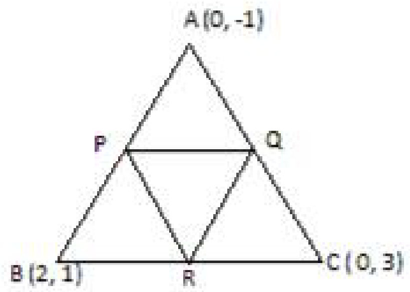
Exercise 7.3

$\Rightarrow$ Area of $\triangle ABC$

$= \frac{1}{2}$ [0 (1 − 3) + 2 {3 − (−1)} + 0 (−1 − 1)] = $\frac{1}{2} \times 8$

= 4 sq. units



P, Q and R are the mid−points of sides AB, AC and BC respectively.

Applying Section Formula to find the vertices of P, Q and R, we get

$$P = \frac{0+2}{2}, \frac{1-1}{2} = (1,0)$$

$$Q = \frac{0+0}{2}, \frac{-1+3}{2} = (0,1)$$

$$R = \frac{2+0}{2}, \frac{1+3}{2} = (1,2)$$

Applying same formula, Area of $\triangle PQR$ = $\frac{1}{2}$ [1 (1 − 2) + 0 (2 − 0) + 1 (0 − 1)] = $\frac{1}{2}$ $|-2|$

= 1 sq. units (numerically)

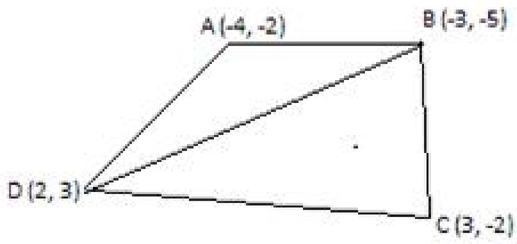
Now, $\frac{Area\ of\ \Delta PQR}{Area\ of\ \Delta ABC} = \frac{1}{4} = 1:4$

4. Find the area of the quadrilateral whose vertices taken in order are (−4, −2), (−3, −5), (3, −2) and (2, 3).

Ans. Area of Quadrilateral ABCD

= Area of Triangle ABD +

Area of Triangle BCD ... (1)



Using formula to find area of triangle:

Area of ΔABD

$$= \frac{1}{2}[x_1(y_2 - y_3) + x_2(y_3 - y_1) + x_3(y_1 - y_2)]$$

$$= \frac{1}{2}\ [-4\ (-5 - 3) - 3\ \{3 - (-2)\} + 2\ \{-2 - (-5)\}]$$

$$= \frac{1}{2}\ (32 - 15 + 6)$$

$$= \frac{1}{2}\ (23) = 11.5 \text{ sq units} \ldots (2)$$

Again using formula to find area of triangle:

Area of ΔBCD =

$$\frac{1}{2}[x_1(y_2 - y_3) + x_2(y_3 - y_1) + x_3(y_1 - y_2)]$$

$$= \frac{1}{2}\ [-3\ (-2 - 3) + 3\ \{3 - (-5)\} + 2\ \{-5 - (-2)\}]$$

$$= \frac{1}{2}\ (15 + 24 - 6)$$

$$= \frac{1}{2}\ (33) = 16.5 \text{ sq units} \ldots (3)$$

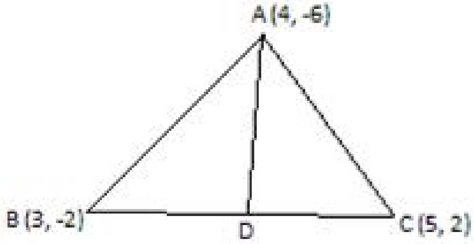
Putting (2) and (3) in (1), we get

Area of Quadrilateral ABCD = 11.5 + 16.5 = 28 sq units

5. We know that median of a triangle divides it into two triangles of equal areas. Verify this result for ΔABC whose vertices are A (4, −6), B (3, −2) and C (5, 2).

Ans. We have ΔABC whose vertices are given.

We need to show that ar(ΔABD) = ar(ΔACD).



Let coordinates of point D are (x, y)

Using section formula to find coordinates of D, we get

$$x = \frac{3+5}{2} = \frac{8}{2} = 4$$

$$y = \frac{-2+2}{2} = \frac{0}{2} = 0$$

Therefore, coordinates of point D are (4, 0)

Using formula to find area of triangle:

Area of $\triangle$ABD =

$$\frac{1}{2}[x_1(y_2 - y_3) + x_2(y_3 - y_1) + x_3(y_1 - y_2)]$$

$$= \frac{1}{2}\ [4(-2-0) + 3\{0-(-6)\} + 4\{-6-(-2)\}]$$

$$= \frac{1}{2}\ (-8 + 18 - 16)$$

$$= \frac{1}{2}\ (-6) = -3 \text{ sq units}$$

Area cannot be in negative.

Therefore, we just consider its numerical value.

Therefore, area of $\triangle$ABD = 3 sq units ... (1)

Again using formula to find area of triangle:

Area of $\triangle$ACD =

$$\frac{1}{2}[x_1(y_2 - y_3) + x_2(y_3 - y_1) + x_3(y_1 - y_2)]$$

$$= \frac{1}{2}\ [4(2-0) + 5\{0-(-6)\} + 4\{-6-2\}]$$

$$= \frac{1}{2}\ (8 + 30 - 32) = ½\ (6) = 3 \text{ sq units} \ldots (2)$$

From (1) and (2), we get ar($\triangle$ABD) = ar($\triangle$ACD)

Hence Proved.

*********** END **********