**BY: Fadi Alahmad Alomar 120180049**

# Question 1:  
data = [60, 62, 65, 43, 51]

dataSquared = [3600, 3844, 4225, 1849, 2601]

indices = [60, 84, 22, 84, 60]

collision when entering 43

Thus, new index for 43 = (84+12) mod 100 = 85

indices = [60, 84, 22, 85, 60]

collision when entering 51

Thus, new index for 51 = (60+12) mod 100 = 61

indices = [60, 84, 22, 85, 61]

# Question 2:  
Looking at B:

|  |  |  |
| --- | --- | --- |
| Node | Previous node | Shortest time from A |
| A | A | 0 |
| B | A | 2.5 |
| E |  |  |
| F |  |  |
| C |  |  |
| H |  |  |
| G |  |  |
| D |  |  |
| I |  |  |

Looking at E:

|  |  |  |
| --- | --- | --- |
| Node | Previous node | Shortest time from A |
| A | A | 0 |
| B | A | 2.5 |
| E | A | 3 |
| F |  |  |
| C |  |  |
| H |  |  |
| G |  |  |
| D |  |  |
| I |  |  |

Looking at F:

|  |  |  |
| --- | --- | --- |
| Node | Previous node | Shortest time from A |
| A | A | 0 |
| B | A | 2.5 |
| E | A | 3 |
| F | A | 2 |
| C |  |  |
| H |  |  |
| G |  |  |
| D |  |  |
| I |  |  |

Looking at C:

Has two paths from E or from B

From E time = 3 + 10/8 = 4.25

From B time = 2.5 + 49/7 = 9.5

Thus, the path from E is taken

|  |  |  |
| --- | --- | --- |
| Node | Previous node | Shortest time from A |
| A | A | 0 |
| B | A | 2.5 |
| E | A | 3 |
| F | A | 2 |
| C | E | 4.25 |
| H |  |  |
| G |  |  |
| D |  |  |
| I |  |  |

Looking at H:

Has three paths from C, E and F

From C time = 4.25 + 70/10 = 11.25

From E time = 3 + 60/20 = 6

From F time = 2 + 4/1 = 6

Thus, the path from F is taken

|  |  |  |
| --- | --- | --- |
| Node | Previous node | Shortest time from A |
| A | A | 0 |
| B | A | 2.5 |
| E | A | 3 |
| F | A | 2 |
| C | E | 4.25 |
| H | F | 6 |
| G |  |  |
| D |  |  |
| I |  |  |

Looking at G:

Has paths from H, F

Time from H = 6 + 22/5 = 10.4

Time from F = 2 + 12/3 = 6

Thus, the path from F is taken

|  |  |  |
| --- | --- | --- |
| Node | Previous node | Shortest time from A |
| A | A | 0 |
| B | A | 2.5 |
| E | A | 3 |
| F | A | 2 |
| C | E | 4.25 |
| H | F | 6 |
| G | F | 6 |
| D |  |  |
| I |  |  |

Looking at D:

D only has a path from C

Time = 4.25 + 64/16 = 8.25

|  |  |  |
| --- | --- | --- |
| Node | Previous node | Shortest time from A |
| A | A | 0 |
| B | A | 2.5 |
| E | A | 3 |
| F | A | 2 |
| C | E | 4.25 |
| H | F | 6 |
| G | F | 6 |
| D | C | 8.25 |
| I |  |  |

Looking at I:

Has three paths D, H and G

Time from D = 8.25 + 30/5 = 14.25

Time from H = 6 + 5/1 = 11

Time from G = 6 + 15/3 = 11

Thus, the path from G is Taken

|  |  |  |
| --- | --- | --- |
| Node | Previous node | Shortest time from A |
| A | A | 0 |
| B | A | 2.5 |
| E | A | 3 |
| F | A | 2 |
| C | E | 4.25 |
| H | F | 6 |
| G | F | 6 |
| D | C | 8.25 |
| I | G | 11 |

Shortest path = A,F,G,I with total time of 11