

# **SECONDARY MATHEMATICS, I**

Published @ 2017 Trieste Publishing Pty Ltd

ISBN 9780649077908

Secondary mathematics, I by Harry M. Keal & Nancy S. Phelps

Except for use in any review, the reproduction or utilisation of this work in whole or in part in any form by any electronic, mechanical or other means, now known or hereafter invented, including xerography, photocopying and recording, or in any information storage or retrieval system, is forbidden without the permission of the publisher, Trieste Publishing Pty Ltd, PO Box 1576 Collingwood, Victoria 3066 Australia.

All rights reserved.

Edited by Trieste Publishing Pty Ltd.  
Cover @ 2017

This book is sold subject to the condition that it shall not, by way of trade or otherwise, be lent, re-sold, hired out, or otherwise circulated without the publisher's prior consent in any form or binding or cover other than that in which it is published and without a similar condition including this condition being imposed on the subsequent purchaser.

[www.triestepublishing.com](http://www.triestepublishing.com)

**HARRY M. KEAL & NANCY S. PHELPS**

**SECONDARY  
MATHEMATICS, I**



# SECONDARY MATHEMATICS

I.

By

**HARRY M. KEAL**

*Head of the Mathematics Department  
Cass Technical High School  
Detroit, Michigan*

and

**NANCY S. PHELPS**

*Grade Principal  
Southeastern High School  
Detroit, Michigan*



**ATKINSON, MENTZER & COMPANY**  
NEW YORK      CHICAGO      ATLANTA      DALLAS

37409

COPYRIGHT, 1947, BY  
ATKINSON, MENTZER & COMPANY

QA39  
K19  
v.1

# Introduction

**T**HE growth of this series of Mathematics for Secondary Schools, has covered a period of seven years, and has been simultaneous with the growth and development of the shop, laboratory, and drawing courses in Cass Technical High day school, as well as in the evening and continuation classes.

The authors have had clearly in mind the necessity of first developing a sequence of mathematics that would enable the student to recognize fundamental principles and apply them in the shop, drawing room, and laboratory; and, second to so develop the course that each year's work would be a unit and not depend upon subsequent development for intelligent application.

It has been assumed that the school work-shop, drawing room, and laboratory would furnish opportunity to apply mathematics and that it was not necessary to exhaust every possible application in the mathematics class.

The authors have been aware of the popular demand for a closer union of algebra and geometry, but have recognized that demand only when the union came about naturally and would assist the mathematical sequence desired.

Instructors in the wood shop, pattern shops, machine shop, drawing rooms, chemistry, physics, and electrical laboratories, etc., have furnished examples of mathematical application incident to the respective subjects. Hundreds of problems arising in the industries, have been brought in by the machinists, sheet metal workers, carpenters, electrical workers, pattern makers, draughtsmen, etc., etc., coming to the evening and continuation classes. Complete charts of machine shop work and electrical distribution requirements have been made, including a statement of the required sequence of mathematics. All of this material has been classified, with a view to the mathematical sequence.

The net result is a series of Mathematics so organized that a mastery of the text makes it possible for a student to use mathematics intelligently in the various departments of the school, in the industries, and at the same time prepare for college mathematics.

**E. G. ALLEN,**  
Director Mechanical Department,  
Cass Technical High School,  
Detroit, Mich.

M 2-12 3-26

Source information - 1923

# TABLE OF CONTENTS

	PAGE
CHAPTER I	
THE EQUATION .....	1
CHAPTER II	
EVALUATION .....	15
CHAPTER III	
THE EQUATION APPLIED TO ANGLES.....	25
CHAPTER IV	
ALGEBRAIC ADDITION, SUBTRACTION, MULTIPLICATION AND DIVISION .....	38
CHAPTER V	
RATIO, PROPORTION AND VARIATION.....	79
CHAPTER VI	
PULLEYS, GEARS AND SPEED.....	96
CHAPTER VII	
SQUARES AND SQUARE ROOTS.....	107
CHAPTER VIII	
FORMULAS .....	123
CHAPTER IX	
QUADRATIC EQUATIONS .....	131
CHAPTER X	
EQUATIONS AND FACTORING.....	140
CHAPTER XI	
LITERAL EQUATIONS .....	151
CHAPTER XII	
MISCELLANEOUS EQUATIONS .....	171
CHAPTER XIII	
SIMULTANEOUS EQUATIONS .....	183
CHAPTER XIV	
THE GRAPH .....	204





## CHAPTER I

### THE EQUATION

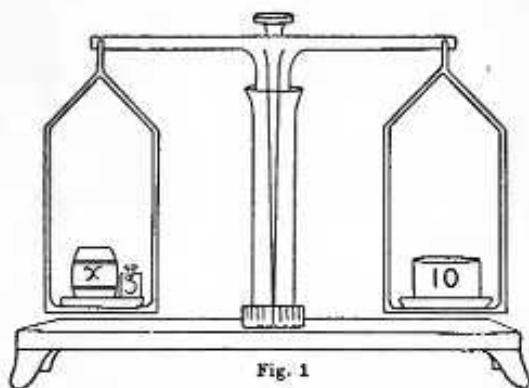


Fig. 1

1 In order to find the weight of an object, it was placed on one pan of perfectly balanced scales (Fig. 1). It, together with a 3-lb. weight, balanced a 10-lb. weight on the other pan. If 3 lbs. could be taken from each pan, the object would be balanced by 7 lbs. This may be expressed by the *equation*,  $x+3=10$ , in which the expressions  $x+3$  and 10 denote the weights in the pans, the sign ( $=$ ) of equality denotes the perfect balance of the scales, and  $x$  is to be found.

2 *Equation*: An *equation* is a statement that two expressions are equal. The two expressions are the *members* of the equation, the one at the left of the equality sign being called the *first member*, and the one at the right, the *second member*.

3 From the explanatory problem, it will be seen that *the same number may be subtracted from both members of an equation*.

#### Oral Problems:

Solve for  $x$ :

1.  $x+7=21$

3.  $x+1.1=3.5$

5.  $x+\frac{5}{7}=\frac{1}{12}$

2.  $x+2=3$

4.  $x+2\frac{5}{8}=7\frac{1}{2}$

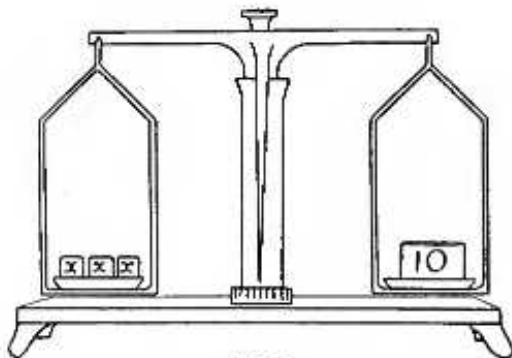


Fig. 2

4 It is required to find the weight of a casting. It is found that 3 of them exactly balance a 10-lb. weight (Fig. 2). If the weight in each pan could be divided by 3, one casting would be balanced by  $3\frac{1}{3}$  lbs. This may be expressed by the equation,

$$3x = 10,$$

$$x = 3\frac{1}{3}, \text{ (dividing both members by 3)}$$

5 From this explanatory problem, it will be seen that *both members of an equation may be divided by the same number.*

Oral Problems:

Solve for x:

1.  $4x = 12$
2.  $2x = 16$
3.  $5x = 9$
4.  $11x = 33$
5.  $1.1x = 12.1$

Example: Solve for x:  $5x + 12 = 37$

$$5x = 25 \quad \text{Why?}$$

$$x = 5 \quad \text{Why?}$$