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projection of right angle

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Theorem. The <http://planetmath.org/ProjectionOfPointprojection> of a right angle in \mathbb{R}^3 onto a plane is a right angle if and only if at least one of its sides is parallel to the plane.

Proof. Consider the projection of an angle α with <http://planetmath.org/Anglevertex> P onto the plane π . Let P' be the projection of P onto π . If neither of the sides of α is parallel to π , then the lines of the sides intersect the plane in two distinct points A and B . In order to that the angle of view of the segment AB seen from the point P would be a right angle, P must be on a sphere with diameter AB centered at a point O . In order to that the projection angle $AP'B$ would be a right angle, the point P' must be on a circle of the plane π having AB as diameter. But OP' is as the projection of the segment OP shorter than OP . It follows that the angle $AP'B$ is obtuse and hence cannot be right.

On the other hand, it's not hard to see that the projection of a right angle is a right angle always when one or both of its sides are parallel to the projection plane.

References

- [1] E. J. NYSTRÖM: *Korkeamman geometrian alkeet sovellutuksineen*. Kustannusosakeyhtiö Otava, Helsinki (1948).