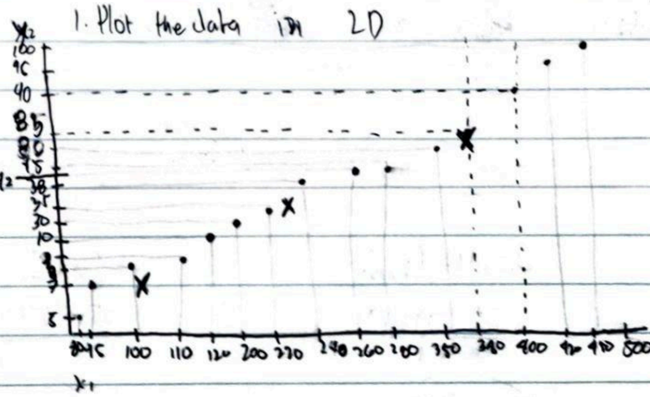
NO.:
DATE:

Stephen Acc F.S4 COM231

Money Spent $		Minutes inside
380	—	85
90	—	5
280	—	45
400	—	60
220	—	35
110	—	9
350	—	80
450	—	100
100	—	8
290	—	38
120	—	10
260	—	42
95	—	7
200	—	30
420	—	95

1. Plot the data in 2D



2-3 Using the randomly selected data points, Calculate the distance. Assign each data point to a cluster

2-3 Money Spent	Minutes inside	d_1	d_2	d_3	Cluster
1. 380	85	310.98	30.91	188.71	B
2. 90	5	0	280.22	122.58	A
3. 280	45	203.96	78.26	81.39	B
4. 400	60	331.10	51.09	305.99	B
5. 220	35	301.50	571.78	20.61	C
6. 110	9	20.26	250.28	92.41	A
7. 350	80	280.22	0	158.11	B
8. 450	100	382.0	102	269.6	B
9. 100	8	20.22	300.1	102	A
10. 290	38	163.3	11.7.75	10.80	C
11. 120	10	40.3	290.4	82.9	A
12. 260	42	183.8	97.7	61.2	C
13. 95	7	15.1	265.2	107.49	A
14. 200	30	122.6	158.1	0	C
15. 420	95	351.9	70.7	228.0	B

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9. Calculate the New Means

New Cluster 1 New x mean (money) Cluster 2 New x (money)

$\frac{(90+110+100+120+95)}{5}$ $\frac{(380+280+400+375+450+420)}{6}$

$x = 110$ $x = 384.5$

New y = (mins) $y = (mins)$

$\frac{5+9+8+10+7}{5}$ $\frac{85+45+90+80+100+95}{6}$

$y = 7.5$ $y = 82.5$

Centroid 1: (101, 7.8)

Centroid (380, 82.5)

Cluster 3 $x = \frac{(220+290+260+230)}{4}$

$= 230$

$y = \frac{(35+30+42+30)}{4}$

$= 36.25$

Centroid (230, 36.25)

Fi

$= \frac{230}{1}$

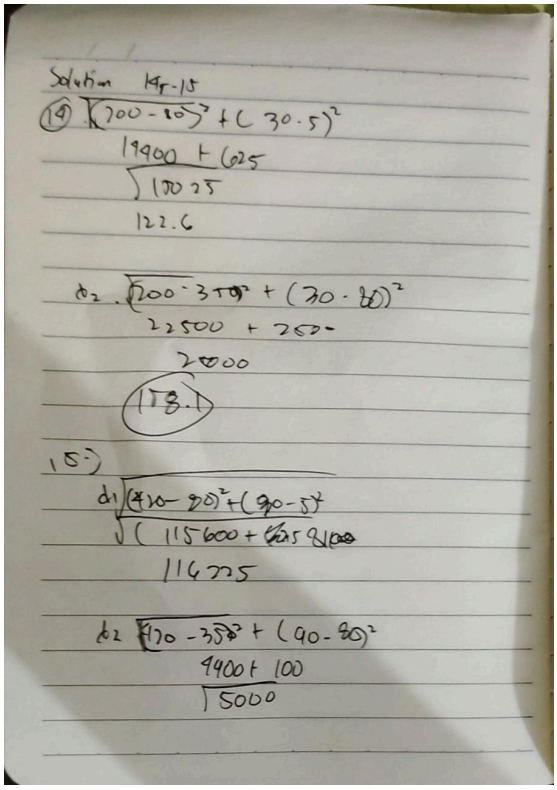
$y = \frac{[35+30+42+30]}{4}$

$= 36.25$

Centroids $(230, 36.25)$

	d_1 (101, 7.8)	d_2 (380, 82.5)	d_3 (230, 34.25)	Final Cluster
1	289.5	2.5	157.7	2
2	21.2	309.8	153.2	1
3	182.8	106.8	50.8	3
4	310.1	21.4	178.3	2
5	122.1	166.4	10.1	3
6	9.1	279.8	123.1	1
7	254.3	30.1	127.7	2
8	361.0	72.2	229.1	2
9	1.0	289.7	133.0	1
10	142.2	146.9	10.2	3
11	19.1	269.4	113.1	1
12	162.6	126.7	30.5	3
13	6.1	294.8	130.1	1
14	101.5	188.5	30.6	3
15	338.7	99.9	148.9	2

Solution



Solution 14-15

(14) $\sqrt{(200-185)^2+(30-5)^2}$

$19900 + 625$

$\sqrt{20525}$

122.6

$d_2 \sqrt{(200-350)^2+(30-80)^2}$

$22500 + 2500$

25000

(158.1)

15.)

$d_1 \sqrt{(230-200)^2+(90-5)^2}$

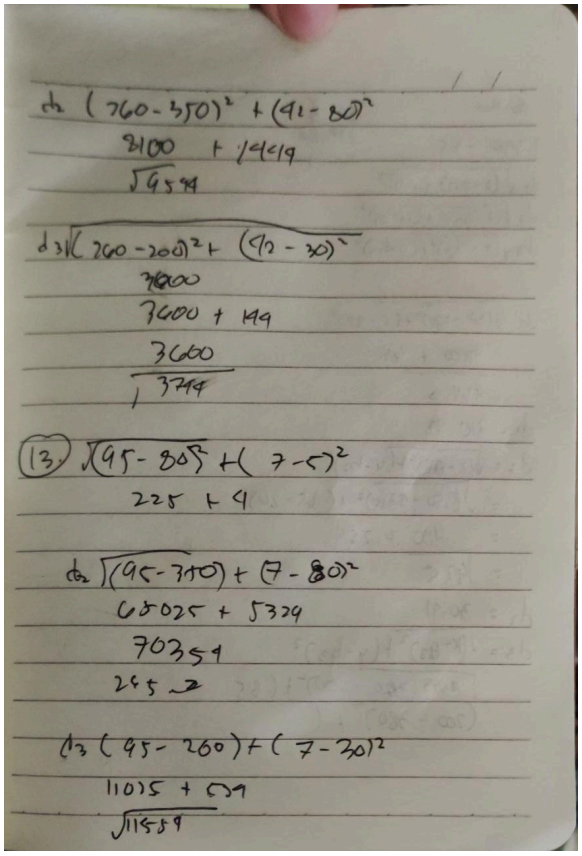
$\sqrt{115600+6525}$

116725

$d_2 \sqrt{(230-350)^2+(90-80)^2}$

$9400 + 100$

$\sqrt{5000}$



$d_2 (260-350)^2+(91-80)^2$

$8100 + 121$

$\sqrt{8221}$

$d_3 \sqrt{(260-200)^2+(91-30)^2}$

3600

$3600 + 121$

$\sqrt{3721}$

(13) $\sqrt{(95-80)^2+(7-5)^2}$

$225 + 4$

$d_2 \sqrt{(95-350)+(7-80)^2}$

$65025 + 5329$

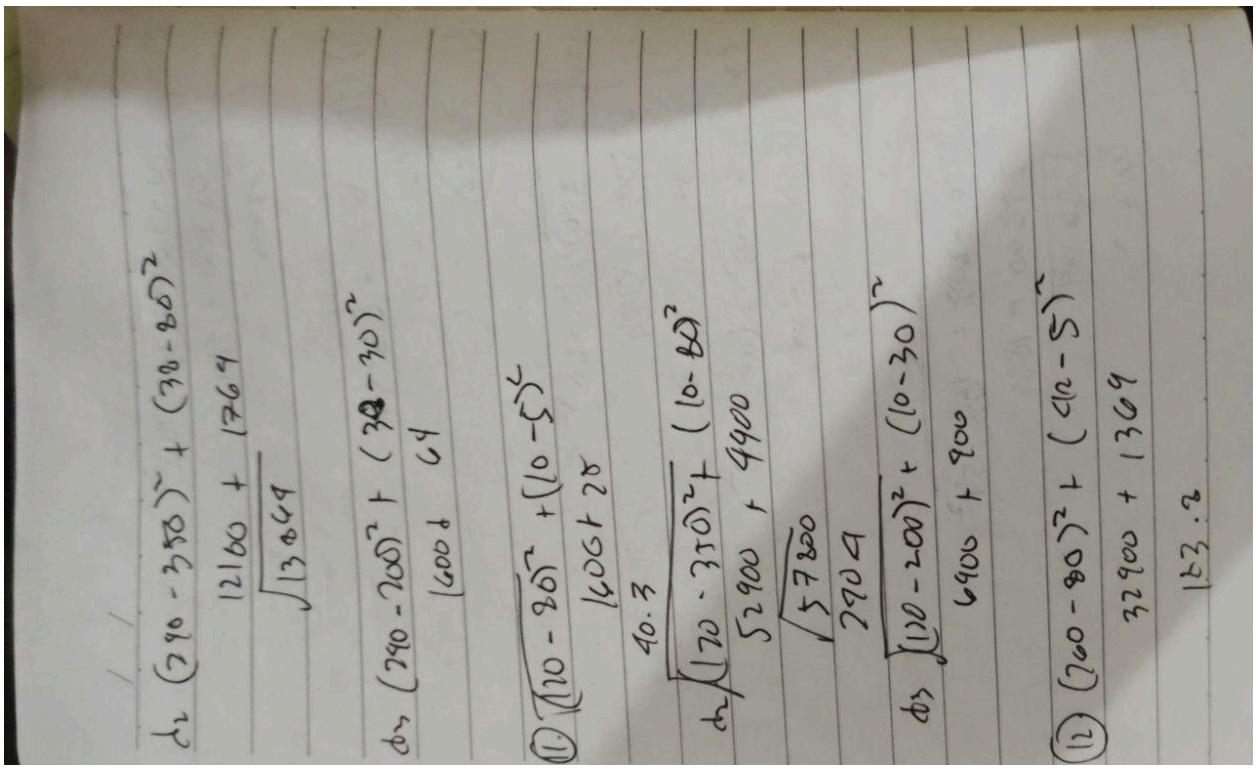
70354

265

$d_3 (95-260)+(7-30)^2$

$11025 + 529$

$\sqrt{11554}$



$d_2 (290-350)^2+(30-80)^2$

$12100 + 1764$

$\sqrt{13864}$

$d_3 (290-200)^2+(30-30)^2$

$8100 + 0$

(11) $\sqrt{(10-80)^2+(10-5)^2}$

$4900 + 25$

40.3

$d_2 \sqrt{(170-350)^2+(10-80)^2}$

$32400 + 4900$

$\sqrt{37300}$

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

$36100 + 400$

(12) $(260-80)^2+(12-5)^2$

$32400 + 1369$

183.2

6. $d_3 = (110-200)^2 + (9-30)^2$

$8100 + 441$

$\sqrt{8541}$

7. $\sqrt{(350-300)^2 + (80-5)^2}$

$2500 + 5625$

$\sqrt{79525}$

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

$22500 + 2500$

8. $\sqrt{(950-80)^2 + (100-5)^2}$

$\sqrt{136900 + 9025}$

$\sqrt{145925}$

$d_2 \sqrt{(950-350)^2 + (100-80)^2}$

$10000 + 400$

$\sqrt{10400}$

$= 102$

$d_2 = \sqrt{(950-200)^2 + (100-70)^2}$

$(62500 + 900$

$\sqrt{63400}$

9. $\sqrt{(100-80)^2 + (8-5)^2}$

$400 + 9$

$d_1 + 2022$

$d_2 \sqrt{(100-350)^2 + (80-60)^2}$

$62500 + 5184$

67684

$d_3 \sqrt{(100-200)^2 + (80-30)^2}$

$10000 + 484$

(d3) 102

10. $d\sqrt{(2904-30)^2 + (38-5)^2}$

$25600 + 1089$

$\sqrt{26689}$

163.3

$d_2 \sqrt{(280-200)^2 + (45-30)^2}$

$6400 + 225$

$\sqrt{6625}$

$= 81.39$

④

$d_1 \sqrt{(400-80)^2 + (90-5)^2}$

$\sqrt{102400 + 7225}$

$\sqrt{109625}$

$= 331.10$

$d_2 \sqrt{(400-300)^2 + (90-80)^2}$

$\sqrt{25000 + 100}$

$\sqrt{2600}$

$d_3 \sqrt{(400-100)^2 + (90-30)^2}$

$\sqrt{90000 + 3600}$

⑤ $d_1 \sqrt{(320-80)^2 + (35-5)^2}$

$90000 + 900$

$\sqrt{90900}$

$= 301.50$

$d_2 \sqrt{(320-350)^2 + (35-30)^2}$

$\sqrt{329400 + 2025}$

$\sqrt{326975}$

$\neq 571.78$

$d_3 \sqrt{(320-200)^2 + (35-30)^2}$

$400 + 25$

$\sqrt{425}$

$= 20.61$

⑥ $\sqrt{(110-30)^2 + (9-5)^2}$

d_1 $900 + 16$

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

$\sqrt{57600 + 5041}$

$\sqrt{62641} = 250.28$

$d_1 = \sqrt{(80-80)\ (85)^2}$

$= 0$

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

$\sqrt{72900 + 5625}$

$= \sqrt{78525}$

$= 280.223$

$3 = \sqrt{(80-200)^2 + (5-30)^2}$

$14460 + 625$

$\sqrt{15075}$

$\sqrt{}$

(3) $d_1 \sqrt{(280-200)^2 + (95-5)^2}$

$90000 + 1600$

$\sqrt{91600}$

$C_1 = 303.96$

$d_2 \sqrt{(260-300)^2 + (\overset{25}{80}-80)^2}$

$\sqrt{1600 + 1225}$

78.26

Solution

$d_1 \sqrt{(x-a_1)^2 + (y-b_1)^2}$ $\quad x \quad y$

$d_2 \quad (x-a_2)^2 + (y-b_2)^2 \quad 380 \quad 85$

$d_3 \quad (x-a_3)^2 + (y-b_3)^2$ $\quad$ (1.)

$d_1 \sqrt{(380-80)^2 + (85-5)^2}$

$\sqrt{90000 + 6400}$ (300)

$d_1 = \sqrt{96400}$

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

$\sqrt{900 + 25}$

$925 = 30.41$

$d_3 \sqrt{(x\,380 - 100)^2 + (85 - 30)^2}$

$= \sqrt{32400 + 3025}$

$= 188.21$ $\quad x \quad y$ (2.)

$80 \quad 5$

$d_1 \sqrt{x-a_1}$

$d_2 \sqrt{\quad}$

$d_3 \sqrt{\quad}$