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Business Arithmetic for Co-operatives and Other
Small Businesses

by: Trevor Bottomley

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**BUSINESS
ARITHMETIC FOR
CO-OPERATIVES
and Other Small Businesses**

by Trevor Bottomley
Co-operatives Panel
Intermediate Technology
Development Group

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Business Arithmetic for Co-operatives and Other Small Businesses

This manual is designed to enable co-operative society managers and staff, as well as officers in co-operative departments, to train themselves to do the calculations necessary for the running of a co-operative business. Though written for co-operatives, it could well be applicable to any small business.

The use of arithmetic is required in almost every aspect of business organisation – to calculate the costs of production and distribution, trade discounts, cash discounts, gross and net profit. In fact, the financial health of business as a whole depends on it.

The booklet sets out to do three things. In Part I, to provide a revision of the basic rules of arithmetic, so that the user can revise his knowledge and skill before going on to the more advanced calculations (some people will find this elementary and will feel confident enough to go straight on to the later stages of the manual). In Part II, to describe and explain the main calculations used in business organisation. The appendix provides practical exercises, so that the user can improve his skill in the use of figures and acquire confidence in his ability to work out all the calculations normally called for in a business.

The author is secretary for education at the International Co-operative Alliance, and a member of the Intermediate Technology Development Group's Co-operatives Panel. His previous appointments include Registrar of Co-operatives in Botswana; lecturer in business studies in Britain and Adviser on Co-operatives in Lagos.

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**BUSINESS
ARITHMETIC FOR
CO-OPERATIVES
and Other Small Businesses**

**A basic manual
for the employees of primary
co-operative societies**

**by Trevor Bottomley
Co-operatives Panel
Intermediate Technology
Development Group**

Intermediate Technology Publications

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Previous versions of this text have been studied and criticised by British people with much relevant experience and by co-operative workers from Sri Lanka, Nigeria and Cyprus. The Co-operatives Panel would like to express its grateful thanks for their collaboration.

Preface

This manual will, I believe, meet a much felt need. It is designed to enable co-operative society managers and staff, as well as officers in co-operative departments, to train themselves to do the calculations necessary for the running of a co-operative business. Though written for co-operatives, it could well be applicable to any small business.

It is widely known that co-operatives can succeed or fail according to the quality of their book-keeping and accounts. Book-keeping is dealt with in a separate series of manuals published by the International Co-operative Alliance. This manual deals with the closely related subject of business calculations. A good book-keeping system is no good unless the calculations on which it is based are accurate, and it is hoped that this manual will help those many of us whose arithmetic was not very advanced or has gone rusty.

Part I of the manual is very elementary and intended only for those who feel they need to go back to the beginning. Part II covers all the calculations normally called for in a co-operative society's business. The examples are mainly based on a consumer's co-operative society but will still be useful for those working other types of co-operative or small business.

I very strongly commend this manual to students and teachers alike.

B. A. Youngjohns
Co-operatives Adviser

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Introduction

Arithmetic is a basic tool of business. Its use is required in almost every aspect of business organisation. For example, in the process of making or distributing goods, we have to be able to calculate the costs of production or the costs of distribution, and from them the selling prices of the commodities concerned. We have to be able to forecast what profits we can expect to make and to find out how much we have *actually* made.

It is, therefore, important that cooperative managers and secretaries are skilled in the use of figures and in particular types of calculations which are useful in business organisation. In this connection it is as well to remember that cooperatives are business organisations; like any other type of business, they have to be run in an efficient, business-like way. This means, for example, that a business, like a family, can, in the long run, only spend what it earns. It has to make profits to pay wages, buy equipment, or spend money on other things for running the business otherwise it loses money, and will be unable to continue in business.

That is why arithmetic is a tool of business. It enables us to make the necessary calculations so that we can charge the right prices, know how much we are spending, and can afford to spend, and how much profit or loss we have made.

This manual sets out to do three things. First, in Part I, to provide a revision of the basic rules of arithmetic, so that the user has an opportunity to revise his knowledge and skill before proceeding to the more advanced calculations. *Some people will find this very elementary and will feel confident enough to go straight to the later stages of the manual.* Second, in Part II, to describe and explain the main calculations used in business organisation. Third, to provide practical exercises, so that the user can improve his skill in the use of figures and acquire confidence in his ability to calculate.

Throughout the manual, the arithmetic used is based on the decimal system. So far as money calculations are concerned, examples and exercises are given in the British system of currency, which is the £ sterling divided into 100 pence (100p).

It is also necessary to mention one or two things closely concerned with calculations that the manual does not do. It does not describe any book-keeping or cash control system, or stock control procedures. These are described and discussed in other manuals in this series. This manual is concerned only with the arithmetic necessary for using such procedures efficiently and intelligently.

The manual is written as a self teaching programme. This means that the user should be able to satisfy himself that he fully understands each stage, without further help, before he proceeds to the next. This is important. Arithmetic is a skill based on a few basic rules of calculation which are then developed and applied in a logical and progressive way. Each stage must be fully understood before you proceed to the next. After each lesson, a short exercise is set to test the user on his understanding of the work in that particular lesson. For those people who fail this test at the first attempt, additional exercises for each lesson are given at the end of the manual.

In the first nine lessons we shall begin with *Check Exercises*. This is to find out whether or not it is necessary for the user to study that particular lesson. If all your answers to a Check Exercise are correct, *you proceed direct to the next Check Exercise*. If only one of your answers to a Check Exercise is wrong, repeat the calculation, find your error, then proceed direct to the next Check Exercise. If more than one answer is wrong, study the lesson concerned and complete the exercise before proceeding to the next lesson.

Answers to exercises set are given on the page following each exercise. Do not turn the page until you have completed and checked your work.

The appendix contains the Additional Exercises.

In order to make the working of a sum easier to follow, bold type has been used to indicate which figures are being worked at each stage of a sum. The figures in small type are those being carried over and not part of the main calculation.

Part I: Basic Calculations

Revision of Basic Rules

While most people will have continued to develop their skill in the basic rules since leaving school, it is necessary to begin with a revision of these to make our course complete. While doing so, it may be useful to include a few hints on how to calculate quickly and accurately.

Remember that to be of any use at all, calculations *must be correct*. Errors made in simple adding or subtraction, for example, will make any subsequent work wrong and, therefore, useless and misleading. In business calculations we must develop both accuracy and speed — *but accuracy first*.

Now note a general rule to follow throughout the manual. If any particular method you know and use is different from the methods we use here, do not try to change; use your own method if you feel confident with it and it produces correct answers.

The important thing is to get the calculation right and to have confidence in your ability to calculate quickly and accurately.

Check Exercise 1: Do the following calculations:

1. Add	468.23	2. Add	9.59	3. Add	74.72
	1021.96		16.34		81.16
	480.28		74.26		29.75
	279.12		138.84		65.42
	42.16		426.25		19.19
	5450.77		330.04		28.38
	_____		_____		_____
	_____		_____		_____

Turn over and check your answers.

Answers: Lesson 1

Check Exercise 1:

1. 7742.52
2. 995.32
3. 298.62

If all three answers are correct, proceed to Check Exercise 2 (page 13).
If two of your answers are correct, repeat the one which is wrong, find your error, and proceed to Check Exercise 2.

If less than two of your answers are correct, study Lesson One and complete the exercise set.

Lesson One: Addition

The sign for addition is +

Let us study this simple exercise in addition. First note, and this is **very important**, that all figures in each column, and the decimal points, are neatly in line. (As shown in the example on the right.) When writing figures by hand, make sure your figures are written neatly in columns. Otherwise mistakes easily occur.

Example

$$\begin{array}{r} 18.20 \\ 21.54 \\ + 9.27 \\ \hline 160.83 \\ 42.99 \\ \hline 252.83 \end{array}$$

Now look at the calculation again. Take a pencil and check its accuracy in this way:

Start at the top of the right hand column and add *downwards*. We find that the total is 23. Write the 3 below the 9 and carry the 2 to the top of the next column.

$$\begin{array}{r} \\ 18.20 \\ 21.54 \\ + 9.27 \\ \hline 160.83 \\ 42.99 \\ \hline 3 \end{array}$$

Second column: starting at the top again and with the 2 carried forward, add downwards. The total for the second column is 28. Write down the 8 below the 9 in the second column and carry the 2 over to the next column. Before adding the next column, however, note that we have come to the decimal point. *The simple rule is: put down the decimal point when you come to it.*

$$\begin{array}{r} \\ 18.20 \\ 21.54 \\ + 9.27 \\ \hline 160.83 \\ 42.99 \\ \hline .83 \end{array}$$

Then proceed as before, adding each column in turn until all the columns have been added:

^{2 2} 18.20 21.54 + 9.27 160.83 42.99 <hr style="border: 0.5px solid black;"/> 2.83 <hr style="border: 0.5px solid black;"/>	^{1 2} 18.20 21.54 + 9.27 160.83 42.99 <hr style="border: 0.5px solid black;"/> 52.83 <hr style="border: 0.5px solid black;"/>	¹ 18.20 21.54 + 9.27 160.83 42.99 <hr style="border: 0.5px solid black;"/> 252.83 <hr style="border: 0.5px solid black;"/>
--	---	--

When a sum has been completed, check your answer by adding upwards, starting again, of course, with the right hand column: $9+3+7+4+0=23$ and so on.

Some hints:

Look out for pairs of numbers that make 10 (for example 8 and 2) and get into the habit of 'seeing' the pair as 10 rather than as two separate figures to be added. This will speed up your work. Look at our example again. In the right hand column we could say $4 + 10$ (7 and 3) + 9 = 23.

Practice adding figures in columns. You will soon develop a skill for adding quickly and accurately. Always check your work. Write clear figures and keep them in neat columns. Avoid the bad habit of scribbling untidy figures on odd bits of paper when doing a calculation. Always work neatly — make it a habit. Also remember that, in business calculations, figures should never be altered by writing over them. If you write a wrong figure, cross it through like this, ~~6~~, and write the correct figure just above it.

Exercise: Do the following calculations:

1. Add	16.89	2. Add	1648.06
	94.33		794.63
	101.74		325.27
	59.62		3280.55
	748.57		399.05
	38.53		821.69
	71.22		665.84
	_____		_____
	_____		_____

Do not forget to check your answers — add down and then up.
Turn the page and see if your answers are correct.

If both your answers are correct, proceed to Check Exercise 2.
If one of your answers is wrong, repeat the calculation, find your error, then turn to Additional Exercise A at the end of the book and do the exercise set before proceeding to Check Exercise 2.

Do not proceed until you can add at least four sets of figures similar to those in the exercise and get them right the first time.

If necessary make up your own sets of figures for additional practice

Check Exercise 2: Do the following calculations:

1. Take 1,623 from 3,002.96
2. Take 168.18 from 2,649.67
3. Take 8,602.77 from 10,000

Turn over and check your answers.

If all three answers are correct, proceed to Check Exercise 3 (page 17).
If two of your answers are correct, repeat the one which is wrong, find your error, and then proceed to Check Exercise 3.

If less than two of your answers are correct, study Lesson Two and complete the exercise set.

Answers: Lesson 1

Exercise:

1. 1130.90 2. 7935.09

Check Exercise 2:

1. 1,379.96 2. 2,481.49 3. 1,397.23

Lesson Two: Subtraction

The sign for subtraction is $-$. This is also known as a *minus* sign.

Example: $7960.75 - 1642.03$

Put the figures down like this:

$$\begin{array}{r}
 7960.75 \quad (\text{the starting figure}) \\
 1642.03 \quad (\text{the figure being taken away}) \\
 \hline
 \\
 \hline
 \quad (\text{the remainder})
 \end{array}$$

Set out the figures as shown in the example on the right. The number we wish to subtract is always written underneath the number we are subtracting from.

$$\begin{array}{r}
 7960.75 \quad _ \\
 1642.03 \quad _ \\
 \hline
 \\
 \hline

 \end{array}$$

Start with the right hand column, and subtract 3 from 5. The answer is 2, so write 2 in the correct column, below the 3.

$$\begin{array}{r}
 7960.75 \quad _ \\
 1642.03 \quad _ \\
 \hline
 2 \\
 \hline

 \end{array}$$

Move to the next column and subtract 0 from 7. The answer is 7. Write in 7 in the correct column, below the 0. Now we have come to the decimal point. The rule is the same as before: write it in when you come to it, so put in the decimal point below the others.

$$\begin{array}{r}
 7960.75 \quad _ \\
 1642.03 \quad _ \\
 \hline
 72 \\
 \hline

 \end{array}$$

Now move to the next column. Because we cannot take 2 from 0, we 'borrow' from the next column. So neatly cross out the six in the tens column and write in 5, so that you remember when you come to that part of the subtraction. Write in a small 1 by the side of the 0. We now have 10 in the units column. $10 - 2$ equals 8 so write in the 8 in the correct column, below the 2.

$$\begin{array}{r}
 51 \\
 79\cancel{6}0.75 \quad _ \\
 1642.03 \quad _ \\
 \hline
 8.72 \\
 \hline

 \end{array}$$

Always write in the working of a calculation, so that if a mistake occurs, you can check exactly what you did in each stage, easily find out where the error was and correct it.

In the next column, we now have to subtract 4 from 5. The answer is 1, which you write in the correct column below the 4.

$$\begin{array}{r} ^5 ^1 \\ 79\cancel{6}0.75 \\ - 1642.03 \\ \hline 18.72 \end{array}$$

Move to the next column. Subtract 6 from 9. The answer is 3, which you write in the correct column, below the 6.

$$\begin{array}{r} ^5 ^1 \\ 79\cancel{6}0.75 \\ - 1642.03 \\ \hline 318.72 \end{array}$$

The final part of this subtraction is to subtract 1 from 7, which equals 6. Write in the 6 underneath the 1. The answer to the whole calculation, according to our working is 6318.72.

$$\begin{array}{r} ^5 ^1 \\ 79\cancel{6}0.75 \\ - 1642.03 \\ \hline 6318.72 \end{array}$$

Next we check that our calculation is correct by adding together the two lower numbers, following the rules for addition, and the answer should be the top number. *Remember: always check your work.*

$$\begin{array}{r} 1642.03 \\ + 6318.72 \\ \hline 7960.75 \end{array}$$

Now try another example:

$$\begin{array}{r} 457.63 \\ - 363.54 \\ \hline \\ \hline \end{array}$$

4 from 3 is not possible so make the 3 into 13 and 4 from 13 is 9. Write in the 9.

Because we used 1 from the next column, the 6 now becomes 5 and 5 from 5 leaves 0. Put it down.

Continue with the calculation and when completed, check your answer by adding the two lower numbers together. The correct answer is 94.09.

Exercise: Complete the following:

$$\begin{array}{r} 1. \quad 792.68 \\ - \quad 87.19 \\ \hline \\ \hline \end{array}$$

$$\begin{array}{r} 2. \quad 403.07 \\ - \quad 178.42 \\ \hline \\ \hline \end{array}$$

$$\begin{array}{r} 3. \quad 86.43 \\ - \quad 69.21 \\ \hline \\ \hline \end{array}$$

$$\begin{array}{r} 4. \quad 6038 \\ - \quad 4210 \\ \hline \\ \hline \end{array}$$

Do not forget to check your answers.
Turn the page and see if your answers are correct.

You will have noticed that in calculating No. 4 there was no decimal point. We simply had to subtract one whole number from another. When dealing with whole numbers, follow the same rules as before without using a decimal point because it is not needed.

If all your answers are correct, proceed to Check Exercise 3.
If one of your answers is wrong, repeat the calculation, find your error, then proceed to Check Exercise 3.
If more than one answer is wrong, study the whole lesson again, repeat the exercise and then turn to Additional Exercise B and do the exercise set.
Do not proceed until you can do at least four calculations similar to the exercises set and get them all right the first time. If necessary make up your own sets of figures for additional practice.

Check Exercise 3: Do the following calculations:

- | | | |
|--------------------|----------------------|--------------------|
| 1. 874×8 | 2. $1,025 \times 3$ | 3. 709×10 |
| 4. 496×27 | 5. $5,799 \times 39$ | |

Turn over and check your answers.

Answers: Lesson 3

Example:

- | | | | |
|----|--------|----|--------|
| 1. | 705.49 | 2. | 224.65 |
| 3. | 17.22 | 4. | 1828 |

Check Exercise 3:

- | | | | | | |
|----|--------|----|---------|----|-------|
| 1. | 6,992 | 2. | 3,075 | 3. | 7,090 |
| 4. | 13,392 | 5. | 226,161 | | |

If all your answers are correct, proceed to Check Exercise 4 (page 25).
If only one of your answers is wrong, repeat the calculation, find your error and then proceed to Check Exercise 4.
If more than one of your answers are wrong, study Lesson Three and do the exercise set.

Lesson Three: Multiplication

The sign for multiplication is x.

First we take a simple example of multiplying one figure by another which is less than 10. Most people will find this easy and be able to work out the answer without having to write the calculation down, but to revise the method used, it goes like this:

Example: 438×6

Put the figures down like this:

$$\begin{array}{r} 438 \\ \times \quad 6 \\ \hline \end{array}$$

We need to multiply each number in the top line in turn by 6. Starting with the right hand figure of the top number we say $6 \times 8 = 48$. Write 8 in the line under the 6 and carry the 4 forward to be added into the next column.

$$\begin{array}{r} 438 \\ \times \quad 6 \\ \hline 8 \\ 4 \\ \hline \end{array}$$

Move to the next number. 6×3 is 18, plus the 4 we carried forward, equals 22. Write down the 2 next to the 8 and carry 2.

$$\begin{array}{r} 438 \\ \times \quad 6 \\ \hline 8 \\ 4 \\ 28 \\ \hline \end{array}$$

Next, take the 4 in the last column and multiply by 6, which is 24. Add the 2 carried forward, making 26, which should be written down in front of the 2 to complete the answer.

$$\begin{array}{r} 438 \\ \times \quad 6 \\ \hline 8 \\ 4 \\ 28 \\ 2628 \\ \hline \end{array}$$

Of course to do even simple calculations like this quickly and accurately, you will need to know the multiplication tables up to 9. If you have forgotten a table, or get confused over certain numbers, don't bother to try to memorise them. Write them out on the inside back cover of this book and turn to them whenever you are in doubt. You will soon find yourself remembering them after you have used them several times.

A multiplication table can be constructed using the addition method. For example, $8 \times 2 = 8 + 8 = 16$ and 8×3 is $16 + 8 = 24$ and 8×4 is $24 + 8 = 32$ and so on up to $8 \times 10 = 80$.

Exercise 1: Do the following calculations:

1. $6,347 \times 9$

2. 488×4

3. $29,039 \times 7$

Turn to page 22 and check your answers.

If your answers are correct, proceed to Lesson Four. If any of your answers are wrong, study this lesson again, repeat the exercise and then turn to Additional Exercise C and do the exercise set there before proceeding. If any of your answers to the Additional Exercise are wrong, find out where your mistakes are by checking against written multiplication tables. Remember that it is often mistakes made in the simple parts of arithmetic that lead to incorrect answers to more complicated problems, so make sure you can multiply accurately by single numbers before you proceed.

Multiplying by 10

To multiply a figure by 10 we proceed as follows:

If the number being multiplied is a whole number (no decimal point in it), we simply add a 0 to the end of the number like this:

Example: $23 \times 10 = 230$

$$609 \times 10 = 6090$$

If the number being multiplied includes a decimal point, we simply move the decimal point one place to the right like this:

Example: $43.69 \times 10 = 436.9$

$$102.05 \times 10 = 1020.5$$

$$27.7 \times 10 = 277$$

Exercise 2: Multiply the following by 10:

1. 640

2. 2.6

3. 59.07

4. 239.1

Turn the page and check your answers.

Answers: Lesson 3

Exercise 1:

1. 57,123 2. 1,952 3. 203,273

Exercise 2:

1. 6400 2. 26
3. 590.7 4. 2391

Lesson Four: Multiplying by a Number Larger than 10

Let us work an example:

$$968 \times 138$$

Put the numbers down like this:

$$\begin{array}{r} 968 \\ \times 183 \\ \hline \\ \hline \end{array}$$

Starting with the right hand figure of the number we are multiplying by, multiply the whole of the top number by that figure.

$$\begin{array}{r} 968 \\ \times 183 \\ \hline \end{array}$$

So $8 \times 3 = 24$. Write in the 4 directly under the 3 and carry the 2 to be added into the next column.

$$\begin{array}{r} 968 \\ \times 183 \\ \hline 4 \\ ^2 \end{array}$$

$6 \times 3 = 18$, plus the 2 we carried forward = 20. Write down the 0 next to the 4 and carry the 2 forward.

$$\begin{array}{r} 968 \\ \times 183 \\ \hline 4 \\ ^2 0 \end{array}$$

$9 \times 3 = 27 + 2 = 29$. There are no more figures to be multiplied by 3, so put down the 29 and the calculation now looks like this:

$$\begin{array}{r} 968 \\ \times 183 \\ \hline 2904 \end{array}$$

We now proceed to multiply by the next figure, which is 8. $8 \times 8 = 64$. Write down the 4 *under the 8 we are multiplying by* and carry the 6 forward.

$$\begin{array}{r} 968 \\ \times 183 \\ \hline 2904 \\ 4 \\ ^6 \end{array}$$

$6 \times 8 = 48 + 6 = 54$. Write down the 4 in front of the other 4 and carry the 5.

$$\begin{array}{r} 968 \\ \times 183 \\ \hline 2904 \\ 544 \\ ^5 \end{array}$$

$9 \times 8 = 72 + 5 = 77$. There are no more figures to be multiplied by 8 so write down the 77 in front of the 4 and the calculation should now look like this:

$$\begin{array}{r} 968 \\ \times 183 \\ \hline 2904 \\ 7744 \end{array}$$

Continue by multiplying by the next figure (which is 1) by following the same procedure — putting the first figure multiplied by the 1 (the 8) down in line with 1 and then the others in the next columns as necessary.

$$\begin{array}{r} 968 \\ \times 183 \\ \hline 2904 \\ 7744 \\ 8 \end{array}$$

$6 \times 1 = 6$.

$$\begin{array}{r} 968 \\ \times 183 \\ \hline 2904 \\ 7744 \\ 68 \end{array}$$

$9 \times 1 = 9$.

$$\begin{array}{r} 968 \\ \times 183 \\ \hline 2904 \\ 7744 \\ 968 \end{array}$$

To complete the calculation we then add all three numbers together and our completed calculation will now look like this:

$$\begin{array}{r} 968 \\ 183 \\ \hline 2904 \\ 7744 \\ 968 \\ \hline 177144 \end{array}$$

Study this calculation again working the figures through in your mind and checking its accuracy.

Exercise: Do the following calculations:

1. 68×32
2. 491×71
3. 4892×2345

Turn the page and check your answers.

If all your answers are correct, proceed to Check Exercise 4.

If any of your answers are wrong, study the whole of this part again, repeat the exercise, finding your error, and then turn to Additional Exercise D and do the exercise set.

Do not proceed until you can do at least three calculations similar to the exercises set and get them all right the first time.

If necessary make up your own sets of figures and get someone else to check them.

Check Exercise 4: Do the following calculations:

- | | |
|------------------------|------------------------|
| 1. 14.5×6.3 | 2. 707.94×16 |
| 3. 62.38×8.79 | 4. 22.45×7.38 |

Turn over and check your answers.

If all your answers are correct proceed to Check Exercise 5 (page 29).

If only one of your answers is wrong, repeat the calculation, find your error, and proceed to Check Exercise 5.

If more than one of your answers are wrong, study Lesson Five and do the exercise.

Answers: Lesson 4

Exercise:

1. 2176 2. 34861 3. 11471740

Check Exercise 4:

1. 91.35 2. 11327.04
3. 548.3202 4. 165.6810

Lesson Five: Multiplying Numbers including Decimal points

Frequently, we have to multiply when one or both numbers we are using include a decimal point and it is important to know how this will affect the answer. Let us take an example:

Example: 27.21×4.33

Put the figures down like this:

$$\begin{array}{r} 27.21 \\ \times 4.33 \\ \hline \\ \hline \end{array}$$

Then we proceed in exactly the same way as in the previous lesson until we have multiplied the top number by each of the figures in the bottom number in turn. So we begin with the 3 and say, $1 \times 3 = 3$. Put it down under the 3 and continue, $2 \times 3 = 6$, and so on.

What about the decimal point? The rule is that at this stage we ignore it -- pretend it is not there and carry on as we did in the previous lesson, but remember -- and this is very important -- to keep all your figures neatly in their proper columns, otherwise you will get a wrong answer. When the calculation has been completed, it will look like this:

$$\begin{array}{r} 27.21 \\ \times 4.33 \\ \hline 8163 \\ 8163 \\ 10884 \\ \hline 1178193 \\ \hline \end{array}$$

Now what about the decimal point -- where does that go? Its position is very important indeed because if it is one figure out of place, it will multiply or divide (depending on which way the error is made) the correct answer by 10.

The simple way we decide where it is to go is by counting all the figures after the decimal point in *both* the numbers we have used and then include the same number of decimal places in our answer. For example in 27.21 there are *two* figures after the decimal point – the 2 and the 1, and in 4.33 there are *two* more, making four in all. Starting from the right of our answer, therefore, we count four figures and put in the point after the fourth figure like this:

$$117.8193 = \text{answer.}$$

Remember that in this type of calculation the position of the decimal point is very, very important. If you get a figure out of line or put the point in the wrong place, you make a great error.

Read through the whole of this lesson so far again.

Now, in your mind, work through the following calculation studying and understanding it as you go:

$$\begin{array}{r}
 140.1 \\
 2.36 \\
 \hline
 84\ 06 \\
 420\ 3 \\
 2802 \\
 \hline
 3306\ 36 \\
 \hline
 \end{array}$$

and the answer is: 330.636

Note the number of places after the decimal point.

Try another, using one number which does not include a decimal point:

$$\begin{array}{r}
 46.892 \\
 32 \\
 \hline
 93784 \\
 140676 \\
 \hline
 1500544 \\
 \hline
 \end{array}$$

and the answer is: 1500.544

Exercise: Do the following calculations:

1. 48×1.2
2. 206.34×14
3. 66×27
4. 68.23×6.41
5. 78.22×3.06
6. 397×1.22

If all your answers are correct, proceed to Check Exercise 5.

If only one of your answers is wrong, repeat the calculation, find your error, and then proceed to Check Exercise 5.

If more than one of your answers are wrong, study this part of the lesson again, repeat the exercise and then do Additional Exercise E before proceeding.

Check Exercise 5: Do the following calculations:

1. $7904 \div 8$
2. $477 \div 3$
3. $486.29 \div 9$ (to three decimal places)
4. $6.805 \div 5$

Turn over and check your answers.

If all your answers are correct, proceed to Check Exercise 6 (page 32).

If one of your answers is wrong, repeat the calculation, find your error, and then proceed direct to Check Exercise 6.

If more than one of your answers are wrong, study Lesson Six and do the exercise.

Turn over and check your answers.

Answers: Lesson 5

Exercise:

- | | | | | | |
|----|----------|----|----------|----|--------|
| 1. | 57.6 | 2. | 288.76 | 3. | 1782 |
| 4. | 437.3543 | 5. | 239.3532 | 6. | 484.34 |

Check Exercise 5:

- | | | | | | | | |
|----|-----|----|-----|----|--------|----|-------|
| 1. | 988 | 2. | 159 | 3. | 54.032 | 4. | 1.361 |
|----|-----|----|-----|----|--------|----|-------|

Lesson Six: Division

The sign for division is \div .

For the first working example we shall use whole numbers, that is, numbers with no figures after a decimal point.

Example

8968 divided by 4 would be written as $8968 \div 4$. Put it down like this:

$$4 \overline{) 8968}$$

Then we proceed by dividing 4 into 8968 beginning from the *left*. First divide 8 (the first figure on the left) by 4 and the answer is 2. Put down the 2 above the 8 (above the line).

$$\begin{array}{r} 2 \\ \hline 4 \overline{) 8968} \end{array}$$

Now divide 9 by 4. The answer is 2 and 1 over. Put down the 2 above the 9 and, thinking of the 1 as 10, add it to the 6 making 16.

$$\begin{array}{r} 22 \\ \hline 4 \overline{) 89^1 68} \end{array}$$

By carrying over 1 from the previous column we now have 16 in the next column. Divide 16 by 4 and the answer is 4. Put it down above the 6.

$$\begin{array}{r} 224 \\ \hline 4 \overline{) 89^1 68} \end{array}$$

Then divide 8 (the last figure) by 4 and the answer is 2. This completes the calculation, which now looks like this:

$$\begin{array}{r} 2242 \\ \hline 4 \overline{) 8968} \end{array}$$

To check your sum, multiply your answer by the divisor. The answer should be the number you have just divided.

$$\begin{array}{r} 2242 \\ \times \quad 4 \\ \hline 8968 \\ \hline \end{array}$$

Supposing the figure we were dividing included a decimal point, but the figure we were dividing by was a whole number. In that case, proceed as above but put in the decimal point when you come to it.

Example: $62.809 \div 8$

Set out the figures in the same way as in the first example:

$$8 \overline{) 62.809}$$

6 divided by 8 is not possible as 8 is larger than 6. In that case we deal with the first two figures together. 62 divided by 8 is 7 and 6 over. Put down the 7 above the 2 (the last figure we used) and, thinking of 6 as 60, add it to the 8 making 68.

$$\begin{array}{r} 7 \\ \hline 8 \overline{) 62.6}809 \end{array}$$

Before going on, notice you have come to the decimal point. Put it into your answer next to the 7, in line with the decimal point in the figure below. In this type of calculation the rule is *put in the decimal point when you come to it*.

$$\begin{array}{r} 7. \\ \hline 8 \overline{) 62.6}809 \end{array}$$

By carrying over the 6 from the previous column we now have 68 in the next column. 68 divided by 8 is 8 and 4 over. Put down the 8 above the 8 and, thinking of 4 as 40, add it to the 0 in the next column, making 40.

$$\begin{array}{r} 7.8 \\ \hline 8 \overline{) 62.6}8^{4}09 \end{array}$$

40 divided by 8 is 5. Put down the 5 over the 0, and proceed to the next column.

$$\begin{array}{r} 7.85 \\ \hline 8 \overline{) 62.6}8^{5}09 \end{array}$$

Divide 9 (the last figure) by 8, which is 1 and 1 over. Put down 1 over the 9. You now have an answer to three decimal places and for most business purposes this is accurate enough. The calculation will now look like this:

$$\begin{array}{r} 7.851 \text{ (and 1} \\ \hline 8 \overline{) 62.6}809^{1} \text{ over)} \end{array}$$

If, however, you want to go further, think of the 1 as 10 and divide that by 8. The answer is 1, and 2 over.

$$\begin{array}{r} 7.8511 \text{ (and 2} \\ \hline 8 \overline{) 62.6}809^{1}0 \text{ over)} \end{array}$$

Again thinking of the 2 left over as 20, proceed in the same way to as many decimal places as required or until the answer works out exactly. The further you go, the more accurate the answer is, but for most business purposes, as we have said, once you have gone to three decimal places you can ignore anything left over.

$$\begin{array}{r} 7.85112 \text{ (and} \\ 8 \overline{) 62.8090^2 0} \text{ over} \end{array}$$

Exercise: Do the following calculations:

1. $702 \div 6$
2. $8593 \div 3$ (give the answer as a whole number with so many left over)
3. $5.848 \div 6$ (give the answer to three decimal places, e.g. 4.289)
4. $679.35 \div 9$ (give the answer to three decimal places)
5. $4794 \div 5$

Turn the page and check your answers.

If all your answers are correct, proceed to Check Exercise 6.

If one of your answers is wrong, repeat the calculation, find your error, and proceed to Check Exercise 6.

If more than one of your answers are wrong, study this lesson again, repeat the exercise, and then do Additional Exercise F before proceeding.

Check Exercise 6: Do the following calculations:

1. $804.56 \div 17$ (to three decimal places)
2. $998.74 \div 36$ (to three decimal places)
3. $169.2 \div 18$
4. $7.29 \div 64$ (to three decimal places)

Turn the page and check your answers.

Answers: Lesson 6

Exercise:

1. 117
2. 2864 and 1 left over
3. 0.974
4. 75.483
5. 958.8

Check Exercise 6:

1. 47.327
2. 27.742
3. 9.4
4. 0.114

If all your answers are correct, proceed to Check Exercise 7 (page 37).
If one answer is wrong, repeat the calculation, find your error, and then proceed to Check Exercise 7.
If more than one of your answers are wrong, study Lesson Seven and do the exercise.

Lesson Seven: Division by Large Numbers

So far our examples and exercises have involved dividing by numbers below 10, but we frequently have to divide by large numbers in tens, or hundreds or thousands. The method used to divide by a large number is called "long division".

Because we are working with larger numbers we write all the working figures underneath the calculation. Instead of carrying over remainders to the next column, as in the previous lesson, in long division we bring down the next figure to the line of working. Write all your figures down neatly and in the correct column. Let us study the method by working the following example.

Example: $62.809 \div 28$

Put it down like this:

$$28 \overline{) 62.809}$$

Write down the numbers as you work them out. 6 cannot be divided by 28, so take the first two figures to start with and divide 62 by 28. 28 will go into 62 twice ($28 \times 2 = 56$). Put down the 2 above the 2 in 62 and 56 below the 62. We have reached the decimal point, so put it in the answer next to the 2.

$$\begin{array}{r} 2. \\ 28 \overline{) 62.809} \\ \underline{56} \end{array}$$

Now take 56 from 62. This leaves 6, so write it in below the 6 in 56. Make sure you are keeping the figures neatly in line.

$$\begin{array}{r} 2. \\ 28 \overline{) 62.809} \\ \underline{56} \\ 6 \end{array}$$

From the number we are dividing, bring down the 8 and write it alongside the 6 making 68.

$$\begin{array}{r} 2. \\ 28 \overline{) 62.809} \\ \underline{56} \\ 68 \end{array}$$

Divide 68 by 28 and again the answer is 2. ($28 \times 2 = 56$). Write the 2 above the 8 and the 56 below the 68.

$$\begin{array}{r} 2.2 \\ \hline 28 \overline{) 62.809} \\ \underline{56} \\ 68 \\ \underline{56} \end{array}$$

Take 56 from 68 and the answer is 12. Put it down and bring the 0 from the next column above making the 12 into 120.

$$\begin{array}{r} 2.2 \\ \hline 28 \overline{) 62.809} \\ \underline{56} \\ 68 \\ \underline{56} \\ 120 \end{array}$$

Now divide 120 by 28. The answer this time is 4 ($28 \times 4 = 112$). Put the 4 at the top above the 0.

$$\begin{array}{r} 2.24 \\ \hline 28 \overline{) 62.809} \\ \underline{56} \\ 68 \\ \underline{56} \\ 120 \\ \underline{112} \end{array}$$

Take 112 from 120, leaving 8. Write it down and bring down the 9, making 89.

$$\begin{array}{r} 2.24 \\ \hline 28 \overline{) 62.809} \\ \underline{56} \\ 68 \\ \underline{56} \\ 120 \\ \underline{112} \\ 89 \end{array}$$

Divide this by 28 and the answer is 3 ($28 \times 3 = 84$) and 5 over. Put down the 3 above the 9 and you now have an answer to three decimal places.

The calculation should now look like this:

$$\begin{array}{r} \underline{2.243} = \text{answer to three decimal places} \\ 28 \overline{) 62.809} \\ \underline{56} \\ 68 \\ \underline{56} \\ 120 \\ \underline{112} \\ 89 \\ \underline{84} \\ 5 \text{ over} \end{array}$$

If you wish to go on, add an 0 to the 5 making it 50, divide that by 28 and so on to as many decimal places as required, or until there is nothing left over.

Carefully study this example again, noting and understanding each move as it is made. You will of course find it difficult to calculate how many times 28 will divide into each number in your head, so do a trial calculation in the margin of your paper. For example, when we have to find how many times 28 will divide into 89 we do this by multiplying 28 by a figure we think is about right in the margin until we find the correct answer. If we try by 4 and multiply 28×4 by 4, the result will be 112 – too high, so we try by 3 and the result is 84 – the nearest we can get.

Exercise: Do the following calculations:

1. $483.91 \div 54$ (to three decimal places)
2. $64800 \div 108$
3. $92105.08 \div 72$ (to three decimal places)
4. $280.81 \div 24$

Turn over and check your answers.

Look at the answer to No. 2 which is 600. We begin by dividing 108 into 648 and find it goes exactly 6 times, so that 6 is written above the 8 and then continue until we have used up all numbers in the figure we are dividing (in this case two 0s). We therefore put in the number of 0s necessary in the answer.

$$\begin{array}{r}
 600 \\
 \hline
 108 \overline{) 64800} \\
 \underline{648} \\
 000
 \end{array}$$

If all your answers are correct, proceed to Check Exercise 7.

If one of your answers is wrong, repeat the calculation, find your error, and then proceed to Check Exercise 7.

If more than one of your answers are wrong, study the lesson again, repeat the exercise, then do Additional Exercise G before proceeding.

Check Exercise 7: Do the following calculations:

1. 2898 \div 4.6
2. 234.98 \div 0.34 (to two decimal places)
3. 60.5 \div 2.5
4. 96.64 \div 6.4

Turn to page 42 and check your answers.

If all your answers are correct, proceed to Check Exercise 8 (page 41).

If one of your answers is wrong, repeat the calculation, find your error, then proceed to Check Exercise 8.

If more than one of your answers are wrong, study Lesson Eight and complete the exercise set.

Answers: Lesson 7

Exercise:

1. 8.961
2. 600
3. 1279.237
4. 11.7

(Answers to Check Exercise 7 on page 42)

Lesson Eight: Dividing by a Number which Includes a Decimal Point

We now come to the most difficult example – dividing *by* a number which includes a decimal point. The rule of this, however, is quite simple, once it is memorised and understood. It is this: Turn the number we are dividing *by* into a whole number by moving the decimal point the necessary number of places to the *right*. Then move the decimal point in the other number the same number of places (also to the right), if necessary adding 0s to make this possible.

Example: $16.42 \div 4.6$ becomes $164.2 \div 46$
The decimal point has been moved one place in each number.

Example: $4956 \div 0.2$ becomes $495600 \div 2$
The decimal point was moved two places to turn .02 into 2, so two 0s were added to 4956.

Example: $5.6 \div .6$ becomes $56 \div 6$
The decimal point has been moved one place in each number.

What we are doing by making this change is simply multiplying both figures by the same amount in order to make the calculation easier by removing the decimal point. The answer we produce as a result will be the correct answer for the original calculation.

Exercise 1: Move the decimal points in the following numbers to make the divisor (the number we are dividing by) into a whole number:

1. $680.07 \div 1.3$
2. $28.9 \div .61$
3. $.802 \div 2.4$
4. $8.906 \div 58.3$
5. $9310 \div .04$

Turn to page 42 and check your answers.

Once we have learned and memorised this rule, we simply proceed as explained in the previous lessons.

Example: $28.9 \div .61 = 2890 \div 61$

answer to three decimal places =

$$\begin{array}{r}
 \underline{47.377} \\
 61 \overline{) 2890} \\
 \underline{244} \\
 450 \\
 \underline{427} \\
 230 \\
 \underline{183} \\
 470 \\
 \underline{427} \\
 430 \\
 \underline{427} \\
 3
 \end{array}$$

The answer 47.377 is not exact, but near enough. Notice that when we had used up all the figures in the number 2890 we put the decimal point into the answer before adding 0s to the remainder.

Let us take another example: $789.4 \div .24$

answer to three decimal places =

$$\begin{array}{r}
 \underline{3289.166} \\
 24 \overline{) 78940} \\
 \underline{72} \\
 69 \\
 \underline{48} \\
 214 \\
 \underline{192} \\
 220 \\
 \underline{216} \\
 40 \\
 \underline{24} \\
 160 \\
 \underline{144} \\
 16
 \end{array}$$

Study these two examples carefully, making sure you understand each move.

Exercise 2: Do the following calculation, stopping at three decimal places where necessary.

- | | | | |
|----|-----------------|----|----------------------|
| 1. | $89.6 \div .4$ | 2. | $9.28 \div .12$ |
| 3. | $780 \div 14.5$ | 4. | $9033.1 \div 422.36$ |
| 5. | $.28 \div .04$ | | |

Turn over and check your answers.

Note the answer to No. 5 particularly. The answer 7 is correct despite the fact that both the other numbers are smaller than the answer. $.28 \div .04$ means how many times will .04 divide into .28 and the answer is 7 times.

If all your answers are correct, proceed to Check Exercise 8.

If one of your answers is wrong, repeat the calculation, find your error, then proceed to Check Exercise 8.

If more than one of your answers are wrong, study the lesson again, repeat the exercise and then do Additional Exercise H before proceeding.

Check Exercise 8: Do the following calculations by simply writing down the answers:

- | | | | |
|----|----------------------|----|---------------------|
| 1. | 68.324×10 | 2. | 991.32×100 |
| 3. | 16.133×1000 | 4. | $18.74 \div 10$ |
| 5. | $43.92 \div 100$ | 6. | $68.4 \div 1000$ |

Turn over and check your answers.

If all your answers are correct, proceed to Lesson Ten.

If one of your answers is wrong, repeat the calculation, find your error and then proceed to Lesson Ten.

If more than one of your answers are wrong, study Lesson Nine and do the exercises.

Answers: Lesson 7

Check Exercise 7:

1. 6 2. 691.11 3. 24.2 4. 15.1

Answers: Lesson 8

Exercise 1:

1. $6800.7 \div 13$ 2. $2890 \div 61$
3. $8.02 \div 24$ 4. $89.06 \div 583$
5. $931000 \div 4$

Exercise 2:

1. 224 2. 77.333
3. 53.793 4. 21.387
5. 7

Check Exercise 8:

1. 683.24 2. 99132 3. 16133
4. 1.874 5. .4392 6. .0684

Lesson Nine: Other Decimal Calculations

In many of the examples and exercises we have used so far we have worked with numbers including a decimal point, for example, the number 49.25, where .25 is the decimal fraction part of this number. In this lesson we revise and practise another, very simple, method of doing certain calculations. We can multiply or divide decimal figures by 10 or 100 or 1000 or 10000 and so on very easily – just by moving the decimal point.

Multiplying by 10: To multiply by 10 we simply move the decimal point *one place to the right* like this:

$$72.468 \times 10 = 724.68$$

Multiplying by 100: To multiply by 100 we move the decimal point *two places to the right* like this:

$$72.468 \times 100 = 7246.8$$

Multiplying by 1000: To multiply by 1000 we move the decimal point *three places to the right* like this:

$$72.468 \times 1000 = 72468$$

Dividing by 10: To divide a decimal figure by 10 we simply move the decimal point *one place to the left* like this:

$$724.68 \div 10 = 72.468$$

Dividing by 100: To divide a decimal figure by 100 we move the decimal point *two places to the left* like this:

$$724.68 \div 100 = 7.2468$$

Dividing by 1000: To divide a decimal figure by 1000 we move the decimal point *three places to the left* like this:

$$724.68 \div 1000 = 0.72468$$

(Note the addition of the 0 before the decimal point. It adds nothing to the answer but is sometimes useful to help to make clear where the decimal point is.)

Exercise: Write down the answers to the following:

1. $46.32 \div 10$

2. 5.95×10

3. $16.3801 \div 100$

4. 16.3801×100

5. $612.53 \div 1000$

6. 29.72×1000

Turn to page 46 and check your answers.

Lesson Ten: Percentages as Easy Fractions

We use percentages for the purpose of being able to express one number or quantity as a fraction of another number or quantity and we do this by thinking of the second number as having 100 parts (100%). For example if we say 20%, we mean 20 hundredths or if we say 34%, we mean 34 hundredths. So if we say 20% of 280, we should really be saying 20 hundredths of 280 and we think of 280 as having 100 parts and then find the value of 20 of those parts.

Example: Find 50% of 100

Remember that 50% means 50 hundredths, so we are saying 50 hundredths of 100. That's easy because one hundredth of 100 is 1, so 50% must be 50.

In the same way:

22% of 100 is 22
46% of 100 is 46
18½% of 100 is 18½

From this we can see that with any unit (for example a £ or a \$) which is divided into 100 smaller units, it is easy to find any given percentage of the main unit. For instance, 17½% of an English £ is 17½ pence or 42% of a US \$ is 42 cents.

In the above example we also notice that 50% is the same as saying ½ because 50 is one-half of a hundred. In other words, 50% of 40 is 20 and so on. Many percentages used in business can easily be changed into easy fractions and we should *memorise* these.

They are:	50%	=	1/2
	33 1/3%	=	1/3
	25%	=	1/4
	20%	=	1/5
	10%	=	1/10
	5%	=	1/20

When you have memorised these, it is often useful to think of a percentage as a fraction in order to complete a calculation.

Example: Find $33\frac{1}{3}\%$ of 66. The easy way is to think of $33\frac{1}{3}\%$ as $\frac{1}{3}$ and one-third of 66 is 22.

Example: Find 20% of 90. $20\% = \frac{1}{5}$ and one-fifth of 90 is 18.

Exercise: Do the following calculations:

1. Find 25% of 1608
2. Find $33\frac{1}{3}\%$ of 729
3. Find 10% of 642
4. Find 20% of 65

Turn to page 50 and check your answers.

Before proceeding, make sure you have memorised the percentages and the fractions they stand for as listed on the previous page.

Answers: Lesson 9

Exercise:

1. 4.632
2. 59.5
3. 0.163801
4. 1638.01
5. 0.61253
6. 29720

Lesson Eleven: Other percentages

To calculate percentages which do not convert to any easy fraction, we use a method based on two facts we have already learned. They are:

- (a) that to divide any number by 10 we have only to move the decimal point one place to the left, and to divide by 100 we move the decimal point two places to the left;
- (b) that 10% is the same as saying one-tenth and 1% is the same as saying one-hundredth.

To calculate any given percentage, we can use these facts to enable us to do so quickly and accurately. It only requires practice.

Example: Find 40% of 280

10% of 280 = 28.0 so 40% of 280 = 28.0 \times 4 = 112.0;
drop the 0 as being unnecessary because it has no value
and the answer is 112.

Example: Find 23½% of £262.42

	10% of £262.42	=	26.242	
so	20%	=	26.242 \times 2	= £52.484
	1% of £262.42	=		2.6242
so	2%	=	(2.6242 \times 2)	= 5.2484
and	½%	=	(2.6242 \div 2)	= <u>1.3121</u>
	So 23½%	=		<u>£61.6687</u>

Example: Find 17¼% of £482.16

	10%	=	£48.216	
	5%	=	24.108	(half of 10%)
	1%	=	4.8216	
	1%	=	4.8216	
	¼%	=	<u>1.2054</u>	(quarter of 1%)
	So 17¼%	=	<u>£83.1726</u>	

Of course while we have produced arithmetically correct answers to these problems, we do not normally wish to go to more than two decimal places when calculating money. The answer to the last example, £83.1726, would *for business purposes* be taken as £83.17. In other words we drop the figures in the third and lower decimal places.

The rule is that if the figure in the third decimal place is 5 or below, omit it and write the answer as it then appears. If the figure in the third decimal place is 6 or above, then add 1 to the second decimal figure.

Therefore:	£ 28.6017	becomes	£ 28.60
	£ 915.214	becomes	£ 915.21
	£ 8.043	becomes	£ 8.04
	£ 17.5729	becomes	£ 17.57
	£ 4.617	becomes	£ 4.62
	£ 37.098	becomes	£ 37.10

Two points to remember:

- (a) this adjustment must not be made until the calculation is fully completed. Only the final figure is adjusted.
- (b) to avoid misunderstanding, money amounts should always be written with two decimal places, e.g. £40.00 or £40.10 or £40.01.

Exercise: Do the following calculations:

1. Find 24% of £500.00
2. Find 18% of £700.00
3. Find 12½% of £620.00
4. Find 27½% of £365.50
5. Find 32% of £1342.00
6. Find 2¼% of £20,642.00

Turn to page 50 and check your answers.

If all your answers are correct, proceed to Lesson Twelve.

If one of your answers is wrong, repeat the calculation, find your error and then proceed to Lesson Twelve.

If more than one of your answers are wrong, study Lesson Eleven again and then do Additional Exercise I before proceeding.

Lesson Twelve: One Amount as a Percentage of Another

For business purposes we frequently have to show one figure or amount as a percentage of another. For example, we may want to know what amount of profit we have made as a percentage of our sales. The method for doing this is quite easy. Memorise this rule:

To find one figure as a percentage of another, multiply the first figure by 100 and then divide the answer by the second figure.

Example: £120 as a percentage of £4000
 $120 \times 100 = 12000$
 $12000 \div 4000 = 3\%$ (Note the answer is shown as a percentage not as £s)

Example: 6 as a percentage of 20
 $6 \times 100 = 600$
 $600 \div 20 = 30\%$

Example: £17.25 as a percentage of £250
 $17.25 \times 100 = 1725$
 $1725 \div 250 = 6.9\%$ (If necessary, refer to Lesson Six on division by large numbers).

Exercise: Do the following calculations:

1. Find 168 as a percentage of 1400
2. Find 44.2 as a percentage of 260
3. Find £96.80 as a percentage of £440.00
4. Find £763 as a percentage of £2604 (to two decimal places)
5. Find 463 as a percentage of 2643 (to one decimal place)
6. Find £263 as a percentage of £423,000 (to two decimal places)

Turn the page and check your answers.

If all your answers are correct, proceed to Lesson Thirteen.

If one of your answers is wrong, repeat the calculation, find your error and then proceed to Lesson Thirteen.

If more than one of your answers are wrong, study Lesson Twelve again and then do Additional Exercise J before proceeding.

Answers: Lesson 10

1. 402 2. 243 3. 64.2 4. 13

Lesson 11

1. £120.00 2. £126.00 3. £77.50
4. £100.51 5. £429.44 6. £464.44

Lesson 12

1. 12% 2. 17% 3. 22% 4. 29.30%
5. 17.5% 6. 0.06%

Part II: Business Calculations

Now that we have completed the revision work in Part I we can turn to the more complicated exercises involved in business calculations. Remember what we said in the introduction about arithmetic being a tool of business. What we are going to do now is to use the rules of the arithmetic we have revised and apply them to the working out of some of the calculations necessary in the day to day business operations of our co-operative (or other small business).

Lesson Thirteen: Calculating Interest on Money Borrowed

if we borrow money from a bank we have to pay a price for the use of the money, or if we lend money to other people we charge them a price for the use of it. This price is called *interest*. The amount of interest we have to pay will depend on three things:

- (a) the amount borrowed
- (b) the rate (per cent of interest charged)
- (c) the length of time we keep the money.

For example, suppose we borrow £200 at a rate of interest of $4\frac{1}{2}\%$ per year for 2 years. This means that we agree to pay the lender $4\frac{1}{2}\%$ of £200 for each of the two years we keep the money. The easiest way to find out how much interest we should have to pay is to work out the amount for 1 year and then multiply the result by the number of years.

Example: First calculate the amount of interest for one year, which is $4\frac{1}{2}\%$ of £200. We know that 1% of £200 is £2 (move the decimal point two places to the left to find 1%), so if:

	1%	of £200	=	£2
then	4%		=	£8
and	$\frac{1}{2}\%$		=	£1
therefore	$4\frac{1}{2}\%$		=	£9

Note we have a line under our first calculation (1% of £200) to remind us that this is not to be added into the total.

So 4½% of £200 for 1 year	=	£9 interest
therefore 4½% c i £200 for 2 years will		
equal £9 x 2	=	£18
which is our answer.		

Of course we may have to work out the amount of interest due for a period which includes part of a year. For example, how much interest would we have to pay to borrow £200 for 4 years and 5 months.

We first calculate the amount due for the whole years (which are four). We know the amount for one years is £9, so for four years it will be £9 x 4 = £36.

To find the amount for 5 months, we first find the amount for 1 month by dividing the amount for 1 year by 12 and then multiplying the result by the number of months required, in this case 5. So if the amount of interest due for one year is £9, for one month it will be £9 ÷ 12 which is £0.75 and for 5 months it will be £0.75 x 5 which is £3.75. The total amount of interest for 4 years 5 months would, therefore, be £36 plus £3.75 which is £39.75.

Let us study another example:

Find the amount of interest to be paid if we borrow £128 at 6¼% interest per year for 4 years 10 months.

The interest for 1 year is 6¼% of £128.

	1%	of	£128	=	£1.28
	<hr/>				
then	6%	of	£128	=	£7.68
and	¼%	of	£128	=	£0.32
	<hr/>				
therefore	6¼%	of	£128	=	£8.00
	<hr/>				

So interest at $6\frac{1}{4}\%$ for 1 year	=	£ 8.00	
and interest at $6\frac{1}{4}\%$ for 3 years	=	£24.00	
and interest at $6\frac{1}{4}\%$ for 6 months	=	£ 4.00	($\frac{1}{2}$ of £8)
and interest at $6\frac{1}{4}\%$ for 3 months	=	£ 2.00	($\frac{1}{4}$ of £8)
and interest at $6\frac{1}{4}\%$ for 1 month	=	<u>£ 0.67</u>	($\frac{1}{12}$ of £8 to nearest whole penny)
So interest at $6\frac{1}{4}\%$ for 4 years 10 months	=	<u>£38.67</u>	

Exercise: Do the following calculations (work to the nearest whole penny):

1. £250 by 6% interest for 11 years
2. £27505 at 9% interest per year for $2\frac{1}{2}$ years
3. £14676 at $8\frac{1}{2}\%$ interest per year for 7 years 8 months
4. £2076.35 at $5\frac{3}{4}\%$ interest for 5 years 2 months.

Turn the page and check your answers.

Check your answer to No. 4 against the following:

	<u>1% of £2076.35</u>	=	£20.7635	
So	5% of £2076.35	=	£103.8175	(£20.7635 × 5)
and	$\frac{1}{2}\%$ of £2076.35	=	£10.38175	(£20.7635 ÷ 2)
and	$\frac{1}{4}\%$ of £2076.35	=	£ 5.19087	(£20.7635 ÷ 4)
and	$5\frac{3}{4}\%$ of £2076.35	=	£119.39012	

So	$5\frac{3}{4}\%$ of £2076.35 for 5 years	=	£596.9506	(£119.39012 × 5)
and	$5\frac{3}{4}\%$ of £2076.35 for 2 months	=	£ 19.8983	(£119.39012 ÷ 6)
and	$5\frac{3}{4}\%$ of £2076.35 for 5 years 2 months	=	£616.8489	or
			<u>£616.85</u>	to the nearest whole penny.

If any of your answers are wrong, find your error and do Additional Exercise K before proceeding.

Answers: Lesson 13

- | | | | |
|----|----------|----|----------|
| 1. | £165 | 2. | £6188.62 |
| 3. | £9563.86 | 4. | £616.85 |

Lesson Fourteen: Calculating Trade and Cash Discounts

Trade and cash discounts are almost always stated in percentage terms, and having already revised how to calculate percentages, calculating discounts will cause no difficulty. But first we must understand the difference between these two discounts.

Trade Discount: Some manufacturers and wholesalers quote the prices of goods at retail selling prices and offer a trade discount on these prices to the retailer. If the retailer then sells the goods at the quoted selling prices, the trade discount will represent the gross profit he makes on them. Trade discount is calculated on the total value of the goods the retailer buys. For example, if he buys goods worth £400 at 10% trade discount, this means he should actually be charged £400 less 10% (£40) which is £360.

Cash Discount: This is calculated on the prices of goods *after* any trade discount has already been deducted. For example, if we were offered goods worth £400 at a trade discount of 10% and a cash discount of 5%, we should actually pay £342 calculated like this:

Original price	£400
less 10% trade discount	<u>£ 40</u>
	£360
less 5% cash discount	<u>£ 18</u>
Amount to pay	<u>£342</u>

Notice that the cash discount was calculated on £360 – the amount left over after trade discount has been deducted. Cash discounts are also sometimes called settlement discounts.

Read these definitions of trade and cash discounts over again before proceeding.

Complete the following statements by inserting the correct words into the places indicated:

1. Trade discount is calculated on the _____ value of goods sold.
2. Cash discount is calculated on the price of goods after _____ has been deducted.

Turn the page and check your answers.

If your supplier gives a trade discount, he will calculate this himself and make the deduction before he sends you the invoice. The price on the invoice in the above example would therefore be £360. He will leave you to calculate the amount of cash discount (which is calculated on the £360, not the £400), and to deduct this from the amount you actually pay. The reason for this is that you are only entitled to the cash discount if you pay the account by the date stated by the supplier. He is offering you a cash discount because he wants to persuade you to make prompt payment of his account. If you pay the account within the time stated, you calculate the amount of cash discount yourself, deduct it from the amount stated in the invoice and make out your cheque in payment for the amount remaining. In our example you would therefore actually pay £342, and this sum would be accepted as full payment of the account.

Let us work another example keeping these points in mind:

Original price of goods	£822.40
less 15% trade discount	<u>£123.36</u>
	£699.04
less 2½% cash discount	<u>£ 17.48</u>
Amount to pay	<u>£681.56</u>

Work through the figures yourself to make sure that they are correct.

Exercise: Do the following calculations:

1. Find the amount to pay if the original price of the goods is £600 with a trade discount of 20% and a cash discount of 3%.

2. Find the amount to pay if the invoice price *after* trade discount has been deducted is £294.60 and there is a cash discount of 5%.

Turn the page and check your answers.

If either of your answers is wrong, study the whole lesson again, repeat the exercises, and then turn to Additional Exercise L and work out the exercises set there.

Answers: Lesson 14

1. Trade discount is calculated on the **total** value of goods sold.
2. Cash discount is calculated on the price of goods after **trade discount** has been deducted.

Exercise:

1. £465.60
2. £279.87

Lesson Fifteen: Calculating Mark-up and Margin

Mark-up: We have to add to the cost price of goods bought for resale a sufficient amount to pay the expenses of running the business and to make a profit. We call the amount added to the cost price the *mark-up*, so cost price plus mark-up equals selling price. It is useful to calculate the mark-up as a percentage, as this enables us to compare the mark-up on one type of goods with the mark-up made on other types of goods.

The mark-up represents the amount of profit we expect to make if we succeed in selling the goods at the price we have fixed. However, we may find that we have to reduce the price of the goods in order to sell them, or we may damage them and not be able to sell them at all; or they may be stolen. Mark-up, therefore, is a calculation made, *before* the goods are sold, of the amount we hope to make when we have sold them. It is calculated on cost price.

Margin (or Gross Profit): We use the terms margin and gross profit to mean the same thing; the only difference is that margin is usually used when we are referring to the amount of profit made on the whole of our trade for a particular period of time. But this distinction need not worry us here — for our purpose, both terms mean the same thing.

By margin we mean the amount of profit made on the sale of goods *calculated as a percentage of the selling price*. In other words, margin is a calculation made *after* the goods have been sold and we know exactly what prices we were able to get for them.

Study and learn the following definitions of mark-up and margin:

Mark-up is calculated on cost price. It is the difference between the cost price and the amount we *hope* or *expect* to receive when the goods are sold.

Margin is calculated on selling price. It is the difference between the cost price and the amount we have actually received after the goods have been sold. Margin is the same as gross profit.

We shall study the calculations involved in each of these in turn, but before we do so, complete the following statements by writing in the words required:

1. _____ price plus mark-up equals _____ price.
2. Mark-up is the difference between _____ price and _____ price, calculated as a percentage of _____ price.
3. Margin, or gross profit, is the difference between _____ price and _____ price, calculated as a percentage of _____ price.

Turn to page 64 and check your answers.

Lesson Sixteen: Calculating Mark-up as a Percentage

If we buy goods for £200 and add a mark-up of 25%, this means that we add 25% to give the selling price. 25% of £200 is £50, so the selling price would be £200 plus £50, which is £250.

We could, of course, look at this another way. If we bought goods for £200 and intended to offer them for sale at £250, then the mark-up in money terms would be £50. To calculate this as a percentage, we should show £50 as a percentage of £200 (the cost price), and £50 as a percentage of £200 is 25%.

You will remember that to calculate one figure as a percentage of another we work as follows (taking the figures above as our example):

$$\begin{aligned}50 \times 100 &= 5000 \\5000 \div 200 &= 25\%\end{aligned}$$

Calculating Margin as a Percentage

If we sell goods for £250 which we bought for £200, we have made a gross profit in money terms of £50 and we calculate this as a percentage of the selling price which is £250. £50 as a percentage of £250 is 20%.

So £50 as a percentage of £200 (the cost price) is 25% (the mark-up), and as a percentage of £250 (the selling price) is 20% (the margin), although the same amount of money (£50 in our example) is being added. For this we can see that while mark-up and margin are the same when shown in money terms, they are different when shown as percentages. This is always true because they are, of course, calculated as percentages of different figures:

Mark-up as a percentage of cost price;
Margin as a percentage of selling price.

Since the cost price will always be smaller than the selling price, the mark-up is always a higher percentage than the margin.

The difference between mark-up and margin can sometimes be a little confusing. But if we remember the following points, the difference between the two, and the way there are used, will be clear:

1. Mark-up is the amount we add to cost price to get the selling price. It is what we expect or hope to make as gross profit if we manage to sell the goods at that price. The mark-up is always shown as a percentage of the cost price.
2. When the goods have been sold, we know the actual selling prices we were able to get for them. So we can now take the difference between the cost price and the selling price and show it as a percentage of the selling price. This is the margin — the amount of gross profit we actually made when the goods were sold. Remember margin is the same as gross profit.

Exercise: Do the following calculations:

1. If the cost price is £4 and the selling price is £6, what is:
 - (a) the percentage mark-up;
 - (b) the percentage margin.
2. If the buying price is £30 and the selling price is £40, what is:
 - (a) the percentage mark-up;
 - (b) the percentage margin.
3. If the margin is 25% and the selling price is £400, what is:
 - (a) the cost price;
 - (b) the percentage mark-up.

Turn to page 64 and check your answers.

If any of your answers is incorrect, study the whole lesson again, repeating the exercises, and then do Additional Exercise M before proceeding.

Lesson Seventeen: Relationship between Mark-up and Margin

Suppose we buy goods for £300 and we want to sell them at a price which will give us a margin, or gross profit, of 25% if we succeed in selling them for the price we have fixed. Remember that margin is calculated on selling price, and as yet, although we know the percentage margin we want to make, we do not know the selling price; we only know the cost price which is £300.

If we were to calculate 25% of £300 (which is a mark-up of £75) and add that to the cost price of £300, we should reach a selling price of £375. But then if we calculate £75 as a percentage of £375, we find that it comes to 20% whereas we wanted to aim for a margin, or gross profit, of 25%.

So if we want to aim for any given percentage margin, or gross profit, we have to be able to find the percentage mark-up which has to be added to cost price in order to achieve the required margin. There is a simple formula we can use to work this out:

$$\frac{\text{Margin required} \times 100}{100 - \text{Margin required}} = \text{Mark-up required}$$

For example, suppose we wanted to aim at a margin, or gross profit, of 25%. To find the percentage mark-up required, we should do the following calculations:

$$\frac{25 \times 100}{100 - 25} = \frac{2500}{75} = \frac{100}{3} = 33 \frac{1}{3}\% \text{ (mark-up)}$$

Take another example. Suppose we wanted to aim at a margin, or gross profit, of 50%:

$$\frac{50 \times 100}{100 - 50} = \frac{5000}{50} = \frac{100}{1} = 100\% \text{ (mark-up)}$$

To achieve a margin of 50% therefore, we have to apply a mark-up of 100% to the cost price of the goods.

In practice we do not need to work out the required mark-up each time, because there is a fixed relationship between mark-up and margin and to find what percentage mark-up we must use to achieve a given percentage margin, we can use the following table:

For a margin of 10%, we need a mark-up of 11.11% (11% in round figures).

For a margin of 12½%, we need a mark-up of 14.28% (15% in round figures).

For a margin of 15%, we need a mark-up of 17.64% (18% in round figures).

For a margin of 20%, we need a mark-up of 25%.

For a margin of 25%, we need a mark-up of 33 1/3%

For a margin of 33 1/3%, we need a mark-up of 50%.

For a margin of 50%, we need a mark-up of 100%.

There is no exercise on this lesson, but study it carefully until you are sure you understand it.

Answers: Lesson 15

1. Cost price plus mark-up equals selling price.
2. Mark-up is the difference between cost price and selling price calculated as a percentage of cost price.
3. Margin, or gross profit, is the difference between cost price and selling price calculated as a percentage of selling price.

Answers: Lesson 16

1. (a) Mark up is 50% (£2 as a percentage of £4).
(b) Margin is 33 1/3% (£2 as a percentage of £6).
2. (a) Mark-up is 33 1/3% (£10 as a percentage of £30).
(b) Margin is 25% (£10 as a percentage of £40).
3. (a) Cost price is £300 (Selling price is £400 and margin is 25% of £400 which is £100 and £400-£100 = £300).
(b) Mark-up is 33 1/3% (Cost price is £300 to which is added £100 to find selling price and £100 as a percentage of £300 is 33 1/3%).

Lesson Eighteen: Calculating Gross and Net Profit

We now turn to consider how to calculate the amount of profit we have made during any given trading period. The first step in this calculation is to establish two facts:

- (a) the cost to us of goods we have *actually* sold during the period concerned;
- (b) the income received from the sale of those goods.

Finding the Cost of Goods Sold

Remember we are not concerned here with goods bought but with goods sold during the period. For example, we may have bought some goods during the period which have not yet been sold – they are still in our possession at the end of the period. We only make profits on things we buy *and* sell – until the goods are sold, we have not made a profit on them. To find the cost of goods sold, we use a simple formula:

The cost price of stock in hand at the beginning of the period,
Plus the cost price of all goods bought during the period,
Less the cost price of stock in hand at the end of the period.

We can now shorten that formula to make it easier to remember:

- (a) Stock to begin
PLUS
- (b) Purchases
LESS
- (c) Stock at end
EQUALS
- (d) Cost of Goods Sold.

Remember all figures at cost price.

Write down the formula we have just learned in the following space:

(a) _____
 PLUS (b) _____
 LESS (c) _____
 EQUALS (d) _____

Turn back and check that you got it right. If you did not, study it again until you have memorised it. Now study the following example:

Example: Suppose we had goods to the value of £300 (cost price) in stock at the beginning of a period and that we bought goods worth £1600 (cost price) during the period, and we had goods worth £220 (cost price) in hand at the end of the period. Our calculation in this case would be:

	Stock to begin	£ 300
PLUS	Purchases	£1600
LESS	Stock at end	£ 220
EQUALS	Cost of Goods Sold	£1680

Now work the following exercise:

Exercise:	Stock to begin	£ 1340
	Purchases	£10740
	Stock at end	£ 1680
Find	Cost of Goods Sold.	

Turn the page and check your answer.

If you failed to get this correct, study the whole of this part of the lesson again repeat the Exercise, and then do Additional Exercise N before proceeding.

We must now consider where the figures for *Stock to begin*, *Purchases*, and *Stock at end* come from.

The *Stock to begin* figure will come from your accounts for the last trading period. It was the Stock at end figure for that period representing the value of stock not sold at the end of the period and being carried forward from that period to the present one.

The *Purchases* figure will come from your Purchases ledger. It is the total value of goods bought during the period at cost price including any for which you have not yet paid.

The *Stock at end* figure is found by counting stock in hand at the end of the period and calculating its value at cost price. In the next period this will be the Stock to begin figure.

Of course, in some cases, for instance in the marketing of crops, it may be necessary to calculate only the cost value of crops handled during the period, assuming that there was no stock to begin and no stock at end. In that event the cost of goods is simply the cost value of the crops we have bought and resold.

Finding the Income Received from Sales

If you now refer back to the beginning of this lesson, you will remember that the next figure we require to find is the figure for *Sales* during the period. This figure we establish from our Sales Ledger – it is simply the total value of goods we have sold during the period at selling price. No calculation is required to find this figure, as long as our Sales Ledger has been properly kept up to date.

Answer: Lesson 18

£10,400.

Lesson Nineteen: Gross Profit

Now that we know how to find:

- (a) the cost price of goods actually sold,
- (b) the selling price of goods actually sold,

calculating the amount of gross profit we have made is easy. We simply deduct (a) from (b). Or to put it another way:

<i>Sales</i>	LESS	<i>Cost of Goods Sold</i>	EQUALS	<i>Gross Profit.</i>
--------------	------	---------------------------	--------	----------------------

For example, if the cost of goods sold was £7430 and income from sales was £9240, then our calculation would be like this:

	Sales	£9240
LESS	Cost of Goods Sold	£7430
EQUALS	Gross Profit	£1810

Suppose that our figure for Cost of Goods sold was higher than the figures for sales, what would be the result? Let us look at an example.

Example:	Sales	£12470
	Cost of Goods Sold	£14390

In this case we cannot take the Cost of Goods Sold figure from the Sales figure because the first is greater than the second. Nevertheless we want to find the difference between the two and we do so by taking the Sales figure from the Cost of Goods Sold figure. In our example the difference is £1920. But this is, of course, not *Profit*. We have spent more on goods than we got back for them, therefore instead of a *Profit* we have a *Loss*. In any reasonably run business this should, of course, never happen, but it helps to remind us that we lose money if, for any reason, we sell goods for less than we had to pay for them.

Exercise: Do the following calculation:

Sales	£13000
Cost of Goods Sold	<u>£10400</u>
Gross Profit	_____

Turn to page 72 and check your answer.

If you failed to get this correct, study the lesson again, repeat the exercise, and then do Additional Exercise O before proceeding.

Lesson Twenty: Net Profit

In the previous lesson we saw how to calculate 'Gross Profit'. Why 'Gross Profit' and what is the difference between this and 'Net Profit'?

By *Gross Profit* we mean the total amount of profit made on buying and selling goods. That is the total difference between the cost of goods and the selling price of goods. But of course in the process of buying and selling goods we have incurred *Expenses* which we have to pay. We pay these Expenses out of Gross Profit and the amount of profit left over after paying the Expenses we call *Net Profit*.

Study and learn the following:

Gross Profit is the total difference between the cost price to us of goods sold and the income received from the sale of those goods.

Expenses is the total amount of money spent in the business of buying and selling goods during the period concerned (wages, rent, taxes, transport, light, etc.).

Net Profit is what is left of the Gross Profit after we have deducted Expenses.

Complete the following statements by adding the missing words:

Gross _____ is the _____ between the cost price to us of goods sold and the income received from the sale of those goods.

_____ is the total amount of money spend in the business of buying and selling goods during the period concerned (wages, rent, taxes, transport, light, etc.).

_____ is what is left of the Gross Profit after we have deducted _____ .

To find Net Profit, therefore, we simply deduct Expenses from Gross Profit.

Example:		Gross Profit	£420
	LESS	Expenses	£300
	EQUALS	Net Profit	£120

Exercise: Do the following calculation:

	Gross Profit	£2600
	Expenses	<u>£1950</u>
	Net Profit	_____

Turn to page 74 and check your answer.

If you did not get the answer correct, study this lesson again, repeat the exercise, and do Additional Exercise P before proceeding.

To complete this lesson we must ask ourselves where the figures come from to do this calculation. We saw in Lesson Nineteen how Gross Profit was calculated. The other figure we use is the figure for Expenses. We take this from our Expenses Ledger – it is simply the total amount of money spent during the period on the various expenses of running the business.

One last point to remember – when shown as percentages, *both Gross and Net Profit* are always shown as percentages of the selling price (Sales).

Answer: Lesson 19

£2,600.

Lesson Twenty-One: Gross and Net Profit – An Exercise

Now let us bring the figures used in the last exercises together and see how they relate one to the other:

Exercise 1: Put in the answers where spaces have been left:

Stock to begin	£ 1340
Purchases	£10740
Stock at end	£ 1680
Cost of Goods Sold	£.....
Sales	£13000
Gross Profit	£.....
Expenses	£ 1950
Net Profit	£.....

Exercise 2: From the figures above calculate:

- (a) the percentage rate of gross profit;
- (b) the percentage rate of net profit.

Remember that both gross profit and net profit percentages are calculated on the sales figure.

Turn to page 74 and check your answers.

If you did not get the answers correct, study the last four lessons again and also Lesson Twelve (finding one amount as a percentage of another), repeat the exercises, and then do Additional Exercise Q.

Answers:

Lesson 20

£650.

Lesson 21

Exercise 1:	Cost of Goods Sold	£10400
	Gross Profit	£ 2600
	Net Profit	£ 650

- Exercise 2:** (a) 20%
(£2600 as a percentage of £13000)
- (b) 5%
(£650 as a percentage of £13000)

Lesson Twenty-Two: Distribution of Surplus

In cooperative business we called the *net profit* made during the trading period the *net surplus*. It represents, as we have seen, the amount of money left over after all *expenses have been paid*.

Part of the surplus will be used for future capital needs by putting it into a Reserve Fund and part may also be used for educational or other purposes. After such allocations have been made, the rest of the surplus will be distributed between members in the form of a *bonus*.

Sometimes this bonus is called "patronage refund", sometimes "dividend on purchases". Whatever it is called, the principle of distributing it is the same. The amount or share each member receives will depend on the amount of trade each has done with the cooperative.

The bonus is expressed as a percentage. The rate of bonus is found by taking the *total amount of surplus to be distributed* to the members and expressing this as a *percentage of the total trade* done with members during the period.

Now study the following examples, checking the calculations yourself to make sure you understand how they are worked:

Example 1: A marketing cooperative purchased crops from members to the total value of £22400 (amount paid to members) and made a net surplus of £1860 on the sale of the crops. It decided to put £200 into the education fund and £500 into the reserve fund, leaving £1160 for distribution to members.

£1160 as a percentage of £22400 = 5.1% (to one decimal place), calculated as follows:

$$\begin{array}{rcl} 1160 \times 100 & = & 116000 \\ 116000 \div 22400 & = & 5.1\% \end{array}$$

The cooperative would therefore declare a bonus of 5% and each member would be entitled to receive 5% of the price originally paid to

him for his crops. In this example, the amount paid out as bonus would be 5% of £22400, which is £1120 (check it) and there would therefore be £40 over, which would be carried over to the next trading period.

Example 2: A consumer cooperative made a net surplus of £5184 on total sales of £84650 and after allocations to the reserve fund and the education fund, there was £3684 left over for distribution to members.

£3684 as a percentage of £84650 = 4.3% (to one decimal place), calculated as follows:

$$\begin{array}{rcl} 3684 \times 100 & = & 368400 \\ 368400 \div 84650 & = & 4.3\% \end{array}$$

In this case the cooperative would declare a bonus of 4% of the total amount each member had spent in buying goods from the cooperative.

Note: It is unnecessary to work the rate of bonus beyond one decimal place because the cooperative will use the whole figure for the rate of bonus, leaving any balance to be carried over to the next trading period.

Work the following exercises:

Exercise 1: Find the rate of bonus paid out if total trade is £19460 and total net surplus £1246 and allocations to reserve and education funds total £610.

Exercise 2: A cooperative made a net surplus of £5782 on sales of £84200 and allocated £500 to the reserve fund and £230 to the education fund. What is the percentage amount of bonus payable?

Turn to page 78 and check your answers.

If either of your answers is incorrect, study the whole of this lesson again, and if necessary refer to Lesson Twelve (finding one amount as a percentage of another), then do Additional Exercise R before proceeding.

Lesson Twenty-Three: Calculating Each Member's Bonus

Once we have worked out the rate of bonus, it is a simple matter to calculate how much each member is to receive. If the rate of bonus is 5%, then a member whose trade with the cooperative during the period has amounted to say £160 will receive 5% of £160, which is £8.

In some cases of course the amount will not work out exactly and the amount to be paid out to each member should be calculated to the nearest whole penny (or other appropriate coin, depending on the currency being used). For example, if a member's bonus worked out at £17.435, we should actually pay him £17.43.

Remember that to find 1% of any decimal currency amount, we simply have to move the decimal point two places to the left. For example, 1% of 176.48 is £1.7648 and if we wanted to find 3% of £176.48, we should simply find 1% first and then multiply that by 3 to find 3%.

Complete the following table, showing how much would be received by each member if the rate of bonus is 4%:

<u>Member</u>	<u>Trade done by Member</u>	<u>Bonus Due</u>
A	£178.54	
B	£368.20	
C	£101.45	
D	£564.88	
E	£ 44.69	
F	£369.85	

Turn the page and check your answers.

Answers:

Lesson 22

Exercise 1:

$\pounds 1246 - \pounds 610 = \pounds 636$ and $\pounds 636$ as a percentage of $\pounds 19460 = 3.2\%$ (to one decimal place) and the cooperative would pay a bonus of 3%.

Exercise 2:

$\pounds 5782 - \pounds 730 = \pounds 5052$ and $\pounds 5052$ as a percentage of $\pounds 84200 = 6\%$.

Lesson 23

Calculated to nearest whole penny;

- | | | | |
|----|-------|----|--------|
| A. | £7.14 | B. | £14.72 |
| C. | £4.05 | D. | £22.59 |
| E. | £1.78 | F. | £14.79 |

Lesson Twenty-Four: Rate of Stock Turn

Suppose that in a retail business we have £1000 of capital which we have used for buying stock for resale. As we sell the goods, the cash from sales (less that which we need to pay our expenses) becomes available to buy more goods for resale. The more often we can do this, the more goods we shall sell and the more profit we shall make. The number of times in any given period (say a year) we use the capital invested in stock is called *Rate of Stock Turn*. (Do not confuse this term with the word *Turnover*, which is another word sometimes used for Sales.)

Rate of Stock Turn and its importance can best be illustrated by an example. Suppose, as we said above, we have £1000 to invest in stock and we use an average percentage mark-up of 25%, giving a margin of 20%. (Refer back to Lesson Fifteen to revise on mark-up and margin.)

If we use our £1000 once each year at a mark-up of 25%, we shall have sales of £1250 and a 20% margin, giving a profit of £250.

If we use our £1000 twice each year at a mark-up of 25%, we shall have sales of £2500 and a margin of 20%, giving a profit of £500.

If we use our £1000 six times each year at a mark-up of 25%, we shall have sales of £7500 and a 20% margin, giving a profit of £1500.

In the first case we should have a Rate of Stock Turn of 1 (meaning that we had used our £1000 once during the period); in the second case it would be 2 and in the third case 6. So you can see that the higher the rate of stock turn, the more profit we shall make on *the same amount of capital invested*. We only make profit on goods we sell — there is no profit to be made in keeping them on our shelves.

The rate of stock turn is, therefore, very important to the profitability of our business and we need to know how to calculate it.

Lesson Twenty-Five: Calculating the Rate of Stock Turn

To calculate the rate of stock turn for a particular period, we need the *total sales figure for the period* and the *value of average stock held* at any one time.

Sales: The figure for Sales we obtain from our Sales Ledger. It is the total value of our income from Sales for the period.

Average Stock: The figure for Average Stock we obtain by actually counting the items held in stock at least three times during the period, and calculating their value at *selling price*. We call this *stock-taking*. We have to do it at the end of each trading period, when we make up our accounts at the end of the year. So in any given trading period, we can take the *value of stock to begin* and the *value of stock at end*, and also take stock once more during the year and we then have three valuations of stock in hand at different times. The *average* of these three figures will be the value of *Average Stock*, and the value of Average Stock represents the average amount of capital we have invested in stock at any one time.

Example:	Finding Average Stock:	
	Stock to begin January	£ 720
	Stocktaking July	£ 900
	Stock at end December	<u>£ 840</u>
	Total	<u>£2460</u>
	Average Stock = £2460 ÷ 3 =	£ 820

When we know (a) the Sales figure, and
(b) the Average Stock figure,
We can find the *Rate of Stock Turn* by dividing (a) by (b). In other words, *Sales* divided by *Average Stock* equals Rate of Stock Turn.

Example: Finding Rate of Stock Turn:

Suppose we had Sales of £38400 and Average Stock of £3200, the Rate of Stock Turn would be £38400 ÷ £3200, which is 12.

When doing this calculation, it is important to remember that both the *Sales figure* and the *Average Stock figure* must be at selling price.

- Exercise 1:**
1. If Sales are £80600 and Average Stock £6200, what is the Rate of Stock Turn?
 2. If Sales are £15120 and Average Stock £1680, what is the Rate of Stock Turn?

Turn the page and check your answers.

If either of your answers is incorrect, first check your arithmetic, then read the whole lesson again and repeat the exercise.

Suppose you wanted to know what level of *Sales* you would have to produce to achieve a given *Rate of Stock Turn*. Since we find the Rate of Stock Turn by dividing Sales by Average Stock, we can, by reversing the procedure, find Sales by multiplying Average Stock by Rate of Stock Turn.

Example: If we want to reach a *Rate of Stock Turn* of 12 on *Average Stock* of £1000, we shall need Sales of $£1000 \times 12 = £12000$.

As we saw above, Sales of £12000 divided by Average Stock of £1000 will give us a Rate of Stock Turn of 12.

Exercise 2: If our *Average Stock* is £7420 and we want to reach a Rate of Stock Turn of 8, what Sales will be required?

Turn the page and check your answer.

Answers: Lesson 25

Exercise 1:

1. 13
2. 9

Exercise 2:

£59360 ($£7420 \times 8$).

Conclusion

We have now completed this basic course in business calculations. Whether or not you had need to use the Additional Exercises provided while working through the book, do them all again now. Remember practice makes perfect, and in using arithmetic, we must aim for perfection. Only correct answers are acceptable in business; incorrect answers can lead to serious error. At the beginning of this course we said that in business calculations we must develop accuracy and speed, but accuracy first. Both will come with practice and care. The ability to use basic arithmetic in business is very important to sound business practice. If you have worked through this book carefully, you should be able to do the type of calculations included with confidence in your own ability. But remember, be neat, check your work, and practice. In that way, you will develop both accuracy and speed.

Appendix: Additional Exercises

A. Add:

$$\begin{array}{r} 1) \quad 434.68 \\ \quad 25.01 \\ \quad 163.49 \\ \quad 263.27 \\ \quad 59.36 \\ \hline \end{array}$$

$$\begin{array}{r} 2) \quad 14.62 \\ \quad 58.94 \\ \quad 210.03 \\ \quad 92.47 \\ \quad 68.88 \\ \hline \end{array}$$

$$\begin{array}{r} 3) \quad 3231.40 \\ \quad 2709.62 \\ \quad 3456.74 \\ \quad 8920.33 \\ \quad 6217.48 \\ \hline \end{array}$$

B. Subtract:

$$\begin{array}{r} 1) \quad 3209 \\ \quad 1872 \\ \hline \end{array}$$

$$\begin{array}{r} 2) \quad 6849.08 \\ \quad 4727.79 \\ \hline \end{array}$$

$$\begin{array}{r} 3) \quad 4328.72 \\ \quad 4077.64 \\ \hline \end{array}$$

C. Multiply:

$$1) \quad 38927 \times 9$$

$$2) \quad 41988 \times 6$$

$$3) \quad 174562 \times 7$$

D. Multiply:

$$1) \quad 286 \times 34$$

$$2) \quad 7493 \times 82$$

$$3) \quad 91974 \times 78$$

E. Multiply:

$$1) \quad 444.31 \times 3.09$$

$$2) \quad 16.021 \times 3.43$$

$$3) \quad 7021.6 \times 9.2$$

F. Divide:

$$1) \quad 847 \div 9$$

$$2) \quad 6120 \div 4$$

$$3) \quad 538 \div 8$$

G. Divide: (to three decimal places)

$$1) \quad 68490 \div 23$$

$$2) \quad 5102 \div 164$$

$$3) \quad 89207 \div 327$$

H. Divide: (to two decimal places)

$$1) \quad 39.65 \div 4.03$$

$$2) \quad 789.3 \div 17.12$$

$$3) \quad 8.492 \div 3.66$$

I. Percentages:

$$1) \quad \text{Find } 14\% \text{ of } 7445$$

$$2) \quad \text{Find } 26\% \text{ of } 808$$

$$3) \quad \text{Find } 62\% \text{ of } 5555$$

J. Percentages:

$$1) \quad \text{Calculate } 48 \text{ as a percentage of } 192$$

$$2) \quad \text{Calculate } \text{£}65 \text{ as a percentage of } \text{£}480 \quad (\text{to two decimal places})$$

$$3) \quad \text{Calculate } \text{£}89.45 \text{ as a percentage of } \text{£}536.70 \quad (\text{to two decimal places})$$

K. Interest:

Find the amount of interest to the nearest whole penny which would be paid on:—

- 1) £610 at 9% for 3 years
- 2) £7400 at 8% for 3 years 3 months
- 3) £140910 at 7½% for 5 years 4 months

L. Discounts:

- 1) Find the amount to pay if the original price of the goods is £1400 with a trade discount of 15% and a cash discount of 5%.
- 2) Find the amount to pay if the invoice price after deduction of trade discount is £708.12 and there is a cash discount of 3% (to nearest whole penny).

M. Make-up and Margin:

- 1) If cost price is £9 and selling price is £12, what is:—
 - (a) the percentage mark-up?
 - (b) the percentage margin?
2. If the mark-up is £50 and the selling price is £150, what is:—
 - (a) the cost price?
 - (b) the mark-up as a percentage?
 - (c) the margin as a percentage?

N. Cost of Goods Sold:

- 1) Find the cost of goods sold if stock to begin is £1927; purchases £52000; stock at end is £1043.
- 2) Find the cost of goods sold if stock to begin is £17294; purchases £701905; stock at end is £25432.

O. Gross Profit:

- 1) Find Gross Profit if Sales — £92073; Cost of Goods Sold — £79863
- 2) Find Gross Profit if Sales — £804.32; Cost of Good Sold — £634.87

P. Net Profit:

- 1) If Gross Profit is £17842 and Expenses £12170, what is Net Profit?
- 2) If Gross Profit is £489.32 and Expenses £256.60, what is Net Profit?

Q. Gross and Net Profit:

1) Put in answers where spaces have been left.

Stock to Begin	£ 2791
Purchases	£52080
Stock at End	£ 3162
Cost of Goods Sold	£.....
Sales	£65854
Gross Profit	£.....
Expenses	£ 9076
Net Profit	£.....

2) From the above figures calculate the percentage rates of Gross Profit to two decimal places.

R. Distribution of Surplus:

- 1) Find the rate of bonus to be paid if total trade is £29040 and the total amount to be paid out as surplus is £900.
- 2) If a cooperative made a net surplus of £1608 on sales of £52700 and allocated £350 to Reserves and £200 to the Education Fund, what rate of bonus could be declared?

Answers

- A.**
1) 945.81 2) 444.94 3) 24535.57
- B.**
1) 1337 2) 2121.29 3) 251.08
- C.**
1) 350343 2) 251928 3) 1221934
- D.**
1) 9724 2) 614426 3) 7173972
- E.**
1) 1372.9179 2) 54.95203 3) 64598.72
- F.**
1) 94.111 2) 1530 3) 67.25
- G.**
1) 2977.826 2) 31.109 3) 272.804

