of the fraction, merely finding an equivalent fraction. In that example it was easy to see that, in order to make the denominator 100, we needed to multiply 20 by 5. Here is a warning about using the percentage button on a calculator: the result depends on when you press the % button in your calculation. Sometimes it has no effect, sometimes it seems to divide by 100, and at other times it multiplies by 100. Here are some examples:

- Pressing 48÷400% gives an answer of 12. Now 48÷400 = 0.12, so pressing the % button has had the effect of multiplying by 100. This has found 48 as a percentage of 400.
- Pressing 1 ÷ 2 × 300% gives the answer 1.5. Now 1 ÷ 2 × 300 = 150, so pressing the % button here has divided by 100. This has found 300% of a half.
- Pressing 400 × 50% gives an answer of 200. Now 400 × 50 = 20, 000, so pressing % here has divided by 100. This has found 50% of 400.
- Pressing 50% × 400 results in 400 on the display, requiring = to be pressed to display an answer of 20,000. So pressing the % button here has had no effect.

Complex numbers are the combination of real and imaginary numbers. The real part can be expressed by an integer or decimal, while the imaginary part has a square that is negative. Complex numbers arise from the need to express negative numbers' roots, which real numbers can't do. This is why they reflect all the roots of polynomials. Their use extends to different scientific branches, ranging from mathematics to engineering. Complex numbers can also represent electromagnetic waves and electric currents, so they are essential in the field of electronics and telecommunications. Its mathematical formula is a + b i, where a and b are real numbers, and i is the imaginary number. This expression is known as binomial form because of the two parts that make it up.

French mathematician René Descartes was the first to emphasize the imaginary nature of numbers, positing that "one can imagine as many (numbers) as already mentioned in each equation, but sometimes, there is no quantity that matches what we imagine." However, the conceptualization of complex numbers dates back to the 16th century with the contribution of Italian mathematician Gerolamo Cardano, who proved that having a negative term inside a square root can lead to the solution of an equation. Up until then, it was thought to be impossible to find the square root of a negative number. Later, in the 18th century, mathematician Carl Friedrich Gauss consolidated Cardano's premises, in addition to developing a treatise on complex numbers in a plane and thereby established the modern bases of the term. While their day-to-day application is not as direct as that of real numbers, their imaginary component makes complex numbers important as they make it possible to work very precisely in specific areas of science and physics. This is the case with measuring electromagnetic fields, which consist of

electrical and magnetic components and require pairs of real numbers to describe them. These pairs can be seen as a complex number, hence their importance.

Any numerical category (whether natural, integer, or rational) can be represented graphically on a line. In the case of real numbers, they cover the line completely, and every number corresponds to a place on the line (also called the real line). Complex numbers leave the line to fill a plane called the complex plane. In this case, complex numbers are represented on Cartesian axes, where the X axis is called the real axis and Y the imaginary axis. The formula for complex numbers, a + bi, is represented by the point or end (a,b), called the affix, or by a vector with the origin (0,0). In mathematics, not only objects (numbers, figures, quantities) are studied, but also connections and relations between them. For example, the number 11 is greater (more) than the number 9; 7 is 2 more than 5; The number 5 comes after the number 2, more precisely, it is associated with "big (more)", "many", "comes after" and so on. In geometry, the parallelism and perpendicularity of straight lines, the equality and similarity of figures, the comparison of sets, intersecting or equal, etc. relationships are studied.

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