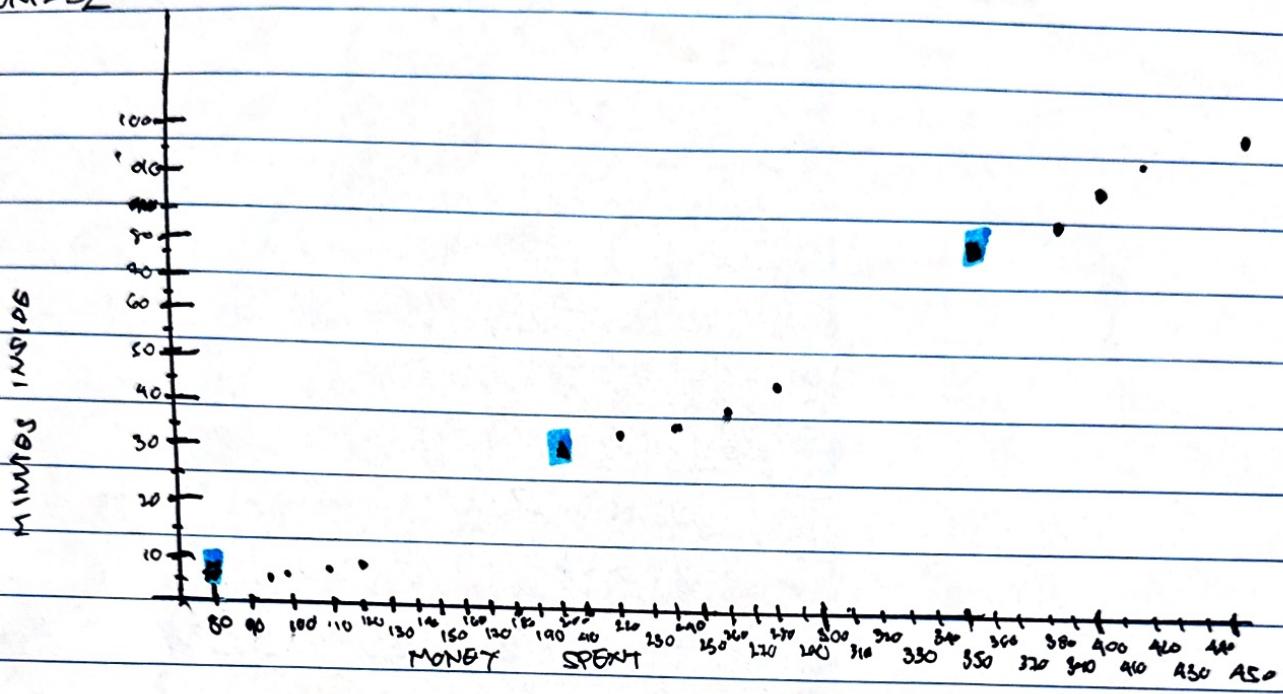


YINAS, GABRIEL ANGELO

CON232

 $K=3$ $\Delta_1 = \text{ANNA REYES } (80, 5)$ * $\Delta_2 = \text{BRIAN LIM } (350, 80)$ □ $\Delta_3 = \text{PAULA GOMEZ } (200, 50)$ △

CUSTOMER NAME	MONEY SPENT	MINUTES INSIDE	Δ_1	Δ_2	Δ_3	CUST
CHLOE MENDOZA	380	85	310.48	30.41	188.22	□
ANNA REYES	80	5	0	280.22	122.58	*
MIREA TAN	280	45	203.96	78.26	81.39	□
ZACH UX	400	90	331.1	50.99	208.81	□
KEVIN RAMOS	220	35	143.18	187.57	20.62	△.
SOFIA DELA PEÑA	110	9	30.27	250.28	92.42	*
BRIAN LIM	350	80	280.22	0	158.11	□
CHIEB ONG	450	100	382	101.91	259.62	□
LIAM CENZ	100	8	20.22	260.16	102.39	*
ELLA NAVARRO	140	38	163.37	117.75	40.79	△
JOHN MERCAPO	120	10	40.31	240.42	82.46	*
JARED HUERTS	260	42	183.76	97.69	11.19	△.
MARY SANTOS	95	7	15.13	265.24	107.49	△
PAULA GOMEZ	200	30	122.59	158.11	0	*
HANNINI ROQUE	420	95	351.71	71.59	229.40	□

$$\begin{aligned} d_1 &= (80, 5) \\ d_2 &= (350, 80) \\ d_3 &= (200, 30) \end{aligned}$$

$$D = \sqrt{(x - a)^2 + (y - b)^2}$$

$$1) CM: (380, 85) \quad d_1 = \sqrt{(380 - 80)^2 + (85 - 5)^2} = 310.48,$$

$$d_2 = \sqrt{(380 - 350)^2 + (85 - 80)^2} = 30.41,$$

$$d_3 = \sqrt{(380 - 200)^2 + (85 - 30)^2} = 188.22,$$

$$2) AR: (80, 5) \quad d_1 = \sqrt{(80 - 80)^2 + (5 - 5)^2} = 0,$$

$$d_2 = \sqrt{(80 - 350)^2 + (5 - 80)^2} = 280.22,$$

$$d_3 = \sqrt{(80 - 200)^2 + (5 - 30)^2} = 122.88,$$

$$3) MT: (280, 45) \quad d_1 = \sqrt{(280 - 80)^2 + (45 - 5)^2} = 203.96$$

$$d_2 = \sqrt{(280 - 350)^2 + (45 - 80)^2} = 78.26$$

$$d_3 = \sqrt{(280 - 200)^2 + (45 - 30)^2} = 81.39$$

$$4) ZV: (400, 90) \quad d_1 = \sqrt{(400 - 80)^2 + (90 - 5)^2} = 331.1$$

$$d_2 = \sqrt{(400 - 350)^2 + (90 - 80)^2} = 50.99$$

$$d_3 = \sqrt{(400 - 200)^2 + (90 - 30)^2} = 208.81$$

$$5) KR: (220, 35) \quad d_1 = \sqrt{(220 - 80)^2 + (35 - 5)^2} = 143.18$$

$$d_2 = \sqrt{(220 - 350)^2 + (35 - 80)^2} = 137.57$$

$$d_3 = \sqrt{(220 - 200)^2 + (35 - 30)^2} = 20.62$$

$$6) SDP: (110, 9) \quad d_1 = \sqrt{(110 - 80)^2 + (9 - 5)^2} = 30.27$$

$$d_2 = \sqrt{(110 - 350)^2 + (9 - 80)^2} = 250.28$$

$$d_3 = \sqrt{(110 - 200)^2 + (9 - 30)^2} = 92.42$$

$$7) BL: (350, 80) \quad d_1 = \sqrt{(350 - 80)^2 + (80 - 5)^2} = 280.22$$

$$d_2 = \sqrt{(350 - 80)^2 + (80 - 80)^2} = 0.$$

$$d_3 = \sqrt{(350 - 200)^2 + (80 - 30)^2} = 158.11$$

$$8) CO: (450, 10) \quad d_1 = \sqrt{(450 - 80)^2 + (10 - 5)^2} = 382$$

$$d_2 = \sqrt{(450 - 350)^2 + (10 - 80)^2} = 101.98$$

$$d_3 = \sqrt{(450 - 200)^2 + (10 - 30)^2} = 259.52$$

CM = 350

9) LC: (100, 8) $d_1 = \sqrt{(100-80)^2 + (8-5)^2} = 20.22$,
 $d_2 = \sqrt{(100-350)^2 + (8-80)^2} = 260.16$,
 $d_3 = \sqrt{(100-200)^2 + (8-30)^2} = 102.89$,

10) SM: (120, 10) $d_1 = \sqrt{(120-80)^2 + (10-5)^2} = 40.81$,
 $d_2 = \sqrt{(120-350)^2 + (10-80)^2} = 240.42$,
 $d_3 = \sqrt{(120-200)^2 + (10-30)^2} = 82.46$.

11) EN: (240, 38) $d_1 = \sqrt{(240-80)^2 + (38-5)^2} = 163.37$,
 $d_2 = \sqrt{(240-350)^2 + (38-80)^2} = 117.75$,
 $d_3 = \sqrt{(240-200)^2 + (38-30)^2} = 40.79$,

12) JF: (260, 42) $d_1 = \sqrt{(260-80)^2 + (42-5)^2} = 183.76$,
 $d_2 = \sqrt{(260-350)^2 + (42-80)^2} = 97.60$,
 $d_3 = \sqrt{(260-200)^2 + (42-30)^2} = 61.19$,

13) MC: (95, 7) $d_1 = \sqrt{(95-80)^2 + (7-5)^2} = 15.13$,
 $d_2 = \sqrt{(95-350)^2 + (7-80)^2} = 265.24$,
 $d_3 = \sqrt{(95-200)^2 + (7-30)^2} = 107.49$,

14) PG: (200, 30) $d_1 = \sqrt{(200-80)^2 + (30-5)^2} = 122.50$,
 $d_2 = \sqrt{(200-350)^2 + (30-80)^2} = 158.11$,
 $d_3 = \sqrt{(200-200)^2 + (30-30)^2} = 0$

15) HR: (420, 95) $d_1 = \sqrt{(420-80)^2 + (95-5)^2} = 351.71$,
 $d_2 = \sqrt{(420-350)^2 + (95-80)^2} = 71.59$,
 $d_3 = \sqrt{(420-200)^2 + (95-30)^2} = 229.90$,

PART#9

NEW CENTROID OF ⚫ CLUSTER:

$$a_1 = \frac{(80 + 110 + 100 + 120 + 95)}{5} = 101,$$

 $(101, 7.8)$

$$b_1 = \frac{(5 + 9 + 8 + 10 + 7)}{5} = 7.8$$

NEW CENTROID OF □ CLUSTER:

$$a_1 = \frac{380 + 280 + 400 + 350 + 450 + 420}{6} = 380,$$

 $(380, 82.5)$

$$b_1 = \frac{85 + 85 + 90 + 80 + 100 + 95}{6} = 82.5$$

NEW CENTROID OF Δ CLUSTER:

$$a_1 = \frac{220 + 240 + 260 + 200}{4} = 230,$$

 $(230, 36.25)$

$$b_1 = \frac{35 + 38 + 42 + 30}{4} = 36.25,$$

PART#5

CUSTOMER NAME	MONEY SPENT	MINUTES INSIDE	$d_1 \star$	$d_2 \square$	$d_3 \Delta$	NEW CLUSTER
CELIA MENDOZA	380	85	2801.48	2.5	157.72	□
ANNA REYES	80	5	21.01	309.85	153.22	★
MIKA TAN	280	45	182.82	104.8	50.7	△
ZACH UY	400	90	310.00	21.34	178.20	□
KAREN RAMOS	220	35	122.07	166.9	10.08	△
SOFIA DELA PEÑA	110	9	9.08	2701.13	125.06	★
BRIAN LIU	350	80	259.20	30.1	127.73	□
CARLOS ONG	450	100	360.97	72.15	* 2201.05	□
LIAM COOK	100	8	1.02	280.74	133.03	★
KELIA NAVARRO	210	38	142.24	146.9	10.15	△
JOHN MERCADO	120	10	19.13	269.92	113.09	★
JARED RODRIGUEZ	260	42	162.64	126.65	30.55	△
MARY SANTOS	95	7	6.05	201.83	138.13	★
RACHEL GOMEZ	200	30	101.96	187.50	30.69	△
HANNAH ROGERS	420	95	380.70	91.01	198.88	□

d₁: (101, 7.8) *d₂: (380, 82.5) □d₃: (230, 36.25) △

$$\rightarrow \text{CM}: (380, 85) \quad d_1 = \sqrt{(380-101)^2 + (85-7.8)^2} = 289.48$$

$$d_2 = \sqrt{(380-380)^2 + (85-82.5)^2} = 2.5$$

$$d_3 = \sqrt{(380-230)^2 + (85-36.25)^2} = 157.72$$

$$\rightarrow \text{AP}: (80, 5) \quad d_1 = \sqrt{(80-101)^2 + (5-7.8)^2} = 21.9$$

$$d_2 = \sqrt{(80-380)^2 + (5-82.5)^2} = 3001.85$$

$$d_3 = \sqrt{(80-230)^2 + (5-36.25)^2} = 153.22$$

$$\rightarrow \text{MT}: (280, 45) \quad d_1 = \sqrt{(280-101)^2 + (45-7.8)^2} = 182.82$$

$$d_2 = \sqrt{(280-380)^2 + (45-82.5)^2} = 106.8$$

$$d_3 = \sqrt{(280-230)^2 + (45-36.25)^2} = 50.7$$

$$\rightarrow \text{ZU}: (400, 90) \quad d_1 = \sqrt{(400-101)^2 + (90-7.8)^2} = 310.09$$

$$d_2 = \sqrt{(400-380)^2 + (90-82.5)^2} = 21.36$$

$$d_3 = \sqrt{(400-230)^2 + (90-36.25)^2} = 178.29$$

$$d_4 = \sqrt{(280-101)^2 + (90-7.8)^2} = 310.09$$

$$\rightarrow \text{KR}: (220, 35) \quad d_1 = \sqrt{(220-101)^2 + (35-7.8)^2} = 122.07$$

$$d_2 = \sqrt{(220-380)^2 + (35-82.5)^2} = 166.90$$

$$d_3 = \sqrt{(220-230)^2 + (35-36.25)^2} = 10.08$$

$$d_4 = \sqrt{(280-101)^2 + (35-7.8)^2} = 122.07$$

$$\rightarrow \text{SDP}: (110, 9) \quad d_1 = \sqrt{(110-101)^2 + (9-7.8)^2} = 9.08$$

$$d_2 = \sqrt{(110-380)^2 + (9-82.5)^2} = 279.83$$

$$d_3 = \sqrt{(110-230)^2 + (9-36.25)^2} = 125.06$$

$$d_4 = \sqrt{(280-101)^2 + (9-7.8)^2} = 9.08$$

$$\rightarrow \text{BL}: (350, 80) \quad d_1 = \sqrt{(350-101)^2 + (80-7.8)^2} = 259.26$$

$$d_2 = \sqrt{(350-380)^2 + (80-82.5)^2} = 30.1$$

$$d_3 = \sqrt{(350-230)^2 + (80-36.25)^2} = 127.73$$

$$\rightarrow \text{CO}: (450, 100)$$

$$d_1 = \sqrt{(450-101)^2 + (100-7.8)^2} = 360.97$$

$$d_2 = \sqrt{(450-380)^2 + (100-82.5)^2} = 72.15$$

$$d_3 = \sqrt{(450-230)^2 + (100-36.25)^2} = 229.05$$

a) LC: (100, 8)

$$d_1 = \sqrt{(100-101)^2 + (8-7.8)^2} = 1.02$$

$$d_2 = \sqrt{(100-380)^2 + (8-82.5)^2} = 289.79$$

$$d_3 = \sqrt{(100-280)^2 + (8-36.25)^2} = 133.03$$

$$d_4 = \sqrt{(8-7.8)^2 + (28-36.25)^2} = 8.5$$

b) EN: (290, 38)

$$d_1 = \sqrt{(290-101)^2 + (38-7.8)^2} = 192.29$$

$$d_2 = \sqrt{(290-380)^2 + (38-82.5)^2} = 146.90$$

$$d_3 = \sqrt{(290-280)^2 + (38-36.25)^2} = 10.15$$

$$d_4 = \sqrt{(38-7.8)^2 + (290-36.25)^2} = 28.1003$$

c) JM: (120, 10)

$$d_1 = \sqrt{(120-101)^2 + (10-7.8)^2} = 19.13$$

$$d_2 = \sqrt{(120-380)^2 + (10-82.5)^2} = 269.02$$

$$d_3 = \sqrt{(120-280)^2 + (10-36.25)^2} = 113.04$$

$$d_4 = \sqrt{(38-7.8)^2 + (120-36.25)^2} = 8.101$$

d) SF: (260, 42)

$$d_1 = \sqrt{(260-101)^2 + (42-7.8)^2} = 162.64$$

$$d_2 = \sqrt{(260-380)^2 + (42-82.5)^2} = 120.65$$

$$d_3 = \sqrt{(260-280)^2 + (42-36.25)^2} = 30.55$$

$$d_4 = \sqrt{(38-7.8)^2 + (260-36.25)^2} = 28.15$$

e) MS: (95, 7)

$$d_1 = \sqrt{(95-101)^2 + (7-7.8)^2} = 6.05$$

$$d_2 = \sqrt{(95-380)^2 + (7-82.5)^2} = 299.83$$

$$d_3 = \sqrt{(95-280)^2 + (7-36.25)^2} = 138.13$$

$$d_4 = \sqrt{(38-7.8)^2 + (95-36.25)^2} = 90.01$$

f) PG: (200, 80)

$$d_1 = \sqrt{(200-101)^2 + (80-7.8)^2} = 101.46$$

$$d_2 = \sqrt{(200-380)^2 + (80-82.5)^2} = 187.50$$

$$d_3 = \sqrt{(200-280)^2 + (80-36.25)^2} = 30.64$$

$$d_4 = \sqrt{(38-7.8)^2 + (200-36.25)^2} = 82.1022$$

g) HR: (420, 95)

$$d_1 = \sqrt{(420-101)^2 + (95-7.8)^2} = 330.70$$

$$d_2 = \sqrt{(420-380)^2 + (95-82.5)^2} = 91.91$$

$$d_3 = \sqrt{(420-280)^2 + (95-36.25)^2} = 198.88$$

$$d_4 = \sqrt{(38-7.8)^2 + (420-36.25)^2} = 1.08$$

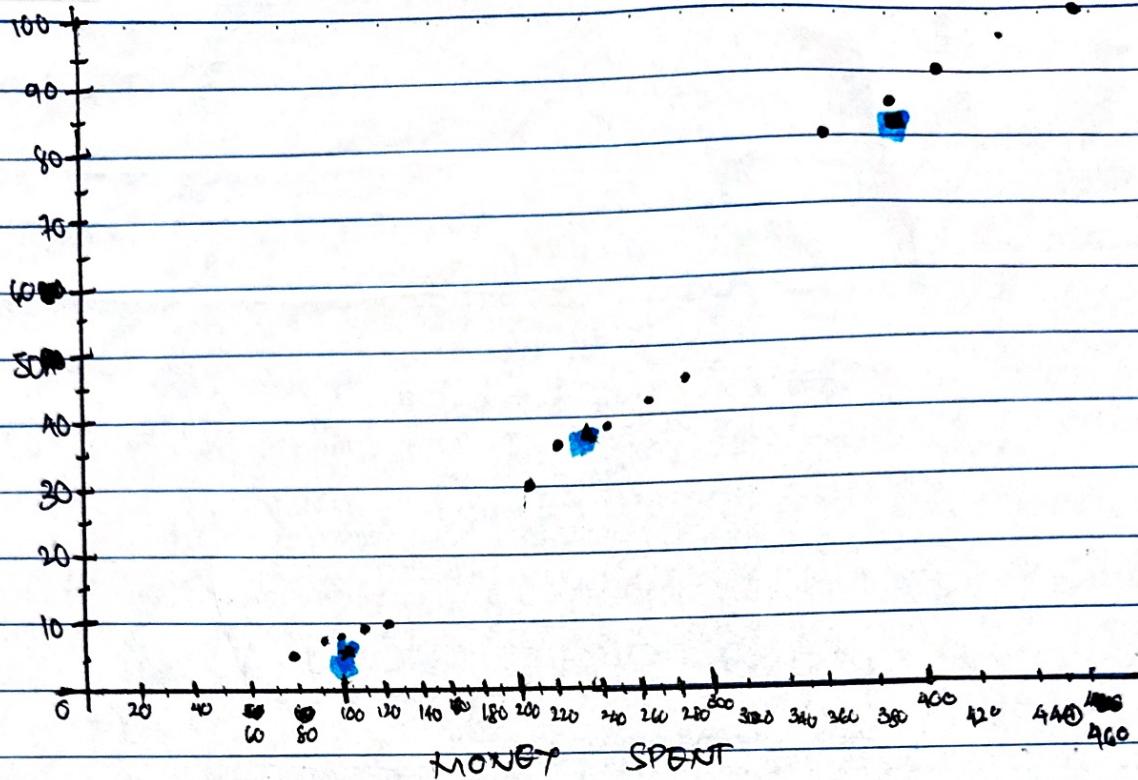
$$d_5 = \sqrt{(28-7.8)^2 + (420-36.25)^2} = 89.55$$

h) ODE: (80, 001)

$$d_1 = \sqrt{(80-101)^2 + (001-02A)^2} = 16$$

$$d_2 = \sqrt{(80-380)^2 + (001-02A)^2} = 121.5F$$

$$d_3 = \sqrt{(80-280)^2 + (001-02A)^2} = 20.055$$

INCOME
MINUTES

★ = LOW VALUE CUSTOMERS : △ = MEDIUM VALUE CUSTOMERS :

ANNA RYES

MIKA TAN

SOFIA DELA PENA

KEVIN RAMOS

LIAM CRUZ

ELLA NAVARRO

JOHN MERCADO

JARED PLORDS

MARK SANTOS

PAULA GOMEZ

□ = HIGH VALUE CUSTOMERS :

CHLOE MENDOZA

ZACH VY

BRIAN LIM

CALEB ONG

MANNAM PEGGVO