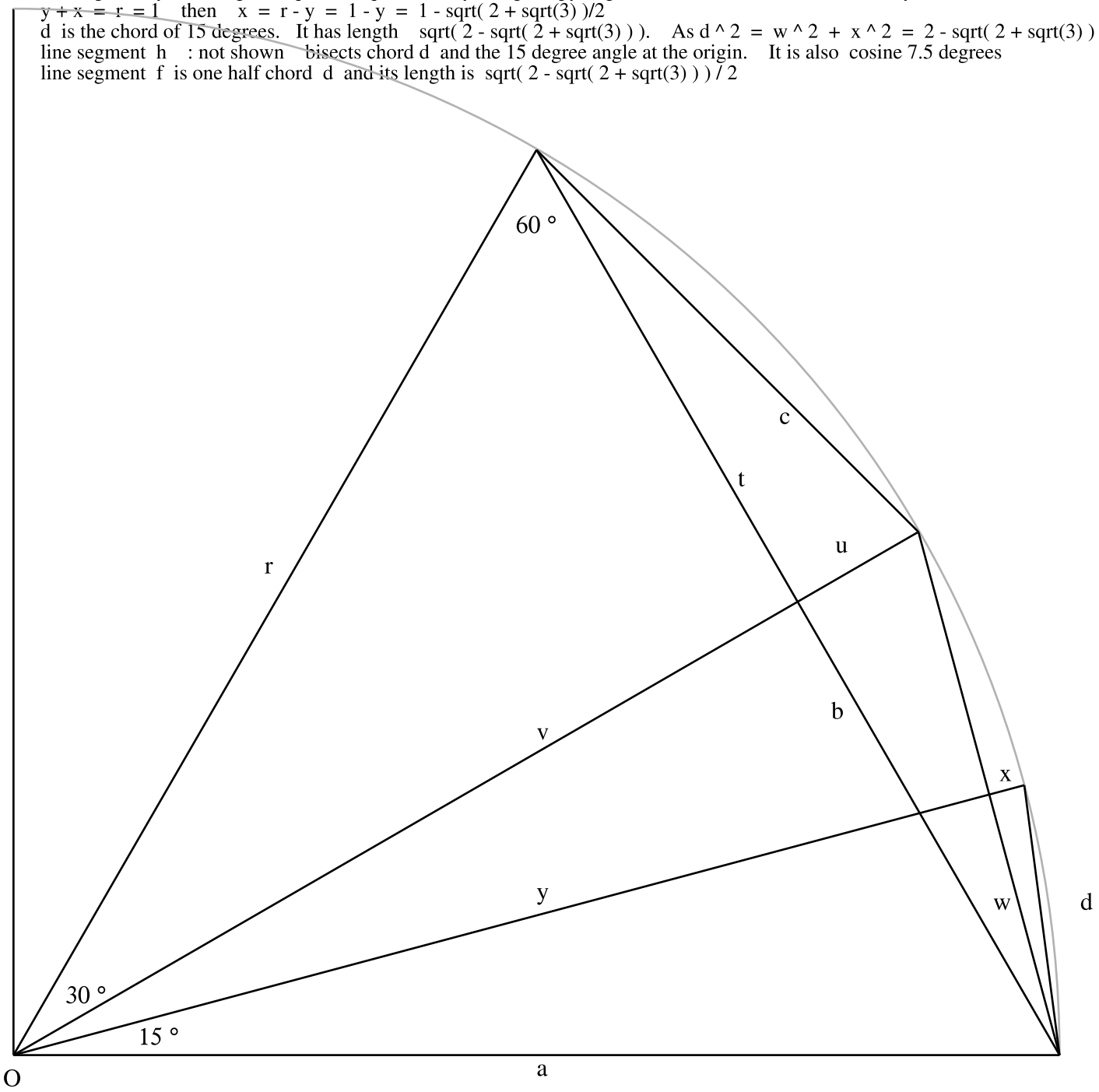
Trigonometric ratios for 60, 30 and 15 degree arcs

a is a radius of a unit circle as is r. Their lengths are 1 unit
b is the chord of 60 degrees and is of radius length i.e. a = b = r = 1 Note that a, b and r form an equilateral triangle
line segment v bisects chord b and the 60 degree angle at the origin It is also cosine 30 degrees
line segment t is one half chord b and its length is one half. It is also sine 30 degrees
line segment v has length sqrt(3)/2 by using the pythagorean theorem r ^ 2 = t ^ 2 + v ^ 2
Since the radius r = 1 and v + u = r then u = r - v = 1 - v = 1 - sqrt(3)/2
c is the chord of 30 degrees. It has length sqrt(2 - sqrt(3)). As c ^ 2 = t ^ 2 + u ^ 2 = 2 - sqrt(3)
line segment y bisects chord c and the 30 degree angle at the origin It is also cosine 15 degrees
line segment w is one half chord c and its length is sqrt(2 - sqrt(3)) / 2 It is also sine 15 degrees
line segment y has length sqrt(2 + sqrt(3))/2 by using the pythagorean theorem r ^ 2 = w ^ 2 + y ^ 2
y + x = r = 1 then x = r - y = 1 - y = 1 - sqrt(2 + sqrt(3))/2
d is the chord of 15 degrees. It has length sqrt(2 - sqrt(2 + sqrt(3))). As d ^ 2 = w ^ 2 + x ^ 2 = 2 - sqrt(2 + sqrt(3))
line segment h : not shown bisects chord d and the 15 degree angle at the origin. It is also cosine 7.5 degrees
line segment f is one half chord d and its length is sqrt(2 - sqrt(2 + sqrt(3))) / 2