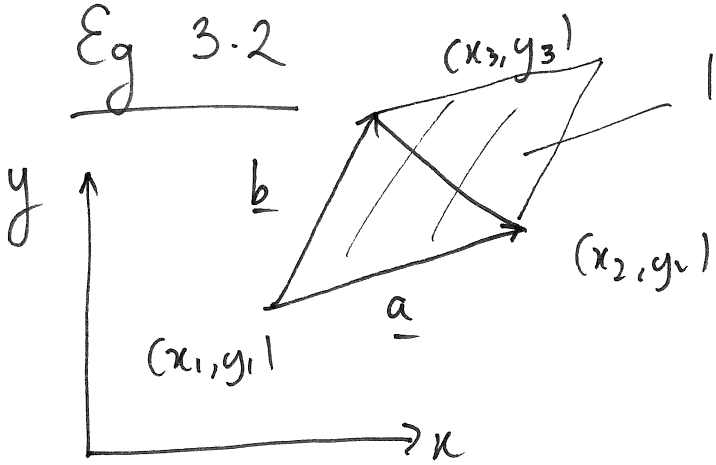
Eg 3.2



let

$$\underline{a} = (x_2 - x_1)\underline{i} + (y_2 - y_1)\underline{j}$$

$$\underline{b} = (x_3 - x_1)\underline{i} + (y_3 - y_1)\underline{j}$$

$$\Delta \text{ area} = \frac{1}{2} |\underline{a} \times \underline{b}|$$

$$= \frac{1}{2} \left| \begin{vmatrix} \underline{i} & \underline{j} & \underline{k} \\ x_2 - x_1 & y_2 - y_1 & 0 \\ x_3 - x_1 & y_3 - y_1 & 0 \end{vmatrix} \right|$$

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

4-stage Program Development

I/ Given (x_1, y_1), (x_2, y_2), (x_3, y_3) calculate the area of the triangle with these 3 points as vertices:

$$\text{area} = \frac{1}{2} | x_1 y_2 - \dots - x_1 y_3 |$$

II/ Coarse Logic

Read coordinates from file

Calculate area

Print data & result in specified format.

III/ Refine the Pseudocode

Program ...

Aim / Description

Declare variables ← OPEN data file

Read X1, Y1, X2, Y2, X3, Y3

Area = $\frac{1}{2}$ | X1 * Y2 − ... |

↑ abs( )

Output :

Print skip 2 lines

Triangle Vertices :

(1) b XX.X, b XX.X

(2)

(3)

< blank line >

Triangle Area :

XXXX.XX

↑ align with i in Triangle

" " blank

End program

IV

```
PROGRAM triangle
! Calculate the area of a triangle
! with vertices (X1,Y1), (X2,Y2)
! (X3,Y3) read from a file
!  triangle.dat.
IMPLICIT NONE  ! recommended.
REAL X1,Y1,X2,Y2,X3,Y3, AREA
OPEN (1, FILE = 'triangle.dat')
READ (1,*) X1,Y1,X2,Y2,X3,Y3
AREA = 0.5 * ABS( X1*Y2 - X2*Y1 &
           + X2*Y3 - ... )
! Output ~~results:~~ data & results:
WRITE (*, 10) X1,Y1,X2,Y2,X3,Y3, AREA
10 FORMAT (/, 8X, 'Triangle Vertices:' / &
           8X, '  (1)  ', F4.1, ',', F4.1 / &
           8X, '  (2)  ', F4.1, ',', F4.1 / &
           8X, '  (3)  ', F4.1, ',', F4.1 // &
           8X, 'Triangle Area:' / &
           8X, '  ', F7.2 )
END PROGRAM triangle.
```

continue statement to next line

output to screen

statement label of FORMAT statement

You can split the WRITE statement & FORMAT into several smaller statements and avoid continuing the FORMAT statement over 5 lines.

Use T in place of X:

```
10 FORMAT(//,T9,'Triangle Vertices:'/&
          T11,'(1)',F5.1,',',F5.1/&
          T11,'(2)',F5.1,',',F5.1/&
          T11,'(3)',F5.1,',',F5.1/&
          T9,'Triangle Area:'/&
          T11,F7.2)
```

For real numbers we can use an F descriptor:

Fw.d

- w: number of columns for the number to be printed i.e. "width"
- d: number of decimal places to print