Adding auxiliary lines: Student worksheet

http://topdrawer.aamt.edu.au/Geometric-reasoning/Misunderstandings/Revealing-the-invisible/Adding-auxilliary-lines

For each of the problems below it will be necessary to construct auxiliary lines in order to prove the required result.

1. In the diagram below, \( AB \parallel ED \). Prove that \( b = a + c \).

2. Prove that the angle in a semicircle is a right angle. Aim: To prove \( \angle ACB = 90^\circ \).

3. Prove that the angle at the centre is twice the angle at the circumference standing on the same arc. Aim: To prove \( \angle AOB = 2 \times \angle ACB \).
4. In the quadrilateral $ABCD$, $AB = DC$ and $AB \parallel DC$. Prove that $ABCD$ is a parallelogram.

5. $\triangle PQR$ is right-angled isosceles triangle. $PX$ bisects $\angle RPQ$. Prove that $PQ = PR + RX$.

Challenges

1. The line $AB$ intersects three parallel lines, $PQ$, $UV$ and $XY$ at $R$, $W$ and $Z$ respectively. Also, line $DE$ intersects $PQ$, $UV$ and $XY$ at $F$, $G$ and $H$ respectively. Prove that $FG : GH = RW : WZ$.

2. In $\triangle PQR$, the bisector of $\angle PQR$ meets $PR$ at $X$. Prove that $\frac{PQ}{QR} = \frac{PX}{XR}$.