


$$BD : DC = AB : AE = AB : AC \quad \text{E.O.S}$$

$$\text{Ex 7 } CD = BC \times \frac{b}{c-b} = \frac{ab}{c-b} \quad \text{Ex 3}$$

$$\cos(180^\circ - \theta) = \frac{a^2 + b^2 - c^2}{2ab} \quad \text{--- काँस}$$

$$\cos \theta = - \frac{a^2 + b^2 - c^2}{2ab} \quad \text{E 23}$$

$$\begin{aligned}
 (3) \quad AD^2 &= AC^2 + CD^2 - 2AC \cdot CD \cos \theta \\
 &= b^2 + \left(\frac{ab}{c-b} \right)^2 - 2b \times \frac{ab}{c-b} \times \left(- \frac{a^2 + b^2 - c^2}{2ab} \right) \\
 &= b^2 + \frac{a^2 b^2}{(c-b)^2} + \frac{b(a^2 + b^2 - c^2)}{c-b} \\
 &= b \times \frac{b(c-b)^2 + a^2 b + (c-b)(a^2 + b^2 - c^2)}{(c-b)^2} \\
 &= b \times \frac{(c-b)(bc - b^2) + (c-b)(a^2 + b^2 - c^2) + a^2 b}{(c-b)^2} \\
 &= b \times \frac{(c-b)(bc - b^2 + a^2 + b^2 - c^2) + a^2 b}{(c-b)^2}
 \end{aligned}$$

$$\begin{aligned}
AD^2 &= \frac{b \{ (c-b)(bc+a^2-c^2) + a^2b \}}{(c-b)^2} \\
&= \frac{b(b^2c - b^2c + a^2c - \cancel{a^2b} - c^3 + bc^2 + \cancel{a^2b})}{(c-b)^2} \\
&= \frac{bc(bc - b^2 + a^2 - c^2 + bc)}{(c-b)^2} \\
&= \frac{bc \{ a^2 - (b^2 + c^2 - 2bc) \}}{(c-b)^2} \\
&= \frac{bc \{ a^2 - (b-c)^2 \}}{(c-b)^2} \\
&= \boxed{\frac{bc(a+b-c)(a-b+c)}{(b-c)^2}}
\end{aligned}$$