

# Application of Addition sign rules in preparing general multi-column worksheet

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## Abstract

When Luca Pacioli invented the Double Entry System in the 15th century, it was discovered as a branch of arithmetic. Today, accounting is no longer limited to book-keeping but has evolved as an information system. In the current era of information technology, the importance of information systems is immeasurable. Algebra is basically a branch of mathematics that was discovered by Jabir Ibn Hayyan in his book "Al-Jabr Wal Muqabala". Algebra is a separate branch of mathematics that enriches mathematics. Algebra, we can say that, is a body of formal rules. These rules show, how something written in one form, may be written in another form. In the present world, it has become the practice of preparing worksheets in big organizations before the preparation of financial statements to be sure of the arithmetical accuracy of accounts. The worksheet should be prepared because after the trial balance the adjusting entries should be given. Adjusting entries are given for arrears of income, advance income, arrears of expenditure, advance expenditure, depreciation, etc. The use of this type of language in modeling accounting information systems can build a strong information system. This research was conducted from January 2021 to August 2021. The researcher aims to identify the resources and processes that are necessary to build a strong correlation between

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worksheets and addition sign rules. Although algebra is capable of explaining complex issues, algebra is not used in accounting.

**Keywords:** addition sign rules, multi-column worksheet, book-keeping, algebra, trial balance, adjusted trial balance,



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## Introduction:

Accounting is now called the language of business. No one expresses the current state of a business by its total land, total employed people, or how many units it produces per year, rather it is expressed by gross profit, net profit, EBIT and EAIT, etc. When Luca Pacioli invented the Double Entry System in the 15th century, it was discovered as a branch of arithmetic. But little is known about the relationship of accounting with algebra, or how algebra can enrich accounting. Algebra, it can be said that, is a body of formal rules. They are rules that show how something written in one form, may be written in another form. For what is a calculation if not replacing one set of symbols into another? In arithmetic we replace "2+2" with "4". In algebra, we may replace "a + (-b) with a-b. Today, accounting is no longer limited to book-keeping but has evolved as an information system. In the current era of information technology, the importance of information systems is immeasurable. Extensive research into the use of algebra in accounting began in the 19th century when Americans began to study how to enrich accounting. Asset = Liability, this equation was already known to the accountants, but the Americans first invented it as an accounting equation,  $A = L + O.E.$  (Asset = Liability + Owner's Equity). Algebra is basically a branch of mathematics that was discovered by Jabir Ibn Hayyan in his book "Al-Jabr Wal Muqabala". Algebra is a separate branch of mathematics that enriches mathematics. Accounting is known as a social science but not a natural science.

## Objectives of the study:

- i. Is there any correlation between algebra and accounting?
- ii. The determination of this study is to validate the use of algebra in formulating accounting theories.
- iii. How basic algebraic addition sign rules are followed in preparing worksheets?

## Basic Algebraic Addition Sign Rules:

Now move on to other rules we use when working out calculations. What happens if we have calculations which involve positive and negative numbers? Are there any rules which help us? Let's start with some revision — all real numbers are either positive or negative (or, of course, zero). The positive numbers are those greater than zero, and the negative ones are those less than zero. If a number line is drawn and position zero in the middle. The numbers to the right are the positive numbers and the numbers to the left are negative. Positive three is written as +3, and negative four is written as -4. Superscripts, such as + and - are used, so that they are not confused with the operations add (+) and subtract (-). So, the superscripts help our understanding of what is going on, but with practice, the standard notation is used and the superscripts are no longer needed. Also, as positive numbers are the most frequently used numbers it is not always necessary to include the positive sign + it can be omitted. So, +3 can be written as 3, and we know that it is 'positive three'. So how positive and negative numbers are added and subtracted? Let's take some examples, using a number line. What is  $-4 + +5$ ?

-5 -4 -3 -2 -1 0 +1 +2 +3 +4 +5 -4 + adding 5 1 If we start at -4 and count on five steps, We get to +1.

$7 + 3$ $= 10$	Same sign. Add and keep the sign.
$7 - 3$ $= 4$	Different signs. Subtract and keep the sign of the larger absolute value.
$-7 + 3$ $= -4$	Different signs. Subtract and keep the sign of the larger absolute value.

### General Multi-column Worksheet:

A worksheet is a multiple-column form that is used in preparing and adjusting financial statements. 3 types of the worksheet are there; (1) General worksheet, (2) Detailed worksheet, (3) Audit worksheet. For preparing an accounting worksheet 8 Simple Steps must be followed to verify accounting information accuracy before the preparation of financial statements. Prepare financial statements from a worksheet is relatively easy because all necessary accounting information is properly presented and structured in the worksheet. It is Multiple column sheets wherein all necessary information used for the preparation of the financial statement is recorded in a systematic process. The worksheet is not a permanent account. It is not a part of a journal or ledger. It is a device used for easy preparation of adjusting entries and financial statements. In bigger organizations where the volume of accounts and adjustments are much more, the possibility of error remains at the time of adjustment of adjusting entries with ledger accounts if the worksheet is not prepared.

### Methodology:

This is basic research rather than applied research. An empirical study was not done in this case. The study was entrenched in secondary data sources. On the left side of this equation is the basic algebraic addition sign rules: -

Table: 1 Rules for integers

			=	
(+)	and	(+)	=	(+)
(-)	and	(+)	=	Which one is bigger
(+)	and	(-)	=	Which one is bigger
(-)	and	(-)	=	(-)

It has already been proven, so there is no need to prove it anymore. This is axiomatic. On the right side of this equation, there is a general multi-column worksheet. Now all the "+" have been replaced with "debit", and all "-" have been replaced with "credit". It was then checked whether the results are exactly similar to the addition sign rules. Thus, attempts have been made to prove that the addition sign rules are used in preparing the general multi-column worksheet.

### **Literature Review and Research Gap:**

The preparation of financial statements correctly becomes complicated and sometimes is delayed nowadays. In the present world, it has become the practice of preparing worksheets in big organizations before the preparation of financial statements. Accountants make adjustments of adjusting entries with other relevant ledger accounts before the preparation of financial statements. Before the preparation of financial statements, the accountants want to be sure of the arithmetical accuracy of accounts by making adjustments of adjusting entries with ledger accounts through the worksheet and then go for the preparation of financial statements.

The worksheet is prepared at the end of the accounting period before the preparation of financial statements.

Types of worksheets are;

1. General worksheet,
2. Detailed worksheet,
3. Audit worksheet.

Now the question is why worksheet is prepared? The worksheet should be done because after the trial balance we have to give the adjusting entries. Adjusting entries should be given for arrears of income, advance income, arrears of expenditure, advance expenditure, depreciation, etc. The biggest opportunity to manipulate when preparing financial statements is "Accrual-based Earnings Management" (AEM) (Cecchi, Autumn-2018). Significant negative correlations have been found between adjusting entry values and unadjusted transactional income. When trading off between "reliability" and "relevance", accrual accounting creates an opaque area that often cannot be verified by financial transactions. Accrual anomaly refers to the negative relationship between accounting accruals and future earnings and stock returns. This idea was first proposed by Sloan in 1996, which challenged rational asset pricing theory.

Pacioli and his contemporary researchers considered accounting to be a branch of arithmetic, although it took a long time to find its relationship with other branches of mathematics. (Perez, Rambaud, Nehmer, & Robinson). Statistical methods have been used for a long time, but applied mathematics was first adopted in the seventeenth century. Economics has recently begun to use a risk analysis and probability theory (Perez, Rambaud, Nehmer, & Robinson). Although algebra is capable of explaining



complex issues, algebra is not used in accounting. The purpose of this study is to demonstrate the use of algebra in formulating accounting theories.

The structure of basic accounting can be expressed in the language of formal algebra. The use of this type of language in modeling accounting information systems builds a strong information system. The English algebraist Arthur Cayley wrote in 1894 that "The principles of book-keeping by double entry constitute a theory which is mathematically by no means uninteresting; it is in fact, like Euclid's theory of ratios, an absolutely perfect one, and it is only its extreme simplicity which prevents it from being as interesting as it would otherwise be" (Cayley, 1894).

The rules of adjustment should be followed while adjusting the trial balance of the general ledger. Adjusted trial balance must be created by following the rules of adjustments from the pre-closing trial balance (U.S. Patent 8386352 B1, February 26, 2013). An adjusted trial balance is required to make financial statements. Any member of the accounts department of a company will file the adjusting entries. Just as the total debit of the trial balance has to be equal to the total credit, the total debit has to be equal to the total credit in the adjusted trial balance. If an accountant is not proficient in this industry or the type of account, he will have to do a lot of research to make adjustments (U.S. Patent 8386352 B1, February 26, 2013). The accuracy of an adjusted trial balance depends on the accuracy of its trial balance and all of the adjusting entries. It is also possible that multiple accountants from multiple locations can order the computer system to make adjustments. In this case, the accounting adjustment rule has to be followed while making the adjustments.

### Hypothesis:

Now, what is the hypothesis here? Let the first column of basic algebraic addition sign rules as unadjusted trial balance. Let the middle column of the rules as adjustments, and let the rightmost column of the rules as adjusted trial balance. And let replace all the "+" signs by "Debit" and all the "-" signs by "credit". Then whether "debit" or "credit" will be in the adjusted trial balance column?

Based on the above literature review, the following hypotheses are developed: -

**Hypotheses # 01:** The Basic algebraic addition sign rules have no relationship with the general multicolumn worksheet.

**Hypotheses #02:** It is not possible to prepare adjusted trial balance from unadjusted trial balance without applying basic algebraic addition sign rules.

### The General Multi-column Worksheet and the Application of Addition Sign Rules:

The general worksheet consists of four to six pairs of columns.

Usually, five pairs of columns or ten columns' worksheets may serve the purpose of general enterprises. These five pair columns are;

- Unadjusted trial balance,
- Adjustments,
- Adjusted trial balance,
- Income statement, and
- Balance sheet.

The steps of preparing an accounting worksheet are explained below: -

1. Name of business enterprise and date of preparation.
2. Drawing columns and heading the columns.
3. Pre-closing trial balance.
4. Adjustments.
5. Adjusted trial balance column.
6. Income statement column.
7. Retained earnings statement (in case of joint-stock companies only)
8. Balance sheet.

### **1. Name of the business enterprise and date of preparation:**

At the very beginning the name of the enterprise for which the worksheet is prepared is to be written in the heading and also the date of preparation of the worksheet is to be written in the bellow.

### **2. Drawing columns and heading the columns:**

Drawing column titles are to be mentioned here, e.g., serial number in the first column, particulars in the second column, and pair of columns thereafter.

### **3. Pre-closing Trial Balance:**

After the serial number and particulars columns, in the pre-closing trial balance, pair of columns ledger accounts balances are posted to check the arithmetical accuracy of the trial balance. It is called a pre-closing trial balance because it is prepared with the ledger balances before adjustments. Debit and credit balances of ledger accounts are written in the debit and credit columns of the trial balance in the worksheet respectively.

### **4. Adjustments:**

Adjusting entries should be given for arrears of income, advance income, arrears of expenditure, advance expenditure, depreciation, etc. At the end of the year, the items or transactions which have not yet been recorded are written in the adjustment columns.

In adjustments, if there is no such item in the trial balance, this adjusting item is to be written below the trial balance under the appropriate head in debit and credit columns of adjustment.

### **5. Adjusted trial balance column:**

Giving necessary adjustments in the adjustment column of the worksheet, the balance of every account relating to adjustments is calculated and afterward, all ledger balances including adjusted ledger balances are recorded in the debit and credit columns of the post-closing trial balance. That is, unadjusted balances of trial balance



are adjusted as per adjustment rules (U.S. Patent 8386352 B1, February 26, 2013) and these are written down in the column of post-closing trial balance. Posting all ledger balances – adjusted and unadjusted in adjusted trial balance totals of debits and credits are determined to prove the arithmetical accuracy of the ledger accounts.

#### **6. Income statement column:**

The income statement shows three columns, the far-right column being the full year audited results, and the other two columns being six months for the period ended for the current year and the previous year in order to compare. The first column lists the accounts for a company's balance sheet and income statement. The balance sheet accounts include cash, accounts receivable, inventory, accounts payable, and owner's capital. The income statement accounts include sales, marketing expenses, interest and taxes. The income statement presents revenue, expenses, and net income. The components of the income statement include: revenue; cost of sales; sales, general, and administrative expenses; other operating expenses; non-operating income and expenses; gains and losses; non-recurring items; net income; and EPS.

#### **7. Retained earnings statement (in case of joint-stock companies only):**

Retained earnings displays a firm's cumulative net earnings or profit after accounting for dividends. They're also referred to as the earnings surplus. The statement of retained earnings is a financial statement prepared by respective corporations that details changes in the volume of retained earnings over some period. Retained earnings are profits held by a company in reserve in order to invest in future projects rather than distribute as dividends to shareholders.

#### **8. Balance sheet:**

A balance sheet is a financial statement of a company's or business's assets, liabilities, and owner's equity as of any given date or at a specific point in time. Typically, a balance sheet is prepared at the end of set periods (e.g., every quarter; annually). A balance sheet is comprised of two columns. The column on the left lists the assets of the company. There are three types of balance sheets such as the classified, common size, comparative, and vertical balance sheets. Ideally, we see, balance starts with current assets, then non-current assets, and total assets. Below that are liabilities and stockholders' equity, which includes current liabilities, non-current liabilities, and finally shareholders' equity.

#### **Difference Between Adjusted and Unadjusted Trial Balance**

An unadjusted trial balance is used to identify the necessary adjusting entries to be made at the end of the year. Adjusting entries are made mainly due to the usage of the accrual basis of accounting. In the accrual basis of accounting, revenue and expenses are recorded when they are earned or accrued regardless of whether the cash is handed over or not. Basically, five types of adjusting entries are given when preparing an adjusted trial balance which relates to advance revenue, prepaid expenses, accrued revenues, arrear expenses, and depreciation expenses. When these are adjusted, the trial balance is called adjusted trial balance.

Usually, there are 11 columns in a general worksheet. The most left column is the account title after which the unadjusted trial balance has two columns. An unadjusted trial balance is prepared at the end date of the accounting period but it is prepared without adjustments. The next two columns are for adjustments. There may be two or more debits and credits in the adjustments but, there must be at least one debit and one credit in the adjustments. The next two columns are for the adjusted trial balance. Now the adjusted amount will go to the debit side or to the credit side that depends upon unadjusted trial balance and adjustments.

If an entry is on the debit side of the worksheet's trial balance and is also debited to the adjustment, it will go to the debit side of the adjusted trial balance. Here "debit" will be regarded as "+". Again, if any entry is on the credit side of the worksheet's trial balance column, and is also credited to the adjustment, then it will be credited to the adjusted trial balance. Here "credit" will be regarded as "-". Let's take the "debit" column to the left of the trial balance column of the worksheet as the first "+" of the addition sign rules. And let's take the "credit" of the right of the trial balance column as the second "-" of the addition sign rules. Again, we will take the "debit" on the left side of the adjustment column as the middle "+" of the addition sign rules.

And we will take the "credit" on the right side of the adjustment column as "-" in the middle of the addition sign rules.

**basic format of a worksheet**

..... Company  
**Worksheet**  
for the year ended .....

Account Titles	Trial Balance		Adjustments		Adjusted Trial Balance		Income Statement		Balance Sheet		
	Dr.	Cr.	Dr.	Cr.	Dr.	Cr.	Dr.	Cr.	Dr.	Cr.	

Prepare trial balance on the worksheet

Enter adjusted trial data

Enter adjusted balance

Enter relevant adjusted balance to income statement

Enter relevant adjusted balance to balance sheet

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Figure: 2 Template of a general worksheet

Now if an entry in the trial balance is a debit (i.e., the sign rules have a "+") and the adjustment has a credit (i.e., a "-" in the sign rules) then the greater of the two debits



and credits will sit on the adjusted trial balance column. Again, if an entry is on the credit side of the trial balance (i.e., a "-" in the sign rules) and the adjustment column is on the debit side (i.e., the sign rules have a "+"), then whichever is greater between these two will sit in the adjusted trial balance column.

Table: 2 Debit or credit obtained from trial balance by adjustments

Trial Balance	Adjustments	=	Adjusted Trial Balance
Debit (+)	Debit (+)	=	Debit (+)
Credit (-)	Debit (+)	=	Which one is bigger
Debit (+)	Credit (-)	=	Which one is bigger
Credit (-)	Credit (-)	=	Credit (-)

We can see that we must follow the addition sign rules to create an adjusted trial balance from the trial balance. So, we cannot create worksheets without following the addition sign rules.

Thus, the null hypothesis is rejected and the alternate hypothesis is accepted. Now we can say that there is a strong correlation between the general multi-column worksheet and addition sign rules.

### Findings:

1. There is a strong correlation between the general multi-column worksheet and addition sign rules.
2. In the present world, it has become the practice of preparing worksheets in big organizations before the preparation of financial statements to be sure of the arithmetical accuracy of accounts.
3. Anyone is not able to create an adjusted trial balance from an unadjusted trial balance without following addition sign rules.
4. People are using addition sign rules in preparing general multi-column worksheets, but unconsciously.
5. In this case, accounting is acting like natural science.
6. Algebra is capable of explaining complex issues.

### Recommendations:

1. Accountants should prepare a worksheet before the preparation of financial statements to be sure about the arithmetical accuracy of accounts.
2. Application of addition sign rules in preparing a general multi-column worksheet can be beneficial in programming automated accounting software like *Tally*.
3. Extensive research should be done on how algebra can be used to enrich accounting.
4. Further research should be done to identify those cases in which accounting acts like natural science.

## Conclusion and Further Research:

From the above discussion, we can say that it is the multiple-column worksheet wherein all necessary information used for the preparation of the financial statement is recorded in a systematic process. The worksheet is not a permanent account. It is not a part of a journal or ledger. It is a device used for easy preparation of adjusting entries and financial statements. Anyone is not able to create an adjusted trial balance from an unadjusted trial balance without following addition sign rules.

Accounting is a social science, not a natural science. When we prepare an adjusted trial balance from an unadjusted trial balance in a worksheet, we use basic algebraic addition sign rules unconsciously. Extensive research should be done on how algebra can be used to enrich accounting. Further research should be done to identify those cases in which accounting acts like natural science.

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