Q3

a. ~~$a = \$1000$~~ ~~$r =$~~ 1.035

~~$I_{20} = ar^{n-1}$~~

~~$= 1000 \times$~~ ~~$^{20-1}$~~

$a = 1000 \quad r = 1.035 \quad n = 20$

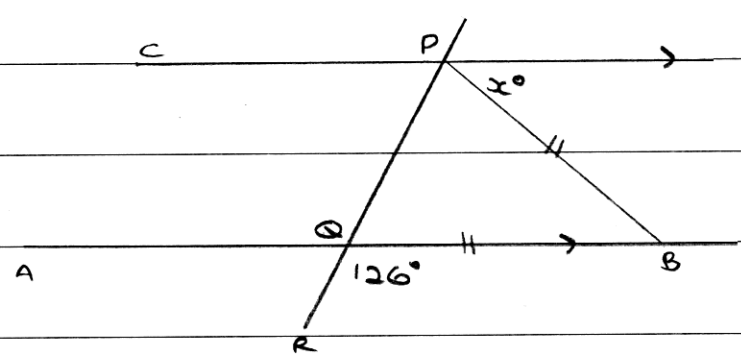
$T_{20} = ar^{20-1}$

$T_{20} = 1000 \times 1.035^{19}$

$= 1922.50$

∴ at the end of 20 years Josh will have earnt $1922.50

b.



$\angle PQB + \angle RQB = 180°$ (angle sum of straight line)

$\angle PQB + 126° = 180$

$\therefore \angle PQB = 54°$

PB = QB (given)

∴ QPB is isosceles

∴ ∠BPQ = ∠PQB

∠BPQ = 54°

∠BQP + ∠PBQ + ∠BPQ = 180° (angle sum of triangle PBQ)

54° + ∠PBQ + 54° = 180°

∠PBQ = 72°

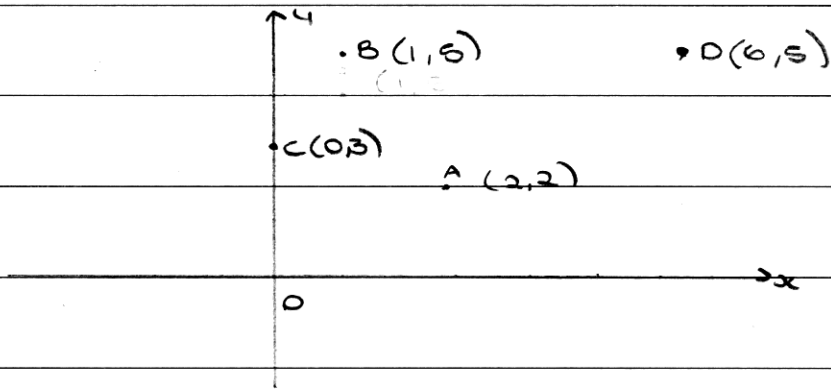
∠PBQ = ∠OPB (alternate angles since AB || CD)

∠OPB = 72°

∠OPB = x°

∴ x = 72°

c.



i. $M_{AB} = \left[\frac{x_2 + x_1}{2}, \frac{y_2 + y_1}{2} \right]$

$= \left[\frac{2+1}{2}, \frac{2+5}{2} \right]$

$= (3/2, 7/2)$

ii. $m_{AB} = \frac{y_2 - y_1}{x_2 - x_1}$ $\therefore$ perpendicular gradient $= \frac{1}{3}$

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

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

$= -3$

$m = \frac{1}{3}$ and point $(3/2, 7/2)$

$y - y_1 = m(x - x_1)$

$y - 7/2 = \frac{1}{3}(x - 3/2)$

[illegible]

$y - 7/2 = \frac{1}{3}x - 1/2$

$y = 1/3x + 3$

$3y = x + 9$

$x - 3y + 9 = 0$

iii. $D_{AC} = D_{BC}$ $C(0,4)$ $A(2,2)$ $B(1,5)$

$$\sqrt{(x_A - x_C)^2 + (y_A - y_C)^2} = \sqrt{(x_B - x_C)^2 + (y_B - y_C)^2}$$

$$\sqrt{(2-0)^2 + (2-4)^2} = \sqrt{(1-0)^2 + (5-4)^2}$$

$$\sqrt{4 + (2-4)^2} = \sqrt{1 + (5-4)^2}$$

$$4 + (2-4)^2 = 1 + (5-4)^2$$

$$4 + (4 - 4y + y^2) = 1 + (25 - 10y + y^2)$$

$$4 + 4 - 4y + y^2 = 1 + 25 - 10y + y^2$$

$$8 - 4y + y^2 = 26 - 10y + y^2$$

$$6y = 18$$

$$y = 3$$

∴ point C that lies on y-axis is $(0,3)$

iv. $x - 3y + 9 = 0$ — ①

$y = 5$ — ②

sub ② in ①

$x - 15 + 9 = 0$

$x - 6 = 0$

$x = 6$

∴ point D is $(6, 5)$

v. A $(2, 2)$ B $(1, 5)$ D $(6, 5)$

$$d_{AB} = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$$

$$= \sqrt{(1-2)^2 + (5-2)^2}$$

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

$$= \sqrt{10}$$

$m_{AB} = -3$ $(2, 2)$

$y - y_1 = m(x - x_1)$

$y - 2 = -3(x - 2)$

$y - 2 = -3x + 6$

$3y + y - 8 = 0$

$$d = \frac{|ax+by+c|}{\sqrt{a^2+b^2}}$$

$$= \frac{|3\times 6+1\times 5-8|}{\sqrt{9+1}}$$

$$= \frac{15}{\sqrt{10}}$$

$$A\,\Delta ABD = \frac{1}{2}bh$$

$$= \frac{1}{2}\times\sqrt{10}\times\frac{15}{\sqrt{10}}$$

$$= 7\tfrac{1}{2} \text{ units}^2$$