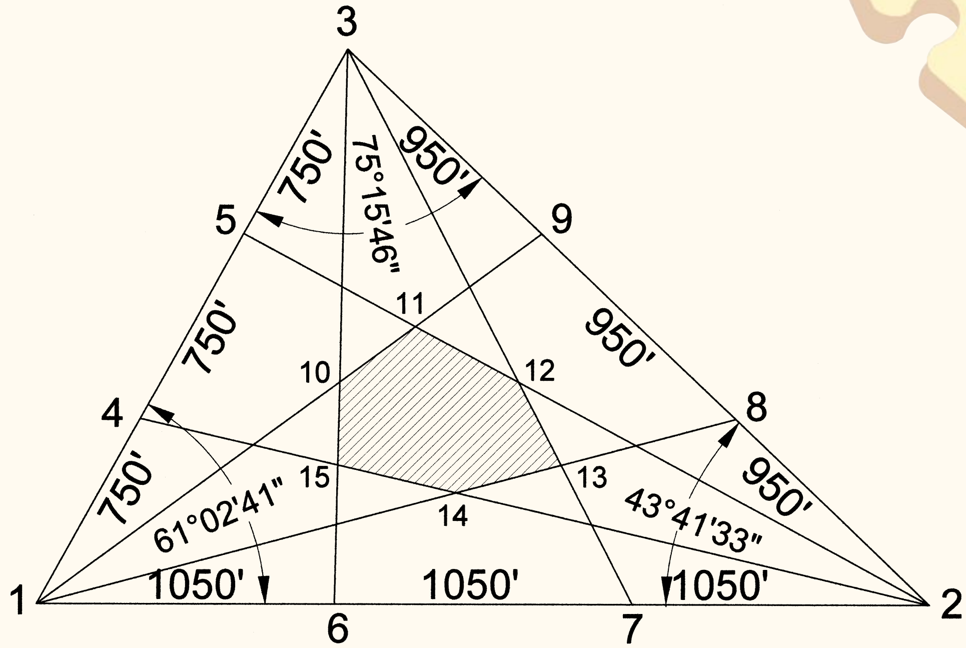
Solution to Problem 115



First, solve for the angles of the triangle A-B-C by the Law of Cosines: angle A = 61°02′41″, angle B = 75°15′46″, angle C = 43°41′33″.

Let A be point #1 with North 0, East 0 and C be point #2 with North 0, East 3150, and other points as noted in the diagram. By distance-distance intersection, B (point #3) = North 1968.7453, East 1089.2860.

Points #4 and #5 lie at N 28°57′19″ E 750′ and N 28°57′19″ E 1500′ from point #1 at North 656.2484, East 363.0953 and North 1312.4969, East 726.1907, respectively.

Points #6 and #7 lie at North 0, East 1050 and North 0, East 2100.

Points #8 and #9 lie at N 46°18′27″ W 950′ and N 46°18′27″ W 1900′ from point #2 at North 656.2484, East 2463.0953 and North 1312.4969, East 1776.1907.

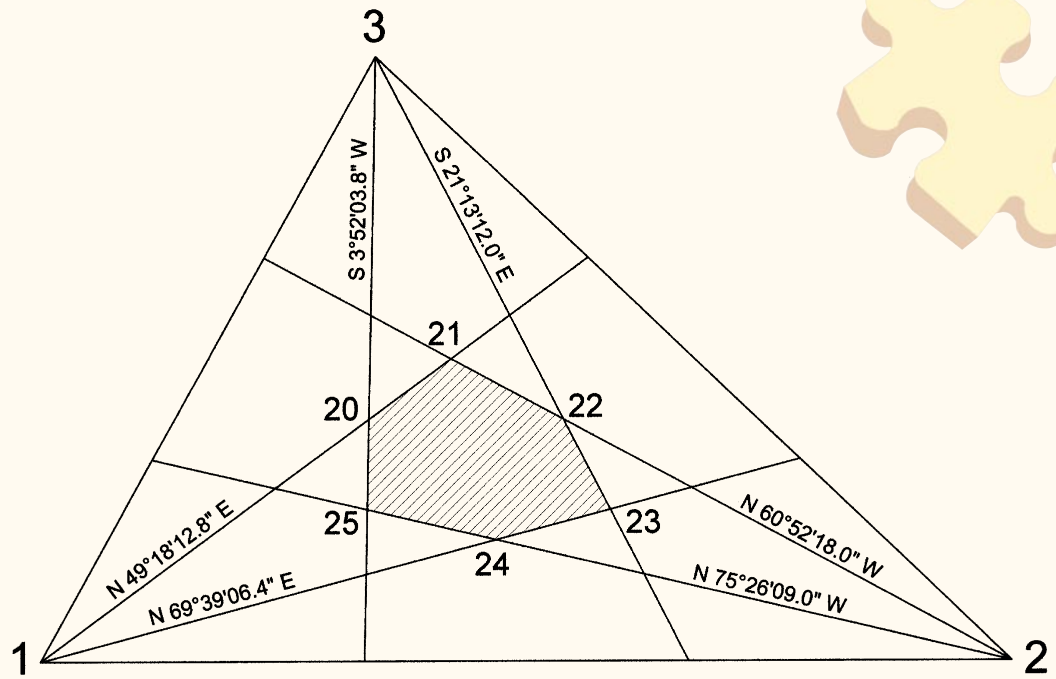
By inverse, line #1–#9 = N 53°32′16″ E, line #1–#8 = N 75°04′52″ E, line #2–#4 = N 76°44′59″ W, line #2–#5 = N 61°33′52″ W, line #3–#6 =S°08′35″W and line #3–#7 = S 27°10′30″ E.

By bearing-bearing or azimuth-azimuth intersections, point #10 = North 787.5020, East 1065.7167, point #11 = North 984.3723, East 1332.1388, point #12 = North 787.4964, East 1695.7136, point #13 = North 492.1860, East 1847.3197, point #14 = North 393.7474, East 1477.8508 and point #15 = North 494.1818, East 1059.8242.

By the method of Problem No. 92 or breaking the hexagon into four triangles, the area is 310,077.3 sq. ft. Since the area of the large triangle is 3,100,773.2 sq. ft., the hexagon is 1/10 the area of the large triangle.

(This can be shown to be EXACTLY 1/10 by Morgan's theorem, where the area of the center hexagon is $8 / (3n+1)(3n-1)$ relative to the original triangle if n is an odd number of segments.)

Solution to Problem 116



Again, solve for the angles of the triangle A-B-C by the Law of Cosines: angle A = 61°02′41″, angle B = 75°15′46″, angle C = 43°41′33″.

Let A be point #1 with North 0, East 0 and C be point #2 with North 0, East 3150, and other points as noted in the diagram. By distance-distance intersection, B = North 1968.7453, East 1089.2860.

Points #24 and #23 lie on a line bearing N 69°39′06.4″ E.

Points #20 and #21 lie on a line bearing N 49°18′12.8″ E.

Points #24 and #25 lie on a line bearing N 75°26′09.0″ W.

Points #22 and #21 lie on a line bearing N 60°52′18.0″ W.

Points #20 and #25 lie on a line bearing S 3°52′03.8″ W.

Points #22 and #23 lie on a line bearing S 21°13′12.0 E.

By bearing-bearing or azimuth-azimuth intersections, point #20 = North 873.1116, East 1015.2133, point #21 = North 1065.1573, East 1238.5151, point #22 = North 921.7915, East 1495.7931, point #23 = North 600.9441, East 1620.3705, point #24 = North 481.2613, East 1297.6609 and point #25 = North 560.1422, East 994.0543.

By the method of Problem No. 92 or breaking the hexagon into four triangles, the area is 249,313.4 sq. ft. Since the area of the large triangle is 3,100,773.2 sq. ft., the hexagon is 8.04% of the large triangle.