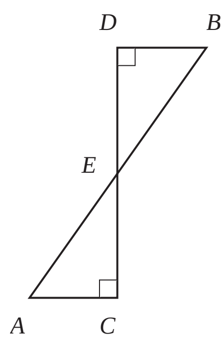
GEK1536, Computation and Machine, Tutorial 3
(For week 5, 6 Feb 06)

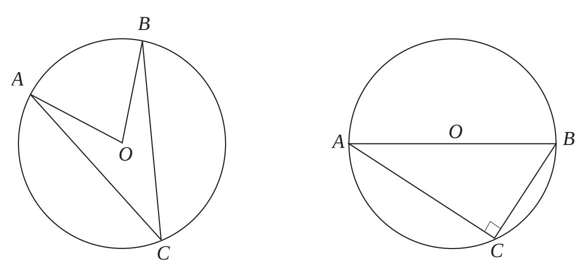
1. Do the addition or subtraction in the Babylonian notation. After you have done so, translate all the numbers involved into Hindu-Arabic decimal notation:
   (a) 𒎙 𒐖 + 𒌋𒁹 (b) 𒌍𒁹 + 𒁹 𒌍𒐖 (c) 𒌍𒐗 𒌋 − 𒎙𒐗

2. Multiply or divide the following Babylonian numbers, using our decimal notation separated by comma for digits and semicolon for the sexagesimal point. For division, use the reciprocal table in lecture 2.
   (a) [23] × [4] (b) [1, 20] × [0 ; 30]
   (c) [23, 18] ÷ [20] (d) [1; 30] ÷ [1; 12]

3. Prove the following Euclidean geometry problem (state clearly all the reasons of your deduction). In the accompanying figure, straight lines <u>*AB*</u> and <u>*CD*</u> intersect at point *E*. The angles at *C* and *D* are right angles. Prove that angle $\angle A$ and $\angle B$ are equal using the fact that lines <u>*AC*</u> and <u>*DB*</u> are parallel. (How do we know they are parallel?) Now prove that $\angle A$ and $\angle B$ are equal without using the parallelism of lines <u>*AC*</u> and <u>*DB*</u>. Is the conclusion that angles $\angle A$ and $\angle B$ are equal valid if Euclid's fifth postulate is false? [You can use any of the theorems that have been proven in the lectures].

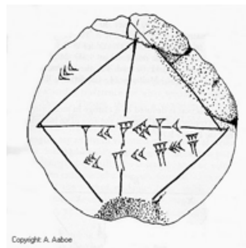


4. Consider a circle centered at *O*. The angle $\angle O$ and $\angle C$ span the same arc *AB*, as shown in the figure. (a) Show that $\angle O = 2\,\angle C$, that is, the angle from the center to the point *A* and *B* is twice as large as the angle starting from a point on the circle but outside arc *AB*. (b) Using this result, show that the triangle inscribed in a half circle is a right triangle.



Home Work (*hand in the following week tutorial*)

5. (**Homework**) On the YBC 7289 tablet, the side is marked with 𒌍 for 30. (a) Interpret the top line on the diagonal as [1 ; 24, 51, 10] and the bottom line as [42 ; 25, 35], translate the two base-60 numbers into decimal.



(b) Compute [1 ; 24, 51, 10] × [30], in sexagesimal, and show that it is exactly equal to the bottom number [42 ; 25, 35].

6. (**Homework**) Read the Euclid's *Elements* book I, proposition 47 (an online version is available at http://aleph0.clarku.edu/~djoyce/java/elements/bookI/propI47.html). Understand the proof steps of the Pythagoras theorem thoroughly. Reproduce this proof as a hand-in of this homework, written with a modern notation/language more familiar to you. State clearly the ideas involved and facts used. The following figure will be helpful.