

Solution of Problem 2

All Arabic words in the problem are made according to one of the patterns $1a2a3t$, $i12\bar{a}3$, $1u23$ and $1u23\bar{e}n$ (whereby words using the first and the second pattern always come together in this order and words using the other two patterns occur on their own). In these patterns 1-2-3 is one of the triples of consonants r - b - ς , s - b - ς , s - d - s , t - l - t , t - m - n , t - s - ς , x - m - s , ς - \bar{s} - r . Let us assume that the consonant triples correspond to numbers between 1 and 10 and the arrangements of the vowels indicate certain functions, in particular, $1a2a3t$ $i1'2'\bar{a}3'$ is either $\frac{n}{n'}$ or $\frac{n'}{n}$ (and in either case $xamast$ $ixm\bar{a}s = \frac{n}{n} = 1$), and $1u23 = \frac{i}{n}$ and $1u23\bar{e}n = \frac{j}{n}$, for some as yet unknown i and j .

From equality (5) we see that s - b - ς and x - m - s are 5 and 7 (in one order or the other), and from $\frac{j}{5} + \frac{j}{7} = \frac{(7+5)j}{35} = \frac{24}{35}$ it follows that $j = 2$, that is, $1u23\bar{e}n = \frac{2}{n}$. Since $1u23$ is shorter than $1u23\bar{e}n$, we can assume that this pattern corresponds to a more basic function, and the only candidate for such a one is $\frac{1}{n}$.

From (1) it follows that t - l - t is 3 (and that the numerator precedes the denominator in the Arabic fractions). From (4) we see that t - m - n is greater than s - b - ς by one. From (3) it follows that $3s$ - d - $s = 2t$ - s - ς . Thus t - s - ς is divisible by three. Since the value 3 is already taken, t - s - ς and s - d - s are either 6 and 4 or 9 and 6, respectively, and t - m - n , s - b - ς and x - m - s are respectively 8, 7 and 5.

We have yet to use equality (2). Letting s - d - s be equal to 4 gets us nowhere ($\frac{7}{3} + \frac{1}{4} = \frac{31}{12}$ can't be reduced to a fraction with a numerator and denominator between 1 and 10), consequently s - d - $s = 6$, and $\frac{7}{3} + \frac{1}{6} = \frac{15}{6} = \frac{5}{2} = \frac{10}{4} = \varsigma$ - \bar{s} - r / r - b - ς . (The root r - b - ς '4' is the source of the word *rubā'i* 'quatrain', used also in English.)

Assignment 1. (1) $\frac{1}{8} + \frac{2}{8} = \frac{3}{8}$, (2) $\frac{7}{3} + \frac{1}{6} = \frac{10}{4}$, (3) $\frac{2}{9} + \frac{1}{9} = \frac{2}{6}$, (4) $\frac{5}{5} + \frac{1}{7} = \frac{8}{7}$, (5) $\frac{2}{7} + \frac{2}{5} = \frac{24}{35}$.

Assignment 2. $rub\varsigma + \varsigma a\bar{s}art\ its\bar{a}\varsigma = \frac{1}{4} + \frac{10}{9} = \frac{49}{36}$ and $saba\varsigma t\ isd\bar{a}s = \frac{7}{6}$. Thus either $\sqrt{rub\varsigma + \varsigma a\bar{s}art\ its\bar{a}\varsigma} = saba\varsigma t\ isd\bar{a}s$ or, perhaps, $rub\varsigma + \varsigma a\bar{s}art\ its\bar{a}\varsigma = (saba\varsigma t\ isd\bar{a}s)^2$ (if we don't consider brackets to be a sign).