1. Fill in the blanks using the correct word given in brackets:

(i) All circles are ……. . (congruent, similar)

(ii) All squares are …… . (similar, congruent)

(iii) All …….. triangles are similar. (isosceles, equilateral)

(iv) Two polygons of the same number of sides are similar, if (a) their corresponding angles are ……. and (b) their corresponding sides are …….. .(equal, proportional)

Sol. **(i)** similar

(ii) similar

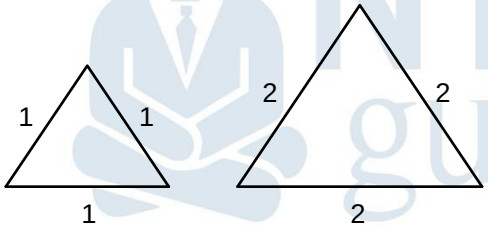
(iii) equilateral

(iv) **(a)** Equal **(b)** Proportional

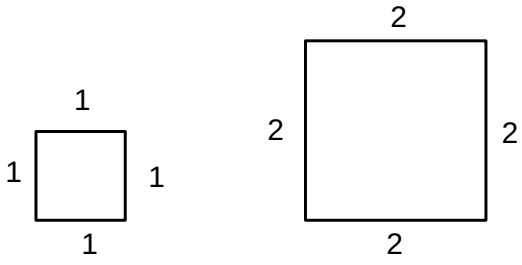
2. Give two different examples of pair of

(i) Similar figures. **(ii)** non-similar figures.

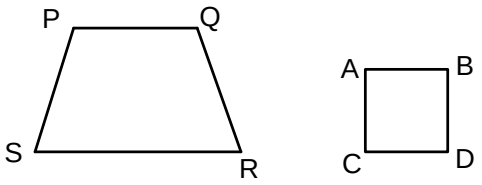
Sol. **(i)** **(a)** Two equilateral triangles with sides 1 cm and 2 cm.



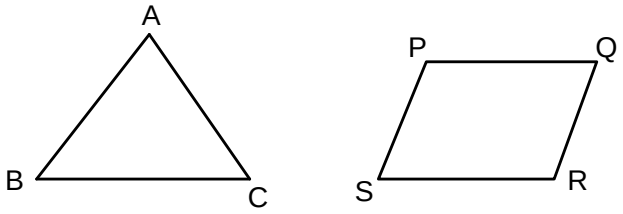
(b) Two squares with sides 1 cm and 2 cm.



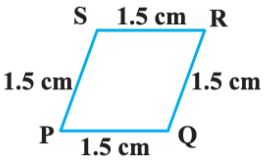
(ii) **(a)** Trapezium and square

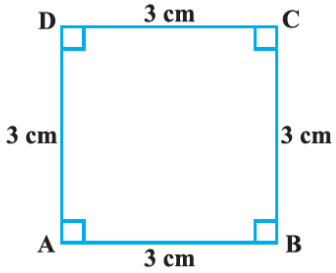


(b) Triangle and parallelogram



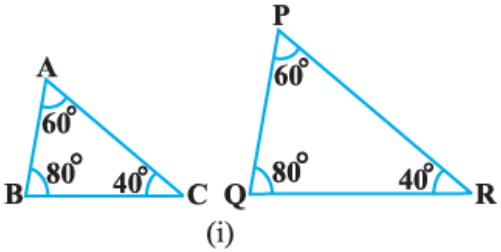
3. State whether the following quadrilaterals are similar or not:



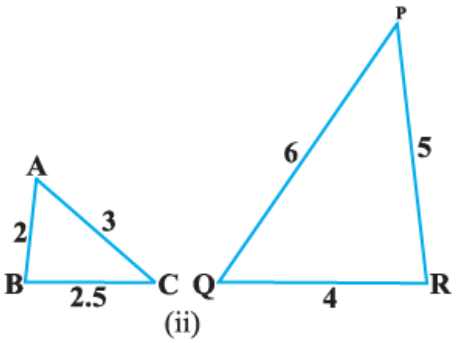


Sol. Since, the corresponding angles of both the figures are not equal, the figures given are not similar.

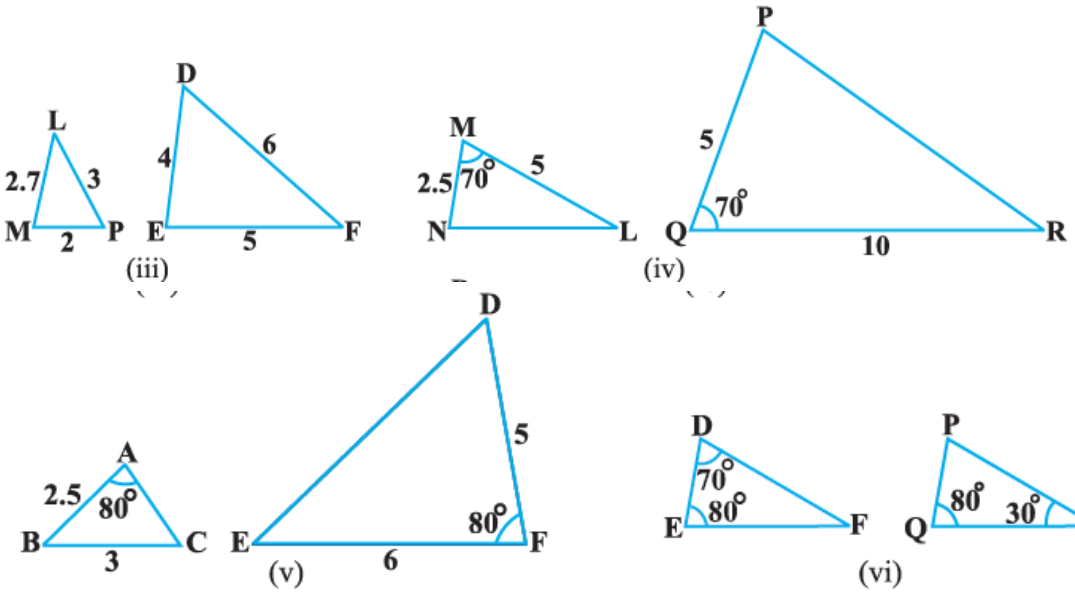
4. State which pairs of triangles in Figure are similar. Write the similarity criterion used by you for answering the question and also write the pairs of similar triangles in the symbolic form :



(i)



(ii)



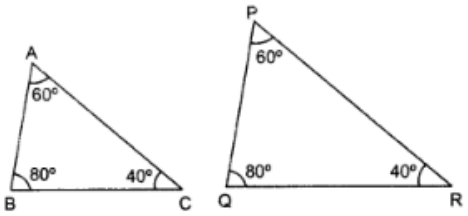
Sol. **(i)** In ΔABC and ΔPQR

$\angle A = \angle P$ **[Each** $60°$**]**

$\angle B = \angle Q$ **[Each** $80°$**]**

$\angle C = \angle R$ **[Each** $40°$**]**

$\therefore$ $\Delta ABC \sim \Delta PQR$ **[AAA Criterion]**



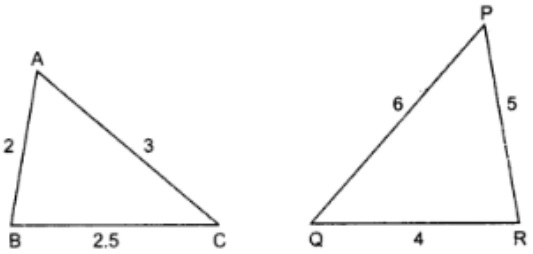
(ii) In ΔABC and ΔPQR

$$\frac{BC}{PR} = \frac{2.5}{5} = \frac{1}{2}$$

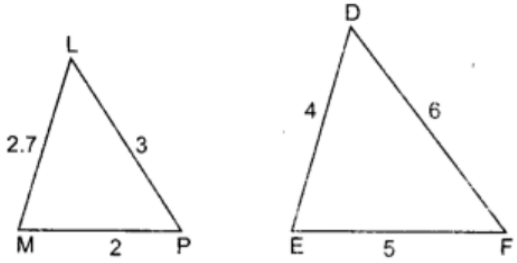
$$\frac{AB}{QR} = \frac{2}{4} = \frac{1}{2}$$

$$\frac{AC}{PQ} = \frac{3}{6} = \frac{1}{2}$$

Hence, $\Delta ABC \sim \Delta QRP$ **[SSS criterion]**



(iii) In ΔLMP and ΔEFD



$$\frac{LM}{EF} = \frac{2.7}{5}$$

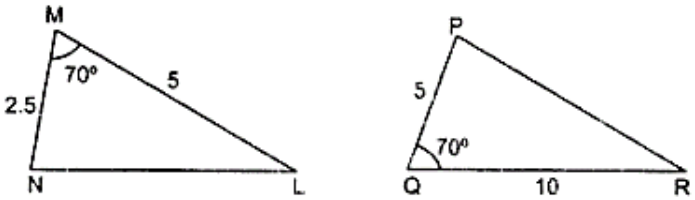
$$\frac{LP}{DF} = \frac{3}{6} = \frac{1}{2}$$

$$\frac{MP}{DE} = \frac{2}{4} = \frac{1}{2}$$

$\therefore$ ΔLMP is not similar to ΔEFD.

Since the three ratios are not same

(iv) In ΔMNL and ΔPQR



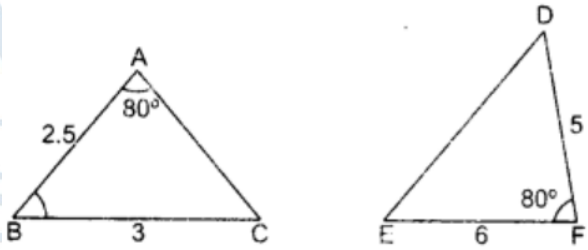
$$\frac{MN}{PQ} = \frac{2.5}{5} = \frac{1}{2}$$

$$\frac{ML}{QR} = \frac{5}{10} = \frac{1}{2}$$

$$\angle M = \angle Q = 70°$$

$\Delta NML \sim \Delta PQR$ **[SAS]**

(v) In ΔABC and ΔDEF



$$\frac{AB}{DF} = \frac{2.5}{5} = \frac{1}{2}$$

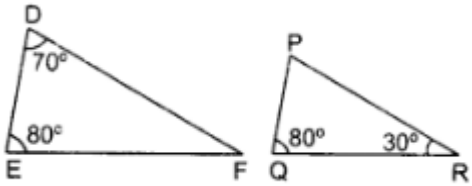
$$\frac{BC}{EF} = \frac{3}{6} = \frac{1}{2}$$

$$\angle A = \angle F = 80°$$

ΔABC is not similar to ΔDEF

$\because$ Angles between two sides are not same.

(vi) In ΔDEF and ΔPQR



$$\angle E = \angle Q = 80°$$

$$\angle F = \angle R = 30°$$

$$\left[\because\ F = 180° - (80° + 70°) = 30°\right]$$

$\therefore$ $\Delta DEF \sim \Delta PQR$ [AA]

5. Let $\Delta ABC \sim \Delta DEF$ and their areas be, respectively, $64\,cm^2$ and $121\,cm^2$. If EF = 15.4 cm, find BC.

Sol. We have $\Delta ABC \sim \Delta DEF$

So, $\frac{AB}{DE} = \frac{BC}{EF} = \frac{CA}{FD}$

$$\Rightarrow \quad \frac{ar(\Delta ABC)}{ar(\Delta DEF)} = \left(\frac{BC}{EF}\right)^2$$

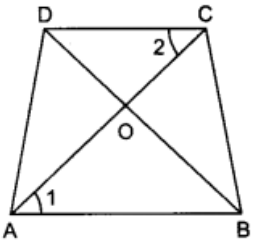
$$\Rightarrow \quad \frac{64}{121} = \left(\frac{BC}{15.4}\right)^2$$

$$\Rightarrow \quad \frac{8}{11} = \frac{BC}{15.4}$$

$$\Rightarrow \quad BC = \frac{8 \times 15.4}{11} = 11.2\,cm$$

6. Diagonals of a trapezium ABCD with $AB \| DC$ intersect each other at the point O. If AB = 2 CD, find the ratio of the areas of triangles AOB and COD.

Sol. ABCD is a trapezium with $AB \| DC$ and $AB = 2CD$



In ΔAOB **and** ΔCOD,

$\angle AOB = \angle COD$ **[V.O.A]**

$\angle 1 = \angle 2$ **[Alternate angles]**

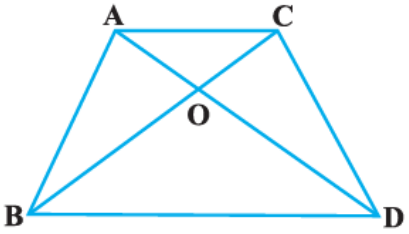
$\therefore \quad \Delta AOB \sim \Delta COD$ **[AA]**

$$\therefore \quad \frac{ar\,\Delta AOB}{ar\,\Delta COD} = \frac{AB^2}{CD^2}$$

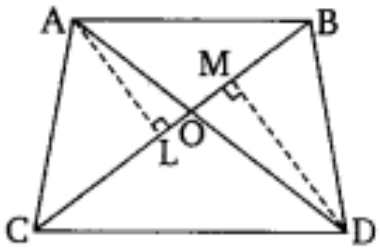
$$= \frac{(2CD)^2}{CD^2} = \frac{4CD^2}{CD^2} = \frac{4}{1}$$

$$\Rightarrow \quad ar\,\Delta AOB : ar\,\Delta COD = 4:1$$

7. In Figure, ABC and DBC are two triangles on the same base BC. If AD intersects BC at O, show that $\frac{ar(ABC)}{ar(DBC)} = \frac{AO}{DO}$



Sol. **Draw** $AL \perp BC$ **and** $DM \perp BC$



In ΔALO **and** ΔDMO, **we have**

$\angle ALO = \angle DMO$ **[Each of** $90°$ **]**

$\angle AOL = \angle DOM$ **[Vertically opposite angles]**

$\therefore \quad \Delta ALO \sim \Delta DMO$ **[By AA similarity]**

$\Rightarrow \quad \frac{AL}{DM} = \frac{AO}{DO}$ **……(i)**

Now, $\frac{ar(\Delta ABC)}{ar(\Delta DBC)} = \frac{\frac{1}{2} \times BC \times AL}{\frac{1}{2} \times BC \times DM}$

$= \frac{AL}{DM} = \frac{AO}{DO}$ **[From (i)]**

Hence proved.

8. Sides of two similar triangles are in the ratio 4 : 9. Areas of these triangles are in the ratio

(a) 2 : 3 (b) 4 : 9 (c) 81 : 16 (d) 16 : 81

Sol. **(d)** Areas of two similar triangles are in the ratio of the squares of their corresponding sides.

$\therefore$ Ratio of areas of triangles $= \left(\frac{4}{9}\right)^2 = \frac{16}{81}$ or 16 : 81

9. Sides of triangles are given below. Determine which of them are right triangles. In case of a right triangle, write the length of its hypotenuse.

(i) 7 cm, 24 cm, 25 cm

(ii) 3 cm, 8 cm, 6 cm

(iii) 50 cm, 80 cm, 100 cm

(iv) 13 cm, 12 cm, 5 cm

Sol. **(i)** **7 cm, 24 cm, 25 cm**

$(7)^2 + (24)^2 = 49 + 576 = 625 = (25)^2 = 25$

$\therefore$ The given sides make a right angled triangle with hypotenuse 25 cm.

(ii) **3 cm, 8 cm, 6 cm**

$(8)^2 = 64$

$(3)^2 + (6)^2 = 9 + 36 = 45$

$64 \neq 45$

The square of larger side is not equal to the sum of squares of other two sides.

$\therefore$ The given triangle is not a right angled.

(iii) **50 cm, 80 cm, 100 cm**

$(100)^2 = 10000$

$(80)^2 + (50)^2 = 6400 + 2500$

$= 8900$

The square of larger side is not equal to the sum of squares of other two sides.

$\therefore$ The given triangle is not a right angled.

(iv) **13 cm, 12 cm, 5 cm**

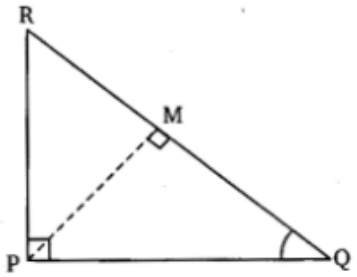
$(13)^2 = 169$

$(12)^2 + (5)^2 = 144 + 25 = 169 = (13)^2 = 13$

Sides make a right angled triangle with hypotenuse 13 cm.

10. PQR is a triangle right angled at P and M is a point on QR such that $PM \perp QR$. Show that $PM^2 = QM.MR$.

Sol. **In a right triangle, perpendicular drawn from right angle to hypotenuse, divides the triangle into two similar triangles.**



$\therefore \quad \Delta PQM \sim \Delta RPM$

$\Rightarrow \quad \frac{ar(\Delta PQM)}{ar(\Delta RPM)} = \frac{PM^2}{RM^2}$ [By Basic Proportionality theorem]

$\Rightarrow \quad \frac{QM}{PM} = \frac{PM}{RM}$

$\Rightarrow \quad PM^2 = QM \times RM$

$\Rightarrow \quad PM^2 = QM \times MR.$

Hence proved.