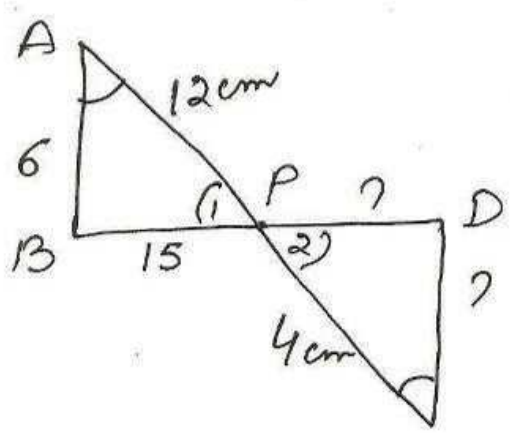
① 

$\angle 1 = \angle 2$ (vert. opp)

$\angle B = \angle C$ (given)

$\therefore \triangle ABP \sim \triangle CDP$ by AA. Cor.

$\frac{AB}{CD} = \frac{BP}{DP} = \frac{AP}{CP}$

$\frac{6}{CD} = \frac{15}{DP} = \frac{12}{4}$ (3)

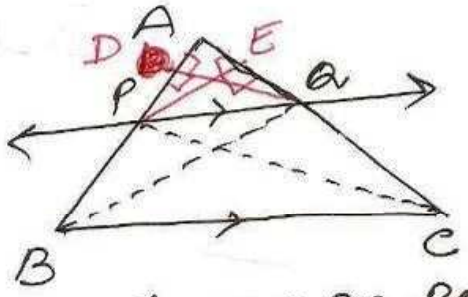
$\frac{6}{CD} = 3 \Rightarrow CD = 2$ cm

$\frac{15}{DP} = 3 \Rightarrow DP = 5$ cm

$\frac{5}{12} = \frac{BC}{15} = \frac{7}{EF}$

$\frac{BC}{15} = \frac{5}{12} \Rightarrow BC = \frac{25}{4}$ cm $= 6.25$ cm

$\frac{7}{EF} = \frac{5}{12} \Rightarrow EF = \frac{84}{5}$ cm $= 16.8$ cm

③ 

given In $\triangle ABC$, $PQ \parallel BC$ intersecting AB in P and AC in Q.

to prove $\frac{AP}{PB} = \frac{AQ}{QC}$

const - draw $DQ \perp AB$, $PE \perp AC$

Proof

$\frac{ar(\triangle APQ)}{ar(\triangle BPQ)} = \frac{\frac{1}{2} \times AP \times DQ}{\frac{1}{2} \times PB \times DQ}$

$= \frac{AP}{PB}$ ... (i)

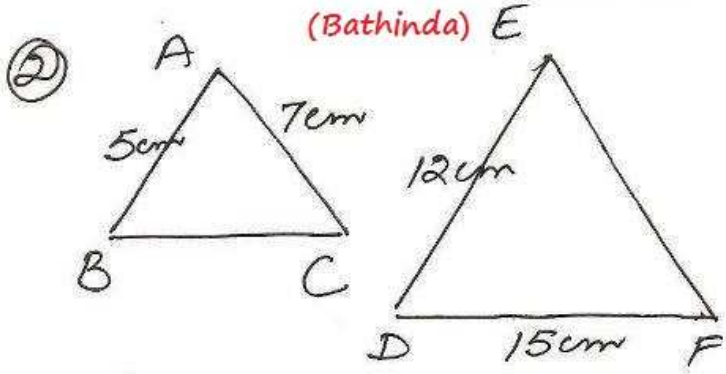
$\frac{ar(\triangle APQ)}{ar(\triangle CQP)} = \frac{\frac{1}{2} \times AQ \times EP}{\frac{1}{2} \times QC \times EP}$

$= \frac{AQ}{QC}$ ... (ii)

$ar(\triangle BPQ) = ar(\triangle CQP)$ ... (iii)

From (i), (ii), (iii)

$\frac{AP}{PB} = \frac{AQ}{QC}$

② 

Sol $\triangle ABC \sim \triangle EDF$

$\frac{AB}{ED} = \frac{BC}{DF} = \frac{AC}{EF}$