

How to become an  
expert calculator on the

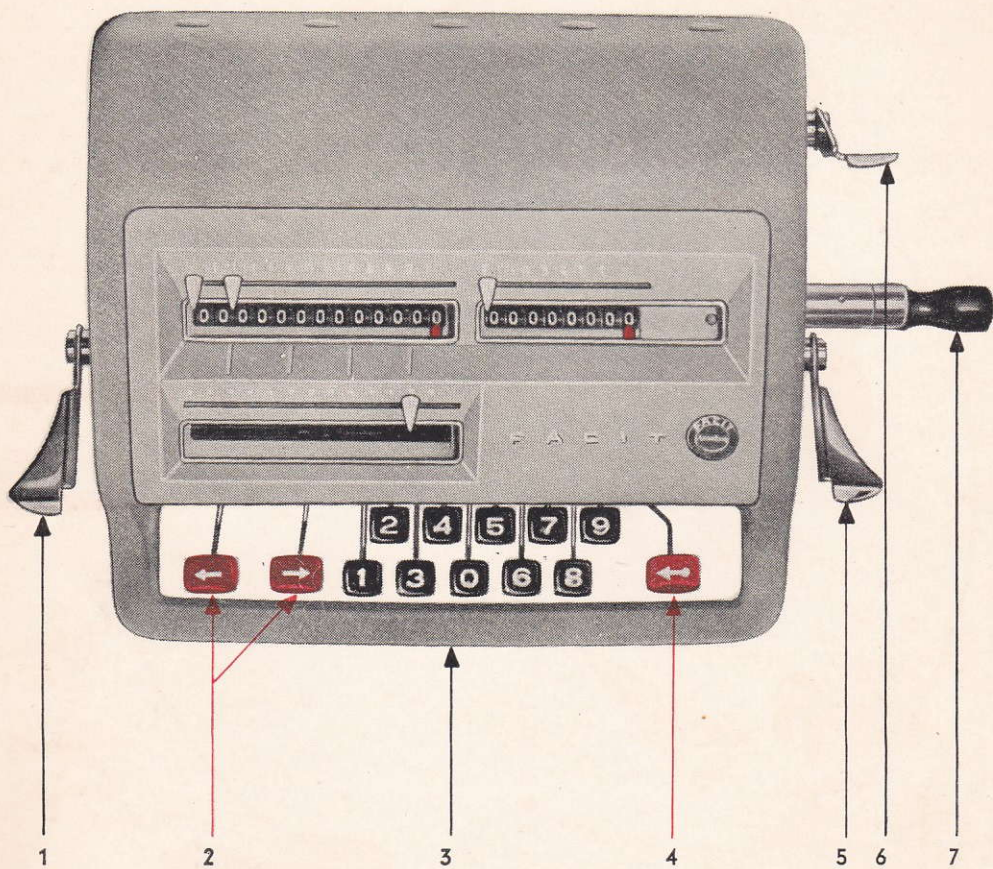
**FACIT**

**C1** 13

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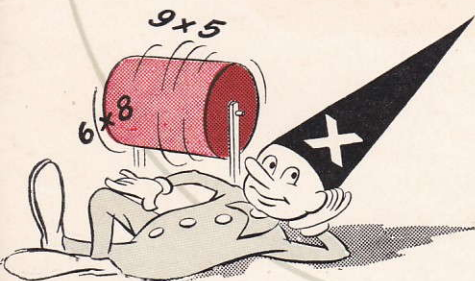
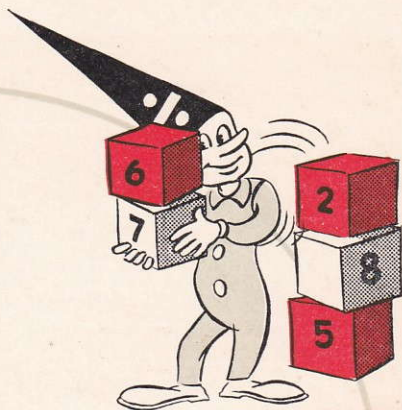
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1. Clearing lever for product register
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5. Clearing lever for setting register
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It takes the Facit C1-13 only ten setting keys and a minimum of auxiliary keys to master all four rules of arithmetic.

**FACIT C1-13 MASTERS ALL FOUR RULES OF ARITHMETIC...**

THE PHYSICAL LABORATORIES  
THE UNIVERSITY,  
MANCHESTER. 13.

In addition to the 10-key system, the Facit C1—13 also offers the following special features.

## FACIT C1-13 at your service ...

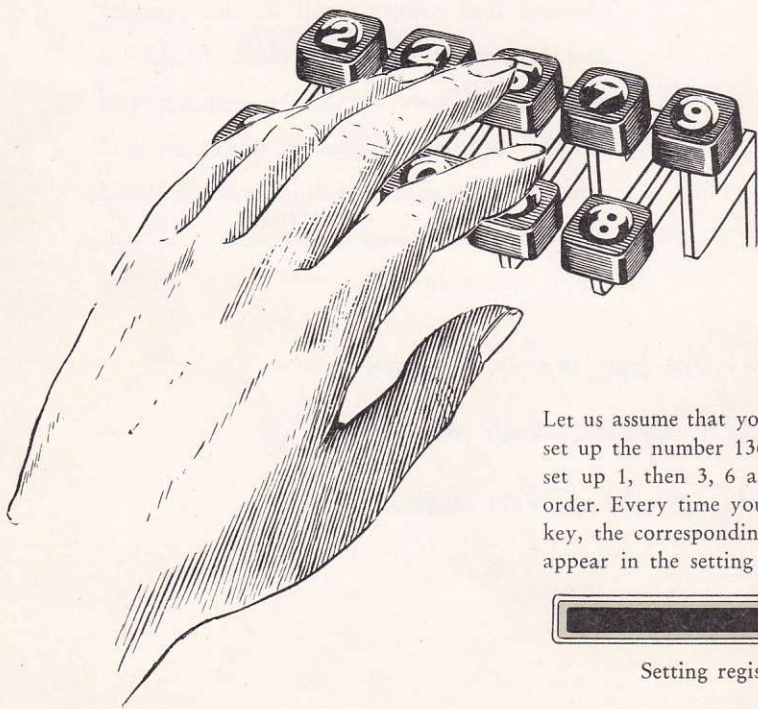
Overall tens transmission in the product and multiplier registers, which facilitates short-cuts, allows immediate readings and ensures complete reliability; direct division setting, which saves time and trouble; rapid clearing, which increases speed and cuts down operating time.

*for the use of 1<sup>st</sup> Year  
HONS. Physics Lab only  
NOT to be taken away*



*All you do is set up the figures  
by depressing the appropriate  
setting keys in the order the figures appear  
in the number*

## Only **10** Setting Keys



Let us assume that you're going to set up the number 1365. First you set up 1, then 3, 6 and 5 in that order. Every time you depress the key, the corresponding figure will appear in the setting register.

1 3 6 5

Setting register



1

2

3  
4  
5  
6

*Here's how to boost your speed  
from the start:*

**Set up the figures  
with your left hand  
— turn the crank  
with your right**

The illustration shows which fingers are used to press down the various setting keys according to the touch system for which the machine has been designed.

## **suffice to do all calculations**

By practising this system right from the start you will very soon learn how to calculate speedily and correctly. Like a trained touch typist you will be able to operate the machine without giving the keyboard as much as a glance.

This left-hand system leaves the right hand free for turning and clearing as well as for making notes.

# The 3 Registers



Product register



Multiplier register



Setting register

## The product register

gives the answer when you add, subtract or multiply. It also shows the remainder when you divide.

## The setting register

immediately records every figure that you depress on the setting keys.

## The multiplier register

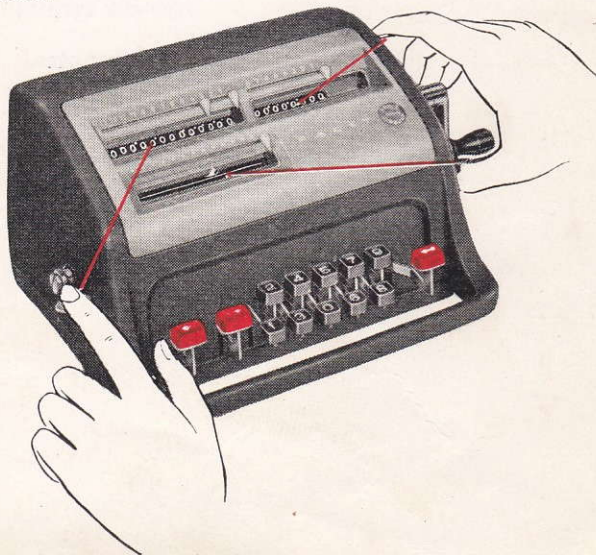
shows the quotient in division, the number of items in addition and the multiplier in multiplication.

*Arithmetical terms are recapitulated on page 24.*

## Clearing the Registers

Each of the three registers has its own clearing lever. Remember to clear all the registers after each completed computation. This is done in the following manner:

With your left hand press down the left-hand clearing lever, and with your right press the other two clearing levers together against each other.





## Carriage Shift Keys

The setting mechanism, and with it the set-up numerals in the setting register, are moved step by step to the right or left by means of the red carriage shift keys. The arrow on the key indicates the direction in which the movement takes place.



The right-hand shift key moves the numerals to the right.



The left-hand shift key moves the set-up numerals towards the left.



## Tabulator

By a single depression of the tabulator key (to the right on the keyboard) the setting carrier is brought to the left as far as it will travel, and this is the usual procedure for division.



At the same time the set-up number is completed with noughts if it contains less than 6 digits. See illustration.

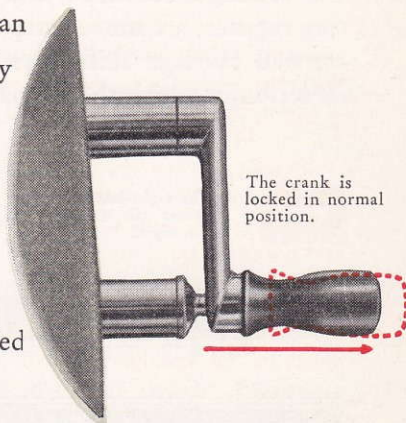


## Turning the crank performs the calculation

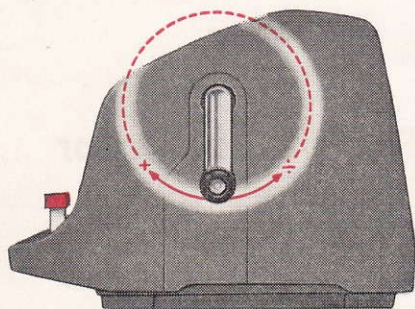
Once you've set up the figures you can add, subtract, multiply or divide merely by turning the crank.

To turn, first pull out the handle (as indicated by arrow) and keep it out until the required amount of turns have been completed.

All turning movements should be carried out smoothly and evenly, not jerkily.



Pulling out the handle in the direction shown by the arrow unlocks the crank.



*Crank forwards (positive turn) to add, and backwards (negative turn) to subtract a number, whichever the calculation requires. A negative turn cancels a positive turn and vice versa—permitting instantaneous correction of cranking mistakes.*

After cranking the necessary number of turns the crank must be returned to its neutral position before the mechanism can be cleared and a new calculating operation begun.



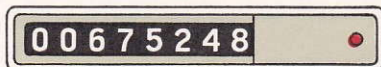
## Revolution Direction Indicator

The number of turns made is shown in the *multiplier register*. This has a turn direction indicator which shows red for negative coupling. Positive or negative coupling is determined as soon as the crank has been turned about half an inch in the positive or negative direction, irrespective of whether the turn is completed in this initial direction or reversed and completed in the opposite direction. A turn that has been initiated more than an inch must be completed. Negative coupling is discounted when the register is cleared with the clearing lever.

The multiplier mechanism counts the number of *positive turns* when the first and following turns are positive. It counts the number of *negative turns* when the first and following turns are negative.

If *positive turns are made with a negative coupled register*, it counts backwards, that is to say, it takes off one for each turn. If a start is made with noughts alone, or the zero line is passed during calculation, the complement of the last number registered in the multiplier register is obtained automatically. (Complement of 1 = 99999999.)

The revolution direction indicator on the multiplier register showing that the machine is ready for negative operation.



## Position Indicator

The red position indicators in the multiplier and product registers are controlled by the red shift and tabulator keys and thus indicate in which column position the machine operates at the moment.

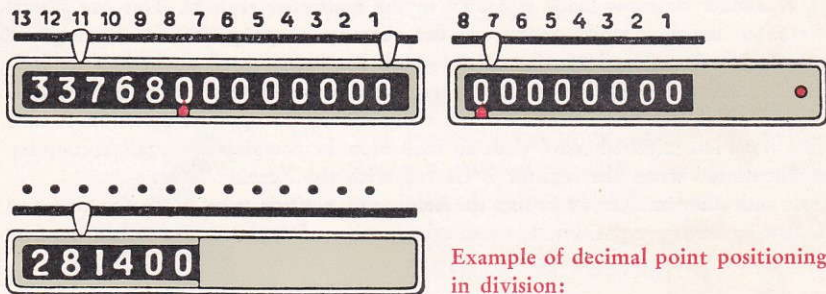


Product register



Multiplier register

# Decimal Points



$$\frac{33.762}{28.14} = 1.2$$

The decimal indicators are placed at the three register apertures and can be moved sideways along calibrated scales. Place the indicator of each register under the figure or point on the scale that corresponds to the number of decimals.

How division is done with Facit C1-13 is described on page 15. After the dividend (33.768) has been set up in the product register, place the decimal indicator at 11. After the divisor (28.14) has been set up and moved over to the left read off the decimal point for this number. Note that the number now has two noughts after it, so that the setting up register shows 28.1400. These noughts are also counted as decimals, which means that there are 4 in all. The difference between 11 and 4 is 7. The multiplier register decimal indicators must therefore be positioned under 7. The result of the division is 1.2.

## *Rules for decimal point*

**Addition and subtraction.** Position the decimal indicator identically in the setting and in the product register. Set up all numbers with the same number of decimals so that they come right relative to the decimal point in the setting register.

**Multiplication.** The number of decimals in the product register is to be the same as the sum of the decimals in the setting up and multiplier registers. Mark the position of the decimal point in the product register according to rule before starting calculation.

**Division.** The number of decimals in the multiplier register is to be the same as the difference between the number of decimals in the product and setting up registers. You can avoid unnecessary calculating work if you determine the position of the decimal point and how many decimals are needed in the answer (quotient) before you start to divide. See also the example at the top of the page.



## The Facit C1-13 is Foolproof



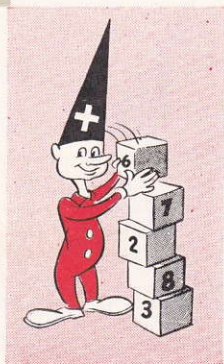
*You can never carry out  
two simultaneous operations  
by mistake*

The machine is so designed that it automatically opposes every manipulation which might jeopardize the reliability of the calculation or possibly damage the mechanism.


Never try to force the machine if it jams. Jamming indicates that some of the operating parts have locked—these must be restored to normal position before you can resume calculating. Most of the time you can unlock the parts by clearing all registers or setting the handle in its original position. If these measures fail, you should get in touch with an authorized Facit mechanic.


# Addition


Example:  $3478 + 394 + 85 + 8962 = ?$



Set up the first four numerals by depressing the appropriate keys. Make one forward turn. From the setting register the numerals will then be transferred to product register,

which will show . . . . 

Clear the setting register. Set up the next numerals, 394, and make a forward turn. The total of the two sets of numerals will then appear in the product register . . . . . 

Clear the setting register once more and continue to add the remaining items. If you have set up the figures correctly, the product register will show the total sum to be . . . . . 

The multiplier register, at the same time, records that you have added

4 items in all . . . . . 

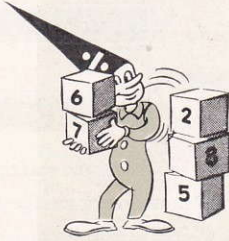
Clear all the registers when you have completed the calculation.



# Subtraction

Example: 276543—80927 = ?

Set up the numerals 276543. Make a forward turn so as to transfer the figures from the setting register to the product register.



Clear the setting register. Set up the lesser number, 80927. Make a backward turn and read off the result . . . . . **0000000195616**

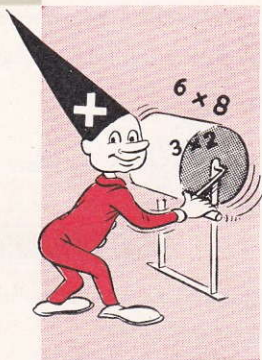
in the product register. This number is the difference between 276543 and 80927.

Clear all the registers when you have completed the calculation.




# Multiplication

*Example:*  $6943259 \times 2043 = ?$




Set up the greater factor 6943259. Make 3 forward turns. The multiplier register now shows . . . **00000003**

The product register shows  
( $6943259 \times 3$ ) . . . . . **0000020829777**

Press down, once only, the left-hand carriage shift key . This will cause the carriage to move one step to the left, which is also recorded by the position indicator. Now make 4 forward turns. You have now multiplied by 43. Look at the multiplier register; it shows . . . **00000043**

The product register shows **0000298560137**

Press the left-hand shift key  twice (passing the figure 0 in the multiplier) and make 2 forward turns. You have now completed the multiplication and can read the answer (the product) in the product register . **0014185078137**

The setting register shows  
the multiplicand . . . . . **6943259**

The multiplier register  
records the multiplier . . . **00002043**

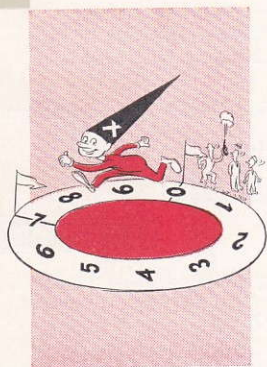
In this way you are able to check that the correct manipulations have been carried out.


Clear all the registers when you have completed the calculation.



# Multiplication

## Short-cut multiplication





If the multiplier contains figures of a higher value than 5, for example 8, it saves time to use the so-called short-cut multiplication method. This is performed by first moving the handle *from its original position* about an inch in the forward direction. You then bring forth the 8 by making two backward turns. The multiplier register to the left of the position indicator will then be filled by nines. In order to remove these nines you press the left-hand shift key  once and make a forward turn (8 being the same as  $-2+10$ ). By saving all the turns required for the operation in the normal way of multiplication you will effect a time-saving of up to 40 % by using short-cuts.


If, instead, you move the handle at once in the negative direction, there will appear to the right in the multiplier register a red dot which indicates that the register is set for minus or negative operation. If this is the case you will have to clear the multiplier register and the product register and repeat the operation.

*Example:*  $758 \times 819 = ?$

Set up 758 by pressing the setting keys. Move the handle about an inch in the forward direction and then make a negative turn. The multiplier register will show a row of nines.

Press the left-hand key  and make two forward turns so that a figure 1 appears in the multiplier register.

Press the left-hand shift key  and make two backward (negative) turns.

Depress the left-hand shift key once more  and make one positive turn. The product register now gives the answer, which is 000000620802

You have completed the operation by 6 turns of the handle. Had you multiplied in the ordinary manner it would have taken 18 turns to get the same result.





# Multiplication

## Multiplication involving addition of products



*Example:*  $2495 \times 374 + 4694 \times 38 = ?$

The multiplication  $2495 \times 374$  is performed in the ordinary manner.

The product register now shows . . . . .



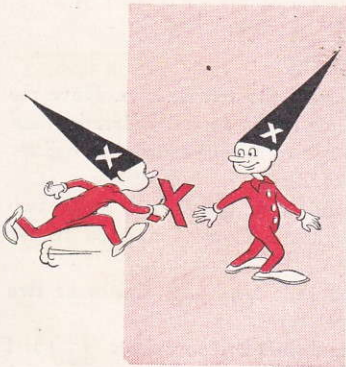
Clear the setting and multiplier registers.

Multiply 4694 by 38.

The product register shows the total amount of the two multiplications . . . . .



## Continuous multiplication



*Example:*  $127 \times 12 \times 311 = ?$

The multiplication  $127 \times 12$  is performed in the normal way.

The product register shows



Clear the setting register. Set up the obtained product, 1524, and make a backward turn, causing the product register to show nothing but noughts.

Clear the multiplier register. Multiply 1524 by 311.


The product register shows


the answer . . . . .




*Example:*  $9955128 : 302 = ?$



Set up the dividend 9955128 by the setting keys. Press the tabulator . Transfer the setting to the product register by a forward turn, then clear the setting and multiplier registers.

Set up the divisor 302 by the appropriate keys. Press the tabulator . Make backward turns until you hear a bell ring and then one forward turn. The product register will now show . . . . .


**0895128000000**  
**30000000**

Press the right-hand shift key  once and continue with backward turns until the bell rings, then one forward turn.

The product register now shows . . . . .


**0291128000000**  
**32000000**

and the multiplier register

Depress the right-hand shift key  once more and turn the handle backwards until the bell rings, then one turn forward. Now the product register shows . . . . .


**0019328000000**  
**32900000**

and the multiplier register

Once again depress the right-hand shift key , crank backwards until the bell rings, then one forward turn. The product register shows . . . . .

**0001208000000**  
**32960000**

and the multiplier register

Again press down the right-hand shift key  and continue backward turns until the bell rings, then a forward turn. The product register now shows nothing but noughts. The division could be completed without leaving a remainder. The answer (quotient) is recorded

**32964000**

in the multiplier register .

*If a division does not work out even the product register will contain a remainder which is smaller than the divisor.*

*Place the decimal point according to the instructions on page 8.*

Clear all the registers when you have completed the calculation.




# Addition and Subtraction

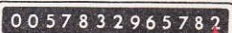
of numbers having 10—13 digits


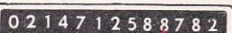
Example:  $57832965782 + 156879623163 - 5289433223 = ?$





Set up as many of the first figures of the number as the setting register can hold (9 figures). The two last figures, therefore, have to be left out. Depress the left-hand shift key  twice (as many times as there are remaining figures in the numbers). Make a forward turn.

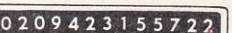
The product register shows 

Clear the setting register. Now set up the two remaining figures, 82, and make a forward turn. The product register now shows the complete number . . . . . 

Clear the setting register. Set up the first 9 figures in the next number. Press the left-hand shift key  three times and make a forward turn. The product register now shows 

Clear the setting register. Set up the three remaining figures, 163, and make a forward turn. The product register now shows the total sum of the two added numbers 

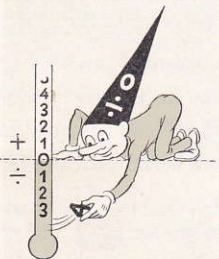
Clear the setting register again. Set up the first 9 figures of the next number. Press left-hand shift key  once and make a backward turn (subtraction).

Clear the setting register, set up the remaining figure 3, and make one more backward turn. The answer to the entire calculation is now ready and appears in the product register . . . . . 



# Subtraction below Zero

*Example:*  $57 - 68 + 34 - 136 = ?$



Set up the number 57. Make one forward turn. Clear the setting register. Set up 68. Make one backward turn. The product register now shows **99999999999989**

The nines to the left in the product register show that the number 89 is negative. The register has counted backwards and shows the complementary number to  $57 - 68$ , which is  $-11$  ( $11 + 89 = 100$ ).

Clear setting register and set up the next number, 34. Make a forward turn. Product register shows **0000000000023**

Clear setting register and set up 136. Make one negative turn. Product register shows **99999999999887**

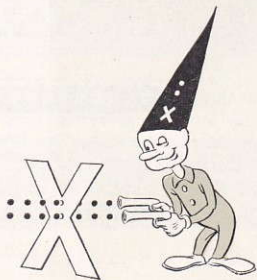
which is a complementary number indicating that the result is a negative number. To read off the answer, clear the setting register and set up three nines immediately followed by 887 (the number found behind the nines in the product register). Turn the handle twice backward.

The product register now shows **9999998000113**

The answer is  $-113$ . The digits to the left of the noughts are of no importance.


# Division by Multiplication


*Example:*  $672 : 28 = ?$



Division can be done in two ways. The most common method has been described previously.

You can also divide by multiplying the divisor (28) as many times as required to reach the value of the dividend (672). By this method you gain the advantage of being able to read off the answer as well as dividend and divisor, each in its appropriate register.

Set up 28. Press tabulator  and continue with positive turns until the number in the product register as near as possible approaches the first two figures of the dividend (67)\*. After two forward turns the figures 56 will appear in the product register; after three, the figures 84. You therefore stop after two turns.

Press the right-hand shift key  and keep turning the handle forward until the factor in the product register comes as close as possible to, or equals, the dividend (672).

After 4 turns the product register shows the dividend

**672 0000000000**

The setting register shows the divisor . . . . .

**280000**

The multiplier register shows the answer . . .

**24000000** •

\* The corresponding number of figures of the divisor, in this case two.



# Rule of three

The rule of three is the name of a calculating operation, which may look as follows:

$$\text{Example: } \frac{35875 \times 435}{725} = ?$$



First you set up the largest factor of the dividend (above the line) preceded by a 0, thus 035875. The nought is introduced to keep you from exceeding the capacity of the machine. Press the tabulator . It will be seen that the position indicator is now set to the extreme left in the multiplier register, and consequently you carry out the multiplication by the figures 435 in the order they appear, *from left to right in the multiplier*. You therefore multiply first by 4. Then press the right-hand shift key and multiply by 3. Press right-hand shift key once more and multiply by 5. The multiplier register

shows . . . . .

To the left in the product register, you now get . . . which is your product.

Clear setting and multiplier registers. Set up 725. As the first figure of the divisor is greater than the first figure of the dividend one nought is set up in front of the divisor. This will give one more decimal in the answer.

The nought in front of the number is not necessary. Press the tabulator and carry out the division in the usual way.

The multiplier register records the answer . . .

If the division is uneven, there will be a remainder which is less than the divisor and it will be shown in the product register.









# Reciprocal values



By the expression reciprocal value is meant: 1 divided by a number or, expressed in fractions:

$$\frac{1}{\text{number}}$$

Example:  $\frac{1}{98} = ?$

This operation can be carried out as an ordinary division, but the simplest method is the following: Set up 98. Press tabulator  and turn handle forward until bell rings, in this particular case, two turns. You will hear the bell at the second turn. This indicates that you have gone a turn too many and, therefore, you have to make a negative turn. Press the right-hand shift key  once and make a forward turn. The bell rings and you therefore give the handle a backward turn. Press the right-hand shift key  again and continue in this manner until the multiplier register has been completely filled with figures. The answer will appear in the multiplier register and is . . . . 

The decimal point is positioned according to the following rule: Put in front of the answer you received in the multiplier register as many noughts as there are units in the original number, in this case two noughts. The first of these is the unit nought. The answer is therefore 0.010204081.

## Summation of products

For certain business computations, such as making up inventory lists or checking invoices, it is necessary to check only the grand totals and not the sub-totals.

*Example:*

$$\begin{array}{r} 392 \times 6.59 \\ 1,279 \times 3.22 \\ 58 \times 2.89 \\ 397 \times 1.93 \\ 18 \times 9.27 \\ \hline \end{array} \qquad \begin{array}{r} \hline ? \end{array}$$

Set up 659 and multiply by 392. Then clear the setting register only. Repeat this procedure with the remaining multiplications.

The product register will show the sum of the products. All the numbers in the left-hand column (the numbers you multiply by) are added in the multiplier register. Our problem now looks like this:

*Example:*

$$\begin{array}{r} 392 \times 6.59 \\ 1,279 \times 3.22 \\ 58 \times 2.89 \\ 397 \times 1.93 \\ 18 \times 9.27 \\ \hline 2,144 \end{array} \qquad \begin{array}{r} \hline 7,802.35 \end{array}$$

# Example

## Computing proportions

*Example:* Total expenses of 68.75 kronor are to be proportioned among the following four sums:

23.43	?
294.80	?
49.64	?
<u>153.28</u>	<u>?</u>
521.15	68.75

The total of these amounts, 521.15, is divided into 68.75 to obtain a constant, 0.13192, which is used in the subsequent multiplications. Set up this constant and multiply by the first number, 23.43. Point off decimal places in the product register and your answer is 3.09. Don't clear the registers. Change the figures 23.43 in the multiplier register into the next number, 294.80, by positive or negative turns. Continue in the same manner with the two remaining amounts, 49.64 and 153.28. Finally, check your computations by adding the answers. Our problem should now look like this:

23.43	3.09
294.80	38.89
49.64	6.55
<u>153.28</u>	<u>20.22</u>
521.15	68.75





# Remember these arithmetical terms

*The four rules of arithmetic*



## Addition

---

$$\textit{Addend} + \textit{Addend} = \textit{Total}$$



## Subtraction

---

$$\textit{Minuend} - \textit{Subtrahend} = \textit{Remainder}$$



## Multiplication

---

$$\textit{Multiplicand} \times \textit{Multiplier} = \textit{Product}$$

The multiplicand and multiplier are also called factors.



## Division

---

$$\textit{Dividend} : \textit{Divisor} = \textit{Quotient}$$

Dividend and divisor can also be expressed thus:

$$\frac{\textit{Dividend}}{\textit{Divisor}} \text{ and are then called } \frac{\textit{Numerator}}{\textit{Denominator}}$$

If the numerator consists of 2 factors, the term is *rule of three*:

$$\frac{\textit{Factor} \times \textit{Factor}}{\textit{Divisor}} = \frac{(\textit{numerator})}{(\textit{denominator})} = \textit{quotient}$$

**Look upon your new Facit C1-13 as a  
carefully manufactured instrument . . .**

**and treat it accordingly**

The Facit C1-13 is a precision machine throughout. It is designed and built to give perfect service for many years. Regular attention will guarantee good and reliable service.

Unlike the majority of calculating machines the Facit C1-13 is entirely enclosed and thus protected against dust.

Naturally the mechanism will be subject to a certain amount of wear as the oil is gradually consumed. Like all other machines it needs cleaning, oiling and adjusting now and then. This should be done once a year, preferably by a service-man approved by the makers.

Obviously the maker's guarantee will be rendered inoperative if the machine has been oiled or repaired by unskilled labour.



**FACIT**





*Thanks for your  
interest!*

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★ The time you have put into reading  
this little book will be repaid by your Facit  
calculator many times over