

ACES MATH: Mental Mathematics (II)

Course Description

This is the second part of a two-semester course on mathematics before prealgebra. There are three main components in this course. The first component is to introduce fundamental laws of arithmetics of integers, including for instance rules for mixed operations. The second component is to introduce fundamental skills, based on the laws of algebra, in fast calculation. The third component is to introduce some fundamental concepts in number theory, such as quotient, remainder, least common multiple and greatest common factor etc, that will be useful in a pre-algebra class. The main objective for the students is to build a solid foundation on arithmetics of multi-digit integers.

Prerequisite. Students taking this course should have taken ACES mathematics course: Mental Mathematics (I). A placement test is required for anyone who did not take the prerequisite course.

Textbooks. This course is mostly based on a set of lecture notes we developed in ACES. No textbook is required.

Main Topics. The main topics of this course include: review of arithmetic operations, rules of mixed operations, the use of various versions of distributive laws for fast calculation, various techniques for estimating large products and divisions, the philosophy of divide and conquer in fast calculation, fundamental concepts in number theory.

Philosophy. Learning mathematics is very similar to learning to play piano: you can not learn anything unless you practice a lot, and if you practice a lot you will be good at it. There is no other secrets here. Therefore, we will have a large (but still reasonable) amount of homework for the students after each lecture.

Communications. Students and their parents are encouraged to communicate with the instructor on issues directly related to the course, through the email address aces.math.info@gmail.com; For other issues related to the ACES after school program, please email aces4kidsinfo@gmail.com .

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Lecture Plan

There are 24 lectures spread in 12 weeks. Here is a rough plan for the lectures. There might be minor changes on the plan based on students' feedback. Those changes will be announced in class.

- Lecture # 01: Review of arithmetics of integers;
- Lecture # 02: Review of arithmetics of fractions;
- Lecture # 03: Decimals I;
- Lecture # 04: Decimals II;
- Lecture # 05: Decimals III;
- Lecture # 06: Decimals IV;
- Lecture # 07: Decimals V;
- Lecture # 08: Decimals VI;
- Lecture # 09: Ratio and percent I;
- Lecture # 10: Ratio and percent II;
- Lecture # 11: Ratio and percent III;
- Lecture # 12: Ratio and percent IV;
- Lecture # 13: Ratio and percent V;
- Lecture # 14: Ratio and percent VI;
- Lecture # 15: Relations between fractions, decimals, ratios and percents I;
- Lecture # 16: Relations between fractions, decimals, ratios and percents II;
- Lecture # 17: Perimeter, area and volume of basic shapes I;
- Lecture # 18: Perimeter, area and volume of basic shapes II;
- Lecture # 19: Perimeter, area and volume of basic shapes III;
- Lecture # 20: One-step variable solutions I;
- Lecture # 21: One-step variable solutions II;
- Lecture # 22: One-step variable solutions III;
- Lecture # 23: One-step variable solutions IV;
- Lecture # 24: **Final Exam**;