**Input**

* Your first step should be to pre-process this data into a usable form. **Conceptually,** you need the data in the following format:

| **Time (sec)** | **Core 0** | **Core 1** | **Core 2** | **Core 3** |
| --- | --- | --- | --- | --- |
| 0 | 61.0 | 63.0 | 50.0 | 58.0 |
| 30 | 80.0 | 81.0 | 68.0 | 77.0 |
| 60 | 62.0 | 63.0 | 52.0 | 60.0 |
| 90 | 83.0 | 82.0 | 70.0 | 79.0 |
| 120 | 68.0 | 69.0 | 58.0 | 65.0 |
|  |  |  |  |  |
|  |  |  |  |  |

* This “table” can be represented by five vectors (or similar data structure), e.g.,

time = []

readings\_core\_0 = []

readings\_core\_1 = []

readings\_core\_2 = []

readings\_core\_3 = []

* Data:

61.0 63.0 50.0 58.0

80.0 81.0 68.0 77.0

62.0 63.0 52.0 60.0

83.0 82.0 70.0 79.0

68.0 69.0 58.0 65.0

82.0 81.0 67.0 77.0

76.0 78.0 63.0 73.0

83.0 84.0 71.0 79.0

74.0 77.0 65.0 73.0

83.0 81.0 71.0 79.0

77.0 79.0 67.0 74.0

65.0 68.0 55.0 64.0

78.0 83.0 64.0 78.0

66.0 67.0 53.0 62.0

65.0 67.0 55.0 63.0

85.0 83.0 71.0 75.0

85.0 83.0 71.0 81.0

66.0 67.0 55.0 64.0

61.0 67.0 53.0 62.0

84.0 83.0 70.0 81.0

65.0 66.0 53.0 58.0

66.0 68.0 56.0 64.0

65.0 66.0 54.0 62.0

85.0 86.0 73.0 81.0

85.0 81.0 72.0 81.0

66.0 68.0 55.0 64.0

86.0 84.0 73.0 81.0

86.0 84.0 73.0 80.0

83.0 83.0 73.0 78.0

86.0 83.0 74.0 81.0

86.0 81.0 72.0 81.0

87.0 86.0 73.0 82.0

86.0 83.0 74.0 83.0

81.0 84.0 73.0 81.0

85.0 83.0 71.0 80.0

66.0 67.0 55.0 63.0

65.0 65.0 55.0 62.0

84.0 83.0 71.0 78.0

84.0 81.0 72.0 80.0

82.0 82.0 72.0 77.0

81.0 82.0 71.0 81.0

83.0 79.0 71.0 79.0

84.0 84.0 73.0 80.0

87.0 83.0 72.0 80.0

82.0 82.0 71.0 79.0

61.0 67.0 57.0 64.0

63.0 66.0 54.0 62.0

67.0 68.0 56.0 64.0

83.0 78.0 71.0 75.0

85.0 84.0 73.0 80.0

87.0 81.0 74.0 82.0

80.0 60.0 53.0 54.0

65.0 64.0 55.0 62.0

83.0 82.0 65.0 78.0

85.0 82.0 73.0 81.0

85.0 83.0 72.0 81.0

65.0 65.0 55.0 62.0

84.0 82.0 71.0 79.0

65.0 66.0 53.0 62.0

68.0 68.0 57.0 63.0

65.0 67.0 54.0 62.0

83.0 83.0 71.0 78.0

65.0 62.0 55.0 61.0

66.0 67.0 56.0 64.0

86.0 83.0 73.0 82.0

68.0 69.0 57.0 64.0

64.0 66.0 54.0 62.0

67.0 68.0 57.0 64.0

66.0 67.0 56.0 62.0

66.0 68.0 56.0 64.0

86.0 83.0 71.0 79.0

78.0 79.0 68.0 75.0

28.0 28.0 25.0 26.0

26.0 26.0 23.0 23.0

82.0 80.0 70.0 79.0

67.0 67.0 56.0 64.0

84.0 79.0 71.0 79.0

66.0 68.0 57.0 64.0

85.0 82.0 71.0 79.0

87.0 83.0 74.0 81.0

65.0 66.0 55.0 62.0

85.0 84.0 73.0 81.0

83.0 82.0 71.0 79.0

67.0 69.0 58.0 64.0

66.0 66.0 56.0 63.0

67.0 69.0 57.0 65.0

85.0 84.0 73.0 81.0

87.0 82.0 71.0 79.0

64.0 67.0 51.0 63.0

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65.0 66.0 56.0 60.0

86.0 85.0 57.0 79.0

80.0 81.0 69.0 77.0

68.0 69.0 56.0 65.0

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85.0 81.0 71.0 79.0

67.0 67.0 55.0 64.0

84.0 77.0 65.0 68.0

67.0 67.0 56.0 63.0

82.0 81.0 71.0 79.0

85.0 83.0 73.0 80.0

65.0 65.0 55.0 62.0

86.0 83.0 72.0 80.0

64.0 66.0 55.0 62.0

81.0 82.0 70.0 77.0

64.0 66.0 54.0 60.0

85.0 83.0 69.0 81.0

84.0 81.0 71.0 79.0

67.0 67.0 57.0 63.0

81.0 82.0 71.0 79.0

63.0 67.0 57.0 59.0

75.0 83.0 73.0 73.0

67.0 68.0 57.0 63.0

83.0 83.0 73.0 77.0

68.0 69.0 58.0 64.0

85.0 83.0 73.0 80.0

67.0 68.0 57.0 64.0

84.0 83.0 70.0 77.0

68.0 69.0 57.0 63.0

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65.0 66.0 54.0 60.0

85.0 83.0 73.0 81.0

65.0 66.0 53.0 62.0

84.0 82.0 71.0 80.0

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83.0 83.0 71.0 79.0

65.0 65.0 54.0 62.0

83.0 83.0 72.0 80.0

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85.0 83.0 71.0 79.0

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85.0 81.0 72.0 80.0

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85.0 82.0 72.0 80.0

65.0 65.0 54.0 61.0

83.0 83.0 71.0 79.0

65.0 66.0 53.0 61.0

82.0 83.0 69.0 80.0

66.0 66.0 55.0 62.0

85.0 83.0 70.0 79.0

77.0 82.0 70.0 77.0

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24.0 25.0 22.0 23.0

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83.0 82.0 71.0 79.0

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64.0 67.0 55.0 62.0

81.0 80.0 68.0 77.0

65.0 66.0 52.0 62.0

87.0 84.0 71.0 82.0

65.0 67.0 55.0 63.0

85.0 80.0 73.0 79.0

66.0 68.0 55.0 59.0

83.0 83.0 73.0 77.0

78.0 82.0 71.0 78.0

84.0 84.0 73.0 77.0

86.0 84.0 71.0 81.0

65.0 66.0 54.0 62.0

87.0 83.0 73.0 79.0

66.0 66.0 55.0 62.0

83.0 84.0 73.0 81.0

86.0 83.0 72.0 78.0

65.0 64.0 53.0 62.0

85.0 81.0 71.0 81.0

71.0 71.0 59.0 64.0

65.0 66.0 53.0 60.0

77.0 81.0 71.0 73.0

35.0 37.0 33.0 33.0

26.0 27.0 24.0 24.0

25.0 26.0 22.0 24.0

26.0 26.0 24.0 23.0

24.0 24.0 21.0 22.0

35.0 39.0 43.0 37.0

51.0 44.0 55.0 49.0

42.0 41.0 34.0 55.0

35.0 35.0 44.0 32.0

23.0 24.0 20.0 21.0

22.0 24.0 20.0 21.0

22.0 22.0 19.0 20.0

22.0 22.0 19.0 20.0

22.0 21.0 18.0 19.0

22.0 21.0 18.0 20.0

25.0 27.0 23.0 24.0

21.0 22.0 19.0 20.0

73.0 75.0 63.0 71.0

80.0 80.0 69.0 76.0

61.0 63.0 51.0 57.0

78.0 77.0 66.0 78.0

81.0 80.0 69.0 76.0

* **Piecewise Linear Interpolation** created an updated codebase with piecewise linear interpolation implemented.
  + **It is basically on the equation of a line between two points, do that for every pair of adjacent points out the line.**
* example of piecewise linear interpolation output for a single core:

0 <= x < 30; y\_0 = 61.0000 + 0.6333x; interpolation

30 <= x < 60; y\_1 = 98.0000 + -0.6000x; interpolation

60 <= x < 90; y\_2 = 20.0000 + 0.7000x; interpolation

90 <= x < 120; y\_3 = 128.0000 + -0.5000x; interpolation

120 <= x < 150; y\_4 = 12.0000 + 0.4667x; interpolation

150 <= x < 180; y\_5 = 112.0000 + -0.2000x; interpolation

180 <= x < 210; y\_6 = 34.0000 + 0.2333x; interpolation

210 <= x < 240; y\_7 = 146.0000 + -0.3000x; interpolation

240 <= x < 270; y\_8 = 2.0000 + 0.3000x; interpolation

270 <= x < 300; y\_9 = 137.0000 + -0.2000x; interpolation

300 <= x < 330; y\_10 = 197.0000 + -0.4000x; interpolation

330 <= x < 360; y\_11 = -78.0000 + 0.4333x; interpolation

360 <= x < 390; y\_12 = 222.0000 + -0.4000x; interpolation

390 <= x < 420; y\_13 = 79.0000 + -0.0333x; interpolation

420 <= x < 450; y\_14 = -215.0000 + 0.6667x; interpolation

450 <= x < 480; y\_15 = 85.0000 + 0.0000x; interpolation

480 <= x < 510; y\_16 = 389.0000 + -0.6333x; interpolation

510 <= x < 540; y\_17 = 151.0000 + -0.1667x; interpolation

540 <= x < 570; y\_18 = -353.0000 + 0.7667x; interpolation

570 <= x < 600; y\_19 = 445.0000 + -0.6333x; interpolation

600 <= x < 630; y\_20 = 45.0000 + 0.0333x; interpolation

630 <= x < 660; y\_21 = 87.0000 + -0.0333x; interpolation

660 <= x < 690; y\_22 = -375.0000 + 0.6667x; interpolation

690 <= x < 720; y\_23 = 85.0000 + 0.0000x; interpolation

720 <= x < 750; y\_24 = 541.0000 + -0.6333x; interpolation

750 <= x < 780; y\_25 = -434.0000 + 0.6667x; interpolation

780 <= x < 810; y\_26 = 86.0000 + 0.0000x; interpolation

810 <= x < 840; y\_27 = 167.0000 + -0.1000x; interpolation

840 <= x < 870; y\_28 = -1.0000 + 0.1000x; interpolation

870 <= x < 900; y\_29 = 86.0000 + 0.0000x; interpolation

900 <= x < 930; y\_30 = 56.0000 + 0.0333x; interpolation

930 <= x < 960; y\_31 = 118.0000 + -0.0333x; interpolation

960 <= x < 990; y\_32 = 246.0000 + -0.1667x; interpolation

990 <= x < 1020; y\_33 = -51.0000 + 0.1333x; interpolation

1020 <= x < 1050; y\_34 = 731.0000 + -0.6333x; interpolation

1050 <= x < 1080; y\_35 = 101.0000 + -0.0333x; interpolation

1080 <= x < 1110; y\_36 = -619.0000 + 0.6333x; interpolation

1110 <= x < 1140; y\_37 = 84.0000 + 0.0000x; interpolation

1140 <= x < 1170; y\_38 = 160.0000 + -0.0667x; interpolation

1170 <= x < 1200; y\_39 = 121.0000 + -0.0333x; interpolation

1200 <= x < 1230; y\_40 = 1.0000 + 0.0667x; interpolation

1230 <= x < 1260; y\_41 = 42.0000 + 0.0333x; interpolation

1260 <= x < 1290; y\_42 = -42.0000 + 0.1000x; interpolation

1290 <= x < 1320; y\_43 = 302.0000 + -0.1667x; interpolation

1320 <= x < 1350; y\_44 = 1006.0000 + -0.7000x; interpolation

1350 <= x < 1380; y\_45 = -29.0000 + 0.0667x; interpolation

1380 <= x < 1410; y\_46 = -121.0000 + 0.1333x; interpolation

1410 <= x < 1440; y\_47 = -685.0000 + 0.5333x; interpolation

1440 <= x < 1470; y\_48 = -13.0000 + 0.0667x; interpolation

1470 <= x < 1500; y\_49 = -13.0000 + 0.0667x; interpolation

1500 <= x < 1530; y\_50 = 437.0000 + -0.2333x; interpolation

1530 <= x < 1560; y\_51 = 845.0000 + -0.5000x; interpolation

1560 <= x < 1590; y\_52 = -871.0000 + 0.6000x; interpolation

1590 <= x < 1620; y\_53 = -23.0000 + 0.0667x; interpolation

1620 <= x < 1650; y\_54 = 85.0000 + 0.0000x; interpolation

1650 <= x < 1680; y\_55 = 1185.0000 + -0.6667x; interpolation

1680 <= x < 1710; y\_56 = -999.0000 + 0.6333x; interpolation

1710 <= x < 1740; y\_57 = 1167.0000 + -0.6333x; interpolation

1740 <= x < 1770; y\_58 = -109.0000 + 0.1000x; interpolation

1770 <= x < 1800; y\_59 = 245.0000 + -0.1000x; interpolation

1800 <= x < 1830; y\_60 = -1015.0000 + 0.6000x; interpolation

1830 <= x < 1860; y\_61 = 1181.0000 + -0.6000x; interpolation

1860 <= x < 1890; y\_62 = 3.0000 + 0.0333x; interpolation

1890 <= x < 1920; y\_63 = -1194.0000 + 0.6667x; interpolation

1920 <= x < 1950; y\_64 = 1238.0000 + -0.6000x; interpolation

1950 <= x < 1980; y\_65 = 328.0000 + -0.1333x; interpolation

1980 <= x < 2010; y\_66 = -134.0000 + 0.1000x; interpolation

2010 <= x < 2040; y\_67 = 134.0000 + -0.0333x; interpolation

2040 <= x < 2070; y\_68 = 66.0000 + 0.0000x; interpolation

2070 <= x < 2100; y\_69 = -1314.0000 + 0.6667x; interpolation

2100 <= x < 2130; y\_70 = 646.0000 + -0.2667x; interpolation

2130 <= x < 2160; y\_71 = 3628.0000 + -1.6667x; interpolation

2160 <= x < 2190; y\_72 = 172.0000 + -0.0667x; interpolation

2190 <= x < 2220; y\_73 = -4062.0000 + 1.8667x; interpolation

2220 <= x < 2250; y\_74 = 1192.0000 + -0.5000x; interpolation

2250 <= x < 2280; y\_75 = -1208.0000 + 0.5667x; interpolation

2280 <= x < 2310; y\_76 = 1452.0000 + -0.6000x; interpolation

2310 <= x < 2340; y\_77 = -1397.0000 + 0.6333x; interpolation

2340 <= x < 2370; y\_78 = -71.0000 + 0.0667x; interpolation

2370 <= x < 2400; y\_79 = 1825.0000 + -0.7333x; interpolation

2400 <= x < 2430; y\_80 = -1535.0000 + 0.6667x; interpolation

2430 <= x < 2460; y\_81 = 247.0000 + -0.0667x; interpolation

2460 <= x < 2490; y\_82 = 1395.0000 + -0.5333x; interpolation

2490 <= x < 2520; y\_83 = 150.0000 + -0.0333x; interpolation

2520 <= x < 2550; y\_84 = -18.0000 + 0.0333x; interpolation

2550 <= x < 2580; y\_85 = -1463.0000 + 0.6000x; interpolation

2580 <= x < 2610; y\_86 = -87.0000 + 0.0667x; interpolation

2610 <= x < 2640; y\_87 = 2088.0000 + -0.7667x; interpolation

2640 <= x < 2670; y\_88 = -288.0000 + 0.1333x; interpolation

2670 <= x < 2700; y\_89 = -1534.0000 + 0.6000x; interpolation

2700 <= x < 2730; y\_90 = 266.0000 + -0.0667x; interpolation

2730 <= x < 2760; y\_91 = -7.0000 + 0.0333x; interpolation

2760 <= x < 2790; y\_92 = 269.0000 + -0.0667x; interpolation

2790 <= x < 2820; y\_93 = 1664.0000 + -0.5667x; interpolation

2820 <= x < 2850; y\_94 = -122.0000 + 0.0667x; interpolation

2850 <= x < 2880; y\_95 = -502.0000 + 0.2000x; interpolation

2880 <= x < 2910; y\_96 = 554.0000 + -0.1667x; interpolation

2910 <= x < 2940; y\_97 = -1580.0000 + 0.5667x; interpolation

2940 <= x < 2970; y\_98 = 576.0000 + -0.1667x; interpolation

2970 <= x < 3000; y\_99 = -315.0000 + 0.1333x; interpolation

3000 <= x < 3030; y\_100 = 285.0000 + -0.0667x; interpolation

3030 <= x < 3060; y\_101 = -18.0000 + 0.0333x; interpolation

3060 <= x < 3090; y\_102 = 186.0000 + -0.0333x; interpolation

3090 <= x < 3120; y\_103 = -432.0000 + 0.1667x; interpolation

3120 <= x < 3150; y\_104 = 296.0000 + -0.0667x; interpolation

3150 <= x < 3180; y\_105 = 2186.0000 + -0.6667x; interpolation

**Input Library**

input\_temps = sys.argv[1]

with open(input\_temps, 'r') as temps\_file:

# ----------------------------------------------------------------------

# Output raw structure

# for temps\_as\_floats in parse\_raw\_temps(temps\_file):

# print(temps\_as\_floats)

# ----------------------------------------------------------------------

for temps\_as\_floats in parse\_raw\_temps(temps\_file):

print(temps\_as\_floats)

with open(input\_temps, 'r') as temps\_file:

# ----------------------------------------------------------------------

# Split data

# for temps\_as\_floats in parse\_raw\_temps(temps\_file):

# time, core\_data = temps\_as\_floats

# print(f"{time = } | {core\_data = }")

# ----------------------------------------------------------------------

for temps\_as\_floats in parse\_raw\_temps(temps\_file):

time, core\_data = temps\_as\_floats

print(f"{time = } | {core\_data = }")

with open(input\_temps, 'r') as temps\_file:

# ----------------------------------------------------------------------

# Split Data

# times = []

# core\_0\_data = []

# core\_1\_data = []

# core\_2\_data = []

# core\_3\_data = []

# for time, core\_data in parse\_raw\_temps(temps\_file):

# times.append(time)

# core\_0\_data.append(core\_data[0])

# core\_1\_data.append(core\_data[1])

# core\_2\_data.append(core\_data[2])

# core\_3\_data.append(core\_data[3])

# print(f"{times[:4] = }")

# print(f"{core\_0\_data[:4] = }")

# for time, \*temps in list(zip(times, core\_0\_data, core\_1\_data, core\_2\_data, core\_3\_data))[4:]:

# print(f"{time=} {temps=}")

# ----------------------------------------------------------------------

times = []

core\_0\_data = []

core\_1\_data = []

core\_2\_data = []

core\_3\_data = []

for time, core\_data in parse\_raw\_temps(temps\_file):

times.append(time)

core\_0\_data.append(core\_data[0])

core\_1\_data.append(core\_data[1])

core\_2\_data.append(core\_data[2])

core\_3\_data.append(core\_data[3])

print(f"{times[:4] = }")

print(f"{core\_0\_data[:4] = }")

for time, \*temps in list(zip(times, core\_0\_data, core\_1\_data, core\_2\_data, core\_3\_data))[4:]:

print(f"{time=} {temps=}")

with open(input\_temps, 'r') as temps\_file:

# ----------------------------------------------------------------------

# Split Data, but Better!

# ----------------------------------------------------------------------

times = []

core\_data = [[] for \_ in range(0, 4)]

**Output Format**

All output must be written to text files (one file per core). Each line must take the form:

xk<=x<xk+1xk<=x<xk+1; yi=c0+c1xyi=c0+c1x ; type

where

* xk and xk+1 are the domain in which yk is applicable
* yk is the kth function
* type is either least-squares or interpolation

You would generate 4 output files

* {basename}-core-0.{txt}
* {basename}-core-1.{txt}
* {basename}-core-2.{txt}
* {basename}-core-3.{txt}

**Note**

* Your program must accept an input filename as the first command line argument. Your program **must NOT** prompt the user for a filename.
* Your solution must be organized into appropriate “modules” (using each language’s best practices). Start with four modules:

1. Input (e.g., using the supplied input libraries)
2. Data pre-processing (i.e., structuring the data for analysis)
3. Piecewise Linear Interpolation

* All code must be properly and fully documented using a language appropriate comment style. All functions (including parameters and return types) must be documented inread.md.