DIPLOMA COURSE

SC SUMLOCK COMPTOMETER

Issued to

DIPLOMA COURSE
OPERATORS NOTE BOOK

INTRODUCTION

During the course of instruction on the Sumlock Comptometer
All British Calculating Machine, your aim should be to become an
efficient operator, and to this end, you must memorise your
decimals, and study your notes regularly.

Correct posture is essential to comfortable and tireless oper-
ating, so from the very first day, see that your chair is ad-
justed to the correct height, and that both feet rest flat on
the floor. The greatest care should be taken of your hands and
nails as these attract attention when you are operating.

An efficient operator never puts down her pencil when operating,
but always holds it between the thumb and forefinger of the right
hand, so that it is immediately available to write down answers.

Take care of this book, as it is intended that you should use it
as a reference book when you have finished the course.

ADDITION

1. When adding you use the large figures on the key-tops. Only one key at a time should be depressed. Slow rhythmical strokes are essential when learning addition. Speed will come naturally with practice.

    <u>YOU MUST NOT LOOK AT THE KEYBOARD</u>

2. No figure on the keyboard above 5 is ever used in addition, with the exception of 6 in the pence column in registering 11 pence. (* see below).

3. Above 5 add:-

    ```
    First 3 then 3 for 6
      "   4  "  3  "  7
      "   4  "  4  "  8
      "   5  "  4  "  9
      "   5  "  5  "  10d in the pence column only.
    *   "   6  "  5  "  11d "   "    "    "     "
    ```

4. <u>Correct Fingering</u>

    <u>Shillings and Pence</u>

10/- key	- Operate with first finger of left hand.
Unit shilling keys	- Operate with first finger of right hand.
Pence keys	- Operate with second finger of right hand.

    <u>Whole Numbers</u>

Units	- Operate with second finger of right hand.
Tens	- Operate with first finger of right hand.
Hundreds	- Operate with first finger of left hand.
Thousands	- Operate with second finger of left hand.
Tens of Thousands	- Operate with third finger of left hand.

    It is often found quicker when adding 6 figures, to add units, tens and hundreds first, and then, thousands, tens of thousands and hundreds of thousands etc., afterwards.

    <u>Adding of £. s. d.</u>

    When all the £'s items are units the £. s. d. are added straight across, using the following fingering:-

    > Second finger of left hand for £'s.
    >
    > First finger of left hand for 10/- key.
    >
    > First finger of right hand for unit shillings.
    >
    > Second finger of right hand for pence.

5. In Cross Casting and Slip-adding the figures are added into the machine in their entirety, commencing with the left hand figure, and using the first two fingers of the right hand only.

Note No.2

MULTIPLICATION

MULTIPLICAND - The figure to be multiplied.

MULTIPLIER - The figure by which you multiply.

PRODUCT - The result of the multiplication.

The large figures on the key tops and all keys 1 to 9 inclusive and left of the 10/- key, are used for multiplication.

Rule of Multiplication

Hold one factor and depress it the number of times indicated by the other factor.

Example   8 x 4. Hold 8 and depress it 4 times = 32.

Multiplication of Whole Numbers

Work from right to left.

Example 1 456 x 345

Hold 456 at the right of machine and depress 5 times (units) move over once to the left and depress 4 times (tens) move again once to the left and depress 3 times (hundreds).

Answer = 157,320

Multiplication of Whole Numbers and Decimals

Work from left to right (Point off before operating)

Count the number of whole numbers in both the multiplier and multiplicand and place the decimal pointer that number of places from the extreme left of the machine (including the 10th carry over register).

Example 2 57.45 x 83.6

Count the whole numbers in the multiplier and multiplicand (in this example there are 4).

Put the decimal pointer in position 4 places from the left hand side of machine.

Hold 57.45 in the units position (57 to left of pointer and 45 to the right of pointer).

Move once to left (this is the tens position) and depress 8 times, move once to the right (units position) and depress 3 times. Move once to the right again (the first decimal place) and depress 6 times.

Answer = 4802.82

2.   Where neither the multiplicand nor the multiplier contain whole numbers the decimal pointer should be put up at the extreme left of the keyboard.

Example 3 .0069 x .0034

Hold .0069 in correct position according to the decimal pointer. Move once to the right for the first '0' (in .0034). Move again to the right for the second '0' (in .0034). Move again to the right and depress 3 times. Move again to the right and depress 4 times.

Answer = .00002346

Note   Memorise the following.

When a decimal pointer is placed in position:-

(a)   The first column to the <u>left</u> of the decimal pointer will be the UNITS.

(b)   The second column to the <u>left</u> of the decimal pointer will be the TENS.

(c)   The third column to the <u>left</u> of the decimal pointer will be the HUNDREDS.

etc. etc.

(d)   The first column to the <u>right</u> of the decimal pointer will be the 1st place of decimals.

(e)   The second column to the <u>right</u> of the decimal pointer will be the 2nd place of decimals.

(f)   The third column to the <u>right</u> of the decimal pointer will be the 3rd place of decimals.

etc. etc.

.General Note

Always hold the factor with the greater number of depressions and depress the lesser number.

Example   234 x 978

Hold 978 and multiply by 234 when only 9 depressions are made. If 234 is held and multiplied by 978, 24 depressions are made.

Fixed Point Method of Multiplication

This method is used in simple extensions - wages, accumulations and work of a similar nature, where the work is repetitive.

Method

Place the decimal pointer in the most suitable position (in accumulation - glance at the work and place pointer for the largest number of whole numbers).

Hold one factor in its correct position over the "FIXED POINT" (the whole numbers to the left of the decimal pointer and the decimals to the right of the decimal pointer).

The figures are now in a position to be multiplied by the units of the other factor. If the figures held are to be multiplied by tens hundreds or thousands, move one place to the left (from units position) for tens and two places for hundreds and so on.

To multiply by a decimal move one place to the right (from the units position) for 1st decimal place, two places to right for 2nd decimal place and so on.

Note No.3

SUBTRACTION

    Subtrahend - The figure to be subtracted

    Minuend   - The figure to be subtracted from

Small figures on the keytops are used in subtraction - less one on last figure of value.

Rules regarding Subtrahend

Rule for '0's'

1.   When '0's' occur between other figures as in 2023 depress small '0' in that column.

2.   When '0's' occur at the end of a number, as in 1230 ignore the '0's' and less one from the last <u>figure</u> of value.

Rule for 9's

1.   When '9' occurs at the beginning or in the middle of a number, DO NOT depress any key in that column.

2.   When '9' occurs at the end of a number - less one and depress small 8.

Example 1   749 - 235

Add 749 into machine (at right hand side of keyboard on large figures).

With a finger or thumb of the left hand, use the subtraction selector immediately to the left of the column of the first figure to be depressed (in this case the hundreds column as we always subtract from left to right).

With the first finger of the right hand:-

Depress small 2 in the hundreds column.
Depress small 3 in the tens column.
Depress small 4 (5 less 1) in the units column.

<div align="center">Answer = 514</div>

Example 2   2345 - 1230

Add 2345 into machine (right hand side of keyboard on large figures)

Use the subtraction selector to the left of the thousands column.

Depress small 1 in thousands column.
Depress small 2 in hundreds column.
Depress small 2 (3 less 1) in tens column.

DO NOT DEPRESS ANY KEY IN UNITS COLUMN.

<div align="center">Answer = 1115</div>

Example 3   3456 - 1023

Add 3456 into machine (at right hand side of keyboard on large figures)

Use the subtraction selector left of the thousands column.

Depress small 1 in thousands column.
Depress small 0 in hundreds column.
Depress small 2 in tens column.
Depress small 2 (3 less 1) in units column.

Answer = 2433

Example 4   4567 - 1945

Add 4567 into machine (at right hand side of keyboard on large figures)

Use the subtraction selector to the left of the thousands column.

Depress small 1 in thousands column.

Leave hundreds column open (as there is no small 9).

Depress small 4 in tens column.
Depress small 4 (5 less 1) in units column.

Answer = 2622

Example 5   27324 - 498

Add 27324 into machine (at right hand side of keyboard on large figures)

498 cannot be subtracted from 324, so we have to borrow (as when working mentally). Therefore use the subtraction selector to the left of the thousands column and depress small '0' in thousands column.

Depress small 4 in hundreds column.

Leave tens column open (as there is no small 9)

Depress small 7 (8 less 1) in units column.

Answer = 26826

Example 6   20324 - 998

Add 20324 into machine (at right hand side of keyboard on large figures)

As it is not possible to subtract 9 hundred from 3 hundred and there are no thousands to borrow from, we must go to the ten thousands column first, then the thousands column.

Therefore use the subtraction selector to the left of the ten thousand column and depress small '0' in the ten thousand column.

Depress small '0' in thousands column.

Leave hundreds column open.

Leave tens column open.

Depress small 7 (8 less 1) in units column.

Answer = 19326

Decimal Subtraction

The principle remains the same, but care must be taken to see that in the amounts concerned, the decimal pointers coincide.

Subtraction of £. s. d.

The principle remains the same with the exception of the 10/- key.

When subtracting an amount containing 10/- such as £13. 17s. 10d. omit depressing the 10/- key, as there is no small 1 in this column.

When subtracting an amount with NO 10/- amount such as £13. 7s. 10d. depress the 10/- key as there IS a small '0' in this column.

Rule for Deducting 1d and 2d

When deducting 1d and 2d from an amount the following rules apply, because there are no 10d. or 11d. keys.

When subtracting 2d - depress LARGE 5d twice.

When subtracting 1d - depress LARGE 6d and LARGE 5d once.

Subtraction of Farthings when using a Farthing Model Machine

When subtracting a sterling amount which includes farthings, it must be remembered that the last figure of value applies to the farthings column.

Example   £2. 16s. 4$\frac{1}{2}$d. - £1. 12s. 3$\frac{3}{4}$d.

Add £2.16s.4$\frac{1}{2}$d into machine. Use the unit £'s subtraction selector and depress small 1 in £'s column.

Leave 10/- key open.

Depress small 2 in shillings column.

Depress small 3 in pence column.

Depress small $\frac{1}{2}$d ($\frac{3}{4}$d less $\frac{1}{4}$d) in farthings column.

Answer = £1. 4s. 0$\frac{3}{4}$d.

General Note

Always remember when subtracting, to add back the subtrahend to prove.

Note No. 4

DIVISION

The DIVIDEND is the figure to be divided into.

The DIVISOR is the figure to be divided by.

The QUOTIENT or ANSWER is the result of the Division.

The DIVIDEND is added into the machine at the left hand side on LARGE figures.

The DIVISOR is held on SMALL figures (less one on last figure of value).

Always point-off before commencing to DIVIDE.

The Pointing-off is done according to the DIVISOR.

Rules for Pointing-Off

1. For each whole number in the divisor, move the decimal pointer one place to the LEFT.

2. If the divisor is a decimal like .345, the decimal pointer is not moved from its original position.

3. If the divisor is a decimal with preceeding ciphers like .0024, the decimal pointer is moved one place to the RIGHT for each CIPHER.

HOLD THE DIVISOR ON THE SMALL FIGURES LESS ONE ON THE LAST FIGURE OF VALUE

Rules for Working

1. Catch up index figure.

2. Reduce the remainder (if possible).

3. Move over one place to right and continue according to rules 1 and 2.

N.B. The Index figure is the first figure in the answer register, immediately to the left of the first column on which the divisor is being held.

Rules for '0's'

1. When '0's' occur in the body of a divisor, small '0' must be held.

2. When '0' occurs at the end of a divisor, ignore and less one from last figure of value.

3. When '0's' occur at the beginning of a divisor, they are ignored once the pointing-off rule has been carried out.

Rules for 9's

1. When 9's occur in the body of a divisor, do not hold any keys in that particular column or columns.

2. When 9 occurs at the end of a divisor, less one and hold small 8.

3. When the first figure of a divisor is a 9 it cannot be held but it must be remembered that it is part of the divisor - therefore the index figure becomes the figure appearing TWO places to the left of the first column on which the divisor is being held.

4. When the first two figures of a divisor are 9's the index figure becomes the figure appearing three places to the left of the first column on which the divisor is being held and so on.

8

To Check Division

Multiply the quotient by the Divisor. This will give the Dividend if the division has been done correctly.

NOTE   When recurring decimals occur in the Dividend, put as many figures in the register as the columns will allow.

LONG DIVISION

Long Division is used when the figures of the Divisor are too many in number or too awkwardly placed to hold in one operation. In these instances it is necessary to split the Divisor.

Hold the first half of the divisor and proceed with rules 1 and 2 of the normal division routine. Before moving over for rule 3 pick up the remaining divisor figures in their correct position and depress the number of times that the first half was depressed. Move one place to the right with the first half of the divisor, and the same operation is repeated.

This routine is continued until the division has been completed.

The Remainder Method of Division

To divide by the remainder method is to work with the object of showing a unit remainder, instead of producing a decimal.

It is chiefly used when converting:-

Lbs. to cwts. qrs. and lbs.
Lbs. to tons. cwts. qrs. lbs.
Pence to Shillings.
Pence to £. s. d.
Singles to gross, dozens and singles.
Drams to lbs. and ozs.
Seconds to Hours and Minutes.

(Remainder method of division may only be used when the division can be made the last operation).

Example   3849 lbs. to cwts. qrs. and lbs.

Place 3849 in machine at right hand side of keyboard.

Place the first decimal pointer in position after the 9 which is the unit.

We must now divide by 112 to bring the lbs. to cwts. and lbs. Place a second decimal pointer three places to the left (between the 3 and 8).

Continue the division in the usual way until the divisor is held between the two pointers, then reduce until the figures between the two pointers are smaller than the divisor. The machine now shows 34.041 i.e., 34 cwts. and 41 lbs. Now reduce the 41 lbs. to qrs. and lbs. Place a third decimal pointer two places to the left of the first and divide by 28. The machine now shows the answer as:-

34 cwts. 1 qr. 13 lbs.

ACCUMULATION OF PRODUCTS

To Accumulate is to allow one product to add to another in the machine.

Using the "Fixed Point" method of multiplication, care must be taken to allow a sufficient number of columns to the left of the decimal pointer for whole numbers in order to have plenty of machine space for the 'carry-over' figures.

Accumulation can be utilised both in checking and in original calculations when only the final figure is required.

Accumulation can only be applied to direct multiplication and not Multiplication Over, (See Note No.6) unless the multiplication over factor is common to all items.

Note No. 6

MULTIPLICATION OVER

When three factors have to be multiplied together, the first two are multiplied by the usual method and the result multiplied by the third factor without clearing the machine.

Example 1   24 x 32 x 7

Multiply 24 x 32 (Fixed decimal Point method).

The result is 768. This figure appears in the answer register in the UNITS position and is considered to be multiplied by ONE.

Pick up the figures in the machine immediately over the figures in the register and depress 6 more times.

<div align="center">Answer = 5376</div>

Example 2   16 x 53 x 47

Multiply 16 x 53 (Fixed decimal Point method)

The result is 848. This figure appears in the register in the UNITS position. As the third factor is a "TEN" we must first multiply 848 by 10, by moving the decimal pointer one place to the right.

Pick up the figures in the machine immediately over those in the register. Depress 3 times, move one place to the right and depress 7 times.

<div align="center">Answer = 39856</div>

When multiplying over by a third factor the decimal pointer must be altered according to the following rules:-

1.   When multiplying over by a UNIT the decimal pointer remains in the same position. (As per Example 1.)

2.   When multiplying over by TENS the decimal pointer is moved ONE place to the RIGHT. (As per Example 2.)

3.   When multiplying over by HUNDREDS the decimal pointer is moved TWO places to the RIGHT.

4.   When multiplying over by THOUSANDS the decimal pointer is moved THREE places to the RIGHT.

<div align="center">or</div>

Decimal pointer is moved one place to the right for every whole number other than UNITS.

5.   When multiplying over by a decimal, the 1st figure of which is in the first decimal place, move the decimal pointer ONE place to the LEFT.

6.   When multiplying over by a decimal, the 1st figure of which is in the second decimal place, move the decimal pointer TWO places to the LEFT.

7.   When multiplying over by a decimal, the 1st figure of which is in the third decimal place move the decimal pointer THREE places to the LEFT so on.

THESE RULES FOR 'POINTING-OFF' MUST BE MEMORISED.

DECIMALISATION

Common Fractions

The decimal equivalent of any common fraction is found by dividing the numerator (top figure) by the denominator (bottom figure).

Example   7/16 to decimals

Add 7 into the machine and divide by 16

Answer = .4375

Converting Pence to Decimals of 1/-

When we are asked to multiply a quantity by a price we have to convert the price to whole numbers and decimals. When the price is given to us as shillings and pence, then we treat the shillings as whole numbers and the pence, "decimals of 1 shilling". The pence decimals will be quickly found by reference to the Decimal Chart but could also be found by dividing the number of pence and pence fractions by 12.

Example 1.   Express 10d. as a decimal of 1/-

Answer = .83·

Example 2.   45 articles @ 3/6¼d. each

= 45 x 3.52083· (the decimal shown against 6¼d. on your decimal chart)
= 158.4375 shillings.

The 158 shillings must be converted to £'s and shillings and so we have to divide by 20. This is simply done by covering the unit shillings and mentally dividing the figures to the left of them by 2. In the above example, we shall be covering the 8, which leaves 15 to be divided by 2 = 7 and 1 over. The "1" over represents 10/-. We have, therefore, £7.10.0d. Now add to this the figure which was covered i.e. 8/- = £7.18.0d. The pence will be found by referring to the decimal chart and finding the decimal nearest your answer i.e. 5¼d. The answer to our multiplication is £7.18.5¼d.

Converting Shillings and Pence to Decimals of £1

If the prices of articles are given as so many £'s, shillings and pence each, then we have to convert both shillings and pence to decimals.

To Decimalise Shillings to £1

Halve the number of shillings and decimalise as so many 10ths.

Example 1.   1 shilling = 1 ÷ 2 = .5 then divide by 10 = .05

Example 2.   10 shillings = 10 ÷ 2 = 5 then divide by 10 = .5

Example 3.   11 shillings = 11 ÷ 2 = 5.5 then divide by 10 = .55

To Decimalise Pence to £1

Refer to the chart headed "Pence as Decimals of £1" and read off the decimals shown against the pence and pence fractions you require.

Example 1.   Express 7/6d. as a decimal of £1

$$7/- \ = \ .35$$
$$6d. \ = \ .025$$
$$7/6d. \ = \ .375$$

12

Converting £1's and Decimals to £.s.d.

Whole numbers = £'s

For Shillings:-

Double the figure in the first decimal place and if the second decimal place is 5 or more add another shilling.

For Pence:-

Mentally subtract the shillings, as decimals, from the figures following the decimal point and convert the remaining decimal to pence and fractions by referring to your decimal chart.

Example 2.   27 articles at £4.9.3d. each

= 27 x 4.4625 = £120.4875

  £'s = 120

  Shillings = 9 (.45)

Remaining decimal = .0375 which you will find to be 9d. on reference to your charts.

Answer = £120.9.9d.

WHOLE PENCE AS DECIMALS OF 1 SHILLING AND

WHOLE PENCE AS DECIMALS OF £1

MUST BE MEMORISED AS SOON AS POSSIBLE.

DISCOUNTS AND INCREMENTS

When a figure has a % sign after it, it means that it is a proportion of ONE HUNDRED, i.e. 25% (25 per cent) = $\frac{25}{100}$

When calculating discounts or increments the percentage figure must first be divided by 100 so that it can be expressed as a decimal, i.e. 25% becomes $\frac{25}{100}$ = .25

Discounts

1. ACTUAL DISCOUNT is the amount which is to be deducted from the given amount.

    Example:- £48.10.0d, less 2½%. What is the discount?

    $\frac{2\frac{1}{2}}{100}$ = .025

    £48.5 x .025 = £1.4.3d = ACTUAL DISCOUNT.

2. NET AMOUNT is the amount left after you have deducted the Actual Discount.

    Example:- £48.10.0d, less 2½%. What is the net amount?

    Deduct the rate per cent from 100 to find the Net Percentage.

    100% - 2½% = 97½%.

    $\frac{97\frac{1}{2}}{100}$ = .975

    £48.5 x .975 = £47.5.9d = NET AMOUNT.

    NOTE The Net Percentage is easily found if you first express the per cent as a decimal (2½% = .025) and hold this decimal in SMALL figures; you have then automatically arrived at the Net Percentage.

Increments

1. AN INCREMENT or PLUS AMOUNT is the amount which is added to the given amount.

    Example:- £246.15.0d plus 5%. What is the Plus Amount?

    $\frac{5}{100}$ = .05

    £246.75 x .05 = £12.6.9d = PLUS AMOUNT.

2. GROSS AMOUNT is the amount arrived at after you have added the Plus Amount.

    Example:- £246.15.0d plus 5%. What is the Gross Amount?

    Add the rate per cent to 100 to find the Gross Percentage.

    100% + 5% = 105%.

    $\frac{105}{100}$ = 1.05

    £246.75 x 1.05 = £259.1.9d = GROSS AMOUNT.

CHAIN DISCOUNTS AND INCREMENTS

Chain Discounts are a series of LESS percentages subtracted from the original amount and Chain Increments are a series of PLUS percentages added to the original amount. Quite often both LESS and PLUS percentages appear in the same "chain".

Normally only the final answer is required, which means only the NET AMOUNT or GROSS AMOUNT. Always work the chain of discounts or increments first then multiply by the money.

Example 1   £35.0.0d, less 5%, less 15%, less $2\frac{1}{2}$%.

.95 x .85 x .975 = .7873125

.7873125 x £35 = £27.11.$1\frac{1}{2}$d.

Example 2   £35.0.0d, plus 5%, plus 15%, plus $2\frac{1}{2}$%.

1.05 x 1.15 x 1.025 = 1.2376875

1.2376875 x £35 = £43.6.$4\frac{3}{4}$d.

Example 3   £35.0.0d, less 5%, plus 15%, less $2\frac{1}{2}$%.

.95 x 1.15 x .975 = 1.0651875

1.0651875 x £35 = £37.5.$7\frac{3}{4}$d.

NOTE   When 'and' occurs in a chain discount or increment it indicates that the sign immediately preceeding is to be repeated e.g. less $2\frac{1}{2}$% and 5% means less $2\frac{1}{2}$%, less 5%.

To find Actual Amount of Discount

Multiply the Net Percentages together and deduct the result from 1.

Example:-   £135.10.6d, less 10%, less $2\frac{1}{2}$%.

.9 x .975 = .8775

1 - .8775 = .1225

£135.525 x .1225 = £16.12.$0\frac{1}{2}$d. = Actual Amount of Discount

---

To find Actual Amount of a Plus Amount

Multiply the Gross Percentages together and deduct 1 from the result.

Example:-   £135.10.6d, plus 10%, plus $2\frac{1}{2}$%.

1.1 x 1.025 = 1.1275

1.1275 - 1 = .1275

£135.525 x .1275 = £17.5.$7\frac{1}{4}$d. = Actual Plus Amount

RECIPROCALS

A reciprocal is the result of dividing any number into 1. <u>Always remember</u>
<u>when finding a reciprocal to put the 1 into the machine at the extreme left</u>
<u>hand side of keyboard.</u>

     <u>Example</u>   The reciprocal of 8 is .125 (1 ÷ 8 = .125)

Reciprocals are used to find the result of a division by simple multiplica-
tion. Since 8 divided into 1 = .125, 8 divided into 1424 equals 1424 x .125.

As division on the machine is a much slower process than multiplication, a
full understanding of Reciprocals and their use will obviously be of great
advantage.

Reciprocal division is mostly used when several amounts have to be divided by
the same number, but this method can often be used to great advantage for a
single division.

     <u>Example</u>   349 ozs. @ 21/9d per lb. = 349 x 21.75 = 7590.75. Leave
               this in the machine and multiply over by .0625 (Reciprocal
               of 16)

                       Answer = £23. 14s. 5d.

(These general reciprocals should be memorised as soon as possible, as a
great deal of time can be saved when the reciprocal of the divisor is known
to the operator).

On other types of work where multiplication over is not required, the decimal
pointer is fixed anew for each calculation.

     <u>Example</u>   £10. 9s. 6d.   )
                £501.11s. 7d.   )
                 £2. 19s. 8d.   )   All to be divided by 16.
                £1065. 4s.11d.   )
                £31. 1s. 8d.   )

Left to Right method of multiplication is used.

<u>NOTE</u>: Reciprocals must always be proved accurate before use, by multiplying
back.

     <u>Example</u>   Reciprocal of 16 is .0625. To prove the reciprocal 16 x
               .0625 = 1.

Some useful reciprocals to memorise.

2	=	.5	16	=	.0625
3	=	.3̇	18	=	.05̇
4	=	.25	25	=	.04
5	=	.2	32	=	.03125
6	=	.16̇	144	=	.00694
7	=	.142857̇	198	=	.0050̈
8	=	.125	165	=	.0060̈
9	=	.1̇	256	=	.00390625
15	=	.06̇	365	=	.00273972

EXTENSIONS

An 'Extension' is the type of calculation involving a given number of articles at a given price, weight or measurement, to arrive at a total price, weight or measurement.

When extending bring the quantity to the same unit as the price 'per'.

The following notes give instructions for calculating various types of extensions:-

Lbs. Ozs. and Drams

16 drams = 1 oz.

16 ounces = 1 lb.

256 drams = 1 lb.

14 lbs. = 1 stone

Decimalise ozs. to lbs. as so many 16ths.

7 ozs. = 7/16th lbs. = .4375 lbs.

Decimalise drams to lbs. multiply drams by .00390625

Example   7 lbs. 6 ozs. 8 drams @ 6/6d per lb.

7 lbs.	=	7
6 ozs.	=	.375
8 drams (8 x .00390625)	=	.03125
		7.40625

Answer = £2. 8s. 2d

Lbs. and ozs. @ price per lb.

Lbs. will be whole numbers, add in ozs. as 16ths. Multiply over by price. (When ozs. have fractions e.g. $15\frac{1}{4}$ ozs. multiply ozs. by .0625).

Lbs. ozs. and drams @ price per oz.

Convert lbs. to ozs. by multiplying by 16, add in the odd ozs. Drams will be added as 16ths.

Multiply over by price

Lbs. ozs. and drams @ price per dram.

Reduce lbs. to drams by multiplying by 256, leave result in machine multiply ozs. by 16, and add in odd drams.

Multiply over by price

Yardage

Yards, Feet and Inches.

12 inches = 1 foot.

3 feet = 1 yard.

36 inches = 1 yard.   Reciprocal of 36 = .027·

Yards, Feet and Inches @ price per yard.

Add yards as whole numbers, add each foot as .33·, multiply inches by .027·

Multiply over by price

Yards, Feet and Inches @ price per foot.

Convert yards to feet by multiplying by 3, add in feet as whole numbers and decimalise inches as pence to 1/- (12ths).

Multiply over by price

Yards, Feet and Inches @ price per inch.

Multiply yards by 36, leave result in machine. Multiply feet by 12, and add in odd inches.

Multiply over by price

Liquid Measure

4 gills = 1 pint

2 pints = 1 quart

4 quarts = 1 gallon

8 pints = 1 gallon

Gallons, Quarts and Pints at price per gallon

Treat gallons as whole numbers, multiply quarts by 2 add pints and decimalise as 8ths.

Multiply over by price

Gallons, Quarts and Pints at price per quart.

Convert gallons to quarts by multiplying by 4, add in quarts and decimalise any pints as halves.

Multiply over by price

Gallons, Quarts and Pints at price per pint.

Convert gallons to pints by multiplying by 8, leave result in machine multiply quarts by 2 and add in pints as whole numbers.

Multiply over by price

Gallons, Quarts and Pints at price per gill.

Bring total quantity to pints (as in previous example) then multiply by 4 to bring to gills.

Multiply over by price

Price Basis Equivalent

1d each	=	1/- per dozen and vice versa.
1/- per cwt.	=	£1. per ton and vice versa.
1/- per quire.	=	£1. per ream and vice versa.

Short cuts such as the above examples will often save considerable time when extending.

Gross

12 singles	=	1 dozen
12 dozen	=	1 gross
144 singles	=	1 gross reciprocal = .00694·
12 gross	=	1 great gross

Gross, Dozen and Singles at price per gross.

Add gross as whole numbers, add dozens as 12ths (decimalised as pence to 1/-)
Multiply singles by .00694·

Multiply over by price

Gross, Dozen and Singles at price per dozen.

Convert gross to dozens by multiplying by 12 add in the dozens as whole numbers and decimalise the singles as 12ths (same as pence to 1/-).

Multiply over by price

Gross, Dozen and Singles at price per single.

Convert gross to singles by multiplying by 144 and then dozens to singles by multiplying by 12. Add in the singles.

Multiply over by price

Work Priced per Hundred and Thousand

(C or %) is an abbreviation for price per hundred.

(M or o/oo or mille) is an abbreviation for price per thousand.

Work on fixed decimal point, mentally divide by 100 or 1,000 before commencing to operate.

i.e.   (two places to left to divide by 100)
        (three places to left to divide by 1,000)

Then make a simple multiplication, quantity by rate.

Note   Weights are sometimes priced per C or C⫲ meaning price per cwt.

Tonnage Extensions

<u>Tons cwts. qrs. and lbs. @ price per ton.</u>

The TONS will be whole numbers.
CWTS. will be decimalised as shillings to £1. (ex. 6/- = .3
∴ 6 cwts. = .3)
QRS. will be   1 qr.   = .0125
                     2 qrs. = .025
                     3 qrs. = .0375

(<u>These must be memorised as soon as possible</u>)

Lbs. are multiplied by the reciprocal of 2240 (.000446428)
All to be multiplied over by the price.

<u>Example</u>   5 tons 18 cwts. 2 qrs. 15 lbs. @ £2. 10s. 0d. per ton.

Add the tons as whole numbers (5) and cwts. as .9 = 5.9
2 qrs.   =   .025   = 5.925
Multiply the 15 lbs. by .000446428   = 5.93169638

Multiply over by the price

Answer   =   £14. 16s. 7d.

<u>Tons cwts. qrs. and lbs. @ price per cwt.</u>

<u>Example</u>   2 tons 5 cwts. 3 qrs. 11 lbs. @ 16/9d per cwt.

Multiply 2 (tons) by 20 and add in the 5 cwts.   = 45
         3 qrs. = .75   = 45.75
         11 lbs. x .008928571(reciprocal of 112) = 45.8482142

Multiply over by the price

Answer   =   £38. 7s. 11½d.

Note   Qrs. to cwts. must be memorised as soon as possible.

<u>Tons cwts. qrs. and lbs. @ price per lb.</u>

Convert tons, cwts and qrs. to lbs. add in odd lbs. and multiply
over by price per lb.

TONNAGE ADDITION

Addition of Tons cwts. qrs. and lbs.

Fix the decimal pointer between the light and dark keys to the left
hand side of the machine.   Add the lbs. to the left of this pointer
and divide by 28, remainder method.   Answer = qrs. and lbs.
Transfer qrs. to sterling side of machine by calling them pence and
multiplying by three (1 qr. = 3d)

Add Tons as £'s, cwts. as shillings and qrs. as threepences.

Converting £. s. d. and lbs. to Tons cwts. qrs. and lbs.

When reading the answer back take £'s and shillings as tons and cwts.
divide the pence figure mentally by 3 (it will only be 3d., 6d. or
9d.) to give quarters and read the odd lbs. from the left hand side
of the machine.

Addition or large numbers of Cwts. qrs. and lbs.

Add the lbs. on units and tens columns (right hand side of machine).
Divide by 28 (remainder method) = qrs. and lbs.   Add qrs. and divide
by 4 (remainder method) = cwts. qrs. and lbs.   Add cwts.   Answer
will then show cwts. qrs. and lbs.   If answer has to be shown in
TONS, read cwts. to tons as shillings to £'s.

Example   456 cwts. 3 qrs. 14 lbs.

           = 22 tons 16 cwts. 3 qrs. 14 lbs.

TABLES

AVOIRDUPOIS WEIGHT

16 drams	= 1 oz.
16 ozs.	= 1 lb.
14 lbs.	= 1 stone
28 lbs.	= 1 quarter
4 qrs. or 112 lbs.	= 1 cwt.
20 cwt. or 2240 lbs.	= 1 ton.

TROY WEIGHT

24 grains	= 1 pennyweight
20 pennyweights	= 1 ounce (tr)
12 ounces	= 1 pound (tr)

APOTHECARIES WEIGHT

20 grains	= 1 scruple
3 scruples	= 1 drachm
8 drachms	= 1 oz. (tr)
12 ounces	= 1 pound (tr)

LIQUID MEASURE

4 gills	= 1 pint
2 pints	= 1 quart
4 quarts	= 1 gallon
8 pints	= 1 gallon

GROSS

12 singles	= 1 dozen
12 dozen	= 1 gross
144 singles	= 1 gross
12 gross	= 1 great gross

LINEAL MEASURE

12 inches	= 1 foot
3 feet	= 1 yard
$5\frac{1}{2}$ yards	= 1 rod, pole or perch
40 poles	= 1 furlong
8 furlongs	= 1 mile
1760 yards	= 1 mile
5280 feet	= 1 mile

SQUARE MEASURE

144 square inches	= 1 square ft.
9 square feet	= 1 square yd.
4840 square yards	= 1 acre
640 acres	= 1 square ml.
100 square feet	= 1 square of flooring
$272\frac{1}{4}$ square feet	= 1 rod of brickwork

CUBIC MEASURE

1728 cubic inches	= 1 cubic ft.
27 cubic feet	= 1 cubic yd.
40 cubic feet (shipping capacity not weight)	= 1 ton.
50 cubic feet	= 1 load.

STANDARD QUANTITY (TIMBER)

30 deals	= 1 quarter
4 quarters	= 1 standard
120 deals	= 1 standard
165 cubic ft.	= 1 standard
23760 board ft.	= 1 standard

PAPER

480's ream

24 sheets	= 1 quire
20 quires	= 1 ream
480 sheets	= 1 ream

500's ream

25 sheets	= 1 quire
20 quires	= 1 ream
500 sheets	= 1 ream

520's ream

26 sheets	= 1 quire
20 quires	= 1 ream
520 sheets	= 1 ream

TONNAGE SUBTRACTION

ADD the largest amount into machine

Add lbs. at left hand side of machine to the left of the pointer, placed between the light and dark keys.   Add tons as £'s, cwts. as shillings and qrs. as threepences. (i.e. 3d., 6d or 9d)

Subtract lbs. from lbs.   If necessary to borrow from qrs. add 28 lbs. to the existing lbs. not forgetting to subtract 3d. (borrowed qr.)

To subtract tons, cwts. and qrs. work from left to right proceeding exactly as for £.s.d. subtraction, remembering that 1 qr. = 3d. 2 qrs. = 6d. 3 qrs. = 9d.

Read answer from machine:-

```
        £'s          as    TONS
        Shillings    as    CWTS.
        Qrs.         as    3d. = 1 qr.  6d. = 2 qrs.  9d. = 3 qrs.
        lbs. will be shown at left hand side of machine.
```

Example		T.52	14 cwts.	3 qrs.	9 lbs.
	−	T.41	2 cwts.	1 qr.	14 lbs.
Answer	=	T.11	12 cwts.	1 qr.	23 lbs.

Always check subtraction by adding back.

FOREIGN CONVERSION

Foreign Conversion is the process of converting one country's currency into that of another country.

The term 'Rate of Exchange' means the value of one country's currency, expressed in terms of another country's currency.

When converting foreign currencies, it is for the operator to decide by applying common sense, whether Multiplication or Division has to be applied.

Note: One point to remember is that if the amount to be converted and the rate of exchange are the same currency you DIVIDE. If they differ you MULTIPLY.

Examples

1. $384.56 to £'s @ $2.79.

As there are 2.79 dollars to £1. there will be fewer £'s than there are dollars, therefore DIVIDE $384.56 ÷ $2.79.

Answer = £137. 16s. 8d.

---

2.   £368.10s.6d. to $'s @ $2.79.

As there are 2.79 dollars to £1. there will be more dollars than £'s therefore MULTIPLY £368.10s.6d. x $2.79.

Answer = $1028.18

---

3.   £450.10s.6d. to $'s @ 7/6d (one dollar being worth 7/6d)

You must find how many times 7/6d. is contained in £450.10s.6d. ∴ decimalise 7/6d. to £1. and DIVIDE 450.525 ÷ .375

Answer = $1201.40

Method of Finding Rate of Exchange

Example   £150. 10s. 6d. = $415.45 find rate of exchange.

DIVIDE the £'s into the foreign currency and the result will be the number of dollars to the £ sterling.

Answer = $2.76

Indian or Pakistani Money

12 pies   = 1 anna

16 annas = 1 rupee

Decimalise pies to a Rupee by multiplying the number by .0052083˙ (the reciprocal of 192)

Decimalise annas to a rupee as so many 16ths.

TIMBER TRADE

TIMBER TABLE (which must be memorised)

Lineal Measure   12 ins. = 1 ft. (1 ft. run) (run ft.) or (ft. Lineal)

Square Measure   144 sq. ins. = 1 sq. ft.   )
                         144 super (or square) ins. as 1" = 1 super ft. as 1"   )
                         ft. of length x ft. of breadth = sq. ft.   ) measurement
                         ft. of length x ft. of breadth as 1" = super ft. (or   ) of surface
                                              square ft.) as 1"   ) or area.
                         100 sq. ft. (or super ft.) = 1 square.   )

Cubic Measure   1728 cu. ins. = 1 cu. ft.
                         ft. of length x ft. of breadth x ft. of depth = cu. ft.)
                         ft. x ft. x ins. ÷ 12   = cu. ft.) measurement
                         ft. x ins. x ins. ÷ 144   = cu. ft.) of capacity
                         ins. x ins. x ins. ÷ 1728   = cu. ft.) or volume.

                         40 cu. ft. = 1 ton (shipping timber) refers to capacity not weight.

                         50 cu. ft. = 1 load

Standard Quantity

         165 cu. ft.   = 1 standard   Reciprocal = .0060̇
         23760 board ft. = 1 standard   Reciprocal = .0000420875
         (1ft. x 1 in. x 1 in. = 1 board ft.)

Lineal Measure

(timber) is measurement of length or long measure and usually quoted and priced at feet run (ft. run) running ft. (run ft.) or feet lineal. Sometimes measurements of width and thickness are given, but these are ignored by the operator if only total ft. run at price per ft. is required.

Square Measure

(timber) is measurement of Area or Surface. This is calculated by multiplying ft. of length x ft. of breadth = sq. ft. Square feet of timber are described as:-
         sq. ft. superficial ft. ft. super. ft. sup.
When ft. and ins. are stated, the inches are decimalised as 12ths, the answer is given as square ft. and 12ths (not square inches).

Cubic Measure

(timber) is measurement of Volume or Capacity. This is calculated by multiplying the length by width by thickness. All measurements as feet and 12ths the answer given as cubic feet and 12ths or cu. ft. inches and parts.

Method of Working   Lineal Measure

Example 1   7/21' @ 1/9d per ft. run = 7 x 21 = total ft. multiply over by price.   Answer = £12. 17s. 3d.

Example 2   15'6" x 2" x $\frac{3}{8}$" @ 2/3d per lineal ft. = 15.5 x 2.25
               Answer = £1. 14s. 10$\frac{1}{2}$d.

Note   Inches are decimalised to ft. as pence to 1 shilling.

Square Measure

> <u>Example 1</u>   4'9" x 3'3" is a multiplication of ft. and 12ths by ft.
> and 12ths = 4.75 x 3.25 = 15.4375 sq.ft. or 15. $5\frac{1}{4}$ (12ths) sq.ft.
>
> <u>Example 2</u>   4'9" x 3'3" x $\frac{3}{8}$". If square ft. are wanted ignore the
> third measurement of $\frac{3}{8}$".

Square of Timber

> Some timber is sold by the square, a square of timber being 100 sq.ft.
> According to the width of the wood, the running ft. in a square of
> timber will vary.
>
> <u>Example</u>   To find the total ft. run. in a square made up of timber
> 6" wide:- Divide the area of the square (100 sq.ft.) by the given width
> of timber as a decimal of a foot.
>
> $$100 \div .5 = 200 \text{ ft.run.}$$
>
> To price a square of timber find the total number of square feet
> divide by 100 and multiply over by the price.

Timber Costing Per Super Ft. as 1"

> When costing square ft. of timber and a third measurement of inches is
> shown and which is priced per super ft. as 1" the third measurement of
> inches must be used.
>
> <u>Example</u>   5' x 3' x $1\frac{1}{4}$" @ 5/9d per ft.sup. as 1".
> Formula is ft. x ft. x ins. x price.
> 5 x 3 x 1.25 x 5.75 = £5. 7s. $9\frac{3}{4}$d.

Areas and Cost of Cases

> Formula = L X B) Accumulate
> L X D) and multiply
> B X D) over by 2.
>
> <u>Example</u>   3'6" (Length) 2'9" (Breadth) 1'6" (Depth) @ 9d. per sq.ft.
> 3.5 x 2.75   )
> 3.5 x 1.5   ) 19' sq. x 2 = 38 sq.ft. x .75 shillings =
> 2.75 x 1.5   )   £1.8s.6d.

Cubic Measure

> <u>Example 1</u>   2'4" x 1'6" x 1'9" = 2.3˙ x 1.5 x 1.75 = 6.125 cu.ft. or
> 6' $1\frac{1}{2}$" (12th) cubic.
>
> <u>Example 2</u>   4/16' 5/17' 6/18' x 3" x 9" @ 6/3d per cu.ft.
> Accumulate the running ft. = 257 x .25 x .75 x 6.25
>
> Answer = £15. 1s.2d.

To calculate feet, inches and parts (cubic) it is necessary to cube in the
normal way, but the answer is dealt with differently.

> <u>Example 3</u>   12' x 2'4$\frac{1}{2}$" x 2' 7$\frac{1}{2}$" = 12 x 2.375 x 2.625 = 74.8125 cu.ft.
>
> Whole numbers are feet = 74 ft.   )
> Multiply .8125 x 12 = 9.75 = 9 inches) cubic
> Multiply .75 x 12 (i.e. read as pence)
>   to 1/-) = 9 parts))
>
> or 74' 9" 9"' cubic

To calculate feet, inches and parts at price per cubic foot. Feet are whole numbers and inches and parts are decimalised as dozens and singles to 1 gross. Then multiply over by price.

Standards of Timber

To find the number of running feet in a Standard

To calculate the number of running feet of differing thickness and width to 1 Standard simply multiply the measurements of thickness and width in inches and divide that number into 23760.

Example   Find the number of running feet in a Standard of 2" x 4½"
          2 x 4.5 = 9
          23760 ÷ 9 = 2640 running feet.

To calculate the Standard quantity and value

Example   24 pieces   37'
          18   "   36'
          42   "   35'   width 3½"
          36   "   34'   thickness 2¼"
          34   "   33'   @ £87.10.0d per Standard

Accumulate running feet = 5352. Multiply by inches of width and thickness = 42147 board feet. Divide 42147 by 23760 (there being 23760 board ft. of 1 inch x 1 inch in 1 Standard) or multiply by the reciprocal for 23760 - .0000420875 = 1.7739 Standards Multiply Standards by price per Standard, 1.7739 x £87.5 = £155.4.4d.

In the above example the Standard quantity was calculated to 4 decimal places. Sometimes it is only necessary to calculate to 3 decimal places. This being so the calculation to find the total value would be as follows:- 1.774 Standards x £87.5 = £155.4.6d.

The following examples are an illustration of the notes given on Timber Trade calculations and should be thoroughly understood before proceeding with the next lesson.

Example   1473 foot run by 2½" wide by 1½" thick. Price at the various
          rates below:-
          8/9d per foot run   = 1473 x 8.75/-
          8/9d per square foot   = 1473 x .2083̇ x 8.75/-
          8/9d per super foot of 1" = 1473 x .2083̇ x 1.5 x 8.75/-
          8/9d per cubic foot   = 1473 x .2083̇ x .125 x 8.75/-
          8/9d per board foot   = 1473 x 2.5 x 1.5 x 8.75/-
          £130 per Standard   = 1473 x 2.5 x 1.5 x £130 ÷ 23760
                                                    or
                                      1473 x .2083̇ x .125 x £130 ÷ 165

ENGINEERING CALCULATIONS

These calculations deal with metals, the quantities being given by measurement and the price by weight.

Example 1   25 bars steel each 12'3" x $1\frac{3}{4}$" x $\frac{1}{2}$" weighing $2\frac{3}{4}$ lbs. per foot run @ 42/6d per cwt.

Find total number of feet (lineal)

i.e. 25 x 12.25 (ignore $1\frac{3}{4}$" x $\frac{1}{2}$" as lineal feet only are required)

Dials read 306.25 ft. Weight per ft. is $2\frac{3}{4}$ lbs.

Multiply 306.25 x 2.75.

Dials read 842.1875 lbs. @ 42/6d per cwt.

Multiply 842.1875 x 42.5 and divide by 112 (cwt. equals by multiplying by the reciprocal.   112 lbs.)

Answer = £15.19s.7d.

Example 2   23 steel sheets each 15'$4\frac{1}{2}$" x 10' 3" weighing 15.56 lbs. per sq.ft. @ £26.10s.0d. per ton.

Find the total number of sq.ft.

i.e. 23 x 15.375 x 10.25.

Dials read 3624.656 sq.ft. Weight per sq.ft. is 15.56 lbs.

Multiply 3624.656 x 15.56

Dials read 56399.65 lbs. @ £26.10s.0d. per ton.

Multiply 56399.65 x 26.5 and divide by 2240 (lbs. to a ton) by multiplying by the reciprocal.

Answer = £667.4s.7d.

PAPER

Wholesale Trade

In the Wholesale Trade, paper is always sold by weight.

The sizes of sheets are varied but all are standard sizes and each type is known by a name.

Example: Royal is 20" x 25"
Demy is $17\frac{1}{2}$" x $22\frac{1}{2}$"
Large Post is $16\frac{1}{2}$" x 21"
Double Crown is 20" x 30" etc. etc.

A ream of paper is usually 480 sheets, 500 sheets or 520 sheets.

The following TABLE should be memorised as soon as possible.

480 sheets to a Ream	500 sheets to a Ream	520 Sheets to a Ream
24 sheets = 1 Quire	25 sheets = 1 quire	26 sheets = 1 quire
20 quires = 1 ream	20 quires = 1 ream	20 quires = 1 ream

There are 20 quires in a ream in each case therefore the quires are always decimalised to a ream as shillings to £'s (i.e. 20ths.)

Example 1.   (Reams of 480 sheets)

11 reams 17 quires 18 sheets @ 25/6d. per ream (480's)
Reams are added into the machine as whole numbers = 11.
Quires as 20ths (or shillings to £1)   =   .85
Sheets are halved and decimalised as pence to a
            £ (18/480ths = 9/240ths)   =   .0375
                                              ———————
                                              11.8875
                                              ———————

Multiply over by price of 25.5

Answer = £15. 3s. 2d.

Example 2.   (Ream of 500 sheets)

7 reams 10 quires 8 sheets @ 26/6d. per ream (500's)
Reams are added into the machine as whole numbers = 7.
Quires are 20ths (or shillings to a £)   =   .5
Multiply sheets by .002 (reciprocal of 500)   =   .016
                                              ———————
                                              7.516
                                              ———————

Multiply over by price of 26.5

Answer = £9. 19s. 2d.

<u>Example 3.</u>   (Ream of 520 sheets)

    8 reams 8 quires 14 sheets @ 15/- per ream (520's)
    Reams are added into the machine as whole numbers = 8.
    Quires are 20ths (or shillings to a £)   = .4
    Multiply sheets by .001923076 (reciprocal of 520) = .0269
                                                              8.4269

    Multiply over by price of 15/-

        Answer = £6. 6s. 5d.

Price per Quire

Extend exactly as for price per Ream, remembering that 1/- per quire is £1 per ream. Therefore, decimalise the price in shillings and then call it £'s.

Price per Sheet

Multiply the Reams and Quires (decimalised as 20ths) by the number of sheets per ream, add in odd sheets, and multiply over by the price.

CASH DISCOUNTS

<u>The following terms are some of those most commonly used:-</u>

1. <u>Prompt Cash</u> - Payment must be made as soon as the goods are delivered.

2. <u>Net Cash 30 Days</u> - Payment may be made any time within 30 days of invoice date, but no discount may be deducted.

3. <u>$2\frac{1}{2}$% for Cash within 10 Days</u> - $2\frac{1}{2}$% may be deducted <u>only</u> if payment is made within 10 days.

4. <u>$2\frac{1}{2}$% One Month</u> - $2\frac{1}{2}$% may be deducted if payment is made within one month of the date of the invoice.

5. <u>5% Monthly</u> - An account is rendered monthly and 5% is allowed for prompt payment after receipt of account.

6. <u>5% One Month, $2\frac{1}{2}$% Two Months thereafter Net</u>.
   5% may be deducted if payment is made within one month of the date of invoice; $2\frac{1}{2}$% if within two months; if payment is delayed for more than two months <u>NO</u> discount may be deducted.

DEBITS AND CREDITS

Sometimes we are asked to add a column of figures containing both Debit and Credit Items. Normally Debit figures are shown in BLACK and Credit figures in RED.

First, add all the Credit figures.

Make a mental note of the total in the machine, put three fingers on the small "0's" to the left of the figures now in the machine then clear and immediately add back the amount on small figures minus one from the last figure of value. Now depress the small "0's" under your three fingers and the rest of the small "0's" to the left of the ones just depressed.

Now add the Debit figures.

If 1 appears at the extreme left of the machine, the amount at the right is the Debit Balance.

If all the 9's show to the left of the amount in the machine then the answer is a Credit Balance.

To arrive at the Credit Balance hold the amount in the machine on the small figures (less "one" on the last figure of value) and depress twice. The amount now showing at the right of the machine is the actual Credit Balance.

WAGES

Wages calculations are mainly simple, but an operator will find they will vary with every firm - so don't be afraid to ask if you come across a new method.

CLOCK CARDS

These are cards stamped with an employees name and number on which is kept a record of the number of hours worked each day. At a glance Clock Cards will show how much Ordinary time has been worked, the number of Overtime hours and any time lost - through illness etc. etc.

At the end of the week the number of hours worked each day are totalled and when calculated at the rate per hour will give the employees' weekly wage.

Normally a Sumlock Operator is required only to total the number of hours and then to do the calculation.

Below is an outline of some of the various methods of Calculating Wages.

(a)   Hours at Rate per Hour

e.g. 52 hours @ 1/1.53d. per hour.

Mentally divide the hours by 12 and multiply by the rate in pence. Read the answer as shillings and decimals of a shilling.

$$= 4.3^{\bullet} \times 13.53 \ = \ 58.63 \ = £2.\ 18.\ 7\tfrac{1}{2}d.$$

(b)   Hours at Rate per Hour plus Overtime

Calculate the number of hours by adding the flat number of hours into the machine. For the overtime, multiply the hours at time and a quarter by 1.25;   the hours at time and a half multiply by 1.5;   the hours at double time multiply by 2 etc.

Multiply over by rate per hour.

If the rate is given in pence and decimals of a 1d. multiply over by pence and decimals, then divide by 12 remainder method.

(c)   Hours and Minutes at Rate per Hour

e.g. 5 hours 37 minutes @ 2.7618/- per hour.

The hours will be whole numbers: multiply the minutes by .016$^{\bullet}$ (reciprocal of 60). Multiply over by the rate per hour.

$$= \ 5.616^{\bullet} \times 2.7618$$

Answer = 15s. 6d.

GROUP OR GANG BONUS

When a set sum of money is being paid as a bonus on a certain job, it is shared by the workers according to the number of hours worked by each man together with their hourly rates of pay.

To work out each individual's bonus when a Gang Bonus is being paid, calculate as in Example 1.

Example 1   A Bonus of 110/- is to be shared amongst the four workers whose normal rates of pay and the hours worked in the Group are:-

    (a)   3/6d. $8\frac{1}{2}$ hours
    (b)   5/2d.   3 hours
    (c)   4/8d. $7\frac{1}{2}$ hours
    (d)   5/0d.   12 hours

Extend the hours worked by the rates to find each man's wage. Check this total by accumulation.

    (a)   29/9d.
    (b)   15/6d.
    (c)   35/0d.
    (d)   60/0d.

Divide the bonus by the total of the wages (140/3d.) to find how much of the bonus would be paid for one shilling of the wages = .78431364/-. This figure is known as the "constant" multiplier.

Using this "constant" multiply by each of the wages in turn and the answers will be the bonus due for each worker.

Therefore A's wage of 29/9d. is worth 23/4d. of the bonus
    "   B's " " 15/6d. "   "   12/2d. of the bonus
    "   C's " " 35/0d. "   "   27/5$\frac{1}{2}$d. of the bonus
    "   D's " " 60/0d. "   "   47/0$\frac{1}{2}$d. of the bonus

                                          110/0d.

To work out individual bonus when Gang Bonus is given in hours, calculate as in Example 2:-

Example 2   Forty hours are allowed for a certain job, and the rates of pay and hours worked by men in the Group are:-

    (a)   3/6d.   5
    (b)   2/8d.   8
    (c)   5/2d.   10
    (d)   4/3d.   5
                         28

If twenty-eight hours were taken for the job, and forty hours allowed, twelve hours can be shared as a Bonus.

Divide the bonus time of twelve hours by the hours worked in the Group, to find how much Bonus time would be awarded for one hour's work = .428571422 hours.

P.A.Y.E.

Pay As You Earn is the method of deducting at source, tax from an employee's wage or salary.

To find the amount of tax due each week when using the 'SUMLOCK TABLES' the following method is used:-

Ascertain the Gross Pay to date subtract the FREE PAY according to the CODE. The remainder is TAXABLE PAY which is reduced to the nearest 5/-, 10/-, or £1 below, according to the BOX in which it falls. (i.e. A.B.C.D.E.F. or G.)

This amount should then be multiplied by the multiplication figure, and the subtraction figure subtracted, in the BOX concerned.

The result in the machine is the Cumulative Tax to Date, which should be read to the nearest whole shilling below.

To arrive at the TAX for the week, subtract the Total Tax to Date paid up to the previous week.

Should the Cumulative Tax to Date be less than the total to date for the previous week, the difference is a REFUND.

Note   There is a separate Tax Table for each week.

COIN DENOMINATING

Example 1	£.	s.	d.		Result			
	2.	13.	9.		Amounts under the various			
	4.	7.	7.		denominations:-			
	3.	12.	3.			£.	s.	d.
	7.	15.	6.		£1 notes	47.	0.	0.
	5.	6.	8.		10/- notes	2.	0.	0.
	9.	10.	5.		Silver	2.	3.	0.
	4.	3.	11.		Threepennybits		1.	6.
	7.	6.	4.		Copper			9.
	6.	8.	10.					
	51.	5.	3.			51.	5.	3.

The total of the above column has to be paid to a certain section of workmen as wages. The cashier, when obtaining the money from the bank must withdraw this sum, (not in £51. of £1.notes and the 5/3d in silver and coppers) but in a number of £1.notes, 10/- notes, silver and coppers, as many or as much as he requires, to enable him to give each workman the exact wage.

To ascertain the necessary amounts of each denomination, work as follows:-

1.   Add £'s only. Note answer and clear machine.

2.   Place the decimal pointer at the left hand side of the machine between the light and dark keys. Add the 10/-'s by striking 1 in the units column for each 10/- (operate with the first finger of the left hand). At the same time add the shillings and sixpences on the shillings and pence keys. (operate with the first and second fingers of the right hand).

    The result in the left hand side of the machine will be the number of 10/- notes required; note the value.

    In the £.s.d. registers will be shown the value of the silver required, note the answer and clear machine.

3.   From the pence column, add into machine all whole 3d's (remembering that the 6d's have already been deducted). Note answer and clear machine.

4.   Strike out the odd pence left in pence column (1d or 2d) on pence keys, note the answer and clear the machine. (If $\frac{1}{2}$d's or $\frac{1}{4}$d's are included these should now be totalled). The total of the various amounts must agree to the total of the NET wage column.

    Coin denominating is an important operation in all Wage Departments.

PERCENTAGES

To find a percentage of an amount

First divide the percentage figure by 100 so that it can be expressed as a decimal i.e. $25\% = \dfrac{25}{100} = .25$

then multiply by the given amount.

      Example:-   What is 25% of £136.10.0d?

$$\dfrac{25}{100} = .25$$

$$.25 \quad x \quad £136.5 \quad = \quad £34.2.6d.$$

To find what per cent IS one amount OF another amount.

Add the amount following IS into the machine.
Multiply by 100.
Divide by the amount following OF.
The answer will be so much per cent.

      Example:-   What % is 254 of 397

$$\dfrac{254 \ x \ 100}{397} \quad = \quad 63.98\%.$$

Note   The IS and OF amounts must be of the same denomination before commencing.

      Example:-   What % is 52 lbs of 3 cwts 1 qr 15 lbs?

                  It will be necessary to convert the 52 lbs to a decimal of a cwt or to reduce the 3 cwts 1 qr 15 lbs to lbs.

PRO-RATING AND PROPORTIONING PERCENTAGES

To Pro-rate means to spread one amount over other amounts in proportion to their size.

Rules for Working

a) Ascertain the total of the items over which the amount is to be pro-rated. CHECK.

b) Put the amount to be pro-rated in the machine at the left hand side, and divide by the total of the items.

c) The answer is the "CONSTANT" which is equal to the amount to be pro-rated in proportion to each UNIT.

d) Prove the "Constant" correct before using it, by multiplying it by the total of the items, and it should equal the amount to be pro-rated.

e) Multiply each item by the "Constant" and note the answers in the same denomination as the amount which is being pro-rated.

The total must agree exactly to the amount pro-rated, therefore it is often necessary for some adjustment to be made, and it is advisable to give some indication as to where it is possible to 'Add' or 'Subtract' ONE in making the adjustment.

Example 1   Pro-rate £59.7s.6d. over the following items:-

£29.	7s.	6d.	£6.	14s.	11d.
32.	15s.	4d.	7.	10s.	6d.
47.	16s.	9d.	10.	19s.	8d.
84.	14s.	3d.	19.	9s.	1d.
63.	17s.	4d.	14.	13s.	4d.
			59.	7s.	6d.

Determine total and check = £258. 11s. 2d.
Add £59.7s.6d. in the machine at the left hand side and divide by
£258.11s.2d. = .229638694.   CHECK.

Multiply each item by the "Constant".

Example 2   To find the % of each item to the total:-

Lighting	£368.	9.49%
Wages	2865.	73.88%
Rent & Rates	435.	11.22%
Insurance	210.	5.41%
TOTAL	£3878.	100.00%

Method: £3878 = 100%   ∴   the answers must add to 100%

Add 100.00 in the machine at the left hand side and divide by 3878
= .025786487.   CHECK (3878 x by constant = 99.99999)

Multiply each item by this constant, correct to 2 decimal places.

Example 3   £21. is being paid for a job of which 5 men have worked a
different number of hours. Ascertain each mans share
according to the hours he has worked.

A.	$4\frac{1}{2}$ hours	£3.	5s.	2d.
B.	6 hours	4.	6s.	11d.
C.	$4\frac{1}{4}$ hours	3.	1s.	7d.
D.	$8\frac{1}{2}$ hours	6.	3s.	1d.
E.	$5\frac{3}{4}$ hours	4.	3s.	3d.
		£21.	0s.	0d.

Determine the total number of hours = 29. CHECK.

Add 21 in the machine at the left hand side and divide by 29
= .72413793. CHECK.

Multiply each man's hours by this "Constant".

_____

Note   A small plus sign indicates where one can be added and a small minus
sign indicates where one can be subtracted.

PERCENTAGES OF INCREASE OR DECREASE

Rules

Add the later dated amount into the machine.
Multiply by 100 and
Divide by the earlier dated amount.

If the answer is more than 100 subtract the hundred and the remainder equals the percentage of INCREASE.

If the answer is less than 100 to determine the percentage of DECREASE subtract the figure in the machine from 100. To do this without clearing the machine, pick up the figures on small figures, less one on the last key and depress twice and the amount shown over the 100 is the percentage of DECREASE.

Example 1   Profits for 1938 = £2400.
             Profits for 1939 = £2850.

             Answer = 18.75% Increase.

Example 2   Profits for 1940 = £3600.
             Profits for 1941 = £2898.

             Answer = 19.5% Decrease.

Note   When the percentage of the later dated amount is less than 10% of the earlier dated amount - i.e. 9.57% - in order to subtract from 100 hold small 09.56 and depress twice.

Note No. 28

SQUARE MEASURE

Measure of Area or Surface

Formulae

    Length x Width = Area

    Area ÷ Width   = Length

    Area ÷ Length = Width

Table

    144 sq. inches   = 1 sq. foot
    9 sq. feet   = 1 sq. yard
    30¼ sq. yards   = 1 sq. rod, sq. pole or perch
    40 perches   = 1 rood (ro)
    4 roods or   )
    4840 sq. yards)   = 1 acre
    640 acres   = 1 sq. mile

Example   To find thd length of carpet of a given width required to cover a floor:-

Find the area of the floor and divide by the width of the carpet. It does not matter in this instance that square measure is being divided by lineal measure, but be sure that the DIVIDEND and DIVISOR are of the same denomination, i.e. square ft. must be divided by feet, and square yards by yards etc.

The above rules also apply to finding wallpaper lengths but it must be remembered that only a complete roll can be purchased.

Note When answers to squaring calculations are required to the nearest sq. ft. or to the nearest sq. inch:-

Complete the initial squaring multiplication and leave it in the machine; note down the whole numbers, marking them sq. yards or sq. ft. whichever is applicable and deduct them from the machine. The remaining decimal should be multiplied over by 9 (sq. ft. to sq. yds.) or by 144 (sq. ins. to sq. ft.)

CUBIC MEASURE

Measure of Volume or Capacity

Formulae

     Length x Width x Height = Volume

     Volume ÷ (W x H)   = Length

     Volume ÷ (L x H)   = Width

     Volume ÷ (L x W)   = Height

Table

     1728 cu.inches = 1 cu.foot
       27 cu.feet   = 1 cu.yard

Note When answers to cubic calculations are required to the nearest cubic foot or cubic inch:-

Complete the cubing multiplications, leave the answer in the machine note down the whole numbers (marking them cu.yds. or cu.ft. whichever is applicable) and deduct them from the machine. The remaining decimal should then be multiplied over by 27 (cu.ft. to cu.yds.) or by 1728 (cu.in. to cu.ft.)

GLASS

Calculations involving measurements of glass are not standard but usually conform to the rules given below:-
Glass is sold by the foot super (square foot) and all measurements are taken to the inch above, e.g. $75\frac{1}{8}$" = 76", $45\frac{1}{16}$" = 46" etc.
Some manufacturers calculate areas of glass to square feet and 1 decimal place only; others calculate areas in square feet and inches.

Example showing square feet and 1 decimal place

22 panes of glass each $7\frac{1}{8}$" x $9\frac{3}{16}$". Find the total area.

$\frac{22 \times 8 \times 10}{144}$ = 12.2 square feet. Now find the value at 4/9d per super foot.

12.2 x 4.75/- = £2.17.11½d.

Examples showing square feet and inches

1. 7 panes of glass each $15\frac{1}{8}$" x $12\frac{1}{16}$".
    7 x 16 x 13 = 1456. Divide by 144 remainder method = 10 r. 16
    Mentally divide the remainder figure by 12 = 1 inch and 4 parts.*
    Area of glass = 10 square feet, 1 inch. Now find the value at 5/3d per super
    foot. 10.083̇ x 5.25/- = £2.12.11¼d.
    NOTE *Parts are 12ths of 1 inch. If the remainder is under six they are
          ignored; if 6 or more they are treated as another whole inch.

2. 6 panes of glass each $8\frac{1}{8}$" x $14\frac{1}{4}$" @ 10/6d per super foot.
    $\frac{6 \times 9 \times 15}{144 \text{ remainder}}$ = 5 square feet, 7 inches, 6 parts. = 5 square feet, 8 inches.
    5.6̇ x 10.5/- = £2.19.6d.

CIRCULAR GLASS

Circular glass is always cut from a square and in order to find the size required 1 inch is added to the diameter. e.g. diameter 27", add 1" inch = 28". Diameter $10\frac{1}{4}$".
First, make this up to the next whole inch - 11" - then add another inch before squaring. 11" + 1" = 12".

Example 1   5 Plates, diameter 21 inches.
            21 + 1 = 22
            $\frac{22 \times 22 \times 5}{144}$ = 16.8 square feet.

Example 2   36 Plates, diameter $6\frac{3}{8}$" @ 4/6d per super foot
            $6\frac{3}{8}$" to inch above = 7" plus 1 inch to find the size of square needed = 8"
            $\frac{8 \times 8 \times 36}{144}$ = 16 square feet.
            16 x 4.5/-   £3.12.0d.

BEVELLING

A small charge is made for bevelling the edges of glass, the charge normally being "per foot run".
A pane of glass has four sides or edges, two of length and two of breadth so to find the total foot run it is necessary to double the length measurement and add it to double the breadth measurement.

            e.g. 17 panes of glass each 26" x 13". Find the cost of bevelling
            @ 2/6d per foot run.

            $\frac{26 + 26 + 13 + 13 \times 17}{12}$ = 110.5 foot run

            110.5 x 2.5/- = £13.16.3d.

PENCE DECIMALS

Multiplication of Decimals of Pence
when £'s are the Whole Numbers

Example   48 x £3.16s.4.2d.

Add pounds and shillings as decimals of £1. into the machine.

Multiply the pence and decimals by .004166˙ (Reciprocal of 240) =
£3.8175.

Multiply over by 48 = £183.24.

£'s and shillings to be converted in the usual way, remaining decimal
to be multiplied by 240 giving pence and decimals of a 1d.

Answer = £183.4s.9.6d.

Example   11 @ £4.16s.10 $\frac{5}{16}$ d.

Add the £'s and shillings as decimals of £1 into the machine.
Mentally decimalise pence fraction and add to the pence, then multiply
by the reciprocal of 240 (.00416˙) = £4.84296867.

Multiply over by 11 = £53.2726553.

£'s and shillings to be converted in the usual way, remaining decimal
will be multiplied over by 240 and read to the nearest fraction of 1d.

Answer = £53.5s.5 $\frac{7}{16}$ d.

Multiplication of Decimals of Pence
when Shillings are the Whole Numbers

Example   236 @ 13/8.364d. each.

Add the whole numbers of shillings into the machine. Decimalise the
pence by multiplying by the reciprocal of 12 (.083333˙).

Result is 13.697/-.

Multiply over this factor by 236 = 3232.492/-

Mentally convert to £'s and shillings in the usual way and multiply
over the remaining decimal by 12 to give pence and decimals of a penny.

Answer   £161.12s.5.904d.

TEXTILE TRADE

Textile Invoices

Textile Invoices, from the Cotton Mills, are always of the same pattern, as illustrated below:-

DR. to BOLLINGS MILLS, STOCKPORT

Messrs. A. Brown   31. 1. 57
    Colchester

42"

2/40   10/40½   41   2/42

@ 3/6d per yard.

From this we understand that the width of the material is 42 inches and that there are two rolls of 40 yards each, ten rolls of 40½ yards each, one roll of 41 yards and 2 rolls of 42 yards each. Three answers are required:-

(a)   Number of pieces.
(b)   Number of yards, and
(c)   Total value.

e.g. in the above example we have:-

    15 pieces
    610 yards
    £106.15s.0d.   Value.

Grammes Per Square Metre

When textiles are exported, it is sometimes necessary to calculate the weight of the cloth in grammes per square metre.

To do this, the length of cloth should be multiplied by the width, the product being given in square yards; this should then be converted to square metres. The weight should be converted to grammes. The total weight divided by the total square metres, to give the weight in grammes per square metre.

The SUMLOCK Decimal Chart, simplifies this procedure and should be used for such calculations whenever possible:-

Convert weight to Grammes. (i.e. To convert kilos to grammes multiply by 1000. To convert lbs. to grammes multiply by 453.59243). Multiply over by the width in inches, taken from decimal chart and divide by the length in yards.

Example

Find the weight in grammes per square metre.
Length 576 yards; width 41 inches; weight 63.25 kilogrammes

Convert weight to grammes (63.25 kilogrammes x 1000) = 63250.

$$\frac{63250 \times 1.05014}{576 \text{ (length)}} \text{ (41 inches by the chart)} = 115.31 \text{ grammes per square metre.}$$

SHIPPING

1 Space or Measurement Ton	= 40 cubic feet.
1 Metric Ton	= 1000 Kilos.
1 Bushel	= 80 lbs.

When goods for export arrive on board ship, the Shipping Company or the agent representing the Company makes out a Freight Note and forwards it to the shipper or the consignee. (See transport Charge terms.) On payment of the amount specified, a Bill of Lading is delivered to the shipper.

Freight is charged in various ways, e.g. per pound weight as in the case of wool, per bushel (80 lbs) as in the case of wheat, a lump sum for such articles as boilers, and a rate of so much per ton weight or ton measurement, is ordinarily charged on other packages.

A measurement or space ton is 40 cu.ft. and it is at the option of the steamship company whether the charge is made by weight or by measurement - usually whichever is the highest.

When the freight has been ascertained, a percentage must be added for PRIMAGE. This is a shipping charge, usually $2\frac{1}{2}\%$ to 15% for expenses in connection with loading and unloading cargo.

A Manifest is a complete list of all cargo carried on board for which Bills of Lading have been issued.

Transport Charges

Sometimes an invoice will state details of transport charges. Either a price will be quoted which includes the whole cost of delivering the goods, or a price which covers only a part of the journey.

i.e. Carriage forward	-	The cost of transport must be paid by the purchaser.
Carriage Paid	-	The transport costs are paid by the seller.
F.O.R. ('free on rail') or Ex quay	-	The seller pays the transport necessary to put the goods on rail at his end. The purchaser pays the rail charges and any further transport charges incurred.
Loco	-	The purchaser pays all transport costs.

The above terms apply only to internal traffic.

For goods being shipped abroad other terms are used.

i.e. Franco (Paris: New York etc.)	-	All delivery costs are paid by the seller to the destination quoted, including any import duty payable.

Cost and Freight (C. & F.)	–	The seller pays the cost of transport to the ship and the freight charges.
Cost, Insurance and Freight.	–	The same as C. & F. but also the seller pays the cost of marine or any other insurance.
Free on Quay (F.O.Q.)	–	All expenses, after the goods have been delivered to the quay, must be paid by the purchaser.
Free alongside Ship (F.A.S.)	–	All expenses, after the goods have been delivered alongside the ship, must be paid by the purchaser.
Free on Board (F.O.B.)	–	The seller pays the cost of delivering the goods on board the ship. The purchaser pays the freight.

Example 1

4 Packages 3'x2'x1'6" @ £26.10.0d per measurement (or space) ton
3 " 4'x3'x2' @ £25.0.0d " " " "
Primage 5%

First line

Find total cubic feet	=	9
Multiply-over by number of packages	=	36
Multiply-over by price per ton	=	954
Multiply-over by .025 (reciprocal of 40 because there are 40 cubic feet in a measurement ton).	=	23.85 = 23 17 0
Calculate the second line in the same way		= 45 0 0
	Add	68 17 0
Find 5% of total (£68.17.0)		3 8 10¼
		£72 5 10¼

Example 2

12,750 Kilos @ 145/- per metric ton.

1 metric ton equals 1000 Kilos so find how many tons there are in 12,750 and multiply by the rate per ton.

12.750 x 145/- = £92.8.9d.

Example 3

8,750 lbs @ 204/9d per Bushel

Multiply lbs by rate per bushel	=	1791562.5
Multiply-over by .0125 (reciprocal of 80 because there are 80 lbs in 1 Bushel)	=	22394.531
	=	£1119.14.6½d.

SIMPLE INTEREST

Interest is the sum of money paid, for the loan of money lent for a certain TIME at a RATE per cent per annum.

The amount lent is called the PRINCIPAL.

The TIME for which the sum of money is lent may be for part of a year, a year or a number of years.

The amount to be paid per cent of the Principal is the RATE.

'Simple' interest is calculated on PRINCIPAL only.

Formulae: $\dfrac{\text{P.T.R.}}{100}$ = $\dfrac{\text{Principal x Time x Rate}}{100}$ = INTEREST.

Example 1   Find the Simple Interest of £547.18s.9d. for 6 years at 5%
= $\dfrac{547.9375 \times 6 \times 5}{100}$ = Answer = £164. 7s. 7½d. (Interest).

When the TIME is in a part of a year, the decimal equivalent must be found (remembering to take a leap year into account, this can be ascertained if the last two figures in the year are divisable by 4)

Example 2   Find the Simple Interest on £564.0.0. @ 6% from August 18th 1930 to November 21st 1938.

There are 8 years from August 18th 1930 to August 18th 1938.

The exact number of days between August 18th 1938 and November 21st 1938 are 95.

(13 remaining in August   )
(30   days   in September)
(31   days   in October   )
(21   days   in November)

95 divide by 365 = .260274 ∴ TIME = 8.260274

= $\dfrac{564 \times 8.260274 \times 6}{100}$ = £279. 10s. 6½d. (Interest).

Example 3 (with leap year)

Find the simple interest on £564. 0s. 0d. at 6% from January 4th 1938 - March 16th 1940.

There are 2 years from January 4th 1938 - January 4th 1940. The exact number of days are as follows:-

(27 days remaining in January   )
(29 days in February - leap year)
(16 days in March   )

72 ÷ 366 = .196721 ∴ TIME = 2.196721

= $\dfrac{564 \times 2.196721 \times 6}{100}$ = £74. 6s. 9d. (Interest).

Note

When an operator is required to do simple interest calculations in her job, she should first ascertain whether or not her employer wishes her to take Leap Year into consideration as it is sometimes ignored. Daily Interest Tables can be used when carrying out Simple Interest Calculations.

COMPOUND INTEREST

Interest is 'Compound' when at the end of one year, the interest is added to the Principal and the interest for the next year is calculated on principal plus interest.

When calculating Compound interest the answer will contain the principal plus the interest which is the answer usually required but if only the interest is asked for do not forget to subtract the principal from your final total or deduct one UNIT from the product of the Compound Interest calculation before multiplying over by the principal.

Example 1   £300 for 2 years @ 5% Compound Interest.

The simplest method of calculating Compound Interest is to find the amount of Compound Interest on £1 for 1 year at the given rate of interest.   Then multiply this result by itself the number of times indicated by the number of years.   Multiply this answer over by the principal.

£1 for 1 year @ 5% = 1.05
£1 for 2 years @ 5% = 1.05 x 1.05 = 1.1025 x £300.

Answer = £330. 15s. 0d.

Example 2   £250 for 3 years @ 5% Compound Interest.

£1 for 1 year @ 5% = 1.05
£1 for 2 years @ 5% = 1.05 x 1.05 = 1.1025
£1 for 3 years @ 5% = 1.1025 x 1.05 = 1.157625 x £250.

Answer = £289. 8s. 2d.

When the loan is for a considerable number of years it would take too long to calculate year by year, so the following method is used:-

6 years - find what 3 years is, then multiply this answer by itself.

8 years - find what 2 years is, then multiply this answer by itself,
= 4 years, multiply this by itself = 8 years.

16 years = £1 for 1 year @ 5% = 1.05.
              £1 for 2 years @ 5% = 1.05 x 1.05 = 1.1025
                   4 years @ 5% = 1.1025 x 1.1025 = 1.21550625
                   8 years @ 5% = 1.21550625 x 1.21550625 = 1.47745535
                  16 years @ 5% = 1.47745535 x 1.47745535 = 2.1828741.

When an odd number of years are given, for example 17 years @ 5%.   We have 16 years = 2.1828741 so multiply this by 1.05 = 2.2920178.

To find the Compound Interest when fractional parts of a year are included.

Example 3   £400 @ 5% C.I. from 11.1.32 to 15.6.34.

Find the number of years and decimal of a year as for simple interest. This is 2.424658.
£1 for 2 years @ 5% C.I. = 1.05 x 1.05 = 1.1025
£1 for .424658 years @ 5% C.I. = .424658 x .05 + 1 = 1.0212329
∴ 2.424658 years @ 5% C.I. = 1.1025 x 1.0212329 = 1.12590925
Multiply over by £400.

Answer = £450. 7s. 3d.

Note   The method of dealing with part of a year is as follows:-

Part of a year, decimalised, times the rate %, then add 1 (£1).

COST & SELLING PRICES

Retailer

A Retailer or Shopkeeper sells direct to the Public and goes to the 'Wholesaler' or direct to the 'Manufacturer' to buy his goods, prior to reselling them to the public.

Wholesaler

A Wholesaler stocks a variety of articles for supplying to the Retailer, and is termed 'the middle man' as he does not make or produce any article.   He buys from the Manufacturer for resale to the Retailer, but NOT TO THE PUBLIC.

Manufacturer

A Manufacturer makes and produces articles and supplies Wholesalers and Retailers, but NOT THE PUBLIC.

When Selling Price and percentage profit on Selling Price is given - find the Cost Price.

(a)   Selling Price = 100%
      Profit is say 21%
      $\therefore$ Cost Price must be 100% - 21% = 79%
      Selling Price multiplied by 79% = Cost Price.

When the Cost Price and the desired percentage of profit is given - find Selling Price.

(b)   Selling Price = 100%
      Required profit is 21%
      $\therefore$ Cost Price will be 100% - 21% = 79%
      DIVIDE the Cost Price by 79% (or .79) this equals

                        The Selling Price

Note Should overheads be included they must be added to the percentage profit required.

   Example   Find the Selling Price when the Cost Price is £276.15s.0d.
   Overhead charges $12\frac{1}{2}$% Net Profit required 25%

   Selling Price   = 100%
   Overheads and Net Profit = 12.5 + 25 = $37\frac{1}{2}$%
   $\therefore$ Cost Price   = $62\frac{1}{2}$%
   DIVIDE £276.75 by .625

                  Answer = £442.16.0. = Selling Price

List Pricing

Many manufactures allow Trade Discounts off list prices therefore a double pricing calculation is necessary when list prices are being prepared.

   Example   Cost Price 20/-
             Desired Profit 15%
             Trade Discount 5%

   First step.   20/- = 85% (100% - 15%) $\therefore$ 20/- ÷ by .85 = 23.529/-
   Second step. 23.529/- = 95% (100% - 5%) $\therefore$ 23.529/- ÷ by .95
                 = 24.767/- = £1. 4s. 9d.

   To Prove   24.767/- less 5% = 23.529/-
              23.529/- less 15% = 20/-

Percentage of Profit Based on Cost Price

This is a very simple calculation with the COST PRICE = 100% and the desired percentage added to it.
i.e. Cost Price = 15/- Gross Profit on C.P. 25% therefore
Selling Price = 15 x 1.25 = 18/9d.

To find Percentage to be added to COST PRICE to cover Percentage of Profit required on the Selling Price.

(a)   Selling Price = 100%   )   What % is 33 1/3 of 662/3 = 50%
          Profit   = 331/3 %)   (If the profit allowed on S.P. is 331/3 %
          Cost Price   = 662/3 %)   50% must be added to C.P.)

(b)   Selling Price = 100%   )   What % is 20 of 80 = 25%
          Profit   = 20%)   (If the profit allowed on S.P. is 20%
          Cost Price   = 80%)   25% must be added to C.P.)

          To Prove Calculation

          Cost Price = £55.
          Selling Price if 20% profit on S.P. is allowed will be £68.15s.0d.
             £55 + 25% = £68. 15s. 0d.

MARK DOWN CALCULATIONS AT SALE TIME

At Sale Times it is the common practise to reduce the selling price by lowering the margin of profit.

<u>To find the Sale Price you must know the percentage drop on the original Selling Price.</u>

Mark Down by a Certain Percentage

<u>Example 1</u> Goods marked down by 5%

Original profit required was 20% on the Selling Price of £68.15s.0d. (Cost price was £55.0s.0d.)

Original Selling Price was 100% - less the agreed 5% which means the sale price will be 95% of £68.15s.0d. = £65.6s.3d.

Having deducted 5%, the actual percentage of profit made at this Sale Price is now required. The Sale Price now equals 95% (not 100% as originally) and the profit made is no longer 20% but 20 - 5 = 15.

Therefore to find the actual percentage of profit we must find what percentage 15 is of 95 = 15.78947%.

<u>Check</u>
Cost price is £55.0s.0d.
Selling price to make a profit of 15.78947% would be £65.6s.3d. (which is the Sale Price already calculated).

<u>Example 2</u> Goods to be marked down by 8%

Original profit required was 15% on Selling Price of £3.8s.4d. (Cost Price £2.18s.1d.)
Sale Price will be 92% of the Original Selling Price = £3.2s.11d.
What is the actual profit now?
Sale Price equals 92% and the profit no longer 15, but 15-8 = 7.
Therefore for actual percentage of profit we must find what % 7 is of 92 = 7.609%

<u>Check</u>
Cost price is £2.18s.1d.
Selling price to make a profit of 7.609% would be £3.2s.11d.

Mark Down to a Certain Percentage

Another method used at Sale Time is to reduce the profit required to another certain percentage.

<u>Example 3</u> Goods marked down so that the profit is now 10% on the Selling Price.
Original Profit was 15% on Selling Price of £17.18s.3d.
(Cost Price £15.4s.6d.)
To find Sale Price, as already stated, you must know by what percentage the original selling price is marked down.
When making 15% profit on the Selling Price, the Cost Price is 85%, so when making 10% profit on the Selling Price, the Cost Price is 90%.
To find this mark down by percentage you must find what 5 (15-10) is of 90 = 5.555%.
Subtract this percentage from the 100% and multiply the present Selling Price by this result decimalised for the Sale Price. £17.18s.3d. x .94445 = £16.18s.4d.

<u>Check</u>
Cost Price is £15.4s.6d.
Selling Price to make a profit of 10% would be £16.18s.4d.

Example 4   Original Profit was 20% on the Selling Price of £68.15s.0d.
                (Cost Price £55.0s.0d.).

Goods marked down so that the profit now made is 15% on the Selling
Price.

The mark down by percentage is found by finding what 5 (20-15) is of
85 (100-15) = 5.882%.

So the Sale Price will be £68.15s.0d. multiplied by .94118
(100 - 5.882, result decimalised) = £64.14s.1d.

Check

Cost Price is £55.0s.0d.
Selling Price to make a profit of 15% is
£64.14s.1d.

PROFIT & LOSS

TO ASCERTAIN THE PERCENTAGE PROFIT OR LOSS GIVEN THE COST AND SELLING PRICE

The Selling Price is 100%

To find the percentage of profit or loss first find what percentage the Cost Price is of the Selling Price as below:-

    Add the Cost Price and any Overheads into the Machine.
    Multiply the result by 100.
    Divide by the Selling Price.

If the answer is more than 100% the Cost Price has exceeded the Selling Price, therefore mentally subtract the 100% and the result will be the Percentage of Loss.

    Example 1   Cost Price is 67/4d.   Overheads 13/6d.
                      Selling Price 75/-d.
                      Answer = 7.8% loss

If the answer is less than 100%, the Selling Price exceeded the Cost Price. To arrive at the percentage of Profit, pick up on small figures the result now in the machine, and depress twice. Mentally subtract the 100% for the percentage of Profit.

    Example 2   Cost Price is 25/-d.
                      Selling Price 40/-d.
                      Answer = $37\frac{1}{2}$% Profit.