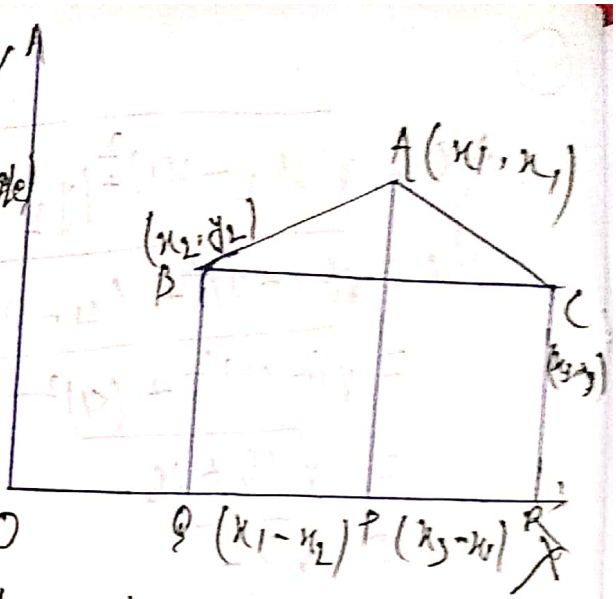
त्रिभुज का क्षेत्रफल (Area of triangle)



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

Proof: ⇒

ΔABC का क्षेत्रफल = समलंब ABQP + समलंब APRC का क्षेत्रफल − समलंब BQRC का क्षेत्रफल

$= \frac{1}{2}(BQ+AP) \times QP + \frac{1}{2}(AP+CR) \times PR - \frac{1}{2}(BQ-CR) \times QR$

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

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

$= \frac{1}{2}\left[x_1y_2 + x_1y_1 - x_2y_2 - x_2y_1 + x_3y_3 - x_1y_1 - x_1y_3 - (x_3y_2 + x_3y_3 - x_2y_2 - x_2y_3)\right]$

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$$= \frac{1}{2}\left[x_1y_2 + x_1y_1 - x_2y_2 - x_2y_1 + x_3y_1 + x_3y_3 - x_1y_1 - x_1y_3 - x_3y_2 - x_3y_3 + x_2y_2 + x_2y_3\right]$$

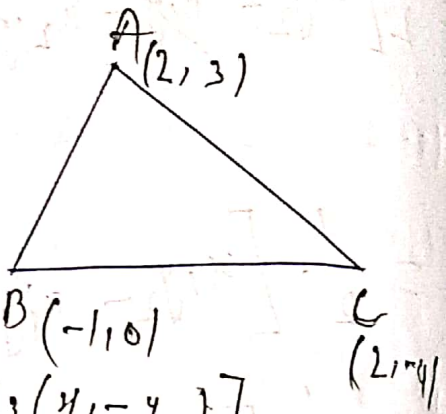
$$= \frac{1}{2}\left[x_1y_2 - x_1y_3 + x_2y_3 - x_2y_1 + x_3y_1 - x_3y_2\right]$$

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

proved

Ex - 7.3

① (i) $(2,3), (-1,0), (2,-4)$



ΔABC का क्षे०

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

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

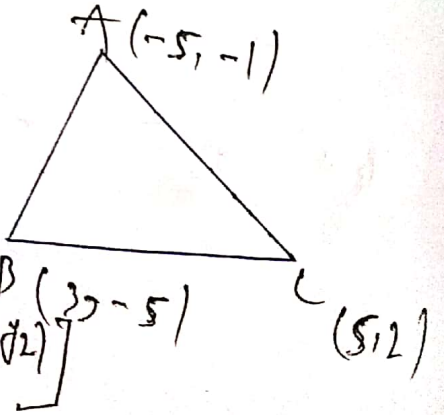
$= \frac{1}{2}[(2)(4) + (-1)(-7) + (2)(3)]$

$= \frac{1}{2}[8+7+6]$

$= \frac{1}{2} \times 21$

$= \frac{21}{2}$ वर्ग मात्रक Ans

(ii) त्रिभुज का क्षे०



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

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

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$= \frac{1}{2}\left[(-5)(-7)+(-3)(7)+(5)(4)\right]$

$= \frac{1}{2}\left[35+21+20\right]$

$= \frac{1}{2} \times 64^{32}$

$= 32$ বর্গ একক

(2) (i)

$ar(\Delta ABC) = 0$

A(7,-2) B(5,1) C(3,k)

or, $\frac{1}{2}\left[x_1(y_2-y_3)+x_2(y_3-y_1)+x_3(y_1-y_2)\right] = 0$

or, $\frac{1}{2}\left[7(1-k)+5(k+2)+3(-2-1)\right] = 0$

or, $\frac{1}{2}\left[7-7k+5k+10-6-3\right] = 0$

or, $\left[7-7k+5+10-9\right] = 0 \times 2$

or, $-2k+8 = 0$

or, $-2k = -8$

$\therefore k = \frac{+8}{+2}$ 4

$= 4$

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(ii)

Δ का क्षेत्रफल = 0

A(8,1) B(K,-4) C(2,-5)

$$\text{or, } \frac{1}{2}\left[x_1(y_2-y_3)+x_2(y_3-y_1)+x_3(y_1-y_2)\right]=0$$

$$\text{or, } \frac{1}{2}\left[8(-4+5)+K(-5-1)+2(1+4)\right]=0$$

$$\text{or, } \frac{1}{2}\left[8(1)+K(-6)+2(5)\right]=0$$

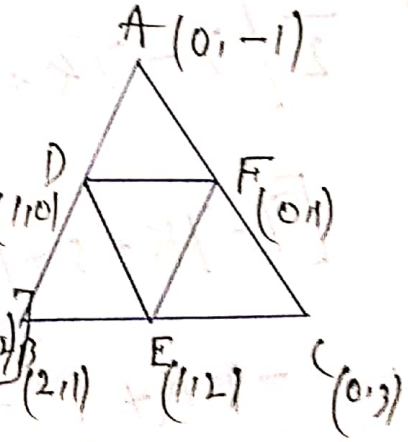
$$\text{or, } \frac{1}{2}\left[8-6K+10\right]=0$$

$$\text{or, } 8-6K+10=2\times 0$$

$$\therefore -6K = -18$$

$$K = \frac{18}{6} = 3$$

(3)



ar(Δ ABC)

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

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

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

$$= \frac{1}{2}\left[0+8+0\right]$$

$$= \frac{1}{2}\times 8 = 4 \text{ वर्ग मात्रक}$$

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बिंदु D का निर्देशांक $= \left(\frac{0+2}{2}, \frac{-1+1}{2}\right)$

$= \left(\frac{2}{2}, \frac{0}{2}\right)$

$= (1, 0)$

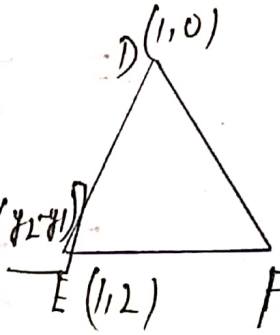
बिंदु E का निर्देशांक $= \left(\frac{2+0}{2}, \frac{1+3}{2}\right)$

$= \left(\frac{2}{2}, \frac{4}{2}\right)$

$= (1, 2)$

बिंदु F का निर्देशांक $= \left(\frac{0+0}{2}, \frac{1+1}{2}\right)$

$= (0, 1)$



क्षेत्रफल $(\Delta DEF) =$

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

$= \frac{1}{2}\left[1(2-1) + 1(1-0) + 0(0-2)\right]$

$= \frac{1}{2}\left[1(1) + 1(1) + 0(-2)\right]$

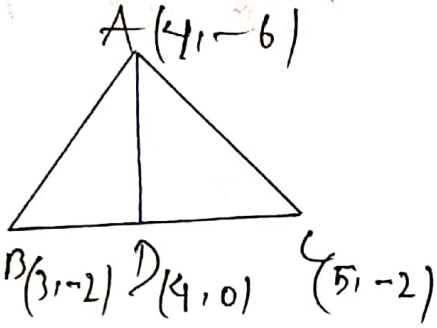
$= \frac{1}{2}\left[1+1+0\right]$

$= \frac{1}{2} \times 2$

$= 1$ वर्ग मात्रक Ans

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(5)



भुजा BD का मध्य बिंदु

$= \left(\frac{3+5}{2}, \frac{-2+2}{2}\right)$

$= \left(\frac{8}{2}, \frac{0}{2}\right) = (4,0)$

$ar(\Delta ABD) = \frac{1}{2}\left[x_1(y_2-y_3) + x_2(y_3-y_1) + y_3(y_1-y_2)\right]$

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

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

$= \frac{1}{2}\left[-8+18-16\right]$

$= \frac{1}{2}\left[-24+6\right]$

$= \frac{1}{2} \times -6$

= -> ऋणात्मक वर्ग

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

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

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$$= \frac{1}{2}\left[4(-2) + 4(8) + 5(-6)\right]$$

$$= \frac{1}{2}\left[-8 + 32 - 30\right]$$

$$= \frac{1}{2}\left[-38 + 32\right]$$

$$= \frac{1}{2} \times -6$$

$$= -3$$

(4)