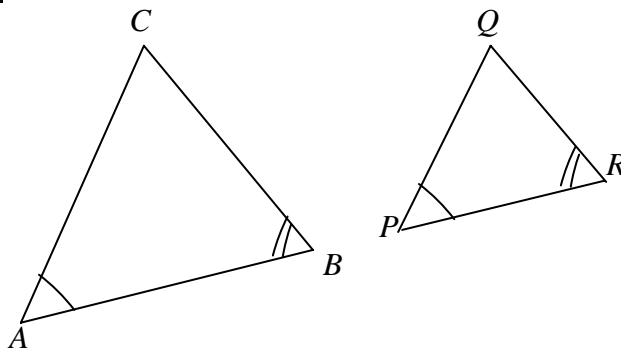


Conditions for Similarity between 2 Triangles

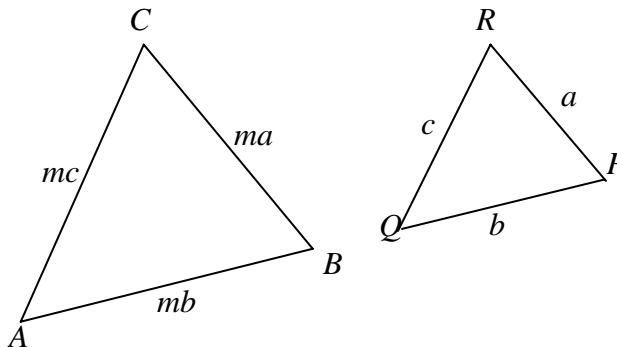
1. 3 equal angles (AAA)

In $\triangle ABC$ and $\triangle PRQ$,
 $\angle A = \angle P$, $\angle B = \angle R$ and $\angle C = \angle Q$
 Hence $\triangle ABC \sim \triangle PRQ$ (AAA)

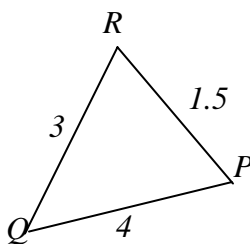
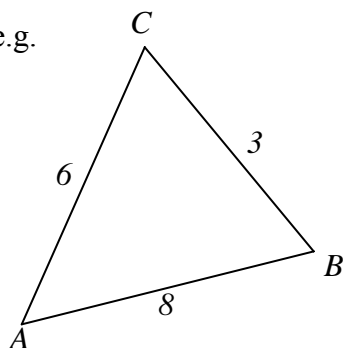


2. Ratio of 3 corresponding sides = m

In $\triangle ABC$ and $\triangle QPR$,
 $\frac{AB}{QP} = \frac{BC}{PR} = \frac{CA}{RQ} = m$,
 where m is a constant.
 Hence $\triangle ABC \sim \triangle QPR$



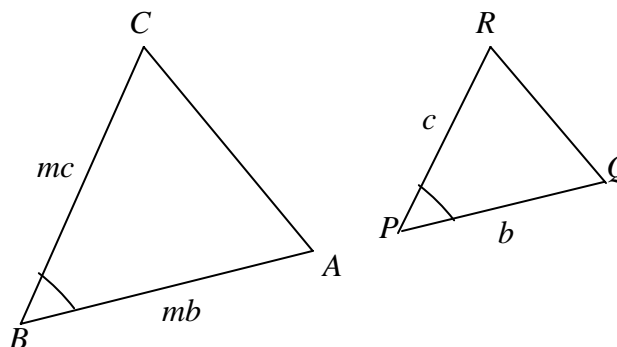
e.g.



$$\frac{8}{4} = \frac{3}{1.5} = \frac{6}{3} = 2$$

3. Ratio of 2 corresponding sides = m and *included* angle equal. (SAS)

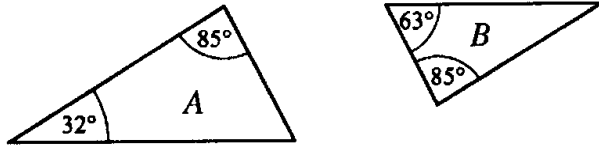
In $\triangle BAC$ and $\triangle PQR$,
 $\angle B = \angle P$ and $\frac{BA}{PQ} = \frac{BC}{PR} = m$
 where m is a constant.
 Hence $\triangle BAC \sim \triangle PQR$



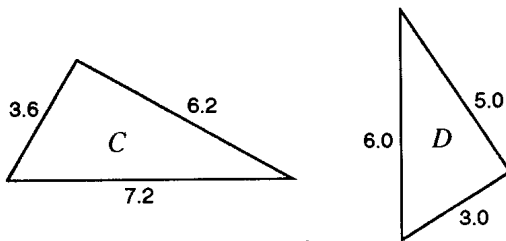
Exercise

Q1 For each pair of triangles, state whether they are similar. Explain your answer clearly.

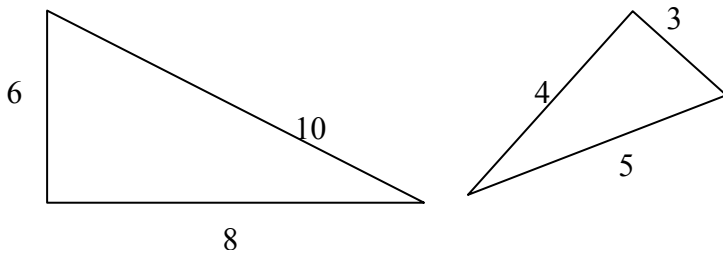
(a)



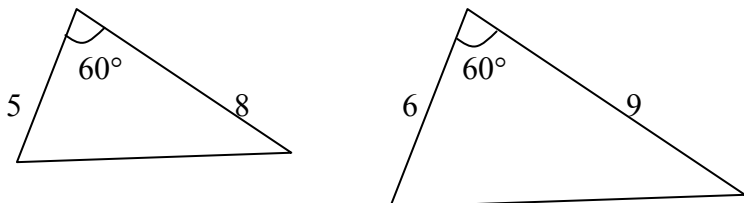
(b)



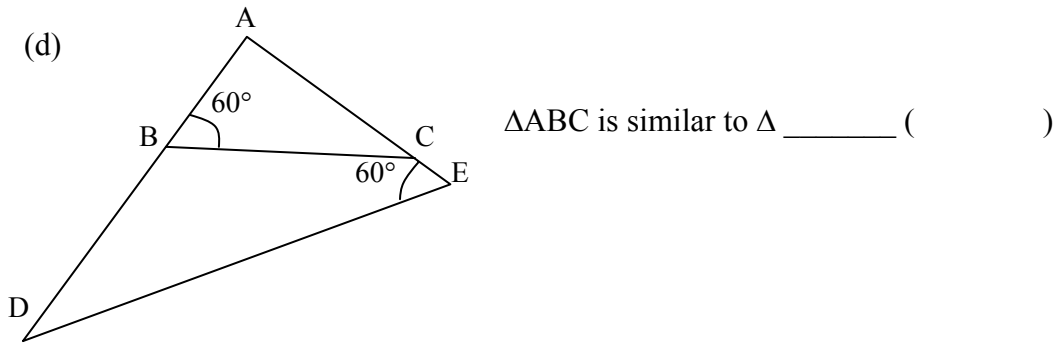
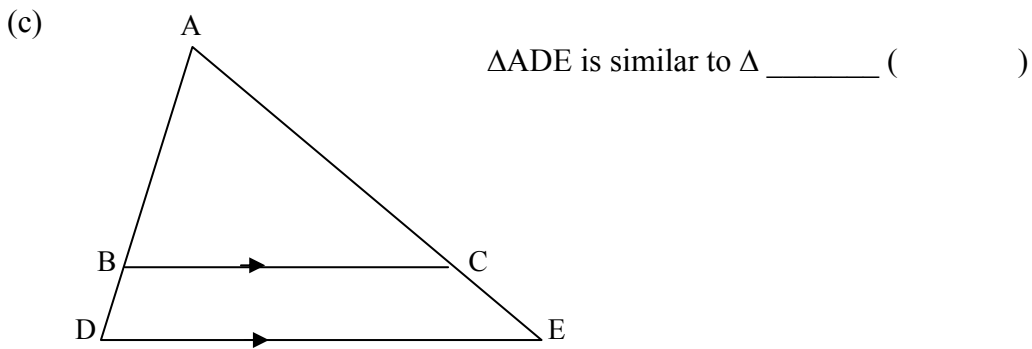
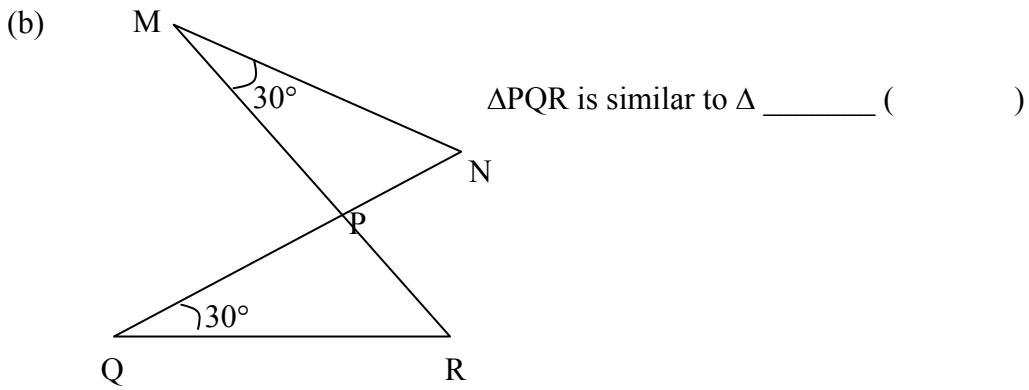
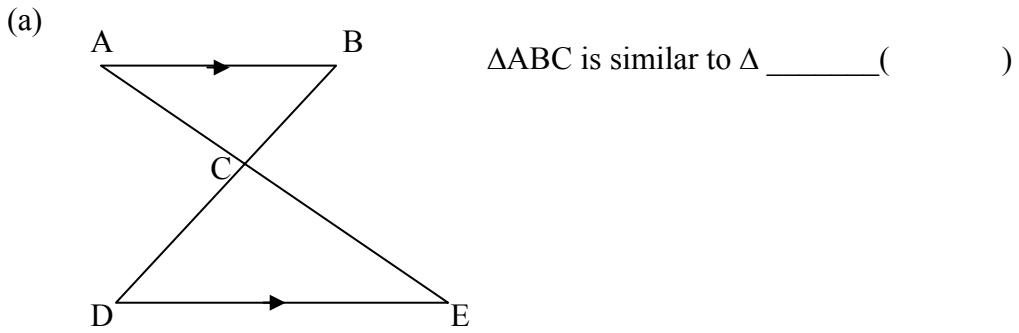
(c)

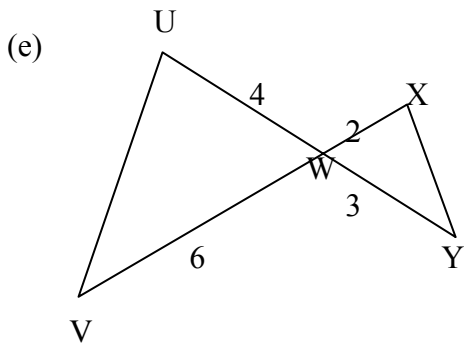


(d)

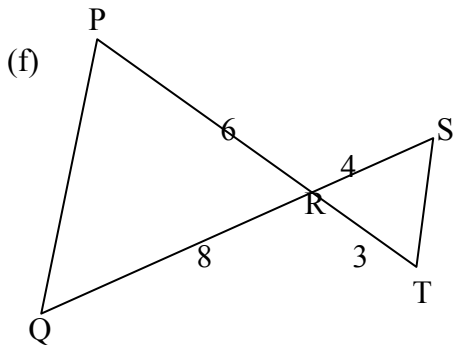


Q2 Study each figure and complete the blanks.



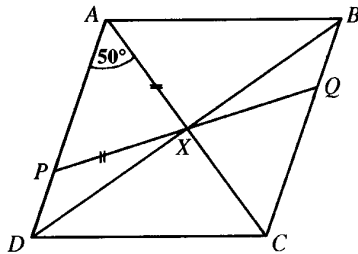


ΔUVW is similar to Δ _____ ()



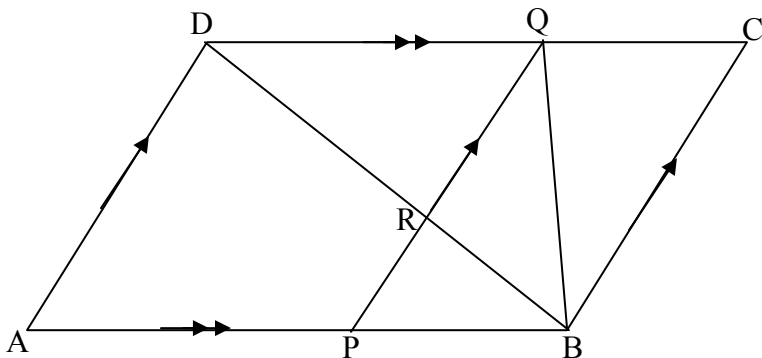
ΔRST is similar to Δ _____ ()

- Q3 In the rhombus $ABCD$, DB cuts AC at X and angle $DAC = 50^\circ$. The point P on AD is such that $PX = AX$. The line PX produced meets BC at Q . Name a triangle which is similar to, but not congruent to, triangle AXP and state the similarity test applied.



- Q4 In the diagram, $ABCD$ is a parallelogram. Given that the ratio of the length of $AP : PB$ is $4 : 3$, PQ is parallel to BC and BD cuts PQ at R ,

- Name a pair of similar triangles and justify your answer fully.
- Find the area of parallelogram $ABCD$ given that the area of $\Delta PRB = 9 \text{ cm}^2$.
- State whether ΔQPB is congruent to ΔBCQ and state the case of congruency if it is true.



****Areas of Non-Similar Triangles**

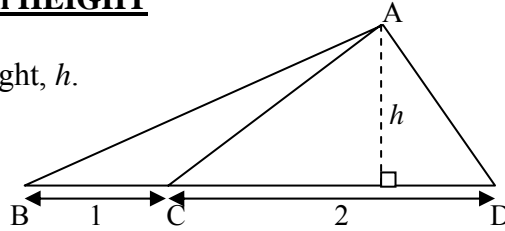
(A) Non-Similar Triangles with a Common HEIGHT

$\triangle ABC$, $\triangle ACD$ and $\triangle ABD$ have the same height, h .

Area of $\triangle ABC$ =

Area of $\triangle ACD$ =

Area of $\triangle ABD$ =



\therefore ratio of these areas = _____ : _____ : _____ = ratio of _____

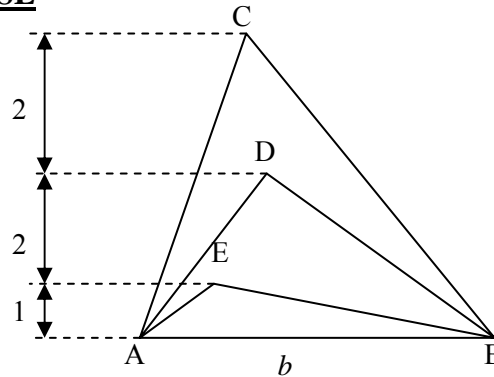
(B) Non-Similar Triangles with a Common BASE

$\triangle ABC$, $\triangle ABD$ and $\triangle ABE$ have the same base, b .

Area of $\triangle ABC$ =

Area of $\triangle ABD$ =

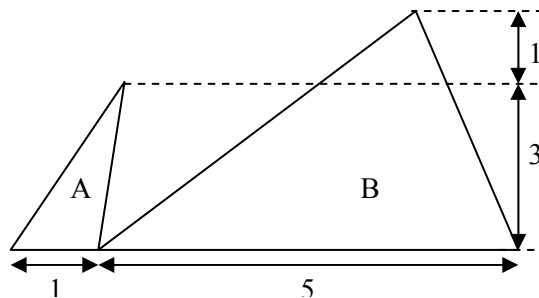
Area of $\triangle ABE$ =



\therefore ratio of these areas = _____ : _____ : _____ = ratio of _____

(C) Non-Similar Triangles without common base nor common height

Two triangles' bases are in the ratio 1 : 5 while their heights are in the ratio 3 : 4.
What is the ratio of their areas?

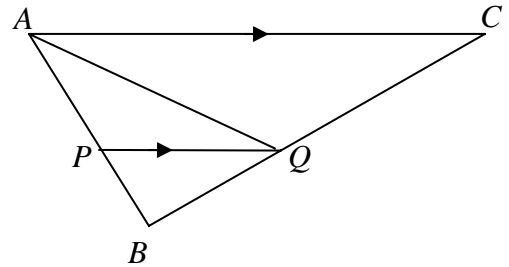


\therefore ratio of these areas = _____ : _____ = ratio of _____

Examples:

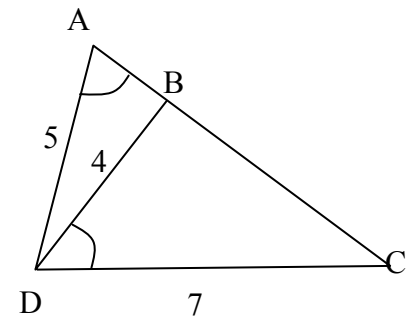
In the diagram, PQ is parallel to AC. Given that BQ = 4 cm, BC = 10 cm and area of $\Delta BPQ = 8 \text{ cm}^2$, Find the area of

- (a) ΔABC ;
- (b) ΔPQC ;
- (c) ΔAQC .



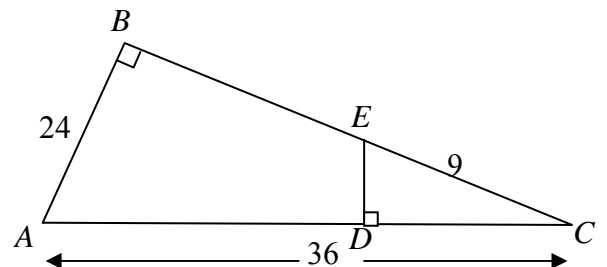
In the figure, ABC is a straight line and $\angle DAC = \angle BDC$.

- (i) Name an angle equal to $\angle DBC$.
- Given further that $AD = 5 \text{ cm}$, $BD = 4 \text{ cm}$ and $DC = 7 \text{ cm}$,
- (ii) calculate AC and BC,
 - (iii) if the area of $\Delta BCD = a \text{ cm}^2$, find, in terms of a , the area of ΔABD .

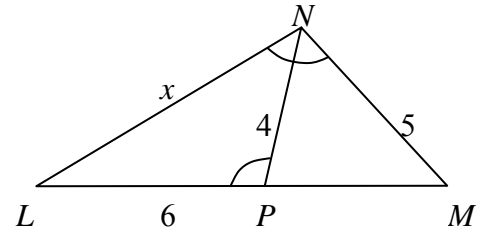


Exercise

Q1 With reference to the diagram, find the value of DE.



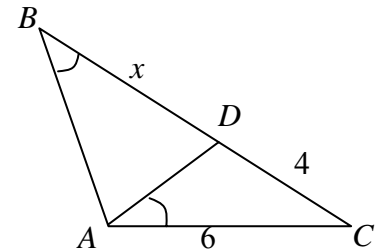
Q2 In the diagram, $\angle LNM = \angle LPN$. Name an angle equal to $\angle LNP$ and calculate x .



Q3 In $\triangle ABC$, D is a point on the side BC such that $\angle ABC = \angle DAC$, $AC = 6$ cm, $CD = 4$ cm and $BD = x$ cm.

(i) If $\triangle ACD \sim \triangle BCA$, show that $x = 5$.

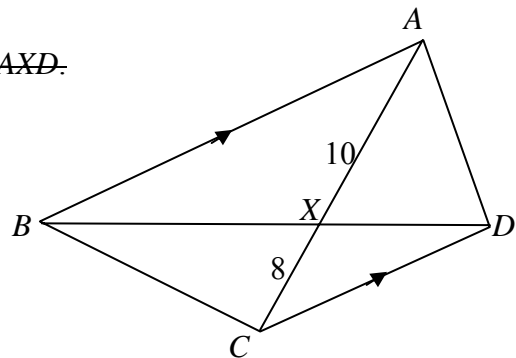
(ii) Calculate the area of $\triangle ACD$ given that the area of $\triangle BCA$ is 12 cm^2 .



Q4 In the diagram, $ABCD$ is a quadrilateral with BA parallel to CD . AC and BD meet at X where $CX = 8$ cm and $XA = 10$ cm.

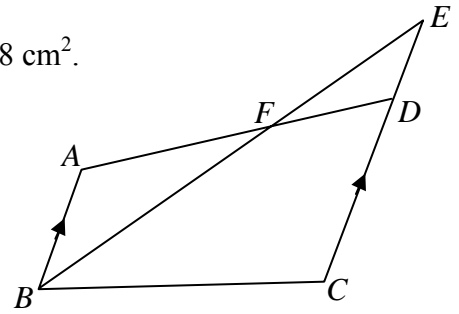
(a) Given that $BD = 27$ cm, find BX .

(b) Find the ratio of area of $\triangle BXC$: area of $\triangle AXD$.



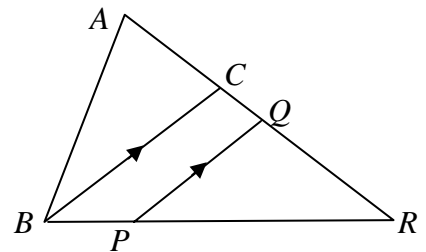
Q5 $ABCD$ is a quadrilateral. AB is parallel to CD . F is the point on AD such that $3DF = DA$. The lines CD and BF produced meet at E .

- (a) Explain why $\triangle ABF$ and $\triangle DEF$ are similar.
- (b) Find the area of $\triangle DEF$ given that the area of $\triangle ABF$ is 8 cm^2 .



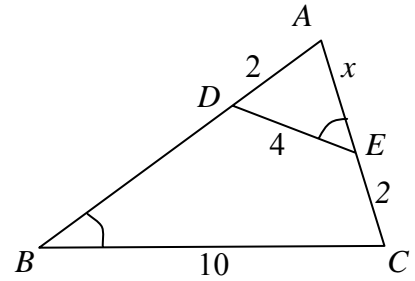
*Q6 In the diagram, C lies on AR such that $AC : CR = 2 : 3$ and PQ is parallel to BC such that $PQ : BC = 2 : 3$.

- (i) Find $CQ : QR$.
- (ii) If $\triangle ABC$ has an area of 18 cm^2 , find the area of $\triangle PQR$.



Q7 In the figure, $\angle AED = \angle ABC$, $AD = 2$ cm, $DE = 4$ cm, $BC = 10$ cm and $EC = 2$ cm. If $AE = x$ cm, calculate

- (a) the value of x ,
- (b) the ratio
 - (i) area of $\triangle AED$: area of $\triangle ABC$,
 - (ii) area of $DECB$: area of $\triangle ABC$.



Q8 In the diagram, ABD , AMN , ACE , BMC and DNE are straight lines. $AD \parallel NC$, $BC \parallel DE$ and $DE = 3NE$. Find

- (a) the ratio area of $\triangle AND$: area of $\triangle ANE$,
- (b) the ratio area of $\triangle ECN$: area of $\triangle EAD$,
- (c) the area of trapezium $ADNC$ if the area of $\triangle ECN = 17$ cm².

