C1 Coordinate Geometry PPQ's

JAN 2006

① $y = 5 - 2x$

(a) If $P(3,-1)$ lies on line then substitute in co-ords and LHS = RHS

$$-1 = 5 - 2 \times 3$$
$$-1 = 5 - 6$$
$$-1 = -1$$

$\therefore$ P lies on line

(b) gradient of perp line $M = +\frac{1}{2}$

through $(3,-1)$

Using $y - y_1 = M(x - x_1)$

$$y - -1 = \frac{1}{2}(x - 3)$$

$\times 2$ $\quad 2y + 2 = x - 3$

$$x - 2y - 5 = 0$$

JAN 2005

② (a) Midpoint $\left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2}\right)$

$$= (8, 2)$$

$$\frac{1+p}{2} = 8 \qquad \frac{7+q}{2} = 2$$
$$1 + p = 16 \qquad 7 + q = 4$$
$$p = 15 \qquad q = -3$$

$\therefore$ Coords of C $(15, -3)$

(b) gradient of AC $= \frac{7 - -3}{1 - 15} = \frac{10}{-14} = -\frac{5}{7}$

perpendicular gradient $= +\frac{7}{5}$

May 2005

④ (a) $M = \frac{1}{3}$ $(9, -4)$

$y - -4 = \frac{1}{3}(x - 9)$

$3y + 12 = x - 9$

$x - 3y - 21 = 0$ — ①

(b) Eq^n of line l_2, $M = -2$ through $(0,0)$

$y = -2x$ — ②

Solve simultaneously for intersection:

Subst ② in ①

$x - 3(-2x) - 21 = 0$

$x + 6x - 21 = 0$

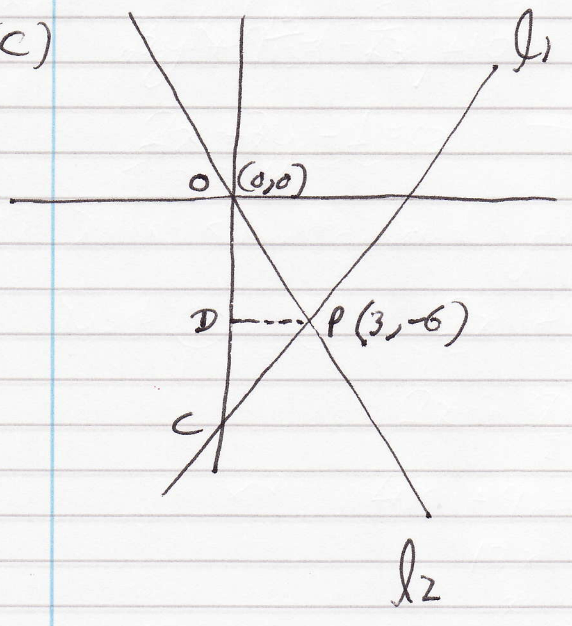
$7x = 21$

$x = \frac{21}{7} = 3$

in ② $y = -2 \times 3 = -6$

$\therefore$ lines intersect @ P$(3, -6)$

(c)



Area of Δ OCP $= \frac{1}{2} \times OC \times DP$

$DP = 3$ (x coord of P)

Line l_1 crosses y axis when $x = 0$

in ① $x - 3y - 21 = 0$

$0 - 3y = 21$

$y = \frac{21}{-3} = -7$

$\therefore OC = 7$

Area of $\Delta = \frac{1}{2} \times 7 \times 3 = \frac{21}{2}$

(2)(b) eq^n line $y-2=\frac{7}{5}(x-8)$

$5y-10=7x-56$

$7x-5y-46=0$ — (1)

(c) Eq^n of AB $y=7$

intersects with — (1) $7x-5(7)-46=0$

$7x-35-46=0$

$7x=81$

$x=\frac{81}{7}$

(3) (a) $y=\frac{3}{2}x-2$ — (1)

JAN 2003

crosses y axis when $x=0$ $y=-2$

$\therefore P(0,-2)$

Midpoint PQ $\left(\frac{5+0}{2}, \frac{-2+-3}{2}\right)=\left(\frac{5}{2},\frac{-5}{2}\right)$

(b) gradient of $l_2=-\frac{2}{3}$

eq^n of line l_2 through $(5,-3)$

$y--3=-\frac{2}{3}(x-5)$

$\times 3$

$3y+9=-2x+10$

$2x+3y-1=0$ — (2)

(c) Solve simultaneously for intersection point:

Subst (1) in (2) $2x+3\left(\frac{3}{2}x-2\right)-1=0$

$2x+\frac{9x}{2}-6-1=0$

$\times 2$ $4x+9x-14=0$

$13x=14$

$x=\frac{14}{13}$

in (1) $y=\frac{3}{2}\left(\frac{14}{13}\right)-2=\frac{21}{13}-2=\frac{21}{13}-\frac{26}{13}=-\frac{5}{13}$

$\therefore R\left(\frac{14}{13},-\frac{5}{13}\right)$

MAY 2006

5 (a) $\overset{x_1\ y_1}{P(-1,2)}$ $\overset{x_2\ y_2}{Q(11,8)}$

$$\frac{y-2}{8-2} = \frac{x--1}{11--1}$$

$$\frac{y-2}{6} = \frac{x+1}{12}$$

$$12y - 24 = 6x + 6$$

$$12y = 6x + 30$$

$$y = \frac{6x}{12} + \frac{30}{12}$$

$$y = \frac{1}{2}x + \frac{5}{2} \quad — (1)$$

(b) gradient of $l_2 = -2$ through $(10,0)$

$$y - 0 = -2(x - 10)$$

$$y = -2x + 20 \quad — (2)$$

lines intersect @ S, solve (1) & (2) simultaneously

equate: $\frac{1}{2}x + \frac{5}{2} = -2x + 20$

$\times 2$

$$x + 5 = -4x + 40$$

$$5x = 35$$

$$x = \frac{35}{5} = 7$$

in (2) $y = -2 \times 7 + 20 = -14 + 20 = 6$

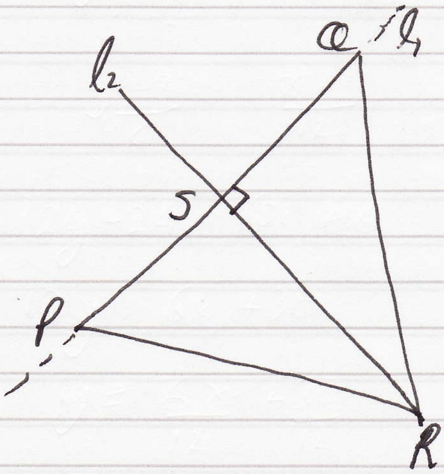
$\therefore$ $S(7,6)$

(5) (c) $|RS| = \sqrt{(10-7)^2+(0-6)^2} = \sqrt{9+36} = \sqrt{45} = \sqrt{9\times5}$

$= 3\sqrt{5}$

As required

(d)



Area $= \frac{1}{2} \times PQ \times SR$

$|PQ| = \sqrt{(11--1)^2+(8-2)^2} = \sqrt{144+36} = \sqrt{180} = \sqrt{36\times5} = 6\sqrt{5}$

$\therefore$ Area $= \frac{1}{2} \times 6\sqrt{5} \times 3\sqrt{5} = \frac{6\times3\times\sqrt{5\times5}}{2} = \frac{18\times5}{2} = 45$