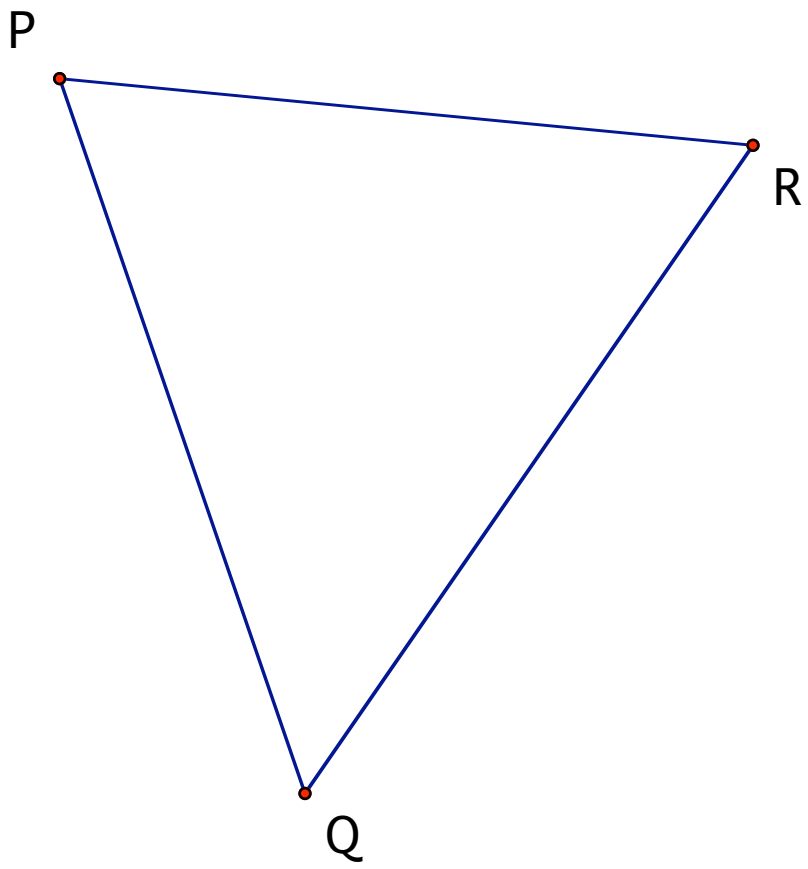
# Construction Portfolio #4

## *27. Altitudes*

Construct the 3 altitudes and the orthic triangle of triangle PQR. (The orthic triangle is the triangle formed by the feet of the altitudes.)



## *28. Half Regular Tetrahedron*

Construct a net for half a regular tetrahedron. Specifically, this will be the net for a tetrahedron formed by cutting in two a regular tetrahedron with edge length s, cutting along one of its planes of symmetry.

## *29. Square-based Pyramid (corner vertex)*

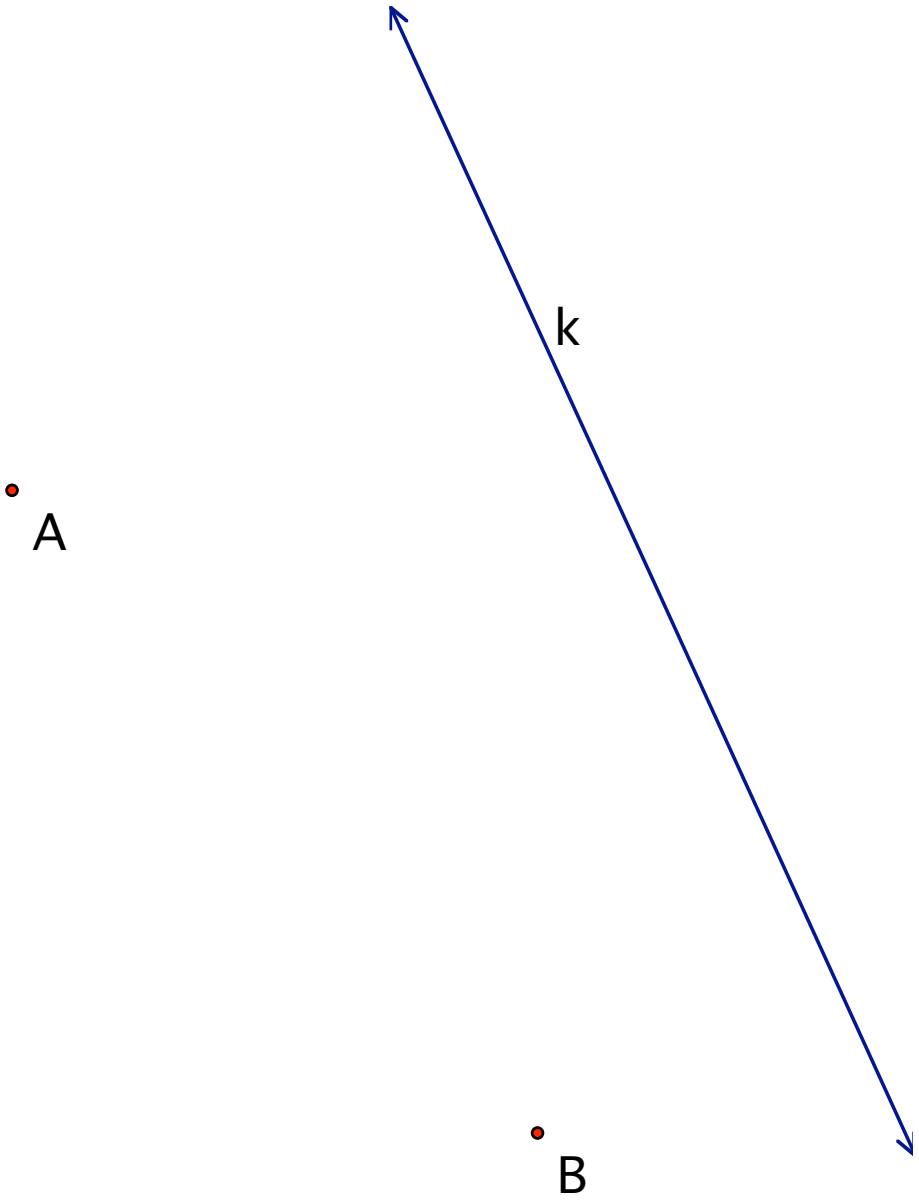
Construct a net for a square-based pyramid ABCDE. The square base ABCD has side length s and the top vertex E is placed so that AE is perpendicular to the plane of ABCD, with AE = s.

## *30. Square-based Pyramid (center vertex)*

Construct a net for a square based pyramid ABCDE formed from one square face ABCD of a cube of side s and E, the center of the cube.

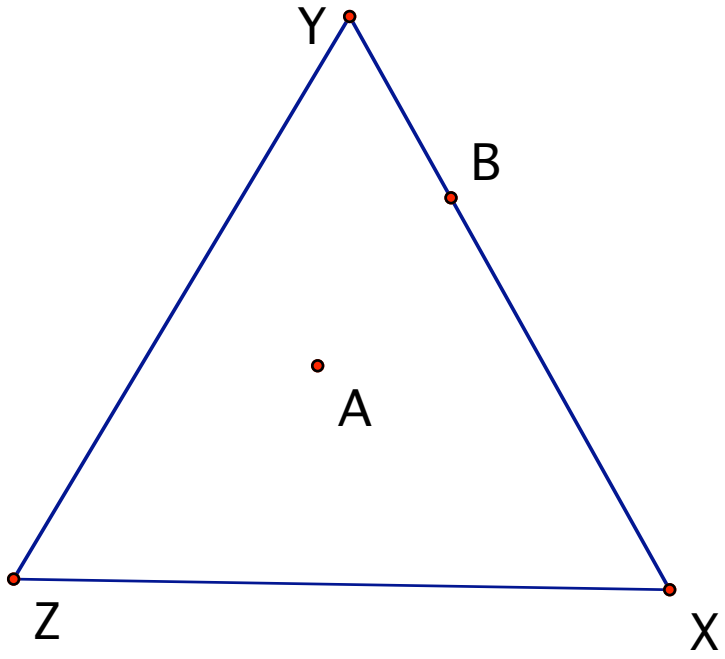
### *31. Light Path*

Construct a point C on line k so that the path from A to C to B is the shortest possible. Specifically, the sum of lengths AC + CB should be smaller than for any other point C on k. This is the path a beam of light would take from A to B if reflected off a mirror k.



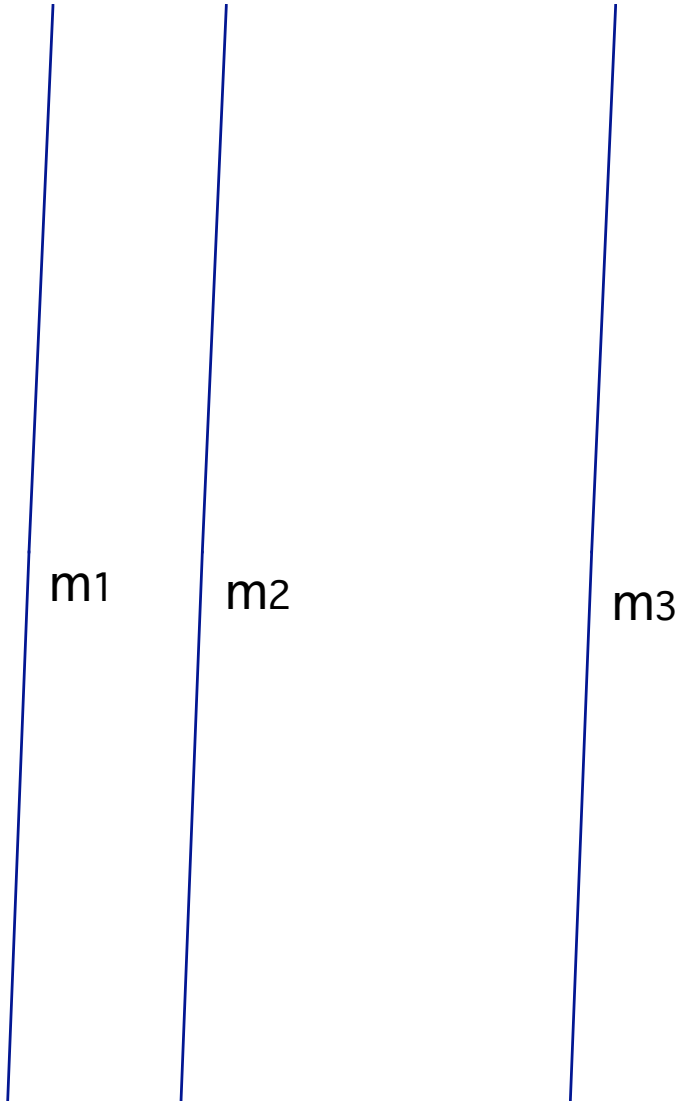
## *32. Triangular Billiards*

Imagine that XYZ is a triangular billiard table. Construct the path of a billiard ball that is banked first off side XZ and then off side YZ before it reaches B.



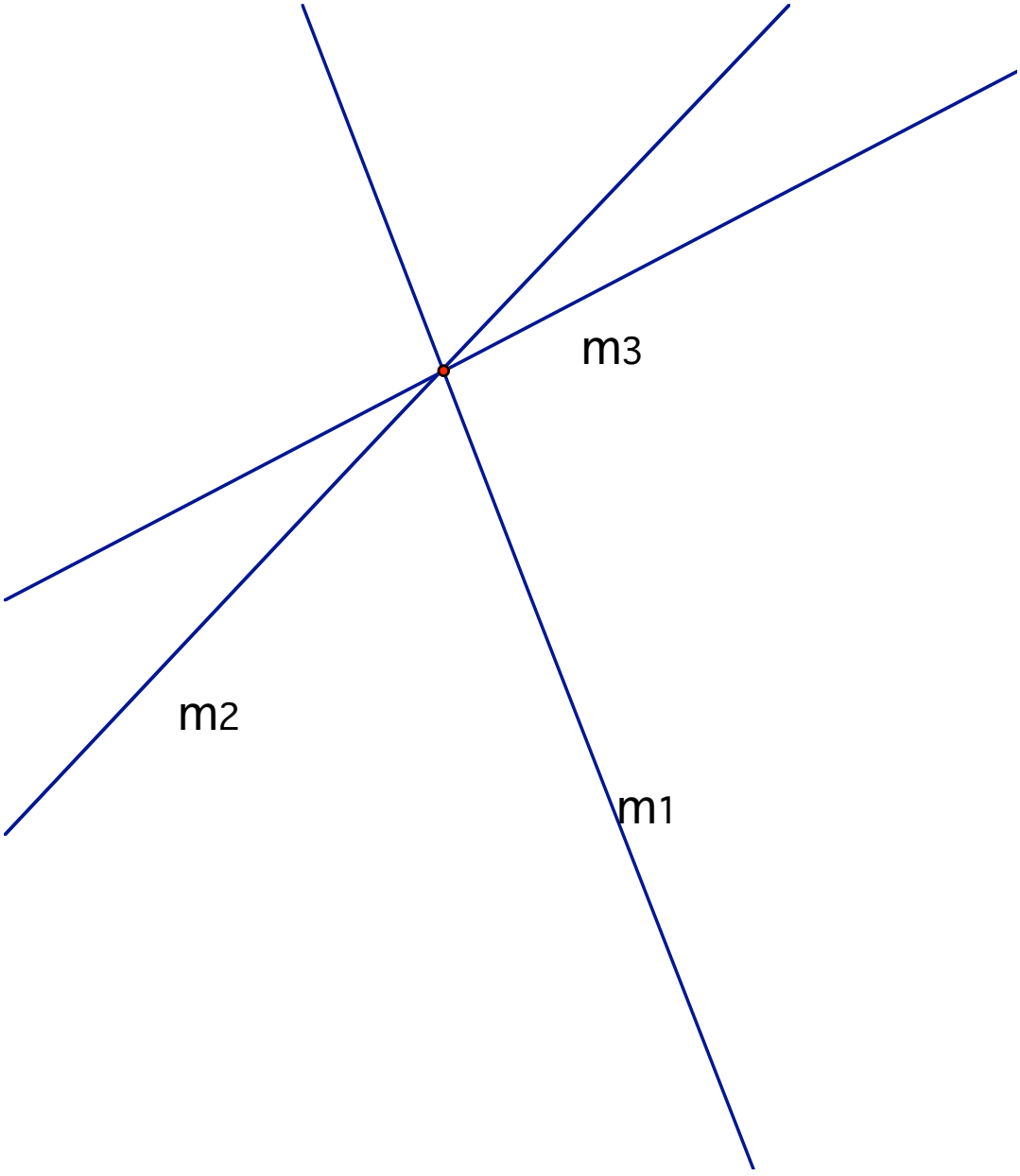
## *33. Triple Line Reflection (parallels)*

Let reflection in parallel lines m1, m2, m3 be M1, M2, M3. Construct a line n so that reflection in n is the same transformation as the composition M3 M2 M1.



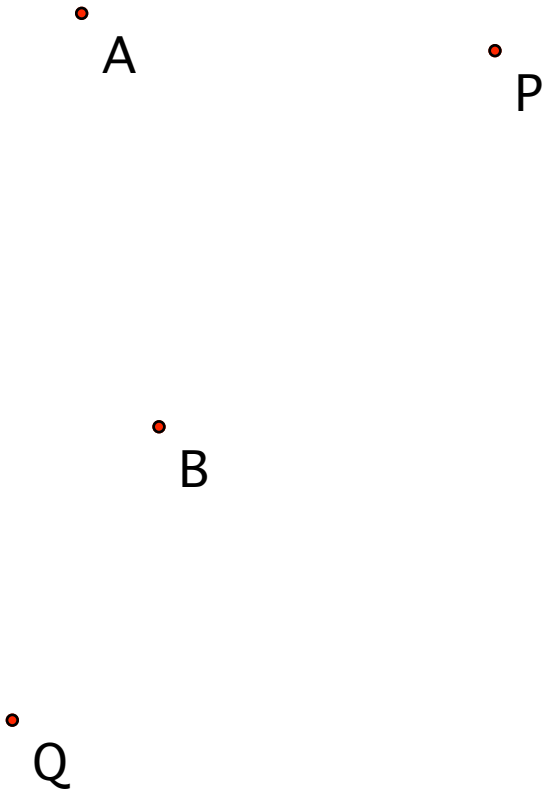
### *34. Triple Line Reflection (concurrent)*

Let reflection in concurrent lines m1, m2, m3 be M1, M2, M3. Construct a line n so that reflection in n is the same transformation as the composition M3 M2 M1.



## *35. Composition of two point symmetries*

Given the points A and B, let $H_A$ and $H_B$ denote the point reflections with centers A and B. Let S be the composition $H_B$ $H_A$. Construct points P' = S(P) and Q' = S(Q).



## *36. Barycentric Coordinates*

In this triangle, construct the point P with barycentric coordinates 1/3, 1/6, 1/2. Also, construct the point Q with barycentric coordiantes x, y, z, where the segment EF has length 1.