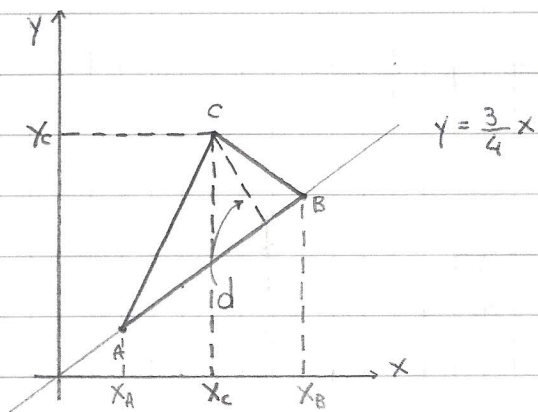


ITEM C

2016-09-05



$$m = 3/4 \quad q = 0$$

$$d = \left| \frac{y_C - mx_C}{\sqrt{1+m^2}} \right| = \left| \frac{y_C - \frac{3}{4}x_C}{\sqrt{1+(\frac{3}{4})^2}} \right| = \left| \frac{\frac{4y_C - 3x_C}{4}}{\sqrt{1+\frac{9}{16}}} \right| = \left| \frac{\frac{4y_C - 3x_C}{4}}{\sqrt{\frac{25}{16}}} \right| =$$

$$= \left| \frac{\frac{4y_C - 3x_C}{4}}{\frac{5}{4}} \right| = \left| \frac{4y_C - 3x_C}{5} \right|$$

Compute the AREA of the triangle

COORDINATES  $\rightarrow$  8 BITS

AREA  $\rightarrow$  16 BITS (only INTEGER part)

ITEM C :  $x_A, x_B, x_C, y_C$  provided at RUN TIME

$$\text{AREA} = \text{BASE} * d * 1/2$$

BASE = DISTANCE BETWEEN A and B

$$\text{BASE} = \sqrt{(y_B - y_A)^2 + (x_B - x_A)^2} = , y_B = \frac{3}{4} x_B \text{ and } y_A = \frac{3}{4} x_A$$

$$= \sqrt{(\frac{3}{4} x_B - \frac{3}{4} x_A)^2 + (x_B - x_A)^2} =$$

$$= \sqrt{\frac{9}{16} x_B^2 + \frac{9}{16} x_A^2 - 2 \cdot \frac{9}{16} x_A x_B + x_B^2 + x_A^2 - 2 x_A x_B} =$$

$$= \sqrt{\frac{25}{16} x_B^2 + \frac{25}{16} x_A^2 - 2 \cdot \frac{25}{16} x_A x_B} = \sqrt{\left(\frac{5}{4} x_B - \frac{5}{4} x_A\right)^2} = \left|\frac{5}{4} x_B - \frac{5}{4} x_A\right|$$

$$\text{AREA} = \text{BASE} * d * 1/2 =$$

$$= \frac{|5x_B - 5x_A|}{4} * \frac{|4y_C - 3x_C|}{5} * \frac{1}{2} =$$

$$= \frac{|5x_B - 5x_A|}{40} * |4y_C - 3x_C|$$

← TO HAVE THE MAXIMUM PRECISION, FIRST  
COMPUTE THE NUMERATOR (MULTIPLY) AND  
THEN DIVIDE BY 40.

AREA :

$$\begin{array}{c}
 \begin{array}{ccccc}
 & 8 \text{ BITS} & & 8 \text{ BITS} & \\
 & \downarrow & & \downarrow & \\
 | & 5 \cdot X_B & - & 5 \cdot X_A & | \\
 \hline
 & 16 \text{ BITS} & & 16 \text{ BITS} & 
 \end{array}
 \cdot
 \begin{array}{ccccc}
 & 8 \text{ BITS} & & 8 \text{ BITS} & \\
 & \downarrow & & \downarrow & \\
 | & 4 \cdot Y_C & - & 3 \cdot X_C & | \\
 \hline
 & 16 \text{ BITS} & & 16 \text{ BITS} & 
 \end{array}
 \end{array}$$

RESULT OF THIS MUL:  $\langle DX \rangle \langle AX \rangle$   
32 BITS

TO OBTAIN THE AREA ON 16 BITS, THE DENOMINATOR (40) MUST BE REPRESENTED ON 16 BITS  
 $\langle DX \rangle \langle AX \rangle / 40 \rightarrow$

$\langle AX \rangle = \text{RESULT} = \text{AREA on 16 bits}$  (integer part)

$\langle DX \rangle = \text{REMAINDER}$  (ignore it!)