MANUAL

OF

MECHANICAL CALCULATION BY MEANS
OF THE CALCULATING MACHINE

"UNITAS"

LUDWIG SPITZ & Co.
G. m. b. H.

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By

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Index:

Principal parts of the machine.

The **key plate P** with **slots W** and movable markers **E.**

The figure slides **L**I and **L**II.

The **crank K** in normal position.

The regulating lever with side lever **J.**

The movable link **G.**

The cancelling device **N.**

(See sketch after page 35 and 36.)

General Directions for the use of the Unitas Calculating Machine which should be strictly followed.

1. The crank is to be given a full turn and in case of an overturn, to be turned until the normal position is again reached, i. e. always complete a turn. On no account attempt to turn back.

2. Never shift the regulating lever or the figure markers in the keyplate, if the crank is in any other but the normal position (see 1).

3. The setting up of figures in the figure discs by turning the small knobs or the cancelling of same is only possible, if both figure slides are lifted simultaneously.

4. The machine should not be inclined more than 25 deg.; it is therefore not advisable to further incline the instrument on a slanting desk or table.

5. Excessive speed in turning the crank and particularly turning irregularly with sudden interruptions or jerks is to be avoided, otherwise the mechanism of the instrument is bound to suffer.

6. Oil the instrument frequently with a good quality of watch oil. The bottom of the box containing the mechanism may be unhinged so that all interior parts become accessible.

All parts indicated by small arrows on the sketch below are to be oiled very carefully and thoroughly.

7. Users are cautioned not to take the instrument apart or to have it repaired by a mechanic **not fully familiar** with its construction.

A thorough examination and cleaning after some years of use is advisable, if possible this should be done at our factory.

Part I.

Description of the individual parts.

To be read before starting to operate the machine.

Before commencing an operation be sure that all figure discs show zero.

The reversing or regulating lever and side lever are to be adjusted according to the kind of operation to be performed, as pointed out below. See sketch on page 36.

Directions for using machines with keys.

On the whole the manipulation of machines with keys is the same as for machines with movable markers, so that in this respect reference may be made to the latter.

Instead of the movable markers E there are in this case keys. The adjustment of the figures is effected simply by depressing the corresponding keys. According as addition or multiplication is to be carried out, the regulating button situated **at the right on the keyboard** is to be set, i. e. at addition or multiplication.

In the case of addition and subtraction the keys are set at zero automatically during the movement of the crank, while in the case of multiplication and division the cancelling device is to be used.

In the electric drive machines with keys there is no crank to be turned and the second factor or multiplier is set in the quotient mechanism by simply depressing the corresponding keys from 1—9 on the electric driving device. Naturally before depressing a key the result mechanism must be brought to the right place.

Decimal pointers. Each figure row is provided with decimal pointers which are shifted longitudinally and serve for marking off the decimal position. These pointers are held in place by friction and can be instantly brought to any required point.

When indicating 986.17, the pointer should be placed between 6 and 1.

The figure slide L 1 is provided with two rows of figure discs S and Q. The large top row **figure discs S** show the results of addition, multiplication and subtraction and the dividend in division and in the lower row the smaller **figure discs Q** show the second factor of multiplication or the quotient of division and they are therefore called "quotient discs".

For adjusting the figures of the figure discs S, there are two alternative ways viz., first by setting them up in the slots of the keyplate P and transferring them into the figure discs S by turning the crank once, or, second by turning the small knobs Z until the number appears. In the latter process the figure slide L is lifted, slightly shifted sideways, resuming its former position after the setting has been completed.

Figure slide L II. By means of this second figure slide which is an independent calculating device in itself, it is possible to **simultaneously** accumulate the results of any amount of operations. In conjunction with L I it is capable of rendering the results of **opposed** problems.

Figure slide L II having only one row of figure discs, and no quotient-discs, multiplication and division are generally performed on figure slide L I.

Our machines have the advantage that the slides can be easily removed if necessary. To effect this the little catch horizontally attached to the round guide-bar, must be brought into the same direction as the guide-bar; the slide in question can then be withdrawn to the left. To replace the slide great care is necessary, violent jerking must especially be avoided. After having properly replaced the slide the little catch is brought back to its original position so that the normal stop is reconstituted.

Link G serves to connect the two figure slides L I and L II when they are to be used in conjunction. To effect the shifting, lift the link G **vertically,** and shift in the direction required, then drop the slides.

To disconnect the slides, press down the triangular milled knob at the point O, turn link G and snap it into catch M on figure slide L I. When using L II independently lift L I and shift it a trifle until the lug which is underneath L I rests on one of the supports of the mechanism.

In this position L I is entirely disengaged and all operations are carried out on L II.

The regulator H and side lever J are for the purpose of setting the machine for the intended operation.

When the main regulating lever H and the side lever J are connected, the operations in both figure slides are identical.

The side lever J can be disconnected by a slight inward pressure and by shifting it up or down, be brought into the position X, where it is caught and held by spring action.

In order to reconnect I with the main regulating lever H, withdraw it from X, shift it again up or down and push it gently to the right until it is caught and firmly held in a slot underneath the knob of the main regulating lever H.

If the regulating lever H and the side lever J are disconnected J being in X, opposed operations are performed in the two figure slides and the Machine is then capable of performing Addition & Subtraction or Multiplication & Division **at the same time.**

The following 4 different positions of the levers can take place, resulting in 4 different effects:

Position I. The main regulating lever H and the side lever J are connected and point to Add$\underline{\underline{on}}$ Mult$\underline{\underline{on}}$. The process of addition or Multiplication is carried out in both slides, simultaneously.

Position II. The main regulating lever H connected with the side lever J points to Sub$\underline{\underline{on}}$ Div$\underline{\underline{on}}$. The process of subtraction or division is carried out in both slides, simultaneously.

Position III. The main regulating lever H points to Add$\underline{\underline{on}}$ Mult$\underline{\underline{on}}$, the side lever J placed on X. The figure slide L I shows in the figure discs S results of addition or multiplication and the figure slide L II shows simultaneously in the figure discs S results of subtraction or division.

Position IV. The main regulating lever H points to Sub$\underline{\underline{on}}$ Div$\underline{\underline{on}}$, the side lever J placed on X. The figure slide L I shows in the figure discs S results of subtraction or division the figure slide L II shows simultaneously in the figure discs S results of addition or multiplication.

The regulating lever H can only be reversed, if the crank K is in its normal position.

When using the machine it is advisable to keep the **left hand** between link G and regulating lever H in order to be able to rapidly shift the figure slides or the regulating lever H, whilst the **right** hand does not leave the crank until the operation is completed.

The crank K can only be turned in **one direction** (following the hands of the watch) and its motion is imparted to the mechanism. The crank must always perform a full turn of 360 degrees, so that after each turn the crank is again in the normal position.

The crank mechanism being naturally delicate all violence must be avoided in case of any sudden resistance, but a thorough search must be made at once in order to ascertain the source of the trouble.

Accustom yourself to a uniform turn and to a fixed rate of speed which latter should not exceed three turns per second.

Cancelling lever N. The figures in the figure discs S and Q are set to Zero by means of the 3 cancelling levers at the right hand end of the figure slides. **Lift the figure slides,** and give the cancelling levers a **short** but **swift pull** to the right.

Correcting. In the event of having made an overturn or having overstepped the normal position of the crank such mistake can be corrected **(after completing the turn)** by moving the regulating lever H to the opposite position, making another complete turn and reversing the regulating lever H to its previous position.

Bell signal and its importance. If for instance in an addition or multiplication 2 nines appear in the product rows of the slides L I & L II, in the two figure discs S which are located to the left of the last slot of the key plate P, then the transferring of the tens beyond these two places cannot take place for mechanical reasons. If, however, in spite of this a manipulation is effected, a bell rings drawing the attention of the operator to the fact that a mistake has been made.

The Bell Signal in Addition and Multiplication. **Example.** The slides of an 8 figure machine being in their normal position. In the products-row appear the figures

29,996,970,325

to which is to be added 14,152,325. After a turn of the handle the products-row shows the number 020,011,122,650 while a bell signal calls the attention of the operator to the fact that a correction has to be made. For the mechanical reasons mentioned before, the tens could not be transferred from 2 to 3 in the fourth place from the left, which must now be done by hand, by simply turning the figure discs on to the next place.

The Bell in Subtraction and Division. If by error a greater number is subtracted from a smaller one the bell will draw the attention of the operator to this error. In the slides there is for instance the number 25, in the key-plate the number 45. Now, if the handle is turned, the lever being on subtraction, a bell signal will be heard. For mechanical and mathematical reasons, however, it is impossible to subtract a greater number from a smaller one.

For **division** the same example may be used.

7845 ÷ 23.

By proceeding as mentioned on page: 21 first divide 78 by 23, i. e. 3 turns of the handle are made, while the lever is on **subtraction.** If 4 turns were made thus subtracting 4 x 23 from 78, the bell would notify the mistake. In this case the lever is then put to Addition, one turn is made and the bell will then indicate that the mistake is corrected. If the speed of the operation oft he machine is increased, turn the crank with regulating lever on division until the bell rings then make one turn on Addition in order to obtain the desired result.

When adding or multiplying all figures shown in the figure discs are **black.**

When subtracting or dividing the number of subtractions as well as the quotient appear in red in the quotient discs with the exception of the figures 0 and 9 which are **always black.**

The four fundamental operations.

Follow the instructions systematically and in the right order not omitting any necessary operation.

Preparations.

Have crank K in normal position.

Lift figure slides L I and L II giving the cancelling levers N, a swift pull to the right and reverse to zero all **markers E** in the slots of the keyplate, place regulating lever H united with side lever J to Add$\underline{\underline{\text{on}}}$ Mult$\underline{\underline{\text{on}}}$.

Addition.

Place regulating lever H in position I. The various amounts to be added are indicated in the keyplate by means of the markers E commencing with the units in the first slot on the right and proceeding with the tens in the second slot, the hundreds in the third slot etc.

The first amount being thus set up, one turn of the crank will transfer it to the mechanism and cause it to appear in the figure discs of both figure slides.

After transferring the first amount, to the slides, the next amount is set up in the keyplate and the figures in the figure discs S and O of the figure slide L I are cancelled to zero, while the figures in the figure discs S of the figure slide L II accumulate there until **all** amounts are added.

In the figure discs S of the figure slide L I always appears the last amount set in the keyplate P, in the figure discs S of the figure slide L II the sum total.

The figure slide L I enables the operator to immediately check the correctness of each item indicated.

Example of addition:

I.		II.	
	538		5.38
	7412		74.12
	46		0.46
	237		2.37
=	**8233**	=	**82.33**

Proceed as indicated on preceding page and the machine gives the following results:

(1)	P =	538	figure slide	L I =	538	Figure slide	L II = **538**
(2)	P =	7412	„ „	L I =	7412	„ „	L II = **7950**
(3)	P =	46	„ „	L I =	46	„ „	L II = **7996**
(4)	P =	237	„ „	L I =	237	„ „	L II = **8233**

If there are decimal places, mark them carefully on the keyplate and figure discs by means of the sliding decimal pointers in the same manner as they are pointed off on paper.

Subtraction.

Place the regulating lever H in position IV. The amount to be reduced (Minuend) is now placed into the figure discs S of the figure slide L I by **lifting the figure slide** and turning the small knobs Z until they show the desired figure, starting with the units from the right. The amount to be subtracted (Subtrahend) is indicated in the slots W of the keyplate P by means of the markers E commencing with the units at the first slot on the right. The setting up is done in precisely the same manner as the numbers would be written down on paper, viz, units under units etc.

Upon making one turn of the crank the difference will appear in the figure discs S of the figure slide L I and at the same time the subtrahend in the figure discs S of the figure slide L II.

Example:

76.347
— 8.378
= **67.969**

Place the regulating lever H in position IV, 76.347 (Minuend) in the figure discs S of the figure slide L I, 8.378 on the keyplate. Give the crank one turn. In the figure discs S of the figure slide L I appears the difference 67.969, in the figure dics S of the figure slide L II the subtrahend 8.378.

Continuous subtraction.

In order to subtract several amounts consecutively from **one** number proceed as follows:

Place the regulating lever H in position IV and proceed as explained for subtraction. In the figure discs S of the figure slide L II always appears the amount to be subtracted, in the figure discs S of the figure slide L I the remainder after deduction of the various subtrahends.

As soon as a new subtrahend is indicated on the keyplate, cancel all figures of the figure slide L II and in Q. **In slide L I the figures are left undisturbed until all the subtractions are performed.**

Example: Subtract from 468574 consecutively the following amounts: 5683, 21,768, 17,867, 53,564, 92,178 = 277,514. Set up 468,574 in figure slide L I by means of the small knobs Z commencing with the units (4) at the first disc on the right. Indicate 5683 on the keyplate P, starting with 3 at the first slot W on the right. Place regulating lever H in position IV, and turn the crank once. The recording mechanism then shows:

in the keyplate P 5683,
in the figure slide L I the difference 462,891,
in the figure slide L II the subtrahend 5683.

After this first subtraction, cancel the figures in slide L II and change the markers E to read the next subtrahend 21,768 on the keyplate P and turn the crank once, the new minuend 462,891 being visible in L I.

The recording mechanism shows on the keyplate P 21,768
in the figure slide L I the difference 441,123,
in the figure slide L II the subtrahend 21,768.

Continue in exactly the same manner and the next differences will be successively 423,256, 369,692 and the final result or difference **277,514.**

Multiplication.

The process of multiplication is simply a series of additions.

25×3 equals $25 + 25 + 25 = 75$.

Place the regulating lever H in position I. Detach link G from figure slide L II and disengage figure slide L II by resting its lug on the support.

The larger of the two factors to be multiplied is indicated on the keyplate P. The second (smaller) factor is to be turned up in the small quotient disc Q as indicated in the example below.

Always see that quotient disc Q is in action which is when it is in coincidence with the vertical arrow on the keyplate.

The result (product) appears in the figure discs S.

Example: $534 \times 26 = 13\,884$.

Indicate the factor 534 (multiplicand) on the keyplate P. Turn the crank as many times as there are units in the multiplier six times. In the first quotient disc Q, which is in coincidence with the arrow, appears the number 6, proving, that the factor 534 has been added six times or has been multiplied by 6. The result of $534 \times 6 = 3204$ appears in the figure discs S.

The slide is then lifted and shifted to the right until the second quotient disc Q (disc of the tens) is in coincidence with the arrow. In this position the crank is turned as many times as there are tens in the second factor, in this instance 2, which shows that 534 has been multiplied by two tens.

In the quotient discs Q the multiplier 26 is now visible, and in the figure discs S the product of the multiplication $534 \times 26 =$ **13,884** has appeared. Suppose the multiplier to be 4526 instead of 26 the multiplication would have to be continued on the above described lines until all figures of **this** number appear in the quotient discs Q.

When multiplying numbers composed of decimal fractions, point them off in the figure discs S before beginning the operation after the well known rule: The decimal point in the product is found by adding together the decimal places of the factors and marking off an equal number in the product, starting from the right.

The individual turns of the crank need not be counted mentally as their number is registered in the quotient discs Q, and can instantly be corrected in the event of an over (or under) turn.

Abbreviated method of multiplication.

The expert accountant when figuring without the assistance of a machine avails himself of various advantages, which serve to simplify and facilitate the solution of the problem. These advantages may equally well be applied to the calculating machine, the only difference being, that the machine accomplishes the same with great speed, little or no mental assistance and unfailing precision.

When multiplying say $344 \times 99 = 34{,}056$ the clever accountant will multiply 344 with 100 and subtract 344: The same method may be adopted on the machine. Instead of turning the crank nine times, for each of the two discs = 18 times, it is sufficient to turn it twice when using the short method.

Example I: $344 \times 99 =$ **34,056.**

Place regulating lever H in position I, disengage figure slide L II, indicate 344 on the keyplate P and multiply with 100. In the figure discs S appears 34,400. Shift L I to the left, until the first quotient disc coincides with arrow, reverse regulating lever H to Sub$\underline{\underline{\text{on}}}$ Div$\underline{\underline{\text{on}}}$ and give the crank one turn. In the last quotient disc Q from the right appears a red I, which indicates that 344 has been subtracted from 34,400 or that it been has multiplied by $100 - 1 = 99$. In the figure discs S appears the result 34,056.

Example II: $3486 \times 587 =$ **2,046,282.**

Place regulating lever H in position I, disengage L II, set up 3486 in the keyplate.

Instead of turning the crank 7, 8 or 9 times multiply by 600 and then subtract 13.

$3486 \times 600 = 2{,}091{,}600$, which will appear in the figure discs S.

Reverse regulating lever H to Sub$\underline{\underline{\text{on}}}$ Div$\underline{\underline{\text{on}}}$, move figure slide L I one place to the left and give the crank one turn. Again shift the figure slide one place further to the left and turn the crank three times.

In the third quotient disc Q appears 6 black and in the two last on the right 1 and 3 red, which indicates, that the multiplicand has not been multiplied by 600, but by **600 — 13 = 587.** In the figure discs S appears the result **2,046,282.**

If there are decimal fractions, count and mark them off on the figure slide as indicated on page 14.

Multiplication and simultaneous addition of products.

When several multiplications have to be performed, and the obtaining of each single product as well as of the Grand Total are required, proceed as follows:

Place regulating lever H in position I and connect the two figure slides by link G. After the first multiplication in the regular way the products in both figure slides are alike. Now cancel the figures in the figure discs S and Q of figure slide L I to zero, **leaving the figures in L II undisturbed.**

After performing the second multiplication, its product appears in figure slide L I, while figure slide L II **simultaneously shows the sum of the two first multiplications.**

This method is continued until all multiplications are performed.

The figure discs S of the figure slide L II then show the **Grand Total** of all the products.

Example:

(1) 378 × 43	L I = 16254	L II =	**16254**
5462 × 214	= 1168868	=	**1185122**
845 × 97	= 81965	=	**1267087**
7914 × 843	= 6671502	=	**7938589**
In the figure slide L II appears the Grand Total			**7938589**
(2) 5.83 × 2.14	L I = 12.4762	L II =	**12.4762**
24.38 × 33.17	= 808.6846	=	**821.1608**
456.82 × 9.34	= 4266.6988	=	**5087.8596**
98.74 × 216.12	= 21339.6888	=	**26427.5484**
In the figure slide L II appears the Grand Total			**26427.5484**

Multiplication and simultaneous subtraction of products.

In order to subtract from a given sum an amount to be found by multiplication (product) proceed as follows:

Place regulating lever H in position III, set up the sum to be reduced (minuend) in figure slide L II and one factor in the keyplate. Then multiply in the regular way. The Multiplication having been performed figure slide L I will show the product subtracted and figure slide L II the remainder of the given sum after deduction of that product.

Examples:

1. 68374 — (217 × 53) = **56873.**

Set up 68,374 in the figure discs S of figure slide L II by means of the small knobs Z. Set 217 on the keyplate and place lever H in position III. After multiplication by 53 the product = 11,501 appears in slide L I while the rest of 68,374 after deduction of 217 × 53 = 11,501 i. e. = **56,873** appears in figure slide L II.

2. 4768 — (38.42 × 24.7) = **3 819,026.**

As the sum of the decimals of the two factors is three, point them off in the figure discs of the two figure slides before co mmen cing the calculation.

Set up 4768.000 in figure slide L II the 3 decimals must be allowed as 4768 is an integral or whole number. Then place 38.42 on the keyplate and multiply by 24.7 as indicated above.

In figure slide L I appears the product of the multiplication = 948.974 and in figure slide L II the remainder of 4768 after the subtraction of this product = **3.819.026.**

Reverse regulating lever H to position II, shift figure slide one place to the left and turn the crank, until 6 is reduced to 5.

By this means the multiplication 2837 × 695 is now performed and the product = **1,971,715** appears in the figure discs S, where it can be **again** noted.

Solution (c) 2,837 × 24,708 = **70,096,596.**

Leave the constant factor 2837 in the keyplate and the figure slide L I at the position which it occupied after the termination of multiplication (b).

Place regulating lever H in position I and turn the crank until 8 appears in place of 5, reverse regulating lever H to position II, shift figure slide L I one place to the right and turn the crank until 0 appears in place of 9. Reverse regulating lever H to position I, shift figure slide L I one place to the right and turn the crank until 7 appears in place of 6.

Leave regulating lever in position I, shift figure slide L I one place to the right and turn the crank until 4 appears.

The multiplication 2837 × 24 708 is now completed and the product = **70,096,596** appears in the figure discs S.

In this way any number of similar multiplications can be performed in a very short time.

In order to simultaneously add the products of multiplications with constant factors, unite figure slide L II by link G with figure slide L I and perform the various multiplications in the **ordinary** manner (i. e. **not by converting** the figures of the last factor into those of the next one.)

In this way as explained before the product of each multiplication appears in the figure discs S of figure slide L I and the grand Total in figure slide L II.

Division.

Division is nothing but a series of subtractions,

for instance 9 divided by 2 means: how many times can 2 be subtracted from 9.

If our explanation be followed attentively it will be found that the operation of division is as simple as other operations.

Proceed as follows:

The bell not signalling at the two first figure discs S on the extreme left, shift the combined figure slides L I and L II so far to the right that the third quotient disc Q from the left is precisely above the white arrow.

Set up the dividend in the figure discs S of figure slide L I by turning the small knobs Z **starting** with the first figure disc **on the left** of the slide. Now indicate the divisor in the keyplate P by means of the markers E, also **starting** from the first slot W **on the left.**

Place regulating lever H in position IV.

Division being a continous subtraction, the dividend (in figure slide L I, must be placed over the divisor (in the keyplate) so that subtraction is rendered possible i. e. **the first left hand figure of the dividend has to exceed or be at least equal to the first left hand figure of the divisor.**

For instance, when 436 is to be divided by 25, the dividend 436 is to be placed into the figure discs S in such a way that the 4 is the same vertical plane with the 2 of the divisor in the keyplate. When to be divided by 68, 3 would have to be over 6, as 68 cannot be subtracted from 43 but must be subtracted from 436.

The crank is to be turned until the figures of the dividend, which are then over the divisor become smaller than the divisor or until of the bell rings. This signal indicates, for subtraction that the last turn has exceeded the capacity of the dividend for subtraction.

In the latter case, the mistake is immediately corrected by reversing the regulating lever H to Add$\underline{\underline{\text{on}}}$ Mult$\underline{\underline{\text{on}}}$ without disturbing the side lever J in X and turning the crank K until the bell again rings.

The second signal indicates that the mistake has been corrected and that the division may be continued.

Upon reversing the regulating lever H Sub$\underline{\underline{\text{on}}}$ Div$\underline{\underline{\text{on}}}$ again, shift the figure slides one position to the left and continue the division until the dividend contains no further figures or until **that** decimal

place is reached, which is found to be of sufficient accuracy or until the last quotient disc Q on the right has been used, when the limit of the instrument has been reached.

In the quotient discs Q always appears the result of the division (Quotient), the figure discs S of figure slide L I either show zeros if the division has been even or the remainder.

If there is a remainder in the figure discs S of figure slide L I, indicate it in the keyplate P, in the slots W which are immediately under the figures of the remainder. One turn of the crank will add the remainder to the amount in figure slide L II and make it disappear in slide L II. In figure slide L II then appears the original dividend which was set up in the figure slide L I so that the accuracy of the result can instantly be proved i. e. the Machine checks its own work.

Always place the decimal pointers in their respective positions in dividend and divisor and move slides until decimal points coincide and mark off the decimal point for the quotient in front of that quotient disc Q which is on the right of the arrow, indicating in advance the decimal places if there are any.

Example: 5248 ÷ 16 = **328.**

Unite the two figure slides and shift them to the right until the third quotient disc Q from the left is precisely over the arrow.

Place regulating lever H in position IV.

Set up 5248 (Dividend) in the figure discs S of figure slide L I.

Indicate 16 (Divisor) on the keyplate P beginning with the first slot W on the left.

The divisor 16 now stands under 52. Turn the crank until 52 becomes smaller than 16 or until the bell rings.

In the latter case correct the mistake as indicated above.

In the quotient discs Q appears **3 (red)**, in the figure discs S of figure slide L II **48**, in the figure discs S of figure slide L I 448. Shift the figure slides one place to the left. The divisor 16 now stands **under 44.** Turn the crank as before. In the quotient discs Q appears 2 **(red)**, in the figure discs S of figure slides L I **128**, in figure slide L II **512.** Shift the figure slides again one place to the left. The divisor **16** now stands **under** the **28** of 128. Turn the crank eight times and in the figure discs S of figure slide L I zeros will appear. The quotient discs Q reads **328** (red) = the quotient, the figure discs S of figure slide L II 5248 i. e. the dividend, which was set up in L I originally.

(2) 86,975 ÷ 214 = **406**, remainder = **91**.

Set up the dividend and the divisor as before.

The divisor 214 stands under 869. Turn the crank until 869

becomes smaller than 214 or until the bell rings. In the quotient discs Q appears **4** (red), in the figure discs S of figure slide L I 1375, in figure slide L II 856. Shift the figure slides one place to the left. Over the divisor in the figure slide L I stands 137. As 214 cannot be subtracted from 137, shift the figure slides again one place to the left. The quotient discs Q show **4** (red), **0** (black). The divisor 214 now stands under 375 of 1375. Turn the crank until 1375 becomes smaller than 214 or until the bell rings. In the quotient discs Q now appears the quotient **406**, in the figure discs S of figure slide L I the remainder **91**, in the figure discs S of figure slide L II 86884 i. e. the product of 214 × 406.

By placing the remainder 91, obtained from figure slide L I into the slots of the keyplate, which are immediately under the figures 91, leaving the position of the figure slides unchanged and turning the crank once, zeros appear in figure slide L I and the original dividend 86975 is shown in figure slide L II.

By this turn of course 1 is added to the last figure of the quotient which must be allowed for.

If there are decimal places to be considered, point them off **before commencing** the division in the figure discs S of figure slides L I and L II and in the keyplate (divisor), shift the figure slides so that the decimal places of dividend and divisor coincide with each other and mark off the decimal point in front of the first quotient disc Q on the right of the arrow, by which means the position of the decimal point in the quotient is determined prior to the actual commencement of the operation.

Now re-shift the figure slides to the required position, so that the subtraction can be commenced.

(3) 259.164 ÷ 4,6 = 56.34.

Set up the dividend and the divisor as indicated in examples 1 and 2.

Place regulating lever **H** in position IV and mark off the decimal places in the figure discs S of figure slide A I (Dividend) and in the keyplate (Divisor). Shift the figure slides to the left, until the decimal points in figure slide L I and in the keyplate stand vertically one under the other and mark off the decimal point in front of the quotient disc Q on the right of the arrow.

Move the figure slides to the right, so that 46 (Divisor) is under 59, in the dividend as indicated before.

Proceed with the division, until zeros appear in figure slide L I. The quotient discs Q show the quotient = **56.34** (red) the figure discs S of figure slide L II the dividend 259.164.

Practical examples embodying the application of the 4 fundamental operations.

The figuring of Percentage and rebates.

Principles: Multiply the sum by the percentage and divide the product by 100. In order to find the percentage of an amount, multiply the sum by the percentage and divide the product by 100 i. e. point off two decimal places in the figure discs S.

In case of decimal places in the sum or in the given percentage or in both, shift the decimal point on the figure discs S one position to the left for each decimal place.

Examples: 1. 5 % of 379 = 18.95.

Place regulating lever H in position I, disengage gure slide L II, indicate 379 in the keyplate and multiply by 5. In the quotient discs Q appears 5 (the percentage) in the figure discs S the amount of the % = 1895 = **18.95.**

2. 5 % of 37.9 = **1.895,**
3. 5 % of 3.79 = **0.1895,**
4. 3½ % (3.5 %) of 379 = **13.265,**
5. 3¼ % (3.25 %) of 379 = **12.3175,**
6. 5¼ % (5.25 %) of 37,9 = **1.98975.**

Addition of percentages and rebates.

In order to find simultaneously the percentage of an amount and to add it to that amount proceed as follows:

Place regulating lever H in position I, transfer the amount from the keyplate to figure slide L II by shifting the united figure slides — in case of no decimals, for instance 4 % so far to the right, that the **third** quotient disc Q from the right is in coincidence with the arrow, and turn the crank once, this having been done, the sum multiplied by 100 will appear in figure slide L II. Cancel the figures in the quotient discs Q and in figure slide L I, shift the figure slides again as far as possible to the left and multiply by the percentage.

In figure slide L II now appears the original amount increased by the amount of the percentage which is to be divided by 100 by marking off two decimal places.

The figure discs S of figure slide L I show the amount of the added percentages, which is also to be divided by 100 in the same manner.

In the quotient discs Q the percentage appears.

In case of decimal places in the percentage transfer the sum from the keyplate into slide L II as above, but shift the figure slides one position to the right for each decimal place of the percentage and then give the crank one turn.

For 6,5 % for instance the fourth quotient disc Q, for 2,75 % the fifth quotient disc Q must be brought into coincidence with the arrow etc.

As to the remainder proceed in the same manner.

In case of the sum also having decimals, mark these off in figure slide L II as explained in the chapter. "Percentage and rebates", page 24.

Examples:

To 538 add 4 %.

Solution: Place regulating lever H in position I. Transfer 538 x 100 (3rd quotient disc Q coinciding with the arrow) = 53,800 from the keyplate to figure slide L II, cancel all figures in figure slide L I, multiply 538 by 4 and mark off decimal places in the figure discs S of each figure slide.

There will appear

in the figure discs S of figure slide L I the amount of percentage = **21.52**

in the figure discs S of figure slide L II the increased amount = **559.52**

in the quotient discs Q the rate of percentage = **4.**

II. To 538 add $6^1/_2$ % = 6.5 %.

Place regulating lever H in position I. Transfer 538 x 1000 (fourth quotient discs Q coinciding with the arrow) = 538000 from the keyplate to figure slide L II, cancel all figures in figure slide L I, multiply 538 by 65 pointing off 3 decimal places in each slide.

There will appear:

in the figure discs S of figure slide L I the amount of the percent = **34.970**

in the figure discs S of figure slide L II the increased sum = **572.970**

in the quotient discs Q the percentage = **6.5.**

III. To 538 add $2^3/_4$ % = 2.75 %.

Place regulating lever H in position I, transfer 538 x 10000 (fifth quotient disc Q coinciding with the arrow) = 5380000 from the keyplate to figure slide L II, cancel all figures in figure slide L I, multiply 538 by 2.75 and mark off 4 decimal places in the figure discs S of each figure slide.

There will appear

in the figure discs S of figure slide L II the amount of the percent = **147.950**

in the figure discs S of figure slide L I the increased sum = **5527.950**

in the quotient discs Q the percentage = **2.75.**

See also page 25.

Subtraction of percentages and rebates.

In order to find simultaneously the rebate on a sum and to subtract it from the said sum, proceed as follows:

Place regulating lever H in position III (see page 28), set the sum in the keyplate and transfer it to figure slide L II in the same manner as explained in the previous examples. Shift the united figure slides entirely to the left and multiply with the percentage or the rebate.

In the quotient discs Q appears the given percentage, in

the figure discs S of figure slide L I the rebate and in the figure discs S of figure slide L II the final result **after deducting** the rebate.

Examples:

I. 349.—4 % = **335,04.**

Place regulating lever H in position III, transfer 349×100=34,900 to figure slide L II. 349 multiplied by 4 gives the rebate = 13.96; in figure slide L II appears the remainder after deduction of the rebate = **335.04.**

II. 823.—$3^1/_2$ % = **794.195.**

Indicate in the keyplate P =	823.
Transfer to the figure slide L II as minuend =	823.000
Result in L I =	28.805
Result in L II =	794.195

III. 7,495.—$4^1/_4$ % = **7176.4625.**

Indicate in the keyplate P =	7,495.
Transfer to the figure slide L II as minuend =	74950.000
Result in L I =	318.5375
Result in L II =	7176.4625

IV. 473.48—$2^1/_4$ % = **462.8267.**

Indicate in keyplate P =	473.48
Transfer to the figure slide L II as minuend =	473.480000
Result in L I =	10.653300
Result in L II =	462.826700

Watch your decimal point.

Do not be confused by the **black** figures in the quotient discs of figure slide L I, as notwithstanding the fact that the examples indicate subtraction, in figure slide L I, only multiplication is performed and consequently black figures **must** appear.

Calculation of interest.

The interest on a certain capital is found by multiplying the capital by the number of days, for which interest is charged and dividing this product called "interest numbers" by the rate of the interest or multiplying the product by the reciprocal of the rate of the interest.

For instance when calculating 5 % interest, one can either divide by the rate of interest 7200 (the year counted at 360 days,

7300 the year counted at 365 days) or multiply by the reciprocal value = 1 ÷ 7200 = 0.00013889.

Rule:

$$\frac{\text{Days} \times \text{capital}}{\text{rate of interest}} \quad \frac{1}{\text{rate of interest}} = \text{days} \times \text{capital} \times \text{reciprocal.}$$

In other words, the calculation is nothing but a double multiplication consisting of multiplying the number of days by the capital and again multiplying this product by the reciprocal number.

The reciprocal values of the various rates of interest, called "reciprocals", are found in the table, which we furnish with each machine. **Up to** $3^3/_5$ % these reciprocals represent **9** decimal places, **above** $3^3/_5$ % only **8** decimals. The noughts before the figures are omitted in order to facilitate the operation.

When the percentage is $3^3/_5$ % or less, **9** decimal places are to be taken off in the figure discs S, in all other cases take off only **8** decimals.

In order to find reciprocals not contained in the tables simply multiply the reciprocal of **1 % = 27778** by the percentage. For instance: what is the reciprocal of $4^2/_3$ %?

27778 × $4^2/_3$ = **27778** × **4,666** = **129612148** or as only 5 places are needed = **12961.**

Example: What is the interest of a capital of 7588,75 at 4 % for a term of 42 days? = M. **35.41.**

In calculating the "interest numbers", the decimals are usually cast off and the last integral figure is increased by 1, when the decimal amounts to more than 50. Instead of indicating M. 7588.75 place 7589 in the slots of the keyplate, disengage figure slide L II and multiply by 42 in the usual way. The "interest numbers" now appearing in figure slide L I are 318738. This amount is now placed into the keyplate and the figure slide L I shifted entirely to the left. Multiply by the reciprocal of 4 % = 11111 and in the figure discs S appears = 3541497918.

From this number take off 8 decimal places = 35.41497918 and the final result is M. **35.41.**

When the number of places of "interest numbers" exceed the capacity of the Machine, omit those places at the right which cannot be placed into the slots; **taking off the corresponding number of decimals** in the figure discs S.

Suppose the "interest numbers" are 43684298 and the machine used contains only six slots, place 436843 into the keyplate and mark off 7 or 6 places in the figure discs S instead of 9 or 8 places.

In case of several amounts with **equal percentage** but **different terms,** proceed as explained for compound multiplication and

addition of products. The total of the "interest numbers" obtained by the various multiplications is employed as stated above and the result represents the total interest on **all** sums.

Example: What is the interest at $3^2/_5$ % = 3.4 % of:

M. 5,674.75 for 45 days
„ 31,475.50 „ 3 „
„ 355.25 „ 25 „

Multiply 5,675 × 45 = 255.375
31,475 × 3 = 94.425
355 × 25 = 8.875

and the total „interest numbers" are **358.675**

Place this number in the keyplate P and multiply by the reciprocal of $3^2/_5$ % = 94444,

358,675 × 94,444 = 33.874,701,700 = M. **33.87.**

In the United Kingdom of Great Britain the year is usually counted at 365 days, while other nations count it at 360 days for interest calculations.

Consequently the English reciprocals are different from those contained in the tables.

The interest divisors are found by multiplying 365 by 100 and dividing the product by the rate of interest, for instance

$$\frac{365 \times 100}{5} = 36{,}500 \div 5 = 7{,}300$$

the interest divisors are for 5 % = 7.300
„ „ „ „ „ 4 % = 9.125
„ „ „ „ „ 3.5 % = 10.429
„ „ „ „ „ 1 % = 36.500 etc.

The reciprocals of these numbers are found as explained before, for instance

$$5\% = \frac{1}{7300} = 0.00013698 = 13698$$

$$4\% = \frac{1}{9125} = 10{,}959$$

$$3.5\% = \frac{1}{10428} = 95{,}890$$

$$1\% = \frac{1}{36500} = 0.000027126 = 27126$$

The enclosed table is compiled according to this method. In order to find a reciprocal not contained in this table multiply the reciprocal of 1 % = 27126 with the rate of interest.

Up to 3.6 % inclusive take off 9 decimal places, above 3,6 8 decimals.

Converting decimal currency.

The following simple rules are to be employed when converting decimal currency into another one:

(a) If the rate is given in the currency to be calculated, multiply the sum to be converted by the rate and divide the product by 100.

(b) If the rate is given in the currency to be converted divide the sum by the rate and multiply the quotient by 100.

The rate is always **taken** for 100 units of the currency in question.

For instance the rate of American dollars is supposed to be M. 422.5 = $ 100 and not M. 4.225 = $ 1.

Examples for (a)

(1) M. 272.89 are to be changed into francs at the rate of 122,85 (i. e. M. 100 = frs. 122,85).

Place 272.89 in the keyplate, disengage figure slide L II and multiply by 122.85 = 335245365

As in addition to the four decimal places of the two factors there are two **more** decimals to be taken off for the division by 100, point off altogether 6 decimals in the figure discs S and the result will be = **frs. 335.24.**

(2) M. 4415 are to be converted into dollars at the rate of 23.64 (i. e. M. 100 = $ 23.64).

Place 4415 in the keyplate, multiply by 23.64 = 10437060, take off 2 decimal places for the factor 23.64 and two more for the division by 100, together four, and the result will be 1043.7060 = $ **1043.71.**

(3) Kr. 862.40 are to be changed into roubles at the rate of 39.70 (100 Kr. = 39.70 Rbl.).

Place 862,40 into the keyplate P multiply by 39.70 = 342372800, take off four decimal places for of the factors, two for the division, together six, and the result is 342.372800 = **Roubles 342.37.**

Examples for (b)

(1) Change M. 6.33 into francs at the rate of 81.30 (frs. 100 = M. 81.30).

Bring the third quotient disc Q from the left in coincidence with the arrow, place 6.33 into the figure discs S of figure slide L I by means of the small knobs Z starting with 6 immediately over the first left hand slot W. Place the regulating lever H in position IV

mark off the decimal point after 6. Indicate 813 in the keyplate P starting with the left hand slot W. mark off the decimal point after 1. Place decimal point under decimal point and in the figure discs Q, to the right of the arrow place a decimal point. As according to the rule given the quotient is to be multiplied by 100, it is advisable to at once place the decimal point two places further to the right, i. e. in front of the third quotient disc Q to the right of the arrow.

The division is now performed in the usual manner and the result will be found to be = 7.785 = frs. **7.78**

(2) Change M. 983.55 into dollars at the rate of 423 ($ 100 = M. 423).

According to the above example place 98355 in the figure discs S of figure sleede L I mark off the decimal point between 3 and 5, place 423 into keyplate P mark off a decimal point after 3, bring the decimal point one over the other, mark off the decimal point before the third quotient disc Q on the right of the arrow and perform the division. The result appears in the quotient discs Q = 232.51 = $ **232.51**.

(3) Change Kr. 89.75 into roubles at the rate of 2.53 (100 roubles = 253 crowns).

Following the same process as outlined in examples (1) and (2) place 89.75 in the figure discs S, decimal point between 9 and 7, place 253 into the keyplate P decimal point after 3, bring the decimal points in coincidence and place the decimal in front of the third quotient disc Q to the right of the arrow. The division gives the result 35.474 = roubles **35.47.**

English currency.

A. Converting English money into decimal currency.

English money not being governed by the decimal monetary system necessitates converting shillings and pence into decimal equivalents of pounds. (£)

£ 1 = 20^{s} 1 s = $^{1}/_{20}$ = **0.05** £

1^{d} = $^{1}/_{12}$ = $\frac{1}{12 \times 20}$ = $^{1}/_{240}$, say = $^{1}/_{250}$ = **0,004** £

Remember: 1^{s} = £ 0.05, 1 d = £ 0.004.

Example. £ 18. 7. 3 are to be converted into Marks at the rate of M. 20.41 = M. 374.76.

£ 18. 7s. 3d. therefore = £ 18.362.

£ 18 =		£	18.—
s 7 =	7 × 0.05 =	„	0.35
d 3 =	3 × 0.004 =	„	0.012
		£	**18.362**

Place 18362 in the keyplate P, disengage figure slide L, II multiply by the rate of 20.41 and the figure discs S, will show 37.476.842.

Point off the five decimal places of the two factors and the final result is = 37476.842 = M. **374.77.**

On page 41 of this instruction book a table will be found containing all decimal equivalents from $^1/_8{}^d$ to 19s/11 of £ to 5 places of decimals.

In order to find the decimal equivalent of an amount given in Shillings and pence, look for the **shillings** in the shilling column, printed in heavy type **from top to bottom** and in the equally heavy type pence-column for the **pence** going **from the left to the right.**

At the crossing point of the two columns the desired equivalent in decimals of a pound will be found.

For instance, to find the decimal equivalent of 5s/7, look in the **heavy type** shilling-column for the number 5 from there follow the horizontal line to the right until you reach the column, headed by the **heavy type** 7 (pence) and one will find it = £ 0.27917.

If only shillings or only pence are given, their decimal equivalents will be found in the column adjacent to the **heavy type** columns for instance 17s = £ 0.85, 11 d = £ 0.04583.

Example: Convert £ 7. 8. 5 into Marks at the rate of M. 20.42 = M. 151.53. From the table it will be seen the decimal equivalent of 8s/5 is = 0.42083 and as the integral number is 7 (7 pounds) place 7.42083 in the keyplate P, multiply by 20.42 and in the figure discs S appears 1515333486 or after pointing off the 7 decimals of the two factors = M. **151.53.**

This method of converting is applicable for all rates of decimal currency.

B. Converting decimal currency into English money.

The rate is given in the currency of the amount to be converted.

Rule: Divide the amount by the rate and convert the decimal places of the quotient into shillings and pence.

Example: Change M. 352.50 at the rate of M. 20.42 to the £ = £ 17. 3. 5.

Shift figure slide L I as far as possible to the right in order to get a sufficient number of decimal places in the quotient, and disengage figure slide L II.

Place 332.5 into the figure discs S, 20.42 into the keyplate P lever H in position II, perform the division and in the quotient discs Q appears 17.26248 = £ **17.26248.**

Look for 26248 or the nearest number (26250) in the table and there will be found 5s/3.

Consequently £ 17.26248 = £ **17. 5. 3.**

The converting of decimals of a pound into shillings and pence without the assistance of the table is done in the following manner.

Divide the two first places after the decimal point by 0.05 and you will find the shillings; to the remainder if any take the next three places and divide this number by 0.0004 and the pence will be found.

Example: £ 12,07008 = £ **12. 1. 5.**

The first two places after the decimal point (0.07) being divided by 0.05 result 1s remainder 0.02. To this take the next three places 008 and 0.02008 divided by 004 result 5.002 = 5 d, together £ **12. 1. 5.**

To find the decimal equivalents of fractions of pence see the tables on pages 47 and 48.

Converting English weight.

English weights likewise not being governed by the decimal system, Cwts, qrs. and pounds have to be converted into decimals of tons.

1 Ton (T) = 20 Hundredweight (Cwt) = 80 Quarters (qrs.) = 2240 Pounds (lbs).

1 Cwt	= 4 qrs.	= 112 lbs.	
1 Cwt	= $^1/_{20}$ T	0.05 T.	
1 qr.	= $^1/_4$ Cwt	= $\frac{0.05}{4}$	= 0,0125 T.
1 lbs	= $^1/_{28}$ qr.	= $\frac{0.0125}{28}$	= 0.00044 T.

1 T = 1015 kilos.

Example: 9 T 13 Cwt 3 qrs. 11 lbs a £ 1. 3. 6. per ton £ = **11. 7. 9.**

		T 9.00000
13 Cwt	= 13 × 0.15 T =	„ 0.65000
3 qrs.	= 3 × 0.0125 T =	„ 0.03750
11 lbs	= 11 × 0.00044 T =	„ 0.00484
		T **9.69234**

The mechanical solution by means of the instrument is as follows:

Place regulating lever H in position I, disengage figure slide L II, mark off the decimal point in the figure discs S and the keyplate P. Place the 9 integral tons **in front of the decimal** point in the sixth slot W from the right and give the crank one turn. Cancel figures in keyplate and the quotient discs Q.

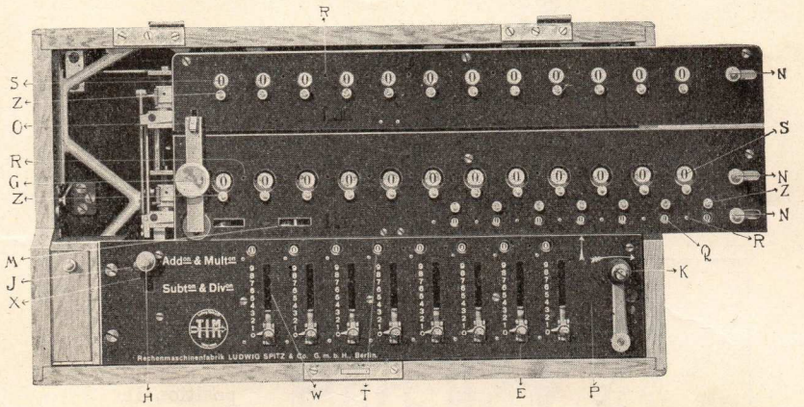
13 Cwt = 13 × 0.05, consequently set 0.05 in the keyplate placing the 0 into the first, the 5 into the second slot W after the decimal point. Multiply by 13 cancel the keyplate figures and the quotient discs Q.

3 qrs. = 3 × 0.0125. Place 0.0125 in the keyplate P as explained before, i. e. the I into the second the 2 into the third and the 5 into the fourth slot W after the decimal point, Multiply by 3, cancel keyplate figures and the quotient discs Q.

11 lbs = 11 × 0.00044, Place 000.44 in the keyplate P as above and multiply by 11.

In the quotient discs Q appears the sum of the product of these four multiplications = **9.69234** a compound multiplication and addition of products having been performed.

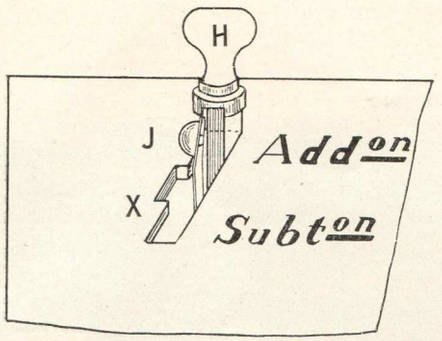
Place 9.69234 in the keyplate P, cancel the quotient discs Q multiply by £ 1. 3. 6 = 1.17500 (according to the table) 11.38849995000 = **11.38849** or after converting the decimals into shillings and pence = £ **11. 7. 9.**



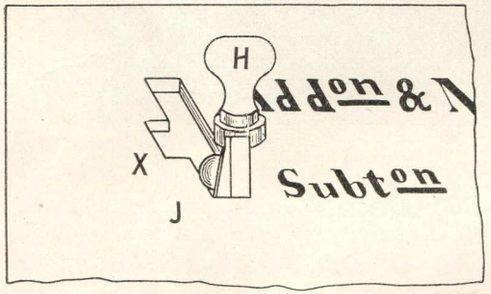
"Unitas".

P key-or fixed plate.
W figure-slots.
E marker.
K crank.
T figure-discs.
H regulating lever.
J small supplemental lever to H.
L I figure-slide.
L II figure-slide.
S figure-discs.
Q quotient-discs.
G slide-lifter and connecting link.
M catch for link G.
O catch for link G.
N canceller.
Z knobs.
R decimal pointers.

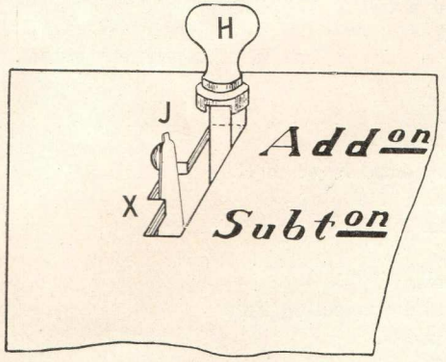
Reversing-lever.



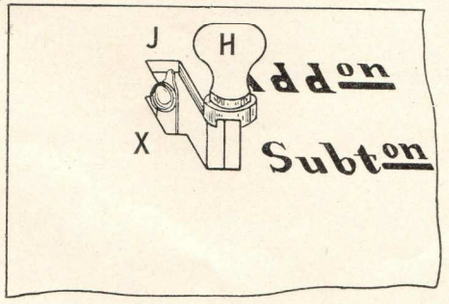
position I.



position II.



position III.



position IV.

Part II.

Conversion-Tables.

Fractions Converted into Decimals (in full) for any Unit.

1/2 — 0.5	13/15 — 0.86667	5/64 — 0.078125
1/4 — 0.25	14/15 — 0.93333	7/64 — 0.109375
3/4 — 0.75		9/64 — 0.140625
1/8 — 0.125	1/16 — 0.0625	11/64 — 0.171875
3/8 — 0.375	3/16 — 0.1875	13/64 — 0.203125
5/8 — 0.625	5/16 — 0.3125	15/64 — 0.234375
7/8 — 0.875	7/16 — 0.4375	17/64 — 0.265625
1/3 — 0.33333	9/16 — 0.5625	19/64 — 0.296875
2/3 — 0.66666	11/16 — 0.6875	21/64 — 0.328125
1/6 — 0.16667	13/16 — 0.8125	23/64 — 0.359375
5/6 — 0.83333	15/16 — 0.9375	25/64 — 0.390625
1/9 — 0.11111	1/32 — 0.03125	27/64 — 0.421875
2/9 — 0.22222	3/32 — 0.09375	29/64 — 0.453125
4/9 — 0.44444	5/32 — 0.15625	31/64 — 0.484375
5/9 — 0.55556	7/32 — 0.21875	33/64 — 0.515625
7/9 — 0.77778	9/32 — 0.28125	35/64 — 0.546875
8/9 — 0.88889	11/32 — 0.34375	37/64 — 0.578125
1/12 — 0.08333	13/32 — 0.40625	39/64 — 0.609375
5/12 — 0.41667	15/32 — 0.46875	41/64 — 0.640625
7/12 — 0.58333	17/32 — 0.53125	43/64 — 0.671875
11/12 — 0.91667	19/32 — 0.59375	45/64 — 0.703125
1/15 — 0.06667	21/32 — 0.65625	47/64 — 0.734375
2/15 — 0.13333	23/32 — 0.71875	49/64 — 0.765625
4/15 — 0.26667	25/32 — 0.78125	51/64 — 0.796875
7/15 — 0.46667	27/32 — 0.84375	53/64 — 0.828125
8/15 — 0.53333	29/32 — 0.90625	55/64 — 0.859375
11/15 — 0.73333	31/32 — 0.96875	57/64 — 0.890625
		59/64 — 0.921875
	1/64 — 0.015625	61/64 — 0.953125
	3/64 — 0.046875	63/64 — 0.984375

Table for the calculation of interest, reciprocals of percentage at 365 days.

%	%	%	%	%	%	%
1 — 27778	2 — 55555	3 — 83333	4 — 11111	5 — 13889	6 — 16667	7 — 19444
1.1 — 30556	2.1 — 58333	3.1 — 86111	4.1 — 11389	5.1 — 14167	6.1 — 16944	7.1 — 19722
1.2 — 33333	2.2 — 61111	3.2 — 88889	4.2 — 11667	5.2 — 14444	6.2 — 17222	7.2 — 20000
1.3 — 36111	2.3 — 63889	3.3 — 91667	4.3 — 11944	5.3 — 14722	6.3 — 17500	7.3 — 20278
1.4 — 38889	2.4 — 66667	3.4 — 94444	4.4 — 12222	5.4 — 15000	6.4 — 17778	7.4 — 20556
1.5 — 41667	2.5 — 69444	3.5 — 97222	4.5 — 12500	5.5 — 15278	6.5 — 18056	7.5 — 20833
1.6 — 44444	2.6 — 72222	3.6 — 10000	4.6 — 12778	5.6 — 15556	6.6 — 18333	7.6 — 21111
1.7 — 47222	2.7 — 75000	3.7 — 10278	4.7 — 13056	5.7 — 15833	6.7 — 18611	7.7 — 21389
1.8 — 50000	2.8 — 77778	3.8 — 10556	4.8 — 13333	5.8 — 16111	6.8 — 18889	7.8 — 21667
1.9 — 52778	2.9 — 80555	3.9 — 10833	4.9 — 13611	5.9 — 16389	6.9 — 19167	7.9 — 21944
1. 1/4 — 34722	1. 3/4 — 48611	1. 1/8 — 31250	1. 3/8 — 38194	1. 5/8 — 45139	1. 7/8 — 52083	1. 1/16 — 29514
2. 1/4 — 62500	2. 3/4 — 76389	2. 1/8 — 59028	2. 3/8 — 65972	2. 5/8 — 72917	2. 7/8 — 79861	2. 1/16 — 57292
3. 1/4 — 90278	3. 3/4 — 10417	3. 1/8 — 86806	3. 3/8 — 93750	3. 5/8 — 10069	3. 7/8 — 10764	3. 1/16 — 85069
4. 1/4 — 11806	4. 3/4 — 13194	4. 1/8 — 11458	4. 3/8 — 12153	4. 5/8 — 12847	4. 7/8 — 13542	4. 1/16 — 11285
5. 1/4 — 14583	5. 3/4 — 15972	5. 1/8 — 14236	5. 3/8 — 14931	5. 5/8 — 15625	5. 7/8 — 16319	5. 1/16 — 14062
6. 1/4 — 17361	6. 3/4 — 18750	6. 1/8 — 17014	6. 3/8 — 17708	6. 5/8 — 18403	6. 7/8 — 19097	6. 1/16 — 16840
7. 1/4 — 20139	7. 3/4 — 21528	7. 1/8 — 19792	7. 3/8 — 20486	7. 5/8 — 21181	7. 7/8 — 21875	7. 1/16 — 19618
1. 3/16 — 32986	1. 5/16 — 36458	1. 7/16 — 39931	1. 9/16 — 43403	1. 11/16 — 46875	1. 13/16 — 50347	1. 15/16 — 53819
2. 3/16 — 60764	2. 5/16 — 64236	2. 7/16 — 67708	2. 9/16 — 71181	2. 11/16 — 74653	2. 13/16 — 78125	2. 15/16 — 81597
3. 3/16 — 88542	3. 5/16 — 92014	3. 7/16 — 95486	3. 9/16 — 98958	3. 11/16 — 10243	3. 13/16 — 10590	3. 15/16 — 10938
4. 3/16 — 11632	4. 5/16 — 11979	4. 7/16 — 12326	4. 9/16 — 12674	4. 11/16 — 13021	4. 13/16 — 13368	4. 15/16 — 13715
5. 3/16 — 14410	5. 5/16 — 14757	5. 7/16 — 15104	5. 9/16 — 15451	5. 11/16 — 15799	5. 13/16 — 16146	5. 15/16 — 16493
6. 3/16 — 17188	6. 5/16 — 17535	6. 7/16 — 17882	6. 9/16 — 18229	6. 11/16 — 18576	6. 13/16 — 18924	6. 15/16 — 19271
7. 3/16 — 19965	7. 5/16 — 20312	7. 7/16 — 20660	7. 9/16 — 21007	7. 11/16 — 21354	7. 13/16 — 21701	7. 15/16 — 22049

If you want a decimal for any percentage, not contained in this table, for instance $3^2/_3$ %, multiply the number, which you find for 1%, 27778 by 3.666.

1/8 % = 034722 1/4 % = 069444 1/2 % = 013889 3/4 % = 020833

Decimal Equivalents of shillings and pence of a Pound.

Pence =		1	2	3	4	5	6	7	8	9	10	11
		0.00417	0.00833	0.01250	0.01667	0.02083	0.02500	0.02917	0.03333	0.03750	0.04167	0.04583
Sh. 1	0.05	0.05417	0.05833	0.06250	0.06667	0.07083	0.07500	0.07917	0.08333	0.08750	0.09167	0.09583
2	0.10	0.10417	0.10833	0.11250	0.11667	0.12083	0.12500	0.12917	0.13333	0.13750	0.14167	0.14583
3	0.15	0.15417	0.15833	0.16250	0.16667	0.17083	0.17500	0.17917	0.18333	0.18750	0.19167	0.19583
4	0.20	0.20417	0.20833	0.21250	0.21667	0.22083	0.22500	0.22917	0.23333	0.23750	0.24167	0.24583
5	0.25	0.25417	0.25833	0.26250	0.26667	0.27083	0.27500	0.27917	0.28333	0.28750	0.29167	0.29583
6	0.30	0.30417	0.30833	0.31250	0.31667	0.32083	0.32500	0.32917	0.33333	0.33750	0.34167	0.34583
7	0.35	0.35417	0.35833	0.36250	0.36667	0.37083	0.37500	0.37917	038333	0.38750	0.39167	0.39583
8	0.40	0.40417	0.40833	0.41250	0.41667	0.42083	0.42500	0.42917	0.43333	043750	0.44167	0.44583
9	0.45	0.45417	0,45833	0.46250	0.46667	0.47083	0.47500	0.47917	0.48333	0.48750	0.49167	0.49583
10	0.50	0.50417	0.50833	0.51250	0.51667	0.52083	0.52500	0.52917	0.53333	0.53750	0.54167	0.54583
11	0.55	0.55417	0.55833	0.56250	0.56667	0.57083	057500	0.57917	0.58333	0.58750	0.59167	0.59583
12	0.60	0.60417	0,60833	0.61250	0.61667	0.62083	0.62500	0.62917	0.63333	0.63750	0.64167	0.64583
13	0.65	0.65417	0.65833	0.66250	0.66667	0.67083	0.67500	0.67917	0.68333	0.68750	0.69167	0.69583
14	0.70	0.70417	0.70833	0.71250	0.71667	0.72073	0.72500	0.72917	0.73333	0.73750	0.74167	0.74583
15	0.75	0.75417	0.75833	0.76250	0.76667	0.77083	0.77500	0,77917	0.78333	0.78750	0.79167	0.79583
16	0.80	0.80417	0.80833	0.81250	0.81667	0.82083	0.82500	0 82917	0.83333	0.83750	0.84167	0.84583
17	0.85	0.85417	0.85833	0.86250	0.86667	0.87083	0.87500	0.87917	0.88333	0.88750	0.89167	0.89583
18	0.09	0.90417	0.90833	0.91250	0.91667	0.92083	0.92500	0.92917	0.93333	0.93750	0.94167	0.94583
19	0.95	0.95417	0.95833	0.96250	0.96667	0.97083	0.97500	0.97917	0.98333	0.98750	0.99167	0.99583

1/8 d = 0.000521 1/4 d = 0.001042 1/2 d = 0.002083 3/4 d = 0.003125

(I)

Table for Converting Pence and pence fractions into Decimals of a Pound.

Pence		1/8	2/8 = 1/4	3/8	4/8 = 1/2	5/8	6/8 = 3/4	7/8
		0.0005208333	0.0010416666	0.0015624999	0.0020833322	0.0026041665	0.0031249998	0.0036458331
1	0.00416666	0.0046874933	0.0052083266	0.0057291599	0.0062499932	0.0067708265	0.0072916598	0.007812493
2	0.00833332	0.0088541533	0.0093749866	0.0098958199	0.0104166532	0.0109374865	0.0114583198	0.0119791531
3	0.01249998	0.0130208133	0.0135416466	0.0140624799	0.0145833132	0.0151041465	0.0156249798	0.0161458131
4	0.01666664	0.0171874733	0.0177083066	0.0182291399	0.0187499732	0.0192708065	0.0197916398	0.0203124731
5	0.02083330	0.0213541333	0.0218749666	0.0223957999	0.0229166332	0.0234374665	0.0239582998	0.0244791331
6	0.02499996	0.0255207933	0.0260416266	0.0265624599	0.0270832932	0.0276041265	0.0281249598	0.0286457931
7	0.02916662	0.0296874533	0.0302082866	0.0307291199	0.0312499532	0.0317707865	0.0322916198	0.0328124531
8	0.03333328	0.0338541133	0.0343749466	0.0348957799	0.0354166132	0.0359374465	0.0364582798	0.0369791131
9	0.03749994	0.0380207733	0.0385416066	0.0390624399	0.0395832732	0.0401041065	0.0406249398	0.0411457731
10	0.04166660	0.0421874333	0.0427082666	0.0432290999	0.0437499332	0.0442707665	0.0447915998	0.0453124331
11	0.04583326	0.0463540933	0.0468749266	0.0473957599	0.0479165932	0.0484374265	0.0489582598	0.0494790931

(II)

Table for Converting Pence and pence fractions into Decimals of a Pound.

	1/16	3/16	5/16	7/16	9/16	11/16	13/16	15/16
	0.0002604165	0.0007812495	0.0013020825	0.0018229155	0.0023437485	0.0028645815	0.0033854145	0.0039062475
1	0.0044270765	0.0049479095	0.0054687425	0.0059895755	0.0065104085	0.0070312415	0.0075520745	0.0080729075
2	0 0085937365	0.0091145695	0.0096354025	0.0101562355	0.0106770685	0.0111979015	0.0117187345	0.0122395675
3	0.0127603965	0.0132812295	0.0138020625	0.0143228955	0.0148437285	0.0153645615	0.0158853945	0.0164062275
4	0.0169270565	0.0174478895	0.0179687225	0.0184895555	0.0190103885	0.0195312215	0.0200520545	0.0205728875
5	0.0210937165	0.0216145495	0.0221353825	0.0226562155	0.0231770485	0.0236978815	0.0242187145	0.0247395475
6	0.0252603765	0.0257812095	0.0263020425	0.0268228755	0.0273437085	0.0278645415	0.0283853745	0.0289062075
7	0.0294270365	0.0299478695	0.0304687502	0.0309895355	0.0315103685	0.0320312015	0.0325520345	0.0330728675
8	0.0335936965	0.0341145295	0.0346353625	0.0351561955	0.0356770285	0.0361978615	0.0367186945	0.0372395275
9	0.0377603565	0.0382811895	0.0388020225	0.0393228555	0.0398436885	0.0403645215	0.0408853545	0.0414061875
10	0.0419270165	0.0424478495	0.0429686825	0.0434895155	0.0440103485	0.0445311815	0.0450520145	0.0455728475
11	0.0460936765	0.0466145095	0.0471353425	0.0476561755	0.0481770085	0.0486978415	0.0492186745	0.0497395075

General table for converting Shillings and Pence into Decimals.

1 s — 0.05 £	1 d — 0.004 £	1 s — 12 d
2 „ — 0.10 „	2 „ — 0.008 „	2 „ — 24 „
3 „ — 0.15 „	3 „ — 0.012 „	3 „ — 36 „
4 „ — 0.20 „	4 „ — 0.017 „	4 „ — 48 „
5 „ — 0.25 „	5 „ — 0.021 „	5 „ — 60 „
6 „ — 0.30 „	6 „ — 0.025 „	6 „ — 72 „
7 „ — 0.35 „	7 „ — 0.029 „	7 „ — 84 „
8 „ — 0.40 „	8 „ — 0.033 „	8 „ — 96 „
9 „ — 0.45 „	9 „ — 0.037 „	9 „ — 108 „
10 „ — 0.50 „	10 „ — 0.042 „	10 „ — 120 „
11 „ — 0.55 „	11 „ — 0.046 „	11 „ — 132 „
12 „ — 0.60 „		12 „ — 144 „
13 „ — 0.65 „		13 „ — 156 „
14 „ — 0.70 „		14 „ — 168 „
15 „ — 0.75 „		15 „ — 180 „
16 „ — 0.80 „		16 „ — 192 „
17 „ — 0.85 „		17 „ — 204 „
18 „ — 0.90 „		18 „ — 216 „
19 „ — 0.95 „		19 „ — 228 „
		20 „ — 240 „

Table for converting Pence into Decimals of a Shilling.

Pence	Shillings	Pence	Shillings	Pence	Shillings
1/2	0.04167	4 1/2	0.37500	8 1/2	0.70833
1	0.08333	5	0.41667	9	0.75000
1 1/2	0.12500	5 1/2	0.45833	9 1/2	0.79167
2	0.16667	6	0.50000	10	0.83333
2 1/2	0.20833	6 1/2	0.54167	10 1/2	0.87500
3	0.25000	7	0.58333	11	0.91667
3 1/2	0.29167	7 1/2	0.62500	11 1/2	0.95833
4	0.33333	8	0.66667	12	1.00000

To find the decimals of shillings divide the number of pence by 12,

for instance $^3/_4$ d $\div 12 = \frac{0{,}75}{12} = 0.0625$

Table for Converting English weights.

lbs. as decimals of a Cwt.

1 qr. = 0.25 Cwt, 2 qrs. = 0.50 Cwt, 3 qrs. = 0.75 Cwt.

1 lb = 0.00892857 Cwt.	15 lb = 0.13392855 Cwt.
2 „ = 0.01785714 „	16 „ = 0.14285712 „
3 „ = 0.02678571 „	17 „ = 0.15178569 „
4 „ = 0.03571428 „	18 „ = 0.16071426 „
5 „ = 0.04464285 „	19 „ = 0.16964283 „
6 „ = 0.05357142 „	20 „ = 0.17857140 „
7 „ = 0.06249999 „	21 „ = 0.18749997 „
8 „ = 0.07142856 „	22 „ = 0.19642854 „
9 „ = 0.08035713 „	23 „ = 0.20535711 „
10 „ = 0.08928570 „	24 „ = 0.21428568 „
11 „ = 0.09821427 „	25 „ = 0.22321425 „
12 „ = 0.10714284 „	26 „ = 0.23214282 „
13 „ = 0.11607141 „	27 „ = 0.24107139 „
14 „ = 0.12499988 „	

Table for converting Engl. Quarters and Pounds into Decimals of a Cwt.

1 Cwt = 4 qrs. = 112 lbs. 1 qr. = 28 lbs.

qrs.	lbs.	Cwt.	qrs.	lbs.	Cwt.	qrs.	lbs.	Cwt.	qrs.	lbs.	Cwt.
0	1/2	.0045	1	0	.2500	2	0	.5000	3	0	.7500
0	1	.0089	1	1	.2589	2	1	.5089	3	1	.7589
0	2	.0179	1	2	.2679	2	2	.5179	3	2	.7679
0	3	.0268	1	3	.2768	2	3	.5268	3	3	.7768
0	4	.0357	1	4	.2857	2	4	.5357	3	4	.7857
0	5	.0446	1	5	.2946	2	5	.5446	3	5	.7946
0	6	.0536	1	6	.3036	2	6	.5536	3	6	.8036
0	7	.0625	1	7	.3125	2	7	.5625	3	7	.8125
0	8	.0714	1	8	.3214	2	8	.5714	3	8	.8214
0	9	.0803	1	9	.3303	2	9	.5803	3	9	.8303
0	10	.0893	1	10	.3393	2	10	.5893	3	10	.8393
0	11	.0982	1	11	.3482	2	11	.5982	3	11	.8482
0	12	.1071	1	12	.3571	2	12	.6071	3	12	.8571
0	13	.1161	1	13	.3661	2	13	.6161	3	13	.8661
0	14	.1250	1	14	.3750	2	14	.6250	3	14	.8750
0	15	.1339	1	15	.3839	2	15	.6339	3	15	.8839
0	16	.1429	1	16	.3929	2	16	.6429	3	16	.8929
0	17	.1518	1	17	.4018	2	17	.6518	3	17	.9018
0	18	.1607	1	18	.4107	2	18	.6607	3	18	.9107
0	19	.1696	1	19	.4196	2	19	.6696	3	19	.9196
0	20	.1786	1	20	.4286	2	20	.6786	3	20	.9286
0	21	.1875	1	21	.4375	2	21	.6875	3	21	.9375
0	22	.1964	1	22	.4464	2	22	.6964	3	22	.9464
0	23	.2054	1	23	.4554	2	23	.7054	3	23	.9554
0	24	.2143	1	24	.4643	2	24	.7143	3	24	.9643
0	25	.2232	1	25	.4732	2	25	.7232	3	25	.9732
0	26	.2322	1	26	.4822	2	26	.7322	3	26	.9822
0	27	.2411	1	27	.4911	2	27	.7411	3	27	.9911

To find these decimals of Cwts. without using the table, divide the given number of Pounds by 112. Viz.: 17 Pounds = 17 ÷ 112 = 0.1518 Cwt or 1 qr. 9 Pounds = 37 ÷ 112 = 0.3782 Cwt

1 lb = 453,4926525 grammes.

Table for converting inches, feet into decimals of a yard.

1 Yard = 3 feet = 36 inches. 1 foot = 12 inches.

Fractions of inches	Decimals of inches	32 inches	Decimals of inches	Inches	Decimals of	
					feet	Yards
— 1/16	.0625	1/32	.03125	1	.0833	.0278
1/8 —	.1250	3/32	.09375	2	.1667	.0556
— 3/16	.1875	5/32	.15625	3	.2500	.0833
1/4 —	.2500	7/32	.21875	4	.3333	.1111
— 5/16	.3125	9/32	.28125	5	.4167	.1389
3/8 —	.3750	11/32	.34375	6	.5000	.1667
— 7/16	.4377	13/32	.40625	7	.5833	.1944
1/2 —	.5000	15/32	.46875	8	.6667	.2222
— 9/16	.5625	17/32	.53125	9	.7500	.2500
5/8 —	.6250	19/32	.59375	10	.8333	.2778
— 11/16	.6875	21/32	.65625	11	.9167	.3056
3/4 —	.7500	23/32	.71875	12	1.0000	.3333
— 13/16	.8125	25/32	.78125			
7/8 —	.8750	27/32	.84375			
— 15/16	.9375	29/32	.90625			
1 Zoll	1.0000	31/32	.96875			

1 Yard = 914,4 mm. 1 foot = 348 mm. 1 inch = 29 mm.

Table for converting ounces into Decimals of a pound Avoirdupois.

1 lb = 16 ounces. 1 ounce = 28,3495408 Grammes.

Oz.	Pound	Oz.	Pound	Oz.	Pound	Oz.	Pound	Oz.	Pound
1/4	.015625	3	.18750	6 1/2	.40625	10	.62500	13 1/2	.84375
1/2	.031250	3 1/2	.21875	7	.43750	10 1/2	.65625	14	.87500
3/4	.046875	4	.25000	7 1/2	.46875	11	.68750	14 1/2	.90625
1	.062500	4 1/2	.28125	8	.50000	11 1/2	.71875	15	.93750
1 1/2	.093750	5	.31250	8 1/2	.53125	12	.75000	15 1/2	.96875
2	.125000	5 1/2	.34375	9	.56250	12 1/2	.78125	16	1.00000
2 1/2	.156250	6	.35500	9 1/2	.59376	13	.81250		

Without using the table divide x ÷ 16, where x = the given number of x ounces

3 Ounces = 3 ÷ 16 = 0. 1875 lbs.

12 1/2 „ = 12,5 ÷ 16 = 0.78125 lbs.

Table for percentage computations.

Formula $\frac{1}{99} + 1 = ?$, $\frac{2}{98} + 1 = ?$ etc.

%	% complement	%	% complement	%	% complement
1	1.01010	35	1.53846	69	3.22580
2	1.02041	36	1.56250	70	3.33333
3	1.03092	37	1.58730	71	3.44828
4	1.04166	38	1.61290	72	3.57143
5	1.05263	39	1.63934	73	3.70370
6	1.06383	40	1.66667	74	3.84615
7	1.07527	41	1.63838	75	4.00000
8	1.08696	42	1.72438	76	4.16667
9	1.09890	43	1.75439	77	4.34782
10	1.11111	44	1.78571	78	4.54545
11	1.12360	45	1.81818	79	4.76190
12	1.13636	46	1.85185	80	5.00000
13	1.14925	47	1.88679	81	5.26316
14	1.16279	48	1.92308	82	5.55556
15	1.17647	49	1.96078	83	5.88235
16	1.19048	50	2.00000	84	6.25000
17	1.20482	51	2.04082	85	6.66667
18	1.21951	52	2.08333	86	7.14286
19	1.23457	53	2.12766	87	7.69231
20	1.25000	54	2.17391	88	8.33333
21	1.26582	55	2.22222	89	9.09091
22	1.28205	56	2.27273	90	10.00000
23	1.29870	57	2.32558	91	11.11111
24	1.31579	58	2.38095	92	12.50000
25	1.33333	59	2.43902	93	14.28571
26	1.35135	60	2.50000	94	16.66667
27	1.36986	61	2.56410	95	20.00000
28	1.38889	62	2.63158	96	25.00000
29	1.40845	63	2.70270	97	33.33333
30	1.42857	64	2.77778	98	50.00000
31	1.44927	65	2.85714	99	100.00000
32	1.47059	66	2.94118	100	—
33	1.49254	67	3.03030		
34	1.51515	68	3.12500		

Table of Reciprocals from 1 to 1000.

(The decimal point is supposed to be before each number).

	1—100	101—200	201—300	301—400	401—500	501—600	601—700	701—800	801—900	901—1000	
1	100000000	0099009900	0049751243	0033222591	0024937655	0019960079	0016638935	0014265335	0012484394	0011098779	1
2	50000000	0098039215	0049504950	0033112582	0024875621	0019920318	0016611295	0014245014	0012468827	0011086474	2
3	33333333	0097087378	0049261083	0033003300	0024813895	0019880715	0016583747	0014224751	0012453300	0011074197	3
4	25000000	0096153846	0049019607	0032894736	0024752475	0019841269	0016556291	0014204545	0012437810	0011061946	4
5	20000000	0095238095	0048780487	0032786885	0024691358	0019801980	0016528925	0014184397	0012422360	0011049723	5
6	16666666	0094339622	0048543689	0032679738	0024630541	0019762845	0016501650	0014164305	0012406947	0011037527	6
7	14285714	0093457943	0048309178	0032573289	0024570024	0019723865	0016474464	0014144271	0012391573	0011025358	7
8	12500000	0092592592	0048076923	0032467532	0024509803	0019685039	0016447468	0014124293	0012376237	0011013215	8
9	11111111	0091743119	0047846889	0032362459	0024449877	0019616365	0016420361	0014104372	0012360939	0011001100	9
10	10000000	0090909090	0047619047	0032258064	0024390243	0019607843	0016393442	0014084507	0012345679	0011989010	10
11	090909090	0090090090	0047393364	0032154340	0024330900	0019569471	001636612	0014064697	0012330456	0010976948	11
12	083333333	0089285714	0047169811	0032051282	0024271844	0019531250	0016339869	0014044943	0012315270	0010964912	12
13	076923077	0088495575	0046948356	0031948881	0024213075	0019493177	0016313213	0014025245	0012300123	0010952902	13
14	071428571	0087719298	0046728971	0031847133	0024154589	0019455252	0016286644	0014005602	0012285012	0010940919	14
15	066666666	0086956521	0046511627	0031746030	0024096385	0019417475	0016260162	0013986013	0012269938	0010928961	15
16	062500000	0086206896	0046296296	0031645569	0024038461	0019379844	0016233766	0013966480	0012254901	0010917030	16
17	058823529	0085470085	0046082949	0031545741	0023980815	0019342359	0016207455	0013947001	0012239902	0010905125	17
18	055555555	0084745762	0045871559	0031446540	0023923444	0019305019	0016181229	0013927576	0012224938	0010893246	18
19	052631570	0084033613	0045662100	0031347962	0023866348	0019267822	0016155088	0013908205	0012210012	0010881392	19
20	050000000	0083333333	0045454549	0031250000	0023809520	0019230769	0016129032	0013888888	0012195121	0010869565	20

Table of Reciprocals from 1 to 1000.

(The decimal point is supposed to be before each number.)

	1—100	101—200	201—300	301—400	401—500	501—600	601—700	701—800	801—900	901—1000	
21	047619047	0082644628	0045248868	0031152647	0023752969	0019193857	0016103059	0013869625	0012180267	0010857763	21
22	045454545	0081967313	0045045045	0031055900	0023696682	0019157088	0016077170	0013850415	0012165450	0010845986	22
23	043478260	0081300813	0044843049	0030959752	0023640661	0019120458	0016051364	0013831258	0012150668	0010834236	23
24	041666666	0080645161	0044642857	0030864197	0023584904	0019083969	0016025641	0013812154	0012135922	0010822510	24
25	040000000	0080000000	0044444444	0030769230	0023529411	0019047619	0016000000	0013793103	0012121212	0010810810	25
26	038461538	0079365079	0044247787	0030674846	0023474178	0019011406	0015974440	0013774104	0012106537	0010799036	26
27	037037037	0078740157	0044052863	0030581039	0023419203	0018975332	0015948963	0013755158	0012091890	0010787486	27
28	035714285	0078125000	0043859649	0030487804	0023364485	0018939393	0015923566	0013736263	0012077294	0010775862	28
29	034482758	0077519379	0043668122	0030695136	0023310023	0018903591	0015898251	0013717421	0012062726	0010764262	29
30	033333333	0076923076	0043478260	0030303030	0023255813	0018867924	0015873045	0013698630	0012048192	0010752688	30
31	032258064	0076335877	0043290043	0030211480	0023201856	0018832391	0015847860	0013679890	0012033694	0010741138	31
32	031250000	0075757575	0043103448	0030120481	0023148148	0018796992	0015822784	0013661202	0012019230	0010729613	32
33	030303030	0075187969	0042918454	0030030030	0023094688	0018761726	0015797788	0013642564	0012004801	0010718113	33
34	029411764	0074626865	0042735042	0029940119	0023041474	0018726591	0015772870	0013623978	0011990407	0010706638	34
35	028571428	0074074074	0042553191	0029850746	0022988505	0018691588	0015748031	0013605442	0011976047	0010695187	35
36	027777777	0073529411	0042372881	0029761904	0022935779	0018656716	0015723270	0013586956	0011961722	0010683760	36
37	027027027	0072992700	0042194092	0029673590	0022883295	0018621973	0015698587	0013568521	0011947431	0010672358	37
38	026315789	0072463768	0042016806	0029585798	0022831050	0018587360	0015673981	0013550135	0011933174	0010660980	38
39	025641025	0071942446	0041841004	0029498525	0022779043	0018552875	0015649452	0013531799	0011918951	0010649627	39
40	025500000	0071428657	0041666666	0029411764	0022727272	0018518518	0015625000	0013513513	0011904761	0010638297	40

Table of Reciprocals from 1 to 1000.

(The decimal point is supposed to be before each number.)

	1—100	101—200	201—300	301—400	401—500	501—600	601—700	701—800	801—900	901—1000	
41	024390243	0070921985	0041493775	0029325513	0022675736	0018484288	0015600624	0013495276	0011890606	0010626992	41
42	023809523	0070422535	0041322314	0029239766	0022624434	0018450184	0015576323	0013477088	0011876484	0010615711	42
43	023255813	0069930069	0041152263	0029154518	0022573363	0018416206	0015552099	0013458950	0011862396	0010604453	43
44	022727272	0069444444	0040983606	0029069767	0022522522	0018382352	0015527950	0013440860	0011848341	0010593220	44
45	022222222	0068965517	0040816326	0028985507	0022471910	0018348623	0015503875	0013422818	0011834319	0010582010	45
46	021739130	0068493150	0040816326	0028901734	0022421524	0018351018	0015479876	0013404825	0011820330	0010570824	46
47	021276595	0068027210	0040650406	0028818443	0022371364	0018281535	0015455950	0013386880	0011806375	0010559662	47
48	020833333	0067567567	0040485829	0028735632	0022321428	0018248175	0015432098	0013368983	0011792452	0010548523	48
49	020408163	0067114093	0040322580	0028653295	0022271714	0018214936	0015408320	0013351134	0011778563	0010537407	49
50	020000000	0066666666	0040000000	0028571428	0022222222	0018181818	0015384615	0013333333	0011764705	0010526315	50
51	019607843	0066225165	0039840637	0028490028	0022172949	0018148820	001536983	0013315579	0011750881	0010515247	51
52	019230769	0065789473	0039682539	0028409090	0022123893	0018115942	0015337423	0013297872	0011737089	0010504201	52
53	018867924	0065359477	0039525691	0028328611	0022075055	0018083182	0015313935	0013280212	0011723329	0010493179	53
54	018518518	0064935064	0039370078	0028248587	0022026431	0018050541	0015290519	0013262599	0011709601	0010482180	54
55	018181818	0064516129	0039215686	0028169014	0021978021	0018018018	0015267175	0013245033	0011695906	0010471204	55
56	017857142	0064102564	0039062500	0028089887	0021929824	0017985611	0015243902	0013227513	0011682242	0010460251	56
57	017543859	0063094267	0038910505	0028011204	0021881838	0017953321	0015220700	0013210039	0011668611	0010449320	57
58	017241379	0063291139	0038759689	0027932900	0021834061	0017921146	0015197568	0013192612	0011655011	0010438413	58
59	016949152	0062893081	0038610038	0027855153	0021786492	0017889087	0015174506	0013175230	0011611443	0010427528	59
60	016666666	0062500000	0038461538	0027777777	0021739131	0017857142	0015151515	0013157894	0011627906	0010416666	60

Table of Reciprocals from 1 to 1000.

(The decimal point is supposed to be before each number.)

	1—100	101—200	201—300	301—400	401—500	501—600	601—700	701—800	801—900	901—1000	
61	016393442	0062111801	0038314176	0027700831	0021691973	0017825311	0015128593	0013140604	0011614401	0010405827	61
62	016129032	0061728395	0038167938	0027624309	0021645021	0017793594	0015105740	0013123359	0011600928	0010395010	62
63	015873015	0061349693	0038022813	0027548209	0021598272	0017761989	0015082956	0013106159	0011587485	0010384215	63
64	015625000	0060975609	0037878787	0027472527	0021551724	0017730496	0015060240	0013089005	0011574074	0010373443	64
65	015384615	0060606060	0037735849	0027397260	0021505376	0017699115	0015037593	0013071895	0011560693	0010362694	65
66	015151515	0060240963	0037593984	0027322404	0021459227	0017607844	0015015015	0013054830	0011547344	0010351966	66
67	014925373	0059880239	0037453183	0027247956	0021413276	0017636684	0014992503	0013037809	0011534025	0010341261	67
68	014705882	0059523809	0037313432	0027173913	0021367521	0017605633	0014970059	0013020833	0011520737	0010330578	68
69	014492753	0059171597	0037174721	0027100271	0021321961	0017574692	0014947683	0013003901	0011507479	0010319917	69
70	014285714	0058823529	0037037037	0027027027	0021276595	0017543859	0014925373	0012987012	0011494252	0010309278	70
71	014084507	0058479532	0036900360	0026954177	0021231422	0017513134	0014903129	0012970168	0011481056	0010298661	71
72	013888888	0058139534	0036764705	0026881720	0021186440	0017482517	0014880952	0012953367	0011467889	0010288065	72
73	013698630	0057803468	0036630036	0026809651	0021141649	0017452183	0014858841	0012936610	0011454753	0010277492	73
74	013513513	0057471264	0036496350	0026737967	0021097046	0017421602	0014836795	0012919896	0011441647	0010266940	74
75	013333333	0057142857	0036363636	0026666666	0021052631	0017391304	0014814814	0012903225	0011428571	0010256410	75
76	013157894	0056818181	0036231884	0026595744	0021008403	0017361128	0014792899	0012886597	0011415525	0010245901	76
77	012987012	0056497175	0036101083	0026525198	0020964360	0017331022	0014771048	0012870012	0011402508	0010235414	77
78	012820512	0056179775	0035971223	0026445026	0020920502	0017301038	0014749262	0012853470	0011389533	0010224948	78
79	012658227	0055865921	0035842293	0026385224	0020876826	0017271157	0014727540	0012836970	0011376564	0010214504	79
80	012500000	0055555555	0035714285	0026315789	0020833333	0017241379	0014705882	0012820512	0011363637	0010204081	80

Table of Reciprocals from 1 to 1000

(The decimal point is supposed to be before each number.)

	1—100	101—200	201—300	301—400	401—500	501—600	601—700	701—800	801—900	601—1000	
81	012335679	0055248618	0035587188	0026246719	0020790020	0017211703	0014684287	0012804097	0011350737	0010193679	81
82	012195121	0054945054	0035460992	0026178010	0020746887	0017182130	0014662756	0012787723	0011337868	0010183299	82
83	012048192	0054644808	0035335689	0026109660	0020703933	0017152658	0014641288	0012771392	0011325028	0010172939	83
84	011904761	0054347826	0035211267	0026041666	0020661157	0017123287	0014619883	0012755102	0011312217	0010162601	84
85	011764705	0054054054	0035087719	0025974025	0020618556	0017094017	0014598540	0012738853	0011299435	0010152284	85
86	011627906	0053763440	0034965034	0025906735	0020576131	0017064846	0014577259	0012722616	0011286681	0010141987	86
87	011494252	0053475935	0034843205	0025839793	0020533880	0017035775	0014556040	0012706480	0011273957	0010131712	87
88	011363636	0053191489	0034722222	0025773195	0020491803	0017006802	0014534883	0012690355	0011261261	0010121457	88
89	011235955	0052910052	0034602076	0025706940	0020449897	0016977020	0014513788	0012674271	0011248593	0010111223	89
90	011111111	0052631578	0034482758	0025641025	0020408163	0016049152	0014492753	0012658227	0011235955	0010101010	90
91	010989010	0052356020	0034364261	0025575447	0020366598	0016920473	0014471780	0012642225	0011223344	0010090817	91
92	010869565	0052083333	0034246575	0025510204	0020325203	0016891891	0014450867	0012626262	0011210762	0010080645	92
93	010752688	0051813471	0034129692	0025445292	0020283975	0016863406	0014430014	0012610310	0011198208	0010070493	93
94	010638297	0051546391	0034013605	0025380710	0020242914	0016835016	0014409221	0012594458	0011185682	0010060362	94
95	010526315	0051282051	0033898305	0025316455	0020202020	0016806722	0014388489	0012578616	0011173184	0010050251	95
96	010416666	0051020408	0033783783	0025252525	0020161290	0016778523	0014367816	0012562814	0011160714	0010040160	96
97	010309278	0050761421	0033670033	0025188916	0020120724	0016750418	0014347202	0012547051	0011148272	0010030090	97
98	010204081	0050505050	0033557046	0025125628	0020080321	0016722408	0014326647	0012531328	0011135857	0010020040	98
99	010101010	0050251256	0033444816	0025062656	0020040080	0016694490	0014306151	0012515644	0011123470	0010010010	99
100	010000000	0050000000	0033333333	0025000000	0020000000	0016666666	0014285714	0012500000	0011111111	0010000000	100

Dozens and pieces in Decimals of a Gross.

(1 Gross = 12 dozen of 12 pieces, each = 144 pieces.)

doz	pieces	= Gross:	doz	pieces	= Gross:	doz	pieces	= Gross:
—	1	=0.00695 Gross	4	1	=0.34028 Gross	8	1	=0.67361 Gross
—	2	0.01388 „	4	2	0.34723 „	8	2	0.68056 „
—	3	0.02083 „	4	3	0.35417 „	8	3	0.68750 „
—	4	0.02777 „	4	4	0.36112 „	8	4	0.69445 „
—	5	0.03472 „	4	5	0.36806 „	8	5	0.70139 „
—	6	0.04167 „	4	6	0.37500 „	8	6	0.70834 „
—	7	0.04862 „	4	7	0.38195 „	8	7	0.71528 „
—	8	0.05557 „	4	8	0.38889 „	8	8	0.72223 „
—	9	0.06250 „	4	9	0.39583 „	8	9	0.72919 „
—	10	0.06944 „	4	10	0.40277 „	8	10	0.73612 „
—	11	0.07639 „	4	11	0.40971 „	8	11	0.74306 „
1	—	0.08334 „	5	—	0.41667 „	9	—	0.75000 „
1	1	0.09029 „	5	1	0.42361 „	9	1	0.75695 „
1	2	0.09724 „	5	2	0.43056 „	9	2	0.76389 „
1	3	0.10417 „	5	3	0.43750 „	9	3	0.77084 „
1	4	0.11112 „	5	4	0.44444 „	9	4	0.77778 „
1	5	0.11807 „	5	5	0.45139 „	9	5	0.78472 „
1	6	0.12502 „	5	6	0.45833 „	9	6	0.79167 „
1	7	0.13195 „	5	7	0.46528 „	9	7	0.79860 „
1	8	0.13888 „	5	8	0.47222 „	9	8	0.80555 „
1	9	0.14583 „	5	9	0.47917 „	9	9	0.81250 „
1	10	0.15277 „	5	10	0.48611 „	9	10	0.81944 „
1	11	0.15972 „	5	11	0.49306 „	9	11	0.82639 „
2	—	0.16667 „	6	—	0.50000 „	10	—	0.83333 „
2	1	0.17361 „	6	1	0.50695 „	10	1	0.84028 „
2	2	0.18055 „	6	2	0.51388 „	10	2	0.84722 „
2	3	0.18750 „	6	3	0.52082 „	10	3	0.85417 „
2	4	0.19445 „	6	4	0.52777 „	10	4	0.86111 „
2	5	0.20139 „	6	5	0.53471 „	10	5	0.86806 „
2	6	0.20834 „	6	6	0.54166 „	10	6	0.87500 „
2	7	0.21529 „	6	7	0.54860 „	10	7	0.88195 „
2	8	0.22232 „	6	8	0.55555 „	10	8	0.88889 „
2	9	0.22917 „	6	9	0.56249 „	10	9	0.89583 „
2	10	0.23610 „	6	10	0.56944 „	10	10	0.90278 „
2	11	0.24305 „	6	11	0.57638 „	10	11	0.90972 „
3	—	0.25000 „	7	—	0.58333 „	11	—	0.91667 „
3	1	0.25695 „	7	1	0.59029 „	11	1	0.92361 „
3	2	0.26389 „	7	2	0.59723 „	11	2	0.93055 „
3	3	0.27084 „	7	3	0.60417 „	11	3	0.93750 „
3	4	0.27778 „	7	4	0.61112 „	11	4	0.94445 „
3	5	0.28472 „	7	5	0.61806 „	11	5	0.95139 „
3	6	0.29167 „	7	6	0.62500 „	11	6	0.95834 „
3	7	0.29861 „	7	7	0.63195 „	11	7	0.96529 „
3	8	0.30556 „	7	8	0.63889 „	11	8	0.97223 „
3	9	0.31250 „	7	9	0.64585 „	11	9	0.97918 „
3	10	0.31945 „	7	10	0.65278 „	11	10	0.98613 „
3	11	0.32639 „	7	11	0.65972 „	11	11	0.99306 „
4	—	0.33333 „	8	—	0.66667 „	—	—	1.00000 „

Hence, e. g.: 16 Gross 10 dozen 5 pieces = 16,86806 Gross.

Part III.

Exercises

for

(a) Machines with 6 figures on keyplate
(b) „ „ 8 „ „ „
(c) „ „ 10 „ „ „

Addition.

(a)	5.768	Mk.	68.—
	2.314	„	217.50
	75.463	„	0.75
	122.005	„	17.429.—
	= 205.550	= Mk.	17.715.25
(b)	4.683.914	Mk.	1.768.40
	4.683	„	134.927.—
	17.608.461	„	368.35
	824.739	„	579 382.—
	= 23.121.797	= Mk.	716.445.75
(c)	421.783.644	Mk.	538.45
	524.013	„	226.401.—
	5.386.400.252	„	1.346.527.80
	380	„	42.655.411.65
	= 5.808.708.289	= Mk.	44.228.878.90

Subtraction.

(a)	564	— 314	=	250
	3.479	— 2.112	=	1.367
	83.654	— 62.414	=	21.240
	45.378.649	—854.271	=	44.524.378

Mk.	713.40	— Mk.	217.—	= Mk.	496.40
„	432.679.45	— „	2.143.80	= „	430.535.65
„	8.724.50	— „	8.714.50	= „	10.00
„	1.65	— „	0.95	= „	0.70

(b)	82.463.942	— 7.139.742	=	75.324.200
	137.649.257	—12.146.837	=	125.502.420
	5.000	— 368	=	4.632
	7.597.643.954	—34.832.714	=	7.562.811.240

Mk.	564.872.689.75	— Mk.	724.867.70	= Mk.	564.147.822.05
„	38.579.241.00	— „	217.689.45	= „	38.361.524.55
„	7.417.35	— „	38.90	= „	7.378.45
„	2.478.631.18	— „	1.475.630.00	= „	1.003.001.18

(c)	139.248.361.734	— 4.687.632.904	=	134.560.728.830
	27.438.492.571.943	— 76.842.541	=	27,438.415.729.402
	27.564.392	— 27.504.382	=	60.010
	15.429.873.410	— 29.873.410	=	15.400.000.000

Mk. 4,263,847,954.80 — Mk. 26,871,793.70 = Mk. 4,236,976,161.10
„ 593,846.35 — „ 4,217.35 = „ 589,629.00
„ 8,271,638,210.30 — „ 7,743,918.75 = „ 8,263,894,291.55

Multiplication.

(a) 3,468 × 425 = 1,473,900
43,274 × 5,614 = 242,940,236
927,143 × 412,378 = 382,333,376,054
235 × 235 = 55,225

(b) 64,378,439 × 749,237,914 = 48,234,767,342,936,246
36,342,017 × 2,176,431 = 79,095,892,401,327
7,421 × 483,649,074 = 3,589,159,778,154
243,893,742 × 24,613 = 6,002,956,671,846

(c) 4,793,246,438 × 642,384,709 = 307,910,8218,239,916,542
34,687,468,942 × 79,384 = 2,753,630,034,491,728
5,438,210,364 × 43,876,402,418 = 238,609,106,364,602,260,152
1,283,467 × 5,384 = 6,910,186,328

Short method of multiplication.

(a) 264 × 98 = 25,872
3,768 × 487 = 1,835,016
357,686 × 9,897 = 3,540,018,342

(b) 42,512 × 19,491 = 828,601,392
7,899,889 × 1,499,421 = 11,845,259,464,269
59,989,799 × 2,463,987 = 147,814,084,868,613

(c) 97,987,988 × 1,736,424,534 = 170,148,746,400,497,592
59,987 × 12,439,768,414 = 746,224,387,850,618
736,474,291 × 2,998,799 = 2,208,538,367,376,509

Multiplication and simultaneous addition of products.

		slide L I	slide L II
1.	7,368 × 569 =	4,192,392	41,92,392
	38,420 × 6,724 =	258,336,080	262,528,472
	297 × 388 =	115,236	262,643,708
	52,493 × 9,489 =	498,106,077	**760,749,785**
2.	58.39 × 4.23 =	246.9897	246.98970
	7,364.8 × 27.15 =	199,954.220	200,201.30970
	88.34 × 23.7 =	2,093.658	202,294.96770
	0.43 × 0.24 =	0.1032	202,295.07090
	5.438 × 7.18 =	39.04484	**202,334.11574**

Compound multiplication and simultaneous Addition of products.

	slide L I	slide L II
375 × 29 =	10,875	10,875
4,641 × 378 =	1,754,298	1,765,173
7,641 × 9 =	68,769	1,833,942
229 × 77 =	17,633	**1,851,575**

Multiplication and simultaneous Subtraction of products.

		slide L I	slide L II
1.	17,368,493 — 5,386 × 348 =	1,874,328	15,494,165
	2,894,500 — 8,764 × 287 =	2,515,268	379,232
	56,342 — 219 × 55 =	12,045	44,297
	783,954 — 374 × 423 =	158,202	625,752
2.	5,893.4627 — 23.4 × 15. =	351.	5,542.4627
	8,324.6973 — 26.17 × 2.98 =	77.9866	8,246.7107
	6,549.3210 — 14.341 × 8.79 =	126.05739	6,423.26361
	24.76314 — 2.17 × 5.27 =	11.4359	13.32724

Continued Subtraction of products.

		slide L I	slide L II
1.	868,379,430,425 — 17 × 24 =	408	868,379,430,017
	— 261 × 468 =	122,148	868,379,307,869
	— 4,739 × 543 =	2,573,277	868,376,734,592
	— 564 × 399 =	225,036	868,376,509,556
		balance	**868,376,509,556**

		slide L I	slide L II
2.	94387621.0893 — 21.3 × 36 =	766.8	94386854.2893
	— 53.17 × 84 =	4466.28	94382388.0093
	— 231.35 × 215 =	49740.25	94332647.7593
	— 768.89 × 63 =	48440.07	94284207.6893
		balance	**94284207.6893**

		slide L I	slide L II
3.	89679342.6430 — 2.5 × 17.32 =	43.300	89679299.3430
	— 37.24 × 36.12 =	1345.1088	89677954.2342
	— 89.89 × 88. =	7910.32	89670043.9142
	— 231.439 × 25.1 =	5809.1189	89664234.7953
		balance	**89664234.7953**

Multiplication with constant Factors.

a) 123,450 × 123,456 = 15240,643,200
123,450 × 51,289 = 6,331,627,050
123,450 × 597,190 = 73,723,105,500
123,450 × 3,473 = 428,741,850

b) 27,648,493 × 3,468,354 = 95,894,761,290,522
27,648,493 × 109,162 = 3,018,164,792,866
27,648,493 × 7,350,849 = 203,239,897,120,557
27,648,493 × 4,360 = 120,547,429,480

c) 2,345,789,016 × 7,434,218 = 17,439,106,926,949,488
2,345,789,016 × 348,309,045 = 817,059,531,934,449,720
2,345,789,016 × 4,764,120,930 = 11,175,622,548,489,704,880
2,345,789,016 × 7,053,000 = 16,544,849,929,848,000

Double Multiplication.

1. 368 × 75 × 83 = 2,290,800
9,435 × 98 × 62 = 57,327,060
684 × 317 × 54 = 11,708,712
65,723 × 268 × 359 = 6,323,341,276
Sum 6,394,667,848

2. 5.34 × 2.19 × 4.38 = 51.222348
846.7 × 31.3 × 2.75 = 72879.7025
9.97 × 5.65 × 3.18 = 179.130990
22.638 × 42.14 × 9.8 = 9348.860136
Sum 82458.915974

Division.

1. 548 ÷ 23 = 23.826
3 926 ÷ 47 = 83.531
143 238 ÷ 867 = 165.211
264 ÷ 738 = 0.357

2. 8.34 ÷ 2.13 = 3.915
76.84 ÷ 9.27 = 8.285
238.40 ÷ 561.33 = 0.424
936.84 ÷ 216. = 4.337

Percentages.

1. 6 % of 342 = 20.52
3 % of 4769 = 143.07
2 % of 12438 = 248.76
4 % of 37 = 1.48

2. 5 % of 27.14 = 1.357
3 % of 6189.34 = 18.57
7 % of 08.76 = 0.06
4 % of 2.13 = 0.08

3. 2 1/2 % of 483 = 12.07
5 3/4 % of 7642 = 439.41
2 1/4 % of 65938 = 1483.60
4 1/8 % of 5434 = 224.15

4. 3 1/2 % of 3.64 = 0.13
2 1/4 % of 56.78 = 1.28
5 3/4 % of 246.39 = 14.17
4 1/8 % of 17.34 = 0.71

Addition of percentages and discounts.

		slide L I	slide L II
1.	368 + 4 % =	14.72	382.72
	2429 + 7 % =	170.03	2599.03
	24376 + 3 % =	731.28	25107.28
	15 + 1 % =	0.15	15.15
			Total 28104.18

		slide LI	slide L II
2.	53.7 + 3 % =	1.611	55.311
	42.68 + 4 % =	1.7072	44.3872
	0.38 + 2 % =	0.0076	0.3876
	58.479 + 5 % =	2.92395	61.40295
			Total 161.48875

		slide L I	slide L II
3.	243 + 2 1/2 % =	6.075	249.075
	3437 + 3 3/4 % =	128.8875	3565.8875
	62 + 1 1/9 % =	0.69750	62.69750
	56924 + 4 1/3 % =	2464.8092	59388.8092
			Total 63266.46920

		slide L I	slide L II
4.	8.43 + 4 1/2 %	= 0.37935	8.80935
	26.521 + 2 3/4 %	= 0.7293275	27.2503275
	0.37 + 1 1/8 %	= 0.0041625	0.3741625
	24.38 + 3 2/3 %	= 0.892308	25.272308
		Total	**61.7061480**

Subtraction of percentages and discounts.

		slide L I	slide L II
1.	537 — 4 %	= 21.48	515.52
	2648 — 3 %	= 79.44	2568.56
	747.95 — 5 %	= 37.3975	710.5525
	28 — 2 %	= 0.56	27.44
		Total	**3822,0725**

2.	422 — 4 1/4 %	= 17.9350	404.0650
	3684 — 5 2/3 %	= 208.5144	3475.4856
	98421 — 3 1/2 %	= 3444.735	94976 365
	46 — 2 1/8 %	= 0.97750	45.02250
		Total	**98900.83810**

		slide L I	slide L II
3.	5.68 — 4 %	= 0.2272	5.4528
	368.7 — 2 %	= 7.374	361.326
	1.4 — 3 %	= 0.042	1.358
	27.983 — 5 %	= 1.39915	26.58385
		Sum	**394.72065**

4.	2.34 — 3 1/4 %	= 0.076050	2.263950
	84.396 — 4 1/8 %	= 3.481335	80.914665
	4046.15 — 1 1/2 %	= 60.69225	3985.45775
	0.53 — 5 3/4 %	= 0.030475	0.499525
		Sum	**4069.135890**

Computation of interest.

What is the Capital, the interest on which at 5 % amounts M. 326.45 in 123 days? = **M. 19109.27**

$$\text{Formula: Capital} = \frac{\text{interest} \times 100 \times 360}{\text{rate of interest} \times \text{time}}$$

$$\text{Capital} = \frac{326.45 \times 100 \times 360}{5 \times 123} = 19109268 = \textbf{M. 19109.27}$$

Computation of interest (account-current discount).

1.	Mks.	568.45	for	25	days at	3 %	= Mks. 1.18
	„	7248.70	„	64	„ „	2 1/2 %	= „ 32.22
	„	862.—	„	93	„ „	3 3/4 %	= „ 8.35
	„	2438.85	„	12	„ „	5 1/4 %	= „ 4.27
	„	471.90	„	127	„ „	3 5/8 %	= „ 6.04
	„	2614.50	„	61	„ „	3/4 %	= „ 3.18

2. 4 1/2 % is to be computed on:

					slide L I	slide L II
Mks.	378.20	for	20	days =	7.560	7.560
„	5743.75	„	73	„ =	419.312	426.872
„	84.60	„	110	„ =	9.350	436.222
„	1997.80	„	72	„ =	143.856	580.078
„	82423.00	„	17	„ =	1,401.191	1,981.269

sum of interest numbers 1,981.269 at 4 1/2 % = **Mks. 247.66**

Computation of compound interest.

What is the capital of M. 3500 at 4 % compound interest after 3 years? **M. 3937.02.**

$$\text{Formula: } E = a\,(1 + \frac{p}{100})^n$$

E = final value of the capital, a = initial-capital, p = rate of interest, n = years.

$$E = 3500\ (1 + \frac{4}{100})^3 = 1{,}04^3 \times 3500 = 1{,}124864 \times 3500 = 393702400$$

$$= 3937.02 \text{ or } \textbf{M. 3937.02}$$

Account-Current

Example:

balanced on the 31st of Decr.

Dr.							Cr.				
Date		days	interest numbers	Mks.	Pfgs.	Date		days	interest numbers	Mks.	Pfgs.
14. July	to cash	166	779	468	50	2. July	by cash	178	1549	870	—
2. Aug.	do.	148	10852	7332	85	30. „	do.	150	1500	1000	—
30. Sept.	do.	90	788	874	60	20. Aug.	sundry bills	113	1088	963	40
5. Octr.	do.	85	5100	6000	—	10. Octr.	cash	80	464	579	80
22. „	do.	68	389	572	15	5. Nov.	do.	55	1580	2873	—
1. Nov.	do.	59	58	98	30	30. Decr.	do.	1	21	2139	70
28. „	do.	32	437	1365	—	31. „	balance			11116	—
14. Decr.	do.	16	38	239	—						
31. „	do.		—	2413	—						
31. „	4 1/2 % interest		12239	152	99						
31. „	1/8 % commission			24	20						
31. „	expenses			1	31						
				19541	90						
	balance			11116	—					19541	90

1. $5\ 1/2\ \%$ interest and $1/8\ \%$ commission
2. $3\ 5/8\ \%$ „ „ $2/3\ \%$ do.
3. $2\ 1/4\ \%$ „ „ $1/2\ \%$ do.

Converting decimal currencies.

Fcs.	546.85	at	81.25	in Marks	= Mk. 444.32
Cr.	2175.65	„	39.60	„ Roubles	= Rbl. 861.56
Fcs.	734.—	„	95.25	„ Crowns	= Kr. 699.14
Mks.	217.85	„	58.95	„ Holl. Gulden	= Fl. 128.42
Rbl.	624.75	„	252.50	„ Crowns	= Kr. 1577.49
Cr.	564.85	„	20.20	„ Dollars	= $ 114.10
Mks.	881.75	„	46.35	„ Roubles	= Rbl. 408 69
$	1684.—	„	523.20	„ Drachm.	= δρ 8810.69
Frcs.	267.30	„	112.75	„ Pesetas	= Ps. 301 38

Converting English currency.

£	27.	4s. 3d.	at 20.43 = Marks	555.95
„	62.	6s. 11d.	„ 24 02 = Crowns	1,497.55
„	129.	18s. 4d.	„ 4.83 = Dollars(amer.)	627.50
„	85.	0s. 9d.	„ 9.48 = Roubles	806.15
„	46.	3s. 0d.	„ 25.09 = Francs	1,157.90

Involution.

$255^2 = 65{,}025$ | $3.17^2 = 10.0489$ | $42.364^2 = 1794.708496$

$275^3 = 20{,}796{,}875$ | $2.24^3 = 11.239424$ | $302.13^3 = 27{,}579{,}192.873597$

Extraction of Square roof.

1. $\sqrt{2116} = 64$ $\quad \sqrt{720\,801} = 849$
   $\sqrt{42159049} = 6493$ $\quad \sqrt{1369} = 37$ $\sqrt{324} = 18$
   computed to 3 decimal places
2. $\sqrt{569} = 23.853$ $\quad \sqrt{9943} = 99.714$
   $\sqrt{1437} = 37.907$
3. $\sqrt{625.65} = 25.012$ $\quad \sqrt{64.72} = 8.044$
   $\sqrt{4399.884} = 663.31$.

Mercantile Computations.

Calculations.

768 pieces of goods Cost M. 2470.80. These goods are made up into dozens which are to be sold at M. 54.70 what is the cost per dozen and how much per cent is the profit?

Solution: 768 doz. M. 54.70 each
prime cost M. 38.60 per doz.
hence profit M. 54.70 — M. 38.60 — M. 16.10 p. doz.
hence profit M. 16.10 : M. 38.60 — M. 41.70

4657 kgs a mount to M. 12568.
What is the selling price of 1 kg if there is a deficit of $6\frac{1}{2}$% on the weight and $33\frac{1}{3}$% profit is to be earned?

Solution: (4657 × 100) — $6\frac{1}{2}$ — 4354.30 kgs
1 kg — 12568 : 4354.30 — 2.89
and $33\frac{1}{3}$% —.96
Selling price M. 3.85

How much can be allowed for goods if a profit of 26% is to be made on a selling price of M. 17.50?

Selling price: M. 17.50

$\frac{1750 \times 26}{100.26}$ = M. 3.61 × 26% „ 3.61

Prime cost M. 13.89

Checking invoices.

1.

736 Ko.	per ‰ Ko.	M	214.30	= M	157.72
6548 Ko.	„ % Ko.	M	38.15	= M	2498.06
29 St.	„ doz.	M	8.42	= M	20.35
234 Ko.	„ ko.	M	6.35	= M	1485.90
5 Dz.	„ doz.	M	4.—	= M	20.—
14 Dz.	„ gross	M	55.10	= M	64.28
243 St.	„ piece	M	2.75	= M	668.25
42.5 m	„ meter	M	0.65	= M	27.63
	freight	M	4.78	= M	4.78
	packing	M	7.—	= M	7.—
			Total	= M	4953.97
			$2\frac{1}{2}$% discount	= M	123.85
			Total	= M	4830.12

5.68 m		at M	1.30	= M	7.38
237.40 m		at M	0.72	= M	170.93
73	piece	at M	4.15	= M	302.95
4	doz.	at M	7.30	= M	29.20
62.40 m		at M	0.85	= M	53.04
9 St. at 15 m	St.	M	3.40	= M	30.60
			Total	= M	594.10
			+ $12\frac{1}{2}$%	= M	74.26
				= M	668.36
			— $2\frac{1}{4}$% discount	= M	15.04
			Total	= M	653.32

Timber-computations.

(a) Square-timber
formula: number × length × height × width

example: 17 beams 4.25 m long, height 0.15 m
25 „ 7.30 m „, width 0.22 m
= **3.60** cbm

42 „ 3.75 m „, height 0.11 m
2 „ 8.85 m „, width 0.23 m
= **0.607** cbm

(b) round-timber
formula: diameter × diameter × length

$$\times \frac{\pi}{4} = \frac{3.1416}{4} = 0.785$$

Example: A trunk or log is 7 m long and 0.48 m diameter
= [(48 × 48) × 7] × 0.785 = 12660480 = **1.266 cbm.**

Statistics.

A turn-over of M. 268.700 was made in one year and in each of the months:

January	Mks 22.500 =	8.373 %	of the annual turn-over
February	„ 18.750 =	6.978 %	„ „ „ „
March	„ 25360 =	9.438 %	„ „ „ „
April	„ 25.840 =	9.616 %	„ „ „ „
May	„ 18.800 =	6.996 %	„ „ „ „
June	„ 18.000 =	6.698 %	„ „ „ „
July	„ 16.000 =	5.954 %	„ „ „ „
August	„ 18.200 =	6.773 %	„ „ „ „
September	„ 18.500 =	6.885 %	„ „ „ „
October	„ 25.100 =	9.341 %	„ „ „ „
November	„ 26.000 =	9.676 %	„ „ „ „
December	„ 35.650 =	13.268 %	„ „ „ „
	= Mks 268.700 =	99.996 %	or in round figures 100%.

Dividend = monthly turn over. Divisor = annual turn over. Divide dividend and divisor by 100 and mark off decimal points, bring decimal point above decimal point and in the quotient discs place the decimal point in front of the disc to the right of the arrow + plus 2 as the quotient is to be divided by 100.

Contract-work Calculation.

A certain work is contracted at M. 250.—. This work is shared by 5 workmen, viz:

The 1st	3 3/4	hours	at M.	—.50	per	hour
„ 2nd	7 1/2	„	„	—.55	„	„
„ 3rd	19	„	„	—.57 1/2	„	„
„ 4th	25 1/4	„	„	—.59	„	„
„ 5th	1/2	„	„	—.61 1/4	„	„

How much is paid to each of them on basis of hours of work and wages per hour?

Solution:

1.	3 3/4	hours	M. —.50	each	= M.	1.88
2.	7 1/2	„	„ —.55	„	= „	4.13
3.	19	„	„ —.57 1/2	„	= „	10.93
4.	25 1/4	„	„ —.59	„	= „	14.90
5.	1/2	„	„ —.61 1/4	„	= „	—.30
						M. 32.14

$$250 \div 32{,}14 = 7{,}778$$

The M. 250,— are divided proportionally as $1 \div 7{,}778$, hence:

The 1st	will receive	$1.88 \times 7.778 =$	M. 14.62
„ 2nd	„	$4.13 \times 7.778 =$	„ 32.12
„ 3rd	„	$10.93 \times 7.778 =$	„ 85.01
„ 4th	„	$14.90 \times 7.778 =$	„ 115.89
„ 5th	„	$-.30 \times 7.778 =$	„ 2.33
			M. 249.97

Technical Computations.

1. $(8.17 \times 5.24) + (2.39 \times 6.20) + (4.58 \times 4.67) =$ **79.02.**
2. $(5.75 \times 4.26) + (3.13 \times 7.38) - (4.18 \times 8.62) =$ **11.56.**
3. $\left(\frac{3.78 \times 3.14}{2}\right) + (6.24 \times 5.64) - \left(\frac{2.12 \times 6.49}{2}\right) =$ **34.25.**
4. $(7.73^2 \times 5.14) - (3.34^2 \times 8.13) + \frac{(7.12 \times 4.22^2)}{2} =$ **279.83.**
5. $(9.37 \times 4.13)\,3 + (8.34 - 6.21)\,{}^1/_4 - \left(\frac{5.21 \times 6.35}{2}\right) =$ **100.09.**
6. $\frac{(5.78 \times 6.34)}{2}\,5 + \sqrt{625} + (8.14 \times 2.37) =$ **13879.**
7. $\left[(8.16 \times 5.19) + (6.64 \times 3.27)\,2 - \frac{(3.18 \times 4.12)}{2}\right] 2.36 =$ **186.971472**
8. $(16100 \times 150) - \left(\frac{2200}{2} \times \frac{280}{4}\right) - \left(\frac{17200}{4} \times \frac{87}{2}\right) =$ **2150950.**
9. $\sqrt{[(8.67 \times 4.18) - \left(\frac{2.38 \times 5.13}{2}\right) + \left(\frac{8.25 \times 4.34}{2}\right)]\,6.17} =$ **17.215.**

10. How many cubicmeters of masonry are required for a chimney stack, if the exterior width (R) is 3.70 m, the interior width (r) is 2.80 m and the height (h) 32.00 m?

= 146.952 cu. m.

Formula: Cubic measure: $-(R^2 - r^2)\,h\,\frac{\pi}{4}$

$$\frac{\pi}{4} = 0.785$$

11. $(4{,}3 + 9{,}2 + 6.8 + 5{,}2) \times 3{,}7 + (5{,}2 \times 6{,}4 \times 3{,}5) + (8{,}3 \times 0{,}7) - (15{,}9 - 3{,}6) = 204{,}34.$

12. The length of the shorter side of a rectangular triangle is 13.4 m, the longer one 26.7 m, what is the length of the hypothenuse?

13.4^2 and $26.7^2 = 29.873$ m

13. What it the moment of resistance W of a rectangular beam of a width of 20 cm and a height of 25 cm?

2083 cbcm.

$$W = \frac{b\,h^2}{6} = \frac{20 \times 25^2}{6} \times 20 = 2083{,}2 = \frac{25}{6} \times 20 = 2083 \text{ cbcm.}$$

14. What is the strength of the key-stone for a vault of quarry stone at a vertical radius (R) of 15 m?

= 0.968 m

Formula: $d = 0{,}25 = \sqrt{r} = ?$ $d = 0.25 = \sqrt{15} =$ 0,96850 = 0.968 m

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