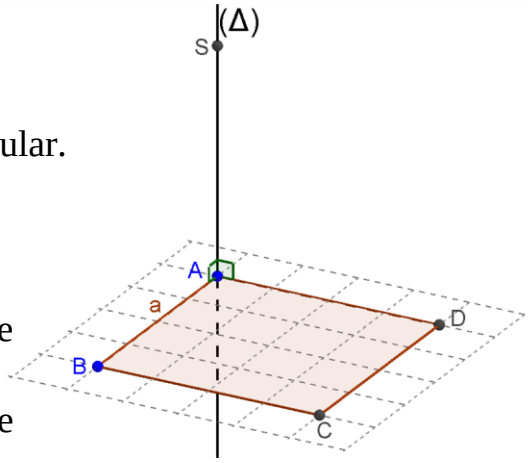
Al- Mahdi High	Mathematics	11th-Grade
Name:	Orthogonality in space	W.S-7.

I- Consider the tetrahedron $ABCD$ in which (AC) is perpendicular to (BCD) where the triangle BCD is right at B. (***Mastering, P:113, Ex:9***)

1. Prove that (BD) is perpendicular to (ABC). What can you say about triangle ABD?
2. In triangle ABC, let $[CE]$ be the height relative to $[AB]$, and $[CF]$ be the height relative to $[AD]$ in triangle ACD. Prove that:
   a. (CE) and (ABD) are perpendicular.
   b. (AF) is perpendicular to (CEF).
3. Let I, M & J be the respective midpoints of the edges $[AD], [DC]$ & $[CB]$ and suppose that $AC = BD$.
   a. What is the nature of the triangle IJM ? Justify.
   b. Deduce the measure of the angle between the lines (AC) & (IJ).
   c. Calculate the measure of AC in terms of a, such that $IJ = \dfrac{a\sqrt{2}}{2}$.

II- Consider the plane (p) formed by the square $ABCD$ of side $a\,cm$, and let S be any point on the straight line (Δ), the perpendicular to (p) at A, so that $SA = a\,cm$.



1- Reproduce the figure and complete when necessary.
2- What does the formed solid represent?
3- a) Prove that the triangle SBC is right and not isosceles.
   b) Deduce that the planes (SAB) and (SBC) are perpendicular.
4- Let O be the center of $ABCD$.
   a. Calculate the exact values of SD & SC.
   b. Deduce the nature of the triangle SBD.
   c. Determine the tangent of the angle formed by the planes (SBD) and (ABC).
5- Let I be the midpoint of $[SC]$ and N be any point of the plane (BID).
   Prove that N is equidistant from the points A & C.
6- a) Let J be a point of the space such that (JC) is orthogonal to (BI) and (DI). Prove that the points A, C & J are collinear.
   b) Calculate $\cos\alpha$, where α is the angle formed by (SC) & (ABD)