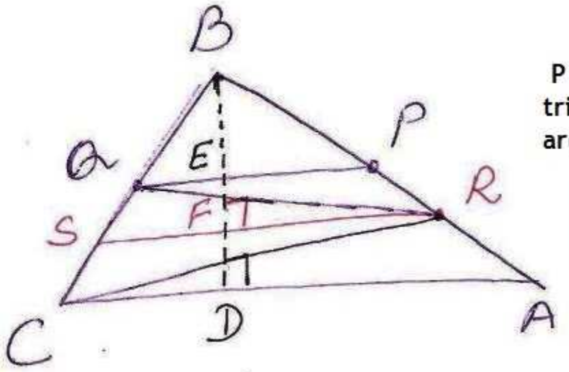
Solution by Dev Anoop (Bathinda)



P and Q are respectively the midpoints of sides AB and BC of triangle ABC and R is midpoint of AP, show that ar(PBQ) = ar(ARC), ar(PRQ) = 1/2 ar (ARC), ar(RQC) = 3/8 ar(ABC)

Construction: Join R with S the midpoint of QC, Draw BD perpendicular CA intersecting QP at E and SR at F

proof QP joins midpoints of sides BC and BA respectively of $\triangle BCA$

$QP \parallel CA$, $QP = \frac{1}{2} CA$ (Midpoint theorem)

In $\triangle BCD$, Q is midpt. of BC, $QE \parallel CD$ ($\because QP \parallel CA$)

$\therefore BE = ED$ (converse of midpoint theorem)

In trapezium CARS SR joins midpoints of legs

Line segment joining midpoints of legs of a trapezium is parallel to bases

$QP \parallel SR \parallel CA$

BD, BA are transversals

$PR = RA$

$\therefore EF = FD$ (equal intercept theorem)

let $EF = FD = x$

$BE = ED = x + x = 2x$, $BD = BE + ED = 2x + 2x = 4x$

$$\frac{ar(\triangle PBQ)}{ar(\triangle ARC)} = \frac{\cancel{\frac{1}{2}} \times QP \times BE}{\cancel{\frac{1}{2}} \times CA \times FD}$$

$$= \frac{QP \times 2x}{2QP \times x}$$

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