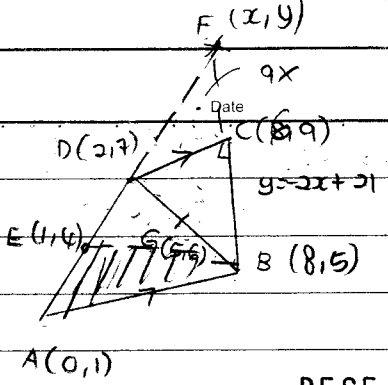
7* Maths Weekend Assignment
-co-ordinate geometry-

Editha Halim (7)
4C1
14/11/2005
Weekend HW1

Co-ordinate Geometry Qs, 10, 31, 32, 37.



RECEIVED BY
17 JAN 2005
E CHUA

5. $m_{DC} = \frac{7-9}{2-6}$

$= 0.5$

$= \frac{1}{2}$

$\therefore m_{AB} = \frac{1}{2}$

eqn of AB: $\frac{y-1}{x} = \frac{1}{2}$

$2y - 2 = x \quad -(1)$

$y = -2x + 21 \quad -(2)$

sub (1) into (2): $y = -2(2y-2)+21$

$= -4y + 4 + 21$

$5y = 25$

$y = 5$

sub $y=5$ into (1): $2(5) - 2 = x$

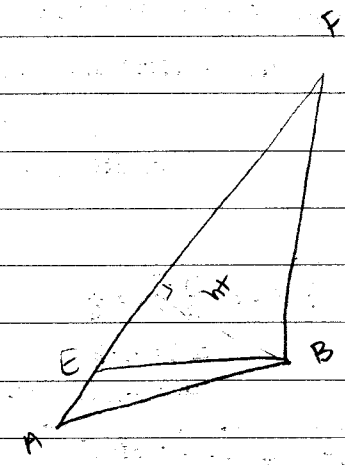
$x = 8$

$\therefore B(8,5)$

b) Area of $\triangle ABF$ = 9x Area of $\triangle AEB$

$\frac{1}{2} \times b \times AF = 9 \times \frac{1}{2} \times b \times AE$

$AF = 9 \times AE$



$AF = \sqrt{(x-0)^2 + (y-1)^2}$

$= \sqrt{x^2 + y^2 - 2y + 1}$

$AE = \sqrt{(1-0)^2 + (4-1)^2}$

$= \sqrt{1+9}$

$= \sqrt{10}$

$\therefore x^2 + y^2 - 2y + 1 = 810$

$x^2 + y^2 - 2y = 809 \quad -(2)$

eqn AF = eqn AD

$\Rightarrow \frac{y-7}{x-2} = \frac{6}{2}3$

$\Rightarrow y - 7 = 3x - 6$

$y = 3x + 1 \quad -(1)$

sub (1) into (2): $x^2 + (3x+1)^2 - 2(3x+1) = 809$

$x^2 + 9x^2 + 6x + 1 - 6x - 2 = 809$

$10x^2 = 810$

$x^2 = 81$

$x = 9$ or -9 (NA)

sub $x=9$ into (1): $y = 27 + 1$

$= 28$

$\therefore F(9, 28)$

Date No.

c) midpt of BD: $\left(\frac{2+8}{2}, \frac{7+5}{2}\right)$

$= \left(\frac{10}{2}, \frac{12}{2}\right)$

$= (5, 6)$

Gradient CG $= \frac{9-6}{6-5}$

$= 3$

Gradient DB $= \frac{7-5}{2-8}$

$= -\frac{1}{3}$

$m_{CG} \times m_{DB} = -1$

$3 \times -\frac{1}{3} = -1$ ∴ since gradient $= -1$ and G is midpt of DB, I conclude that CG is ⊥ bisector DB.

d) Square and bite

10) R$(x, 0)$

∴ $k = 2$

i) ∴ R$(6, 0)$

ii) eqn of mQ: $m_{PR} = \frac{4-0}{4-6}$

$= \frac{4}{-2} = -2$

$\frac{y-2}{x-5} = \frac{1}{2}$

$2y - 4 = x - 5$

$2y = x - 1$ — (1)

eqn of PQ: $y = 4$ — (2)

sub (2) into (1): $2(4) = x - 1$

$x = 9$

∴ sub $x = 9$ into (1): $2y = 8$

$y = 4$

∴ Q$(9, 4)$

iii) eqn of SR: $\frac{y-0}{x-6} = \frac{1}{2}$

$2y = x - 6$

$x = 2y + 6$ — (1)

$\sqrt{(x-6)^2 + (y-0)^2} = 4\sqrt{5}$

$x^2 - 12x + 36 + y^2 = 16(5)$

$x^2 - 12x + 36 + y^2 = 80$ — (2)

sub (1) into (2): $(2y+6)^2 - 12(2y+6) + 36 + y^2 = 80$

$4y^2 + 24y + 36 - 24y - 72 + 36 + y^2 - 80 = 0$

$5y^2 = 80$

$y^2 = 16$

$y = 4$ or -4 (NA)

sub $y = -4$ into (1): $x = 2(-4) + 6$

$= -2$

∴ S$(-2, -4)$

iv) Area: $\frac{1}{2}\left|\begin{matrix} -2 & 6 & 9 & 4 & -2 \\ -4 & 0 & 4 & 4 & -4 \end{matrix}\right|$

$= 30$ units^2

Date No.

3(i) Mdpt of DB: $\left(\frac{4}{2}, \frac{8}{2}\right)$

$= (2,4)$

gradient DB: $\frac{6-2}{6+2}$

$= \frac{4}{8}$

$= \frac{1}{2}$

gradient CA: -2

equation AC: $\frac{y-4}{x-2} = -2$

$y-4 = -2x+4$

$y = -2x+8$ ___ (1)

ii) when $y=0$,

$2x = 8$

$x = 4 \therefore A(4,0)$

iii) A to C, x moved by $\frac{7}{2} \times 2 = 7$

x coordinate of C: $4-7 = -3$

A to C, y moved up by $\frac{4}{2} \times 7$

$= 14$

y coordinate of C: $0+14$

$= 14$

$C(-3,14)$

iii) Area: $\frac{1}{2}\left|\begin{matrix} 4 & 6 & -3 & -2 & 4 \\ 0 & 6 & 14 & 2 & 0 \end{matrix}\right|$

$= 70$ units^2

iv) Area $\triangle ACD$: $\frac{1}{2}\left|\begin{matrix} -3 & -2 & 4 & -3 \\ 14 & 2 & 0 & 14 \end{matrix}\right|$

$= 35$ units^2

OR Area of $\triangle ACD = \frac{70}{2}$

$= 35$

$\therefore$ $\triangle ACD$ and $\triangle ABC$ Symmetrical

Area $\triangle ACD$: $\frac{1}{2} \times$ h dist $\times \left(\sqrt{(4+2)^2+(0-2)^2}\right)$

$35 = \frac{1}{2}$ h dist $\times \frac{1}{2} \times \sqrt{40}$

$\frac{35\sqrt{2}}{\sqrt{40}} =$ h dist

$\frac{35\sqrt{2}}{2\sqrt{10}} =$ h dist

$\frac{35\sqrt{10}}{20} =$ h dist

$\frac{7\sqrt{10}}{2} =$ h dist

Date No

32. D(4,8)

ii) $y = 3x - 8 \quad -(1)$

eqn AD: $\frac{y-8}{x-4} = \frac{8-3}{4-1}$

$\frac{y-8}{x-4} = \frac{5}{3}$

$3y - 24 = 5x - 20$

$3y = 5x + 4 \quad -(2)$

sub (1) into (2): $3(3x-8) = 5x + 4$

$9x - 24 = 5x + 4$

$4x = 28$

$x = 7$

sub $x = 7$ into (1)

$y = 3(7) - 8$

$= 13$

$\therefore E(7, 13)$

iii) Area of $\triangle EDM$ $\qquad M = (5, 7)$

$= \frac{1}{2} \left| \begin{matrix} 5 & 7 & 4 & 5 \\ 7 & 13 & 8 & 7 \end{matrix} \right|$

$= 4 \text{ units}^2$

Area of trapezium ABMD

$= \frac{1}{2} \left| \begin{matrix} 3 & 5 & 4 & 1 & 3 \\ 1 & 7 & 8 & 3 & 1 \end{matrix} \right|$

$= 12 \text{ units}^2$

Ratio $= 4 : 12$

$= 1 : 3$

Date No.

37. $m_{AP} = \frac{10-6}{1+7}$

$= \frac{4}{8}$

$= \frac{1}{2}$

$m_{BC} = \frac{12-2}{0-5}$

$= \frac{10}{-5}$

$= -2$

$m_{AP} \times m_{BC} = -1$

$\therefore AP \perp BC.$

i) $m_{AB} = \frac{12-6}{0+7}$

$= \frac{6}{7}$

eqn of CQ: $\frac{y-2}{x-5} = -\frac{7}{6}$

$6y - 12 = -7x + 35$

$6y = -7x + 47 - (1)$

eqn of AP: $\frac{y-10}{x-1} = \frac{1}{2}$

$2y - 20 = x - 1$

$2y = x + 19 - (2)$

$(2) \times 3$: $6y = 3x + 57 - (3)$

sub (3) into (1): $-7x + 47 = 3x + 57$

$10x = -10$

$x = -1$

sub $x = -1$ into (2): $2y = 18$

$y = 9$

$\therefore M(-1, 9)$

b) $\frac{MP}{AM} = \frac{\sqrt{(-1-1)^2 + (9-10)^2}}{\sqrt{(-7+1)^2 + (6-9)^2}}$

$= \sqrt{\frac{5}{45}}$

$= \frac{\sqrt{1}}{\sqrt{9}}$

$= \frac{1}{3}$

$\therefore MP : AM$

$1 : 3$

Date No.

(iii) Area of $\triangle ABC = \frac{1}{2}\begin{vmatrix} 0 & -7 & 5 & 0 \\ 12 & 6 & 2 & 12 \end{vmatrix}$

$= 50 \text{ units}^2$

Area of $\triangle BMC = \frac{1}{2}\begin{vmatrix} 8 & -1 & 5 & 0 \\ 12 & 9 & 2 & 12 \end{vmatrix}$

$= 12.5 \text{ units}^2$

$\frac{\text{Area } \triangle ABC}{\text{Area } \triangle BMC} = \frac{50}{12.5}$

$= 4$

OR Since $\triangle ABC$ and $\triangle BMC$ have the same base CB,

$\frac{\text{Area of } \triangle ABC}{\text{Area of } \triangle BMC} = \frac{AP}{MP}$

$= \frac{4}{1}$

$= 4$ //