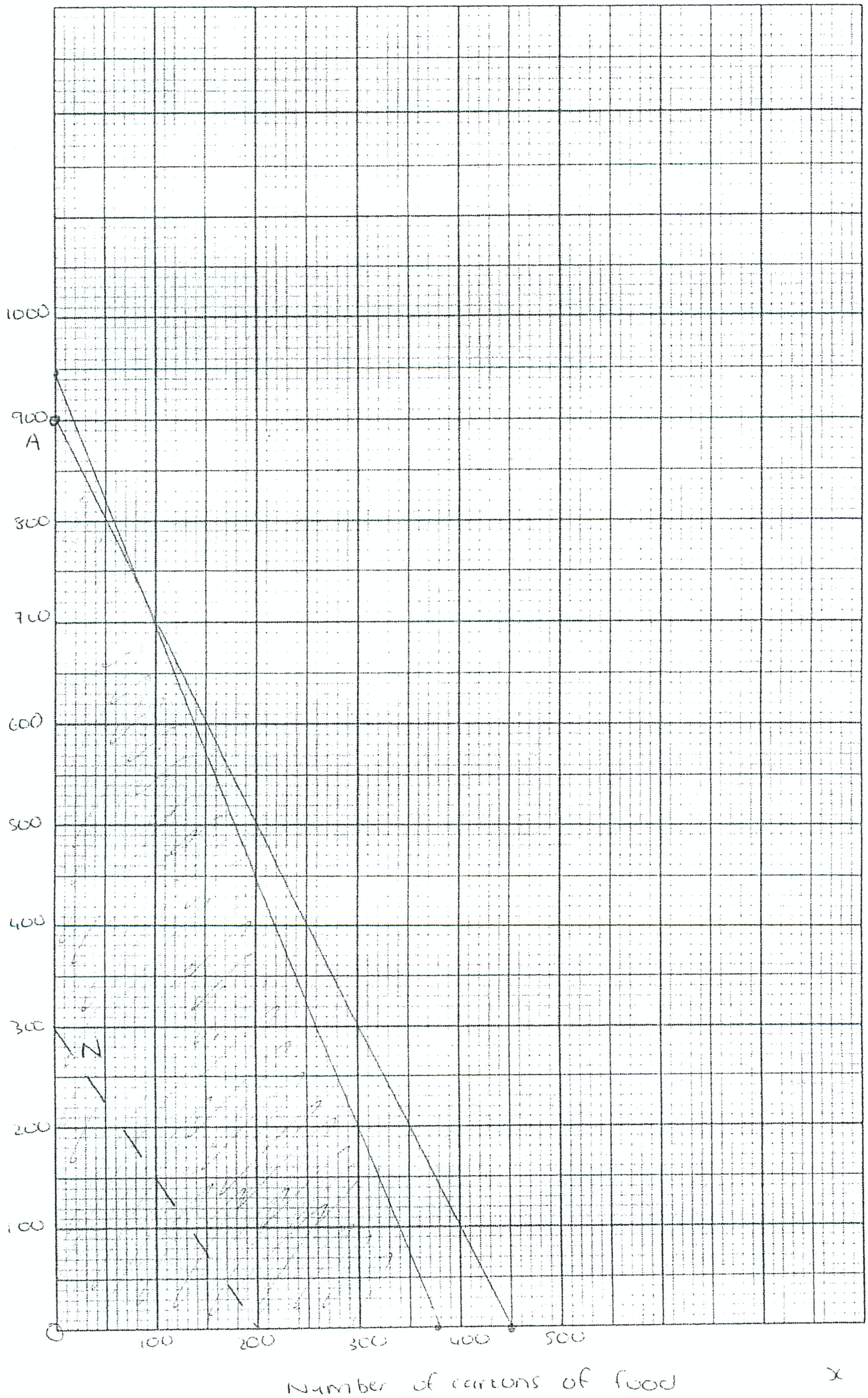
QUESTION 10

(b)

y

cartons
of clothing



- feasible region
region
- each line
+ intercepts

4

$x, y \in \mathbb{N}_0$

(b) Let the numbers be x and y

$x + y = 24$ ✓

$\therefore y = 24 - x$

$P = xy^2$ ✓

$= x^2(24-x)$

$= 24x^2 - x^3$ ✓

$\frac{dP}{dx} = 48x - 3x^2 = 0$ ✓

$3x(16 - x) = 0$

$\therefore x = 0$ OR $x = 16$ ✓ (6)

Numbers are 16 and 8

$\therefore$ Maximum product = ~~128~~ 2048 ✓

(c) $\frac{1}{\sqrt{2x^2-12x+26}}$

Let $y = 2x^2 - 12x + 26$

$x = \frac{-b}{2a} = \frac{12}{2(2)} = 3$ ✓

$y = 2(3)^2 - 12(3) + 26$

$= 8$ ✓

Maximum $= \frac{1}{\sqrt{8}} = 0{,}35$ ✓ (3)

Q 12 8 MARKS

(a) $S_n = n^2 + 2n$

(1) $S_8 = 8^2 + 2(8)$

$= 80$ ✓ (1)

(2) $S_9 = 9^2 + 2(9)$

$= 99$ ✓

$\therefore T_9 = 99 - 80$ ✓

$= 19$ ✓ (3)

(b)

$2^x + 2^{x+1} + 3.2^x + 2^{x+2} + \ldots = 15.2^{x+3}$

LHS $= 2^x(1 + 2 + 3 + 4 + \ldots + 15)$ ✓

$= 2^x \frac{15}{2}(1 + 15)$ ✓

$= 2^x . 15.8$ ✓

$= 2^x . 15 . 2^3$ ✓

$= 15 \; 2^{x+3}$ (4)

$=$ RHS

OR $2^x + 2^x 2 + 3.2^x + 2^2.2^x + \ldots$

$a = 2^x$ ✓

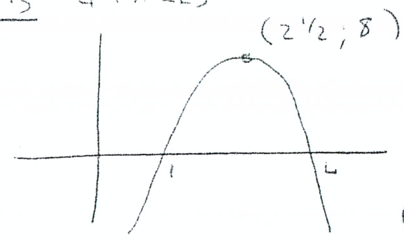
$d = 2^x$ ✓

$n = 15$ ✓ (4)

$S_{15} = \frac{15}{2}[2.2^x + 14(2^x)]$ ✓

$= \frac{15}{2}[16.2^x] = 15.2^{x+3}$

Q13 4 MARKS



✓✓

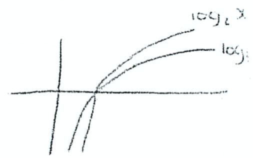
✓ ✓

$\therefore TP_t = (2½ ; -8)$

Q14 15 MARKS

(a) $\log_3 x < \log_2 x$

$x > 1$ ✓✓ (2)



(b)

(1) $10^3 = 1000$ ✓ (1)

(2) Haiti : $M = 7$

Indian Ocean

200 times more intense

$10^x = 200$ ✓✓

$\log 200 = x$ (4)

$x = 2{,}3$ ✓

Indian Ocean : $7 + 2{,}3 = 9{,}3$ ✓

OR $\frac{10^x}{10^7} = 200$ ✓✓

$10^{x-7} = 200$

$x - 7 = \log 200$ ✓

$x = 7 + \log 200$

$= 9{,}3$ ✓ (4)

OR $S_{15} = \frac{15}{2}[2^x + 15.2^x]$ ✓ (4)

$= \frac{15}{2}(16.2^x)$

$= 15 . 2^{x+3}$

(c)

(1) 6,5239 ✓ (1)

(2) 42114 ✓ (1)

(3) $\underline{\log N} = -0{,}9M + 7{,}4$ ✓ ✓ (2)

(4) $\log N = -0{,}9(7) + 7{,}4$

$\therefore N = 10^{1{,}1}$

$= 12{,}6$ ✓✓

"But N is number of earthquakes per year with magnitude greater than or equal to M"

$\log N = -0{,}9(8) + 7{,}4$

$N = 10^{0{,}2}$

$\therefore N = 1{,}6$ ✓

Number of earthquakes = 11 ✓ (4)