

**PRACTICAL PLANE AND
SOLID
GEOMETRY, INCLUDING
GRAPHIC ARITHMETIC**

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Practical plane and solid geometry, including graphic arithmetic by Henry Angel

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HENRY ANGEL

**PRACTICAL PLANE AND
SOLID
GEOMETRY, INCLUDING
GRAPHIC ARITHMETIC**

PRACTICAL PLANE AND SOLID
G E O M E T R Y.

Collins' Elementary Science Series.

PRACTICAL PLANE AND SOLID
GEOMETRY,
INCLUDING
GRAPHIC ARITHMETIC.

BY

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INSTITUTION, AT THE WOOLWICH POLYTECHNIC,
ETC., ETC.

NINETY-THIRD THOUSAND.



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PREFACE.

GEOMETRY is one of the most attractive studies to artizans, on account of its practical utility. But attention has been heretofore confined principally to one branch of the subject—Plane Geometry. It is only of late years that Solid Geometry has been brought so extensively into notice in England.

The Science and Art Department has from year to year more strongly advocated the study of the latter branch of the subject, by rejecting greater numbers of those candidates, at their examinations of science classes, who have failed to come up to the gradually increasing standard of excellence in knowledge of its principles.

Foreign nations have been before us in this matter; and the recent Educational Exhibitions have shown that a knowledge of Solid Geometry is considered indispensable to the well-educated foreigner.

There are few English works upon this subject; and those which do exist are either too learned for the ordinary reader, or they are exceedingly expensive. This little treatise has been prepared expressly for those who are studying Geometry in classes in connection with the Science and Art Department. The aim of the writer, who has taught the subject to large classes of artizans for several years, has been to show, as far as possible, the principles upon which constructions are based, thereby helping the student to avoid the system of "cram," of which examiners so justly complain.

He should not rest satisfied until he can understand the "why" and "wherefore" of the point he is studying, and can reason out for himself any necessary deductions therefrom.

It is understood that, in future, candidates' attention must be confined almost entirely to Solid Geometry.

This book contains rather more than is necessary to correctly work the elementary papers set at the South Kensington Examinations.

H. A.

PREFACE TO THE NEW EDITION.

THE subject of this little book is becoming year by year more popular, primarily on account of its vital importance as a study, comprising as it does the principles which form the basis of true and intelligent draughtsmanship, but also as a valuable educational agent.

The favour with which the former edition has been received amongst the teachers and students of our Institutes and classes has been very marked. Hence it was considered desirable to prepare a re-issue of the work, so revised, corrected, and added to, as to bring it up to date, and to still deserve the recognition and approval of those seeking a knowledge of the subject upon which it treats.

A chapter has been added upon Graphic Arithmetic; many methods of solution have been improved, and a large number of extra exercises inserted.

H. A.

CANONBURY,

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