

## PART1

(a)

FP1: left loop

FP2: right loop

FP3: right loop

FP4: whorl

FP5: left loop

FP6: left loop

FP7: whorl

### Part 2

FP	FP	Delta x	Delta y	Delta theta
FP1	FP2	-21.4246652087669	424.480402774576	108.482142857143
FP1	FP3	371.281029992557	319.846025386996	-162.692307692308
FP1	FP4	424.906365267116	231.680554971727	-140.625000000000
FP1	FP5	-17.941410770016	378.234352107753	116.250000000000
FP1	FP6	13.4090909090909	19.1818181818182	0
FP1	FP7	377.499197595105	68.4734974462556	-113.967391304348
FP2	FP3	375.644855953678	19.8237262644998	-86.6250000000000
FP2	FP4	-73.3760000657330	369.620432526620	83.4375000000000
FP2	FP5	67.2815542888731	-21.891627139874	-9.64285714285714
FP2	FP6	370.195408534153	130.232218207684	-108.281250000000
FP2	FP7	71.8672856558700	76.2369606783611	-12.1875000000000
FP3	FP4	72.6383159639089	-35.781672401188	-11.2500000000000
FP3	FP5	368.199792903731	77.8223145913911	-84.3750000000000
FP3	FP6	-83.1906021661901	-29.412620243678	-8.43750000000000
FP3	FP7	384.032207305980	269.393745240466	-163.636363636364
FP4	FP5	433.348691944002	126.309252848132	-112.500000000000
FP4	FP6	24.2584928961273	324.011652900537	108
FP4	FP7	-54.3600000000000	-28.0800000000	0
FP5	FP6	328.697421801577	75.1676233066336	-105
FP5	FP7	473.606728551953	123.000660181383	-115.875000000000
FP6	FP7	378.972600354931	72.2662175305872	-115.147058823529

### Part 3

FP	FP	Distance	Angle	Pair points	Unpair point
FP1	FP2	12	12	10	63
FP1	FP3	12	12	4	78
FP1	FP4	12	12	8	77
FP1	FP5	12	12	0	64
FP1	FP6	12	12	28	47
FP1	FP7	12	12	8	74
FP2	FP3	12	12	6	67
FP2	FP4	12	12	2	74
FP2	FP5	12	12	0	66
FP2	FP6	12	12	2	74
FP2	FP7	12	12	6	67
FP3	FP4	12	12	4	81
FP3	FP5	12	12	0	64
FP3	FP6	12	12	4	81
FP3	FP7	12	12	2	80
FP4	FP5	12	12	0	67
FP4	FP6	12	12	4	78
FP4	FP7	12	12	64	24
FP5	FP6	12	12	0	67
FP5	FP7	12	12	0	64
FP6	FP7	12	12	6	79

The average number of minutiae points paired is 7.52. I finally decide to use the distance of 12 and rotation of 12 (degree) as my threshold to find paired points. In the beginning, I choose 50 and 50 as my threshold of distance and rotation, but I think 50 is too big and it will not be accurate enough. Therefore, I keep decreasing a little bit for many times to find the threshold that have the best performance. I found that when the threshold is between 10 and 15, it will have the most proper number of pairing points (not too big nor too small) and have the best ability to distinguish if the two fingerprints are from the same person. Finally, I choose 12 to be my threshold to find the paired points.

Based on the pairing results, I think fingerprint 1 and fingerprint 6 are from the same individual. Fingerprint 4 and fingerprint 7 are from the same individual. If there are more than 12 pairs of minutiae of the two fingerprints, it is very possible that the two fingerprints are from the same person. Fingerprint 1 and 6 have 28 pairing points, which means there are 14 pairs of minutiae, and Fingerprint 4 and 7 have 64 pairing points, which means there are 32 pairs of minutiae. Therefore, I think fingerprint 1 and 6, fingerprint 4 and 7 are from the same person.