

Assignment 2
Math 105 History of Mathematics
Prof. D. Joyce, Spring 2017

Assignment 2. Due Friday, Feb 3. On ancient Babylonian mathematics. Exercises from the text on page 29.

17. Convert the fractions $7/5$, $13/15$, $11/24$, and $33/50$ to sexagesimal notation.

18. Convert the sexagesimal fractions $0;22,30$, $0;08,06$, $0;04,10$, and $0;05,33,20$ to ordinary fractions in lowest terms.

19. Find the reciprocals of 18, 32, 54, and 64 (=1,04) in base 60. (Don't worry about initial zeros since the Babylonians didn't.)

Suggestion. Build up your reciprocal table in steps. For example, to get the reciprocal of 18, find first reciprocals of 2, 6, and then 18 (or 3, 9, and then 18).

20. In the Babylonian system, multiply 25 by 1,04 and 18 by 1,21 Divide 50 by 18 and 1,21 by 32 (using reciprocals). Use our standard multiplication algorithm modified for base 60.

24. Determine the accuracy of the Babylonian approximation $1;24,51,10$ of $\sqrt{2}$. Do that by converting that fraction to base 10 to see how many digits it agrees with 1.414213562373095.

25. Use the assumed Babylonian square root algorithm of the text to show that the square root of 3 is about $1;45$ by beginning with the value 2. Find a three-sexagesimal-place approximation to the reciprocal of $1;45$ and use it to calculate a three-sexagesimal-place approximation to the square root of 3.

The method says starting with an approximate root a of n , a better approximation would be $a + b/(2a)$ where $b = n - a^2$. If we use a little modern algebra, we can simplify the expression for the better approximation to $\frac{a + n/a}{2}$, that is, the average of a and n/a .

28. Solve the problem from the Old Babylonian tablet BM 13901: The sum of the areas of two squares is 1525. The side of the second square is $2/3$ that of the first plus 5. find the sides of each square. (You may use modern methods to find the solution.)

Math 105 Home Page at <http://math.clarku.edu/~djoyce/ma105/>