

Kommentar (for den spesielt interesserte)

Mathematics is *axiomatically* founded. This means we declare¹ some propositions to be true, and these we call *aksioms* eller *postulates*. For the subject of calculations we have 12 axioms², but in this book we confined ourselves to explicitly mentioning the following 6:

Aksiom

For tala a , b og c har vi at

$$a + (b + c) = (a + b) + c \quad (\text{A1})$$

$$a + b = b + a \quad (\text{A2})$$

$$a(bc) = (ab)c \quad (\text{A3})$$

$$ab = ba \quad (\text{A4})$$

$$a(b + c) = ab + ac \quad (\text{A5})$$

$$a \cdot \frac{1}{a} = 1 \quad (a \neq 0) \quad (\text{A6})$$

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- (A1) Assosiativ lov ved addisjon
 - (A2) Kommutativ lov ved addisjon
 - (A3) Assosiativ lov ved addisjon
 - (A4) Kommutativ lov ved multiplikasjon
 - (A5) Distributativ lov
 - (A6) Eksistens av multiplikativ identitet

By applying axioms, we can derive more complex contexts which we call *theorems*. In this book we chose to let *rules* be the collective name for definitions, theorems and axioms. This is because alle three, in practice, draws up guidelines (rules) inside the mathematical system in which we wish to operate.

¹Preferably, as few as possible.

²The number can slightly vary, depending on how the axioms are expressed.

In *Part I* we have tried to present the *motivation* behind the axioms, because obviously they are not randomly selected. The train of thoughts that leads us to the aforementioned axioms is the following:

1. Vi define positive numbers as representations of either an amount or a placement on a number line.
2. We define what addition, subtraction, multiplication and division entail for positive integers (and 0).
3. From the marks above, it's as good as self-evident that (A1) - (A6) is valid for all positive integers.
4. We define also fractions as representations of either an amount or a placement on a number line. What the elementary operations entail for fractions rests upon what is valid for the positive integers.
5. From the marks above, we conclude that (A1) - (A6) is valid for all, rational numbers.
6. We introduce negative numbers and an extended interpretation of addition and subtraction. This leads to the interpretations of multiplication and division involving negative numbers.
7. (A1) - (A6) is still valid after the introduction of negative integers. Deriving that they are also valid for negative rational numbers is a formality (omitted in the book).
8. We can never write the value of an irrational number exact, but it can be approximated by a rational number¹. Therefore, all calculations involving irrational numbers is, in practice, calculations involving rational numbers, and in this way we can conclude that² (A1) - (A6) is also valid for irrational numbers.

A similar train of thoughts can be applied concerning the power-rules found in [seksjon ??](#).

¹For example, we can write $\sqrt{2} = 1.414213562373... \approx \frac{1414213562373}{1000000000000}$

²*Obs!* This explanation is good enough for the aim of this book but is a rather extreme simplification. Irrational numbers is a very complex subject, in fact, many books presenting advanced mathematics utilize several chapters to cover the subject in full depth .