

**ARITHMETICAL
EXAMPLES: OR, TEST
EXERCISES FOR THE USE
OF ADVANCED CLASSES**

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Arithmetical examples: or, Test exercises for the use of advanced classes by Various

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ROBINSON'S MATHEMATICAL SERIES.

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P R E F A C E .

IN the preparation of this work, it was not designed to make a book to take the place of any other, nor one to constitute a necessary part of the series to which it belongs, nor to adapt it to the use of beginners, or those commencing the study of Arithmetic ; but it was prepared to meet a demand in graded and advanced schools for a larger number of carefully prepared and practical examples for review and drill exercises than are furnished from ordinary text-books ; and it may be used in connection with any other series of Arithmetics.

Of course, it is no substitute for a *systematic* treatise. On the contrary, its leading aim is to bring together *promiscuously* a large number of practical examples, involving nearly all the principles and ordinary processes of common Arithmetic, and designed thoroughly to test the pupil's judgment ; to bring into use his knowledge of the theory and applications of numbers ; to cultivate a habit of patient investigation and self-reliance ; to test the truth and accuracy of his own processes by proof—the only test he will have to depend upon in all the computations in real business transactions in after life ; in a word, to make him independent of the text-book, and of written rules and analysis.

Although the examples are promiscuous, yet there is a *general* classification of them, the work being divided into six chapters. The first chapter presents the Standards and

Tables of Weights and Measures; the second involves the applications of the Simple Rules of Arithmetic; the third embraces Common and Decimal Fractions; the fourth takes in Compound and Denominate Numbers; the fifth involves Percentage, in all its varied applications; and the sixth comprehends all other subjects properly belonging to this science. The examples in each chapter involve the combination and application of the principles and processes contained in the preceding ones, but not to any extent those of the following chapters. Classes, therefore, that, in regular course, have gone over the Simple Rules of Arithmetic only, will find in the second chapter of this book all they need in the way of supplementary examples for drill and review. Those who have finished, in any systematic treatise, the study of Fractions, will here have in chapter third proper exercises to try their skill in this part of the science; and so they may proceed by successive reviews, till the same searching test comes to be applied to every part of the subject.

Two editions are printed; one with answers at the close of the book, for the use of *teachers*, so that when different members of the same class obtain different results to the same example, he may decide which is correct, without being obliged to take the time necessary to solve or verify it himself. The other edition is without answers, and designed for the use of *classes*.

D. W. F.

NEW YORK, *July*, 1864. —



MEASURES.

CHAPTER I.

1. **Measure** is that by which extent, dimension, capacity, or amount is ascertained, determined according to some fixed standard.

NOTE.—The process by which the extent, dimension, capacity, or amount is ascertained, is called *Measuring*; and consists in comparing the thing to be measured with some conventional standard.

Measures are of seven kinds :

- 1. Length.
- 2. Surface or Area.
- 3. Solidity or Capacity.
- 4. Weight, or Force of Gravity.
- 5. Time.
- 6. Angles.
- 7. Money or Value.

The first three kinds may be properly divided into two classes—Measures of Extension and Measures of Capacity.

MEASURES OF EXTENSION.

2. **Extension** has three dimensions—length, breadth, and thickness.

A Line has only one dimension—length.

A Surface or Area has two dimensions—length and breadth.

I. LINEAR MEASURE.

3. **Linear Measure**, also called Long Measure, is used in measuring lines or distances.

TABLE.

12 inches (in.)	make 1 foot,	ft.
3 feet	“ 1 yard,	yd.
5½ yards, or 16½ feet,	“ 1 rod,	rd.
40 rods	“ 1 furlong,	fur.
8 furlongs, or 320 rods,	“ 1 statute mile,	mi.

The following denominations are also in use :

3	barleycorns	make	1 inch,	} used by shoemakers in measuring the length of the foot.
4	inches	"	1 hand,	
9	"	"	1 span,	} used in measuring the height of horses directly over the fore-feet.
21.888	"	"	1 sacred cubit.	
3	feet	"	1 pace.	
6	"	"	1 fathom,	} used in measuring depths at sea.
1.15 statute	miles	"	1 geographic mile,	
3	geographic	"	1 league.	} used in measuring distances at sea.
60	"	"	or	
69.16 statute	"	"	} 1 degree	} { of latitude on a meridian or of longitude on the equator.
360	degrees	"		

NOTE.—1. For the purpose of measuring cloth and other goods sold by the yard, the yard is divided into *halves, fourths, eighths, and sixteenths*. The old table of Cloth Measure is practically obsolete.

2. A span is the distance that can be reached, spanned, or measured between the end of the middle finger and the end of the thumb. Among sailors 8 spans are equal to 1 fathom.

3. The geographic mile is $\frac{1}{25}$ of $3\frac{1}{2}$ or $\frac{1}{25}$ of the distance round the center of the earth. It is a small fraction more than 1.15 statute miles.

4. The cubit was originally the length of a man's forearm and hand; or the distance from the elbow to the end of the middle finger.

5. The length of a degree of latitude varies, being 68.72 miles at the equator, 68.9 to 69.65 miles in middle latitudes, and 69.30 to 69.34 miles in the polar regions. The mean or average length, as stated in the table, is the standard recently adopted by the U. S. Coast Survey. A degree of longitude is greatest at the equator, where it is 69.16 miles, and it gradually decreases toward the poles, where it is 0.

SURVEYOR'S LINEAR MEASURE.

4. **A Gunter's Chain**, used by land surveyors, is 4 rods, or 66 feet long, and consists of 100 links.

TABLE.

7.92 inches (in.)	make	1 link,	l.
25 links	"	1 rod,	rd.
4 rods, or 66 feet,	"	1 chain,	ch.
80 chains	"	1 mile,	mi.

NOTE.—The denomination, rods, is seldom used in chain measure, distances being taken in chains and links.

II. SQUARE MEASURE.

5. **Square Measure** is used in computing areas or surfaces; as of land, boards, painting, plastering, paving, etc.

TABLE.

144 square inches (sq. in.)	make	1 square foot, sq. ft.
9 " feet	"	1 " yard, sq. yd.
30½ " yards	"	1 " rod, sq. rd.
40 " rods	"	1 " rood, R.
4 roods	"	1 acre, A.
640 acres	"	1 square mile, sq. mi.

Artificers estimate their work as follows :

By the square foot : glazing and stone-cutting.

By the square yard : painting, plastering, paving, ceiling, and paper-hanging.

By the square of 100 square feet : flooring, partitioning, roofing, slating, and tiling.

Bricklaying is estimated by the thousand bricks, by the square yard, and by the square of 100 square feet.

NOTES.—1. In estimating the painting of moldings, cornices, etc., the measuring-line is carried into all the moldings and cornices.

2. In estimating brick-laying by either the square yard or the square of 100 feet, the work is understood to be 12 inches or 1½ bricks thick.

3. A thousand shingles are estimated to cover 1 square, being laid 5 inches to the weather.

SURVEYORS' SQUARE MEASURE.

6. This measure is used by surveyors in computing the area or contents of land.

TABLE.

625 square links (sq. l.)	make	1 pole,	P.
16 poles	"	1 square chain, sq. ch.	
10 square chains	"	1 acre,	A.
640 acres	"	1 square mile, sq. mi.	
36 square miles (6 miles square)	"	1 township,	Tp.

NOTE.—1. A square mile of land is also called a *section*.

2. Canal and railroad engineers commonly use an engineers' chain, which consists of 100 links, each 1 foot long.

3. The contents of land are commonly estimated in square miles, acres, and hundredths; the denomination, *rood*, is rapidly going into disuse.