# INTRODUCTION

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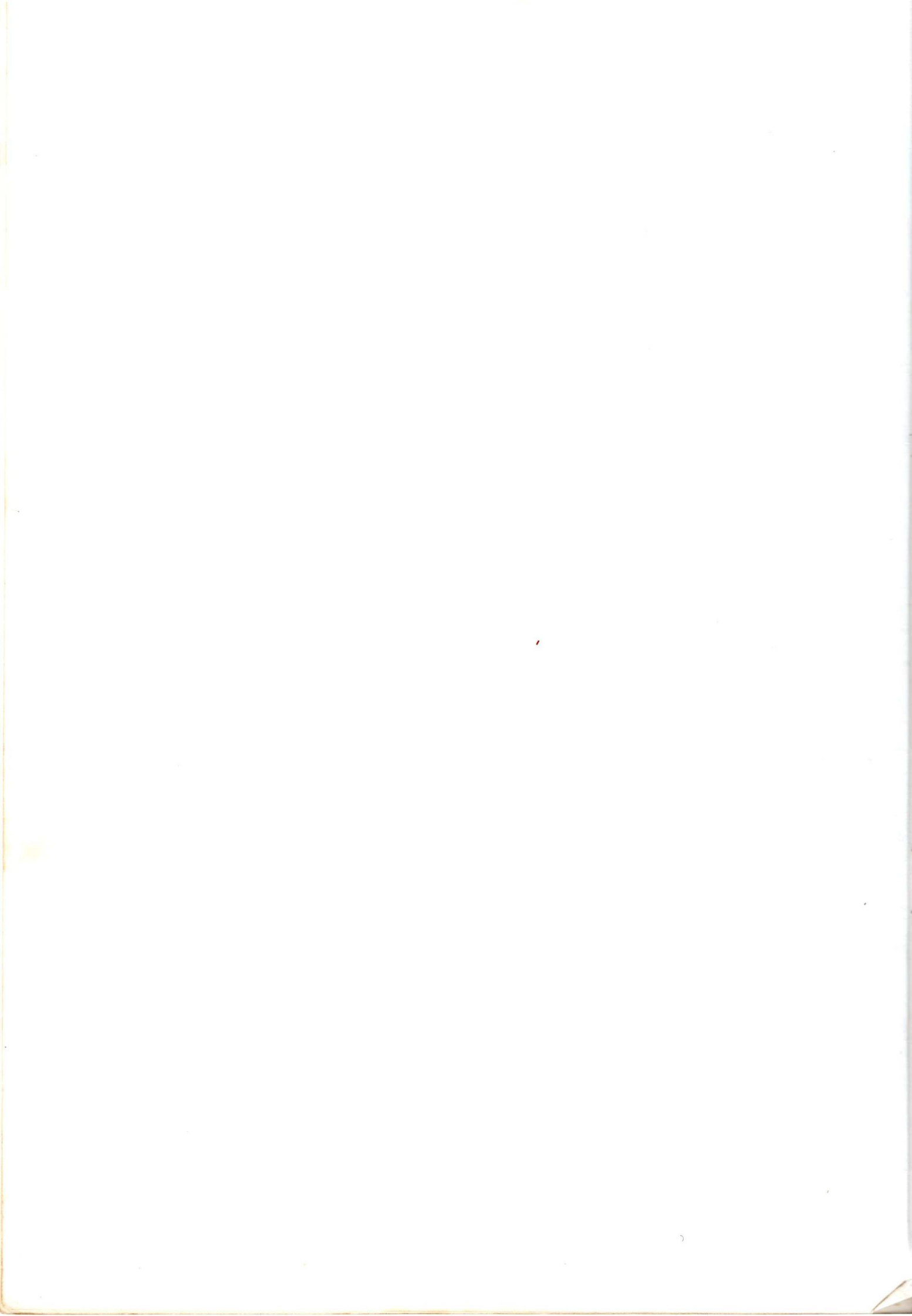
Accuracy First

Speed Later

Correct posture is essential to comfortable and tireless operating, so from the very first day, see that your chair is adjusted 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 holds it between the thumb and palm of the 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 not only during your training but as a reference book when you have finished the course.

# PRIMARY COURSE

## OPERATORS NOTEBOOK

### INDEX

## 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.

### YOU MUST NOT LOOK AT THE KEYBOARD

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. in the pence column only.
```

4. **Correct Fingering**

   **Shillings and Pence**

   | | |
   |---|---|
   | 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. |

   **Whole Numbers**

   | | |
   |---|---|
   | 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. |

   **Note**

   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.

   **Adding of £. s. d.**

   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 — TWO FACTORS

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

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### Rule of Multiplication

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

e.g.   8 x 4    Hold 8 and depress it 4 times = 32

### Working over a fixed decimal point

Place the decimal point in the most suitable position for working. Hold one factor in its correct position over the FIXED POINT, the whole numbers to the left of the decimal point and decimal numbers to the right of it.

When figures are held in their proper or natural positions, this is known as the **UNIT POSITION** and they may be multiplied in this position by **THE UNIT OF THE OTHER FACTOR.**

If the figures held are to be multiplied by tens, hundreds or thousands etc., move one place to the left (from the units position) for tens, two places to the left (from the units position) for hundreds and so on.

If the figures held are to be multiplied by decimal figures move one place to the right (from the units position) when the first figure is in the first decimal place, two places to the right (from the units position) when the first figure is in the second decimal place and so on.

### Multiplication of large factors

e.g.   677.45 x 4983.6    *= 3376139 · 82*

Count the number of whole numbers in both factors and place a decimal pointer that number of places from the extreme left of the machine (including the carry-over register). In the above example the decimal point would be placed seven places from the extreme left of the machine.

### Multiplication of decimal numbers

e.g.   .0069 x .0034   *= ·00002346*

The decimal point should be placed at the extreme left of the **keyboard.**

### AVOID UNNECESSARY WORK

**Example**   234 x 978  *= 228852 ·*

Note that if 234 is held, multiplying by 978 results in 24 key depressions, whereas if 978 is held only 9 key depressions are made!

### COMMON FRACTIONS AND RECURRING DECIMALS

#### Common Fractions

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

**Example**   $\frac{7}{16}$   to decimals

Add 7 into the machine and divide by 16

    Answer = .4375

**MULTIPLICATION — TWO FACTORS — continued**

**Recurring Decimals**

Work out recurring decimals to as many decimal places as will give the required accuracy.

If the answer is to be given to as many decimal places as possible then it will be necessary to work right off the keyboard.

If the decimal point is well to the left of the keyboard and only a few decimal places are required then you may stop calculating when one more place than the number requested has been completed.

SPLIT MULTIPLICATION.

924.3125  ×  7295.38.

METHOD

COUNT WHOLE NOS IN BOTH FACTORS, PLACE D.P.

PICK UP PART OF FIRST FACTOR × BY ALL OF SECOND FACTOR.

PICK UP REMAINDER OF FIRST FACTOR (REMEMBERING READ TO STRIKE UNITS)

ONCE AGAIN × BY ALL OF SECOND FACTOR.

ex    924 ×
         ∨ UNITS POSITION.
      7295.38.
         ∨ .3125.    = 6743210.922.

## DECIMALISATION

**To decimalise pence to shillings**

Pence decimals will be found by reference to the Decimal Chart.

**Example**    45 articles at 3/9d.each

45 x 3.75 = 168.75 shillings.

Mentally divide shillings by 20 to bring to £'s and shillings = £8. 8. 0d.
Refer to decimal chart for pence = 9d.

Answer £8. 8. 9d.

**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 you require.

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

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

**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 decimals to pence by referring to your Decimal Chart.

**Example**    27 articles at £4. 9. 3d. each

= 27 x 4.4625 = £120.4875

   £'s = 120

   Shillings = 9 (.45)

Remaining decimal = .0375 = 9d.

      Answer = £120. 9. 9d.


**WHOLE PENCE AS DECIMALS OF 1 SHILLING**
**WHOLE PENCE AS DECIMALS OF £1**
**MUST BE MEMORISED AS SOON AS POSSIBLE.**

| | |
|---|---|
| 1 s. = | · 05 |
| 2 s = | ·1 |
| 3 s = | ·15 |
| 4 s = | ·2 |
| 5 s = | ·25 |
| 6 s = | ·3 |
| 7 s = | ·35 |
| 8 s = | ·4 |
| 9 s = | ·45 |
| 10 s = | ·5 |
| 11 s = | ·55 |
| 12 s = | ·6 |
| 13 s = | ·65 |
| 14 s = | ·7 |
| 15 s = | ·75 |
| 16 s = | ·8 |
| 17 s = | ·85 |
| 18 s = | ·9 |
| 19 s = | ·95 |

## SUBTRACTION

Both the large and the small figures on the key-tops are used in subtraction.

**Example 1**     56749 — 235

Add 56749 into the machine at the right hand side of the keyboard using **large** figures.

Use the subtraction selector immediately to the left of the column of the first figure to be subtracted (in this example the hundreds column as we always subtract from left to right).

Using the **small** figures depress 2 in the hundreds column, 3 in the tens column and 4 (5 less 1) in the units column.

Answer 56514

**Example 2**     56749 — 1230

Use the subtraction selector to the left of the thousands column.
Depress small 122 — ignore the "0" — do **not** depress any key in the unit column.

Answer 55519

**Example 3**     56749 — 1023

Use the subtraction selector to the left of the thousands column and depress small 1022.

Answer 55726

**Example 4**     56749 — 695

Use the subtraction selector to the left of the hundreds column and depress small 6 — 4.

Answer 56054

**Example 5**     56749 — 874

On all manual Sumlock Comptometers and on some electric models it will be necessary to "borrow" just as when working mentally. To borrow you depress small "0" in the column immediately to the left of that from which the first figure is to be deducted.

In Example 5 use the subtraction selector to the left of the thousands column and depress small 0873.

Answer 55875

**Decimal Subtraction**

The principle remains  the same, but care must be taken to see that the amounts are correctly entered around the decimal point.

**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. 7. 10d. depress the 10/- key as there **IS** a small "0" in this column; although no "0" is written, it is nevertheless understood.

**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.

**NOTE**

Always remember when subtracting, to add back to prove.

$16425 \div 25 = 657$.

$83363 \div 7.35 = 11341 \cdot 90466$.

$25 \cdot 885 \div \cdot 0737 = 351 \cdot 221161$

$866 \cdot 76 \div \cdot 1234 = 7023 \cdot 987$

£46·18·6 — 4) £8·17·5

### Note No. 5

### DIVISION

Add the DIVIDEND into the machine at the *Etreme* left hand side on LARGE figures, placing the decimal point in its correct position.

Point-off according to the DIVISOR, before commencing to divide.

#### Rules for Pointing-Off

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

2.  If the divisor is a decimal such as .345, the decimal point is **not** moved from its original position.

3.  If the divisor is a decimal with preceding ciphers such as .0024, the decimal point is moved one place to the RIGHT for each cipher. (THEN IGNORE CIPHERS)

### 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.

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

    The INDEX FIGURE is the first figure in the answer register, immediately to the **left** of the columns 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 columns on which the divisor is being held. 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 columns on which the divisor is being held and so on.

#### 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:—

Lb. to cwts. qrs. and lb.
Lb. to tons cwts. qrs. lb.
Pence to shillings.
Pence to £. s. d.
Singles to gross, dozens and singles.
Oz. to lb. and ozs.
Seconds to Hours and Minutes.

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

**Note No. 5**

**DIVISION — continued**

**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.

Note No. 6

## MULTIPLICATION OVER – THREE OR MORE FACTORS

SIMPLE OR DIRECT MULTIPLICATION is multiplication of two factors only but in MULTIPLICATION OVER, which is multiplication of three or more factors **without clearing the machine,** the method is to move the decimal point instead.

### Memorise the following rules for pointing-off

When a factor (a set of figures) is in the machine, it is in the natural position, or **UNITS** position and is considered to be multiplied by 1.

To 'multiply-over' by, say, 5, pick up the figures in the machine and depress the keys four more times; call the first stroke "2", then continue with 3, 4 and 5. The first stroke (or multiplication by one) has already been made as the figures were in the machine once.

**When multiplying-over by a number, the first figure of which is not a UNIT** the position of the decimal point can be altered according to the following rules:—

1. 24.26    the **DECIMAL POINT** is moved one place to the **RIGHT** and the keys are depressed 1426 times

2. 324.26    "   "   "   is moved two places to the **RIGHT** and the keys are depressed 22426 times

3. 5324.26    "   "   "   is moved three places to the **RIGHT** and the keys are depressed 432426 times

4. .4    "   "   "   is moved one place to the **LEFT** and the keys are depressed **3** times

5. .04    "   "   "   is moved two places to the **LEFT** and the keys are depressed **3** times

6. .004876   "   "   "   is moved three places to the **LEFT** and the keys are depressed **3876** times

From the last example it will be seen that the decimal point is moved for the point (.) and the number of 0's and **not** for the number of figures after the decimal point.

**REMEMBER** in Multiplication-over you move the **decimal point only:**
you do **not** move your hands as well.

Ex   109 × 68 × 302.

METHOD

109 × 68 AS TWO FACTOR MULTIPLICATION = 7412 TO BE × 302.

AS FIRST FACTOR OF VALUE IS A HUNDRED POSITION MOVE D.P. 2 RIGHT

PICK UP 741200. STRIKE TWO MORE TIMES IN SAME POSITION THEN

MOVE OVER STRIKE 'O' MOVE AGAIN STRIKE 2 = 2238424.

EX .18 × .05 × 4.5 × 280 × .002.

METHOD   18 × .05 AS TWO FACTORS MULTIPLICATION

RESULT × 4.5   D.P. STAYS. PICK UP STRIKE 3 MOVE OVER STRIKE 5.

RESULT × 280   D.P. 2 RIGHT   "   "   "   1   "   "   "   8

RESULT × .002   D.P. 3 LEFT   "   "   "   1

= 2.268.

EX   7 BOX'S 120 ARTICLES. @ 4½d each

7 × 120 × .01875

## ACCUMULATION OF PRODUCTS

To accumulate is to allow one product to add to another in the machine and would be used when only the final figure is required in a series of multiplications.

Work over a fixed point but allow a sufficient number of columns to the left of the decimal point for whole numbers in order to have plenty of machine space for the "carry-over" figures.

Accumulation — when using a Sumlock Comptometer with only one Register — can only be applied to direct multiplication and **not** multiplication-over unless the multiplication-over factor is common to all items. Neither can it be applied to mixed quantities and weights such as:—

        343 lb.      @ £1.  2. 6d.per cwt.
        591 sins.   @ £2. 13. 9d.per gross
         45 oz.     @        11. 6d.per lb.

unless a Storage Register model is available.

PLACE D.P. BY — COUNT WHOLE NOS. +1 WORK BETWEEN
        COLOURED KEYS IF NOT MORE THAN FOUR WHOLE NOS.

D.P. 6+1 = 7.

    38  ×  514
    17  ×  263
   314  ×   28
   227  ×  637 ← THIS ONE CONTAINS THE MOST WHOLE  NOS.
    71  ×   85                                   6 + 1 = 7
   ─────────────
   183 429.

WORK BETWEEN COLOURED KEYS.

    18   @    7/6
    32   @    6/9.
    15   @    9/8.
    87   @    2/3.
   ─────────────
   34 - 11 - 9.

## DISCOUNTS AND INCREMENTS

Discounts and Increments are always quoted per cent (%) — per 100.
When calculating Discounts or Increments first mentally divide the % figure by 100.

**Example**    25% = $\frac{25}{100}$ = .25    5% = $\frac{5}{100}$ = .05

**Discount and Net Amount**

**Discount**    MONEY x .1 AS A DEC.

**Example** £48.10.0d.less 25% = 48.5 x .25 = £12.2.6d.

**Net Amount**    MONEY x .1 FROM 100.

**Example** £48.10.0d. less 25%

Net Percentage    =  75%  =  48.5 x .75   = £36.7.6d.

**Increment and Gross Amount**

**Increment**    MONEY x .1 ASA DEC.

**Example** £246.15.0d. plus 5% = 246.75 x .05 = £12.6.9d.

**Gross Amount**    MONEY x .1 ADDED TO 100.

**Example** £246.15.0d. plus 5%

Gross Percentage  =  105% =  246.75 x 1.05 = £259.1.9d.

% MEANS PER 100.

|  | | H | T | U | |
|---|---|---|---|---|---|
| 100% | = | 1 . | 0 | | |
| 25% | = | . | 2 | 5 | |
| 34½% | = | . | 3 | 4 | 5 |
| 6¼% | = | . | 0 | 6 | 2 | 5 |
| 128½% | = | 1 . | 2 | 8 | 5 |

EXAMPLE.

| 16 | @ | 4/9 EACH | 3 . 16 . 0 . |
| 12 | @ | 1/9½ " | 1 . 1 . 6 . |
| | | | 4 . 17 . 6 |
| | LESS 3% | | 2 . 11 |
| | | | 4 . 14 . 7 . |

A SPACE HAS BEEN LEFT
TO SHOW THE PERCENTAGE,
SO THE ACTUAL AMOUNT
IS REQUIRED.

EXAMPLE

| 22 @ 3/6 EACH LESS 25% | 4-4-0 |
| 18 @ 2/4 " " 25% | 1-17-2 |
| | 6-1-2 |

THE PERCENTAGE VALUE
IS NOT SHOWN, SO THE NET
AMOUNT IS REQUIRED

## CHAIN DISCOUNTS AND INCREMENTS

When there is more than one percentage to be added or deducted this is termed Chain Discount.

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 2½%
               .95 x .85 x .975  =  .7873125
               .7873125 x £35  =  £27. 11. 1d.

———————

**Example 2**    £35. 0. 0d. plus 5%, plus 15%, plus 2½%
               1.05 x 1.15 x 1.025  =  1.2376875
               1.2376875 x £35  =  £43. 6. 5d.

———————

**Example 3**    £35. 0. 0d. less 5%, plus 15%, less 2½%
               .95 x 1.15 x .975 =  1.0651875
               1.0651875 x £35 =  £37. 5. 8d.

———————

**NOTE:**  When the same chains occur repeatedly work these out first and keep a note of them.

**NOTE:**  When 'and' occurs in a chain discount or increment it indicates that the sign immediately preceding is to be repeated e.g. less 2½% and 5% means less 2½%, 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 2½%
          .9 x .975  =  .8775
          1 − .8775  =  .1225
          £135.525 x .1225 = £16. 12. 0d. = **Actual Amount of Discount**

———————

### To Find Actual Amount of Increment

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

**Example**  £135. 10. 6d. plus 10%, plus 2½%
          1.1 x 1.025  =  1.1275
          1.1275 − 1  =  .1275
          £135.525 x .1275 = £17. 5. 7d. =  **Actual Amount of Increment**

## RECIPROCALS

A reciprocal is the result of dividing any number into 1. It would be used to find the result of a division by simple multiplication, since the process of multiplication by Comptometer is usually quicker than that of division. Reciprocal division is mostly used when several amounts have to be divided by the same number.

**Example**  
£   10. 9. 6)  
  501.11. 7)  
    2.19. 8)     All to be divided by 33.5  
  1065. 4.11)  
   31. 1. 8)

The reciprocal of 33.5 is .0298507443. Multiply each item in turn by this decimal number.

Reciprocals can also be used for a single division if the divisor is one which can be used fairly frequently and can be committed to memory.

**Example**    349 oz. @ 18/9d. per lb. = 349 × .9375  
    Leave result in the machine and multiply by .0625 (Reciprocal of 16).

RECIPROCALS MUST ALWAYS BE PROVED ACCURATE BEFORE THEY ARE USED.  
CHECK BY MULTIPLYING BACK.

## Note No. 11

## MISCELLANEOUS 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 using reciprocals to build up decimals. There are also decimal charts covering each of the following groups of extensions which can be used instead of reciprocals.

———

**Lb. Oz.**

**Lb. oz. @ price per lb.**

Multiply lb. and oz. — as 16th — by price per lb.

 **NOTE**   When oz. have fractions e.g. 3lb. 15¼oz. @ 3/9d.per lb.
 add lb. into Register multiplying oz. by .0625, multiply by price.

**Lb. oz. @ price per oz.**

Convert lb. to ozs. by multiplying by 16, add in the odd ozs. multiply by price.

———

**Yardage**

 **Yards, Feet and Inches**

12 inches = 1 foot.
3 feet    = 1 yard.
36 inches = 1 yard. Reciprocal of 36 = .02̇7̇

**Yards and Inches @ price per yard**

Add yards into Register multiply inches by .02̇7̇, multiply by price.

**Yards and Feet @ price per yard**

Multiply yards and feet — 1 foot as .3̇ or 2 feet as .6̇ — by price.

**Yards, Feet and Inches @ price per yard**

Add yards as whole numbers, add each foot as .3̇, multiply inches by .02̇7̇, multiply 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, mentally multiply quarts by 2, add pints and decimalise as 8ths, multiply by price.

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## MISCELLANEOUS EXTENSIONS—Continued

### 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 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 by price.

### Gross

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

### 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 .00694̇ multiply by price.

### Gross, Dozen and Singles at price per dozen

Convert 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 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 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.

### Tonnage Extensions

### Tons, cwts. qrs. and lb. @ price per ton

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

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

**Example**    5 tons 18 cwts. 2 qrs. 15 lb. @ £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 lb. by .000446428     = 5.93169638

Multiply by the price

Answer = £14. 16s. 7d.

## MISCELLANEOUS EXTENSIONS—Continued

**Tons, cwts. qrs. and lb. @ price per cwt.**

| | |
|---|---|
| **Example** | 2 tons 5 cwts. 3 qrs. 11 lb. @ 16/9d. per cwt. |

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

Multiply by the price

Answer = £38. 7s. 11d.

————

**Tons, cwts. qrs. and lb. @ price per lb.**

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

**Lb. @ price per cwt.**

Multiply lb. by price and divide by 112.

**Lb. @ price per ton**

Multiply lb. by price and divide by 2240.

————

Work Priced Per Hundred and Thousand

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

(M or $\%_{o}$ or mille) is an abbreviation for price per thousand.

————

Mentally divide quantity by 100 or 1,000 before commencing the calculation.

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 ₵ meaning price per cwt.

**Metric Conversions**

e.g.   Kilos @ price per lb.
       Metres @ price per yard, etc.

Multiply weight or measure by price; multiply by appropriate decimal from Metric Conversion Table.

## WAGES

### Hours and minutes @ rate per hour

Add hours into Register, multiply minutes by .016 (or use decimal chart).

Multiply by price

If minutes are taken to the nearest five minutes, mentally divide them by 5 and treat as 12ths.

e.g. 7 hrs.40 mins. = $7\frac{8}{12}$  = 7.$\dot{6}$

Multiply by price

### Hours at Rate per Hour plus Overtime

Calculate the number of hours by adding the flat number of hours into the machine and accumulate the overtime by multiplying the hours at time and a quarter by 1.25; the hours at time and a half by 1.5; the hours at double time by 2.

Multiply by rate per hour

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

### Payroll

This could involve any or all of the following:

1) Add daily hours for each employee to give total hours.
2) Extend hours by rate to give gross wage.
3) Cross cost deductions column to give a total deductions figure.
4) Subtract total deductions from Gross wage to give Net wage.
5) Add Gross wage, Total Deductions and Net wage to balance.
6) Coin denomination.

### Coin Denominating

| Example | Result |
|---|---|
| £  s. d. | Amounts under the various denominations:— |

| £  s.  d. | | £  s.  d. |
|---|---|---|
| 12.18.  3 | | |
| 13.14.10 | £1 notes | 109.  0.  0 |
| 18.  1.  5 | 10/- notes | 1.10.  0 |
| 16.  0.  9 | Silver | 1.18.  0 |
| 15.19.  1 | Threepenny bits | 1.  6 |
| 18.  2.  9 | Coppers | 7 |
| 8.  7.  4 | | £112.10.  1d. |
| 9.  5.  8 | | |
| £112.10.  1d | | |

Each item in the above column is the wage to be paid to a certain worker. The cashier must therefore draw from the Bank enough £1 notes, enough 10s. notes and as much silver and copper as will enable him to give each worker the exact money. To find the necessary amounts under each denomination, work as follows:—

1. Add the £'s only and note answer.
2. Add the 10/-'s and note answer.
3. Add the silver (shillings and sixpences) on the shillings and pence keys and note answer.
4. From the pence column, add into machine all whole 3d.'s (remembering that the 6d.'s have already been deducted) and note answer.
5. Add pence on pence keys and note answer.

The total of the various amounts must agree with the total of the Wages column.

**NOTE:** You may be required to list £5 notes and £10 notes; also to reduce silver into terms of large (2/- pieces and 2/6d.pieces) and small (6d.pieces).

## THE 993/S — STORAGE REGISTER

## INTRODUCTION

The foregoing Notes apply to all models of Comptometer. They can be used equally well with Storage Register equipment, often with greater efficiency, accuracy and speed.

The following Notes will explain some of the more obvious advantages you will gain from using a machine with a Storage Register.

## The 993/S

**Addition** — Columnar

Add the column of figures from top to bottom and transfer ⊞ to the Storage Register.

Re-add the column of figures this time from bottom to top. Visually check that answers in both Registers are the same. Write down the answer from the Working Register — compare written answer with that in the Storage Register. Operate the Storage Transfer Control towards ⊟ ; this will achieve two things,

    1. will give a **ZERO PROOF** and
    2. clear the machine ready for the next addition, calculation, etc.

**Addition** — Analysis or Cross Casting

**Example**

|  | A | B | C | D | Total |
|---|---|---|---|---|---|
| 1. | 236 | 95 | 312 | 43 | 686 |
| 2. | 29 | 73 | 250 | 746 | 1098 |
| 3. | 423 | 428 | 65 | 92 | 1008 |
| 4. | 776 | 33 | 231 | 517 | 1557 |
|  | 1464 | 629 | 858 | 1398 | 4349 |

Add column A, record answer, transfer ⊞ to Storage Register.
Repeat for columns B, C and D.

Record grand total now appearing in Storage Register (4349)
Add line 1, record answer, transfer ⊟ from Storage Register
Repeat for lines 2, 3 and 4

BOTH REGISTERS SHOULD NOW READ ZERO.

## The 993/S—Continued

### Subtraction

When two Registers are available subtraction is simplicity itself; no reference whatsoever is made to the small figures on the keytops.

**Example**    200351 − 10970

Add 200351 into the machine at the right hand side of the keyboard; transfer ⊞ to Storage Register.

Add 10970 into the machine at the right hand side of the keyboard; transfer ⊟ to Storage Register.

Answer 189381, appears in Storage Register.

### DEBITS AND CREDITS

**Example 1**        £  s.  d.
                     16.  3.  9
                     13.  1.  8  Cr.
                    145.19.  6
                     27.  3.11
                    108.10.  9  Cr.

Add Debit items; transfer ⊞ to Storage Register

Add Credit items; transfer ⊟ to Storage Register = £67.14.9 — Debit balance.

**Example 2**        £  s.  d.
                     31.17.  6
                      5.18.10  Cr.
                     22.  9.  8
                     43.15.  7  Cr.
                      6.11.  3
                     18.  1.  5  Cr.

Add Debit items; transfer ⊞ to Storage Register

Add Credit items; transfer ⊟ to Storage Register

Register reads 9 999 999 993.2.7 indicating a Credit balance.

In order to find the true Credit balance, ignore the 9's and copy 3.2.7 to the keyboard in **small** figures (small 3.02.6) = £6.17.5.

Check the copy back by operating the Storage Transfer Control to  ⊞ , obtaining zero's in both Registers.

**Multiplication**                                    **Accumulation of Products**

**Example**      3  lb. 6 oz. @ 18/9d.per lb.            3.  3.  3
                 5  lb. 1 oz. @  7/8d.per lb.            1.18.10
                 7¼lb.        @ 11/3d.per lb.            4.  1.  7
                                                        9.  3.  8

## PLACE A DECIMAL POINT IN BOTH WORKING AND STORAGE REGISTERS IN IDENTICAL POSITIONS.

Multiply 3.375 by .9375 (3.16406..) write down the answer — £3.3.3d.— and from the **written** answer enter the pence in the pence column before operating the Storage Transfer Control.

Repeat for the second and third items;
The total now appears in the Storage Register.
Write down the £'s and shillings from the **decimal** total (9.1828.. = £9.3s) and the pence from those appearing in the pence column — 8d.
Answer = £9.3.8d.

**Multiplication**

**Simple Extensions With Discounts And Increments**

**Example**       645      @ £7.10.0d.per 1000              4.16.  9
                 2187      @ £1.12.6d.per C               35.10.  9
                  38½ doz. @ £2.14.6d.per doz.           104.18.  3
                                                         145.  5.  9
                          Less 7½%                        10.17.11
                                                       £ 134.  7.10

Extend each line and transfer ⊞ to the Storage Register.
Hold the figures appearing in the Storage Register (145.28875) and multiply by .075 = 10.8966 ...

You can now record the gross total from the Storage Register (£145.5.9) and the discount from the working Register (£10.17.11d). Transfer ⊟ from Storage Register = £134.7.10d.

**Note 1**    If the percentage figure is one of increase transfer ⊞ would of course, replace transfer ⊟ .

**Note 2**    You may find that the figures which form the gross total, i.e. before discount or increment is applied are too awkward to hold. In this event hold the percentage amount, as a decimal and correctly in relation to the decimal point in the Working Register, and multiply by the contents of the Storage Register.

**Multiplication**

**Using the Storage Register as a Memory**

**Example**       3 Ton 9 cwt. 1 qr. 23 lb. @ £68.12.6d.per ton = £238.6.4.
Add 3.45 into Register starting at extreme left hand side of keyboard.

Add .0125 (1 qr.)
Hold .000446428 and multiply by 23 = 3.47276782

As this is an awkward combination of figures to hold transfer ⊞ to Storage Register. Hold the price and carry out a normal two factor multiplication with the figures 'memorised' by the Storage Register.

You will find many uses for the Storage Register to act as a Memory.

**Pro-Rating and Proportioning Percentages**

There are two ways of utilising the Storage Register when solving these particular problems.

One way uses the Storage Register to memorise the constant.

**Example**      Pro-rate £150 over the following:

```
    37.10. 0
   181. 7. 6
    82.10. 9
    43. 9. 3
  £344.17. 6
```

Find the constant (.434940163) and transfer to the Storage Register.

Calculate each line using the constant 'noted' therein.

Add each calculated amount to check to the figure of pro-ration.

The alternative method involves writing down the constant and accumulating each calculated amount in the Storage Register.

Each method has its advantages and the one you choose will depend upon the work involved.

**Percentage of Decrease**

Divide the later dated amount by the earlier dated amount in the usual way.

Transfer  ⊟  to the Storage Register, this automatically gives you the percentage of decrease

**Example**

Find the percentage of decrease:      1968      £19573
                                       1967      £22135

19573 x 100 ÷ 22135 = 88.4255..

Operate the Storage Transfer Control towards  ⊟  = 911.5745
Ignore the 9 and read the answer as 11.57% Decrease

**NOTE:** This method can be used equally well when calculating percentage of Profit.

## DECIMAL CURRENCY ROUND-OFF INSTRUCTIONS

The new Storage Register Decimal/Sterling Comptometer is fitted with a Rounding Feature for use when Decimal Currency is introduced in 1971.

The Rounding Feature will enable you to round off new Decimal Currency amounts to either the nearest new penny or the nearest new halfpenny and will ensure that the storage register shows the exact total of the rounded-off amounts which you have written down.

The feature consists of two red controls and a contrasting No. 5 key in the existing Sterling £100 column (see separate note for Decimal model).

When using the Rounding Feature **ALWAYS** work round a fixed decimal point between the existing Sterling £10,000 and £100,000 columns (see separate note for Decimal model).

### NEW PENNY CALCULATIONS

When you want to calculate to the nearest new penny:-

1.    Latch the red Penny Rounding Control (the red control to the right of the 1d. and 2d. keys).

2.    Carry out the calculation in the normal way (round the fixed decimal point described above) and then depress the No. 5 Rounding Key (the light coloured key in the existing Sterling £100 column).

3.    Note the answer, reading the first two decimal places (new pennies) *as shown* ignoring all figures to the right of them.

4.    Transfer to store.

       (You will notice that the figures in the 3rd, 4th and 5th decimal positions do not transfer to store).

When you have finished the series of calculations, unlatch the Penny Rounding Control.

A simple example will make the procedure clear (the shillings and pence columns are not shown):-

<p style="text-align:center">1.2 @ £1.22</p>

\*    Latch the red Penny Rounding Control.

\*    Multiply 1.2 x 1.22 and depress the No. 5 Rounding Key:-                                                          1.46900

\*    Note the answer:-                                                                                                                        £1.46

       (£1.46 is right, not £1.47. Remember, read the first two decimal places *as shown* in the register; the machine has already carried out any rounding-off that is necessary).

\*    Transfer to store. The storage register shows:-                                                                           1.46000

## DECIMAL CURRENCY ROUND-OFF INSTRUCTIONS—Continued

### NEW HALFPENNY CALCULATIONS

When calculating to the nearest new halfpenny:-

1. Make sure the Penny Rounding Control is unlatched.

2. Carry out the calculation in the normal way (round the fixed decimal position as before).

3. Look at the result and carry out one of the following operations:-

   a. If the 3rd, 4th and 5th decimal figures lie between 250 and 749, operate the red Halfpenny Rounding Control (which you will find next to the subtraction selectors).

   b. If the 3rd, 4th and 5th decimal figures lie between 250 and 749, operate the red Halfpenny Rounding Control and depress the No. 5 Rounding Key **ONCE**.

      (The red Halfpenny Rounding Control clears the 3rd, 4th and 5th decimal figures from the register, allowing you to adjust the answer if necessary by means of the No. 5 Rounding Key).

   c. If the 3rd, 4th and 5th decimal figures lie between 750 and 999, operate the red Halfpenny Rounding Control and depress the No. 5 Rounding Key **TWICE**.

4. **Note the answer and transfer to store.**

An example will help you to understand the procedure (again, the shillings and pence columns are not shown).

2.25 @ £2.25½

* Make sure the Penny Rounding Control is unlatched

* Multiply 2.25 x 2.255:-      5.07375

   (The 3rd, 4th and 5th decimal figures — "375" — lie between 250 and 749).

* Operate the red Halfpenny Rounding Control:-      5.07000

* Depress the No. 5 Rounding Key **ONCE**:-      5.07500

* Write down the answer:-      £5.07½

* Transfer to store. The storage register shows:-      5.07500

Remember that the Penny Rounding Control must **ALWAYS** be **UNLATCHED** except when rounding to the nearest new penny.

---

One final point. When adding or subtracting in the new Decimal Currency you may find it convenient to use the existing 10/- Key to present the new halfpenny.

### DECIMAL MODEL

The operation of the Rounding Feature in this model is as already described.

The No. 5 Rounding Key, however, is located in the third column of keys from the right and the fixed decimal position

**Note No. 15**

**DECIMALISATION**

Percentage Calculations

is in M/C ÷ of as a %.

ANS. = % (AS % MEANS PER 100.)


Ex. What % is 254 of 397.

254 ~~× 100~~ ÷ 397 = 63.98 = 63.98%.

254 ÷ 3.97

NOTE    The IS and OF amounts must be of
the same denomination.

$$
\begin{array}{r}
£ \\
368 \\
2865 \\
435 \\
210 \\
582 \\
\hline
\end{array}
$$

Find what percentage each item is to the total;
show each percentage correct to two
dec. places.

Total the amounts and check the addition = £4460.
Each item has now to be multiplied by 100 & ÷ by 4460.
You can, however, short cut this process by finding a 'constant'
The constant is found by dividing the total into 100;
check it by multiplying back. Multiply each item
by the constant & read the answers correct to
two dec places. The total of these answers must
equal 100%.

$$100 \div 4460 = \cdot 022421524$$
$$( \cdot 022421524 \times 4460 = 99.999 \ldots )$$

$$
\begin{array}{lll}
& & \% \\
368. \times \cdot 022421524 & = & 8.25 \\
2865 \times \quad '' & = & 64.24 \\
435 \times \quad '' & = & 9.75 \\
210 \times \quad '' & = & 4.71 \\
582 \times \quad '' & = & \underline{13.05} \\
& & \overline{100 \%}
\end{array}
$$

| 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|---|---|---|---|---|---|---|---|---|---|
| | .004166 | | | .0166 | | | | .033 | .0375 |

10            11
98/66       104583

104875    10679/66