

Sheet1

```
python3 2048.py --  
agent=ReflexAgent --  
num_of_games=10 --  
display=SummaryDisplay
```

```
python3 2048.py --  
agent=MinmaxAgent --depth=1 --  
random_seed=1 --  
initial_board=test_layout.txt
```

```
python3 2048.py --  
agent=MinmaxAgent --depth=2
```

```
--agent=AlphaBetaAgent --depth=2  
--evaluation_function=better --  
num_of_games=5 --  
display=SummaryDisplay
```

Heuristics:

```
(h1 = smoothness_heuristic(current_game_state)  
h2 = monotonicity_heuristic(current_game_state)  
h3 = free_tiles_heuristic(current_game_state)  
H4 = max_tile_heuristic(current_game_state))
```

$h1 + h2 + h3/5 + h4$
(max_tile heuristic without log_2)

$h1 + h2 + h3 + h4$
(dominant smoothness)

$h1/5 + h2 + h3 + h4$

$h1/5 + h2 + h3/5 + h4$

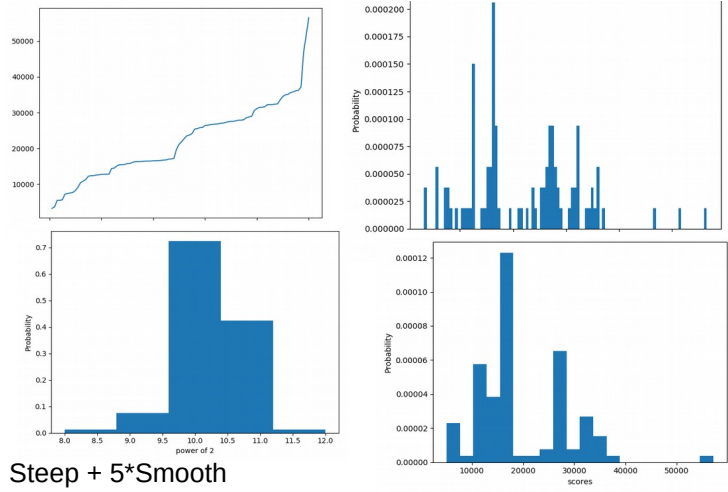
Steep + Smooth

Steep

Steep + 5*Smooth

Steep + 10*Smooth

Sheet1



Steep + 5*Smooth

Steep + 10*Smooth

Steep + 10*Modified smooth

Results

scores: [6700, 7220, 6788, 6668, 3388, 10180, 11760, 7076, 5760, 14560]
highest tile: [512, 512, 512, 512, 256, 1024, 1024, 512, 512, 1024]
game_durations: [3.6722030639648438, 3.7026968002319336, 3.3267080783843994, 3.609514713

scores: [7444, 7364, 6356, 7332, 5780, 7184, 3108, 6332, 3140, 3240]
highest tile: [512, 512, 512, 512, 512, 512, 256, 512, 256, 256]
game_durations: [3.8254876136779785, 4.072579860687256, 3.6911118030548096, 3.897201061248779]
scores: [3184, 3188, 2444, 3244, 6784, 6960, 3428, 3448, 3364, 3112]
highest tile: [256, 256, 256, 256, 512, 512, 256, 256, 256, 256]
game_durations: [2.0132076740264893, 1.8837051391601562, 1.628037691116333, 2.091563224792480]
scores: [5600, 3268, 5680, 3236, 6816, 7916, 3364, 7300, 5460, 15348]
highest tile: [512, 256, 512, 256, 512, 512, 256, 512, 512, 1024]
game_durations: [3.0982143878936768, 2.2227556705474854, 3.2967333793640137, 2.15472316741943]

scores: [6904, 5620, 6448, 12232, 5864, 14176, 5692, 4912, 2840, 3060]
highest tile: [512, 512, 512, 1024, 512, 1024, 512, 512, 256, 256]
game_durations: [3.9027786254882812, 3.062540054321289, 3.580364465713501, 5.650184154510498,
number of games played: 20
scores: [12120, 25192, 15884, 7164, 24228, 16276, 15832, 16068, 12880, 16156, 26152, 8372, 8408, 253
highest tile: [1024, 2048, 1024, 512, 2048, 1024, 1024, 1024, 1024, 2048, 512, 512, 2048, 2048, 204
game_durations: [6.520694017410278, 11.285663843154907, 8.529929399490356, 4.456530332565308,
win rate: 0.35
average score: 17133.0
7000+ proportion: 1.0
average high tile: 1254.4
number of games played: 20
scores: [15568, 13764, 14780, 5388, 22376, 16056, 2116, 7324, 6488, 6364, 19460, 15624, 32040, 5708, 1
highest tile: [1024, 1024, 1024, 512, 2048, 1024, 128, 512, 512, 512, 1024, 1024, 2048, 512, 1024, 2048, 2
game_durations: [8.909505367279053, 8.040616512298584, 8.57675552368164, 3.7677972316741943, 1
win rate: 0.2
average score: 13952.6
7000+ proportion: 0.7
average high tile: 1017.6
number of games played: 100
scores: [7500, 7076, 16460, 11604, 35580, 16764, 36776, 36400, 16116, 12308, 17332, 23336, 51504, 16
highest tile: [512, 512, 1024, 1024, 2048, 1024, 2048, 2048, 1024, 1024, 2048, 4096, 1024, 1024, 20
game_durations: [3.4347333908081055, 3.1442136764526367, 6.361102819442749, 4.490961790084839
win rate: 0.44
average score: 21260.6
7000+ proportion: 0.98
average high tile: 1454.08
Press Enter to continue...
number of games played: 100
scores: [10660, 16136, 28036, 16344, 16400, 7444, 16144, 14784, 35472, 16928, 17000, 16772, 27156, 2
highest tile: [1024, 1024, 2048, 1024, 1024, 512, 1024, 1024, 2048, 1024, 1024, 1024, 2048, 2048, 1024, 2
game_durations: [3.7808806896209717, 5.845377683639526, 8.95038390159607, 6.470235109329224, 6
win rate: 0.5
average score: 22115.52
7000+ proportion: 0.95
average high tile: 1495.04

Sheet1

number of games played: 100
scores: [23724, 27880, 34552, 27880, 32228, 16448, 14480, 31636, 21112, 12748, 32216, 25376, 30592, 1
highest tile: [2048, 2048, 2048, 2048, 2048, 1024, 1024, 2048, 2048, 1024, 2048, 2048, 2048, 2048, 2048, 1
game_durations: [8.07075572013855, 9.83856749534607, 11.935593128204346, 10.005876064300537, 1
win rate: 0.51
average score: 21923.44
7000+ proportion: 0.95
average high tile: 1546.24
number of games played: 100
scores: [16056, 28052, 16772, 16672, 27272, 16512, 16492, 16096, 27384, 34060, 16180, 12808, 14420, 1
highest tile: [1024, 2048, 1024, 1024, 2048, 1024, 1024, 1024, 2048, 2048, 1024, 1024, 1024, 1024, 2048, 1
game_durations: [6.75113320350647, 10.452173233032227, 7.29611349105835, 7.194705009460449, 10
win rate: 0.35
average score: 19744.76
7000+ proportion: 0.97
average high tile: 1364.48
number of games played: 100
scores: [27904, 14148, 15968, 27268, 17220, 15340, 58476, 7736, 27488, 15384, 13372, 12384, 15900, 70
highest tile: [2048, 1024, 1024, 2048, 1024, 1024, 4096, 512, 2048, 1024, 1024, 1024, 512, 2048, 20
game_durations: [10.124497175216675, 5.894779205322266, 6.487570762634277, 9.725243091583252, 9
win rate: 0.46
average score: 22504.32
7000+ proportion: 1.0
average high tile: 1536.0
number of games played: 100
scores: [16444, 17608, 18140, 11440, 23908, 16872, 16480, 36384, 14696, 3368, 27632, 7660, 27676, 55
highest tile: [1024, 1024, 1024, 1024, 2048, 1024, 1024, 2048, 1024, 256, 2048, 512, 2048, 512, 1024, 102
game_durations: [7.346301794052124, 7.874952554702759, 8.12255334854126, 5.442161321640015, 9
win rate: 0.33
average score: 19322.24
7000+ proportion: 0.97
512 amount: 0.12
1024 amount: 0.53
2048 amount: 0.31
4096 amount: 0.02
average high tile: 1326.08
number of games played: 100
scores: [17220, 26884, 17520, 11016, 14444, 14808, 35576, 17224, 16472, 8064, 7376, 17672, 7040, 311
highest tile: [1024, 2048, 1024, 1024, 1024, 1024, 2048, 1024, 1024, 512, 512, 1024, 512, 2048, 1024, 102
game_durations: [7.036326169967651, 9.81471562385559, 7.229621648788452, 4.676940202713013, 5
win rate: 0.38
average score: 20578.08
7000+ proportion: 0.99
512 amount: 0.13
1024 amount: 0.49
2048 amount: 0.37
4096 amount: 0.01
average high tile: 1367.04

Sheet1

number of games played: 100

scores: [5684, 34440, 38604, 11824, 26788, 25568, 16016, 16620, 7452, 34828, 18416, 16020, 31580, 140

highest tile: [512, 2048, 2048, 1024, 2048, 2048, 1024, 1024, 512, 2048, 1024, 1024, 2048, 1024, 2048, 10

game_durations: [2.818512439727783, 11.716631412506104, 13.130659103393555, 4.802930593490601

win rate: 0.43

average score: 21069.08

7000+ proportion: 0.98

512 amount: 0.1

1024 amount: 0.47

2048 amount: 0.43

4096 amount: 0.0

average high tile: 1413.12

Press Enter to continue...

number of games played: 100

scores: [27300, 23552, 16152, 16352, 27964, 16312, 15604, 32616, 16780, 16252, 23496, 23388, 8368, 50

highest tile: [2048, 2048, 1024, 1024, 2048, 1024, 1024, 2048, 1024, 1024, 2048, 2048, 512, 4096, 2048, 1

game_durations: [11.142346143722534, 9.002844333648682, 7.056978225708008, 7.297561883926392,

win rate: 0.45

average score: 21920.0

7000+ proportion: 1.0

512 amount: 0.06

1024 amount: 0.49

2048 amount: 0.41

4096 amount: 0.04

average high tile: 1536.0

2873535, 2.175251007080078, 4.253881931304932, 4.979215145111084, 3.740269422531128

3, 3.3002681732177734, 3.831936836242676, 2.121735095977783, 3.4618563652038574, 2.1473

5, 3.4337704181671143, 3.29649019241333, 2.0791590213775635, 2.055600643157959, 1.96672

36, 3.495859146118164, 3.768953800201416, 2.0939276218414307, 3.6111207008361816, 2.969

3.213409423828125, 6.695775747299194, 3.407723903656006, 2.7179653644561768, 2.0258252

40, 26880, 27344, 16160, 7120, 8176, 26908]

8, 1024, 512, 512, 2048]

10.987003326416016, 8.663662672042847, 8.502809762954712, 8.625328302383423, 6.9973886

15272, 23288, 23336, 3148, 14552, 16400]

048, 256, 1024, 1024]

10.50771450996399, 9.03596830368042, 2.0275626182556152, 4.443982839584351, 4.389935255

284, 16208, 24760, 28300, 16416, 27148, 9016, 23552, 7548, 16876, 30244, 23232, 13988, 16464, 1

48, 2048, 1024, 2048, 512, 2048, 512, 1024, 2048, 1024, 1024, 512, 2048, 512, 2048, 1024, 1

), 11.571162939071655, 7.1044769287109375, 14.685087442398071, 13.878041982650757, 6.432

3340, 14624, 25448, 27360, 27880, 23784, 16204, 34668, 38120, 27520, 16848, 7556, 14692, 1660

048, 2048, 2048, 2048, 1024, 2048, 2048, 2048, 1024, 512, 1024, 1024, 2048, 2048, 2048, 1024, 10

3.166019678115845, 3.4267146587371826, 5.937112331390381, 5.620405435562134, 10.8993086

Sheet1

26840, 22748, 16292, 26448, 24140, 12724, 27020, 5608, 17012, 28032, 31492, 5448, 31456, 16448,
1024, 2048, 2048, 1024, 2048, 512, 1024, 2048, 2048, 512, 2048, 1024, 1024, 1024, 512, 1024, 102
11.128036260604858, 6.717657089233398, 6.017200231552124, 10.794314622879028, 6.91504951

14704, 32452, 27200, 5080, 16268, 17856, 17984, 7372, 10812, 15100, 7676, 16000, 15520, 14628,
2048, 256, 1024, 1024, 1024, 512, 1024, 1024, 512, 1024, 1024, 1024, 2048, 1024, 1024, 1024, 204
).076218843460083, 7.087592601776123, 6.933827638626099, 6.77899956703186, 10.1591148371

008, 27340, 27540, 25084, 27356, 27320, 16364, 17608, 9136, 37872, 27448, 13208, 28088, 32548,
48, 2048, 2048, 2048, 1024, 1024, 512, 2048, 2048, 1024, 2048, 2048, 1024, 512, 2048, 2048
7.451321601867676, 6.695913553237915, 18.788195371627808, 4.074750661849976, 10.0778631

24, 13712, 17656, 11384, 25760, 19544, 8160, 25756, 16360, 7856, 16172, 7964, 12460, 15464, 16
4, 1024, 2048, 1024, 512, 2048, 1024, 512, 1024, 512, 1024, 1024, 1024, 2048, 1024, 1024, 1024, 2
702603340148926, 7.5533246994018555, 7.251799583435059, 14.30817461013794, 6.7371811861

44, 18352, 18552, 17080, 26448, 13872, 28880, 16536, 17120, 16112, 28212, 15952, 14192, 37752,
4, 1024, 2048, 1024, 2048, 1024, 1024, 1024, 2048, 1024, 1024, 2048, 1024, 1024, 1024, 1024, 102
891077280044556, 6.207032680511475, 12.795528411865234, 7.157455682754517, 7.0562977791

Sheet1

624, 28852, 15712, 14668, 35860, 26852, 15024, 27148, 18736, 14428, 13312, 18344, 32424, 16056, 1024, 1024, 2048, 2048, 1024, 2048, 1024, 1024, 1024, 1024, 2048, 1024, 512, 2048, 2048, 512, 512, 1, 9.354461431503296, 9.388949632644653, 6.584068059921265, 6.677210092544556, 3.6426069

6376, 32048, 17844, 27132, 28884, 17852, 12092, 16372, 31916, 33904, 25796, 17360, 13232, 2684, 1024, 2048, 2048, 1024, 1024, 1024, 2048, 2048, 2048, 1024, 1024, 2048, 512, 1024, 2048, 1024, 511.340174436569214, 7.047916650772095, 6.706801414489746, 12.271732568740845, 7.426599

, 3.044772148132324, 6.298325300216675]

53172302246, 2.148775815963745]

74951934814, 1.9578242301940918]

852924346924, 6.074726581573486]

62069702, 2.0870628356933594]

01303101, 8.50090765953064, 12.117806911468506, 5.229467391967773, 5.335613489151001, 1.

050659, 4.193993330001831, 10.232784271240234, 8.73747992515564, 15.654461145401001, 4.2

7164, 31972, 9048, 32952, 16832, 16568, 26948, 7124, 25420, 23636, 3604, 16384, 57304, 7548, 14
024, 2048, 512, 2048, 2048, 256, 1024, 4096, 512, 1024, 1024, 2048, 2048, 2048, 1024, 1024, 2048,
959794998169, 5.550571441650391, 7.405619859695435, 8.017560482025146, 16.0787630081176

0, 33516, 35624, 27584, 13920, 15344, 23588, 34252, 16180, 34352, 15076, 27252, 5772, 32792, 27
24, 2048, 2048, 1024, 2048, 1024, 2048, 512, 2048, 2048, 1024, 1024, 2048, 1024, 2048, 2048, 2048,
81488037, 6.250766754150391, 6.074163436889648, 6.184638500213623, 8.54232668876648, 7.7

3, 12548, 15704, 7652, 14380, 15072, 28780, 27460, 23520, 32364, 3216, 12344, 15504, 16316, 165
4, 2048, 2048, 2048, 2048, 256, 1024, 1024, 1024, 1024, 512, 1024, 2048, 2048, 2048, 4096, 1024, 1
529174805, 5.011847972869873, 11.313501358032227, 8.55589747428894, 10.03651738166809, 6

, 27992, 14368, 15496, 12476, 27012, 17828, 14388, 16216, 15560, 12524, 16688, 31508, 12368, 12
8, 1024, 1024, 1024, 1024, 1024, 1024, 1024, 2048, 1024, 1024, 1024, 2048, 2048, 1024, 2048, 1024, 102
646484, 12.04001522064209, 6.61307168006897, 5.6164021492004395, 5.90460729598999, 6.246

, 34628, 14132, 7080, 23720, 34036, 13832, 16120, 32916, 27456, 14024, 20784, 23732, 34544, 154
, 1024, 1024, 2048, 2048, 1024, 1024, 2048, 2048, 1024, 512, 2048, 1024, 2048, 2048, 1024, 512, 20
216400146, 6.536097049713135, 5.4500892162323, 5.668843507766724, 6.908181190490723, 3.4

184, 36484, 16332, 17812, 13164, 25728, 36196, 23292, 24296, 16564, 23584, 17772, 12300, 16180
048, 2048, 2048, 2048, 1024, 2048, 1024, 1024, 1024, 1024, 512, 1024, 1024, 1024, 2048, 1024, 20
676025, 2.2678427696228027, 11.030962944030762, 4.126171827316284, 10.503724813461304, 1

, 16208, 15164, 16072, 11840, 14480, 36332, 15416, 34632, 16100, 7324, 18636, 26616, 12508, 165
4, 2048, 1024, 2048, 1024, 512, 1024, 2048, 1024, 1024, 2048, 512, 1024, 1024, 1024, 2048, 1024, 1
083252, 4.009479522705078, 3.6294522285461426, 7.327482223510742, 3.4070091247558594, 1.1

5, 7752, 25792, 26464, 7644, 6604, 33148, 34476, 13140, 21816, 16096, 27572, 15880, 36268, 3258
2048, 2048, 1024, 2048, 1024, 2048, 1024, 2048, 2048, 1024, 2048, 1024, 2048, 2048, 2048, :
736480713, 12.019826173782349, 7.124535799026489, 6.607377052307129, 10.825063943862915

44, 9056, 14948, 26920, 16712, 7496, 12240, 52676, 16152, 31284, 23296, 15136, 27164, 10308, 36
2, 1024, 4096, 1024, 2048, 2048, 1024, 2048, 1024, 2048, 1024, 1024, 1024, 1024, 4096, 2048
2641448975, 7.423302412033081, 8.925428867340088, 8.91589093208313, 4.397524118423462, :

1.675814628601074, 12.252376317977905, 12.657881736755371, 8.965096712112427, 4.8708803

:37907648086548, 8.895669221878052, 11.549857378005981, 11.276444673538208, 2.699681520

4880, 14148, 32800, 28228, 31448, 16264, 19944, 31900, 16072, 26112, 4648, 23568, 27480, 34000,
, 1024, 2048, 256, 2048, 2048, 2048, 1024, 1024, 2048, 2048, 2048, 2048, 1024, 2048, 1024, 2048, 1024,
376, 6.903119802474976, 6.755072355270386, 8.745263576507568, 11.363179683685303, 7.0859

7696, 16716, 16632, 29068, 16260, 35720, 30624, 35716, 14256, 6596, 31468, 15896, 8524, 24084,
8, 1024, 512, 2048, 1024, 512, 2048, 1024, 2048, 2048, 2048, 1024, 2048, 2048, 2048, 1024, 2048, 1024,
'929346561431885, 5.711778402328491, 9.172690868377686, 9.153771877288818, 9.2239685058

Sheet1

520, 7504, 15748, 26412, 36252, 21868, 46856, 17180, 33612, 34960, 3608, 26780, 16536, 35828, 1
2048, 2048, 256, 2048, 1024, 2048, 1024, 2048, 2048, 1024, 2048, 1024, 2048, 2048, 1024, 5
3.89844560623169, 7.5618908405303955, 6.278304576873779, 8.757284164428711, 8.055592298

2420, 13244, 29896, 27308, 16416, 23632, 15680, 16252, 7216, 20352, 15804, 26392, 15848, 26696
4, 512, 1024, 1024, 2048, 1024, 2048, 2048, 2048, 1024, 2048, 1024, 1024, 2048, 2048, 1024,
732234954834, 12.038115501403809, 10.118613958358765, 2.904691696166992, 7.55397248268

184, 7796, 36360, 13036, 28884, 33164, 15444, 7320, 27840, 27576, 16176, 25636, 19080, 35684, 3
048, 2048, 1024, 2048, 1024, 2048, 2048, 2048, 1024, 1024, 1024, 2048, 4096, 1024, 1024, 2048, 20
.061148166656494, 10.160632133483887, 10.280220746994019, 8.99032211303711, 10.08469462

), 10744, 7284, 13052, 20056, 16420, 31976, 12692, 22964, 16424, 15516, 17724, 13792, 16920, 85
48, 1024, 1024, 1024, 1024, 1024, 512, 4096, 2048, 2048, 512, 1024, 1024, 2048, 2048, 256, 1024, 3
3.129601240158081, 6.61410927772522, 7.966671943664551, 5.405073881149292, 10.023864030

536, 29624, 6852, 17136, 13872, 15944, 27404, 16536, 31016, 31892, 7312, 27492, 15732, 8128, 27
2048, 2048, 512, 2048, 1024, 512, 2048, 1024, 1024, 2048, 1024, 2048, 1024, 2048, 2048, 512, 2048
1.176010608673096, 7.1332292556762695, 7.5617547035217285, 7.073347806930542, 9.4866778

Sheet1

34, 15872, 36608, 14392, 23548, 14484, 32288, 36224, 27284, 32000, 28012, 12240, 20368, 12992, 2048, 2048, 2048, 1024, 1024, 1024, 1024, 1024, 2048, 1024, 1024, 2048, 1024, 2048, 1024, 2048, 5, 5.677218914031982, 10.245516538619995, 6.40776515007019, 6.100661993026733, 12.233462

3680, 12444, 12268, 16532, 16064, 12212, 50856, 30300, 33352, 27916, 13836, 32580, 16512, 12408, 2048, 2048, 1024, 2048, 1024, 1024, 1024, 1024, 2048, 2048, 1024, 512, 1024, 1024, 2048, 1024, 18.625579595565796, 11.946418523788452, 7.974254608154297, 10.709117889404297, 11.01747

65371704, 5.600830793380737, 12.926922082901001]

462036, 8.001725435256958, 9.414196252822876]

), 15060, 12376, 24932, 35984, 27204, 35216, 12536, 33400, 17008, 32360, 21668, 14904, 17748, 2
2048, 1024, 1024, 2048, 1024, 1024, 1024, 1024, 2048, 2048, 1024, 2048, 1024, 2048, 1024, 1024, 1
21764373779, 9.810197353363037, 4.544085741043091, 8.751553058624268, 4.01829218864440

14400, 29504, 27296, 33864, 16384, 28000, 28848, 27580, 11716, 26592, 25256, 29212, 26476, 77
2048, 2048, 2048, 512, 1024, 2048, 1024, 1024, 2048, 1024, 2048, 2048, 2048, 2048, 512, 2048, 204
59375, 7.764318466186523, 6.340412616729736, 11.061116456985474, 12.277372121810913, 9.0

19740, 27076, 27572, 16756, 28612, 16372, 36100, 26724, 35128, 16068, 5444, 16596, 16272, 9116
12, 1024, 1024, 512, 2048, 2048, 2048, 1024, 1024, 1024, 1024, 512, 1024, 2048, 1024, 2048, 1024,
50769, 5.075723171234131, 9.162406206130981, 2.7146236896514893, 6.747336149215698, 9.70

3, 32500, 26840, 16996, 32556, 16136, 12376, 12300, 28408, 32360, 12184, 12304, 13896, 11512, 2
, 1024, 1024, 1024, 2048, 1024, 2048, 2048, 2048, 1024, 2048, 1024, 1024, 2048, 2048, 1024, 1024,
1274, 7.392024517059326, 7.72133994102478, 3.710427761077881, 4.6451332569122314, 6.1552

30256, 34492, 14416, 19560, 10640, 24740, 56992, 14644, 14700, 32992, 30704, 14964, 27104, 122
048, 1024, 2048, 1024, 2048, 1024, 2048, 512, 1024, 1024, 2048, 4096, 1024, 1024, 1024, 1024, 102
3947144, 10.45810079574585, 6.940170764923096, 7.64187479019165, 4.746080636978149, 13.5

520, 49756, 26820, 31816, 7448, 16572, 10364, 37264, 27456, 4056, 16656, 16068, 14344, 7952, 16
1024, 1024, 512, 1024, 1024, 1024, 2048, 2048, 2048, 2048, 1024, 1024, 2048, 1024, 1024, 20
838013, 8.510899782180786, 4.23088002204895, 9.109744310379028, 7.349802017211914, 4.017

7656, 20152, 12472, 32316, 20016, 30924, 14992, 33144, 37900, 7908, 27580, 49848, 20128, 32456
8, 4096, 1024, 2048, 2048, 2048, 2048, 1024, 2048, 2048, 1024, 512, 2048, 1024, 2048, 2048, 512, 1
85055542, 5.898357152938843, 10.745194435119629, 7.067430019378662, 7.048981428146362,

Sheet1

16216, 17944, 32120, 11236, 16436, 22964, 10716, 34748, 15324, 27304, 26644, 22372, 34928, 23
2048, 2048, 2048, 2048, 1024, 1024, 2048, 1024, 1024, 2048, 1024, 1024, 1024, 512, 1024, 2048, 51
810516357, 9.370938062667847, 5.988870859146118, 9.468898057937622, 7.331455230712891,

08, 15436, 15252, 36172, 28236, 16184, 7924, 13904, 15896, 25672, 15728, 31204, 15108, 27548, 1
, 2048, 1024, 2048, 1024, 2048, 2048, 1024, 4096, 1024, 2048, 2048, 1024, 1024, 2048, 1024, 2048,
5843429565, 7.915452718734741, 5.436338901519775, 7.183152675628662, 11.69987845420837

!9544, 16120, 16228, 16820, 13188, 26188, 35244, 18128, 35596, 15192, 24044, 12876, 16032, 164
1024, 512, 2048, 1024, 1024, 1024, 2048, 2048, 1024, 2048, 2048, 1024, 1024, 2048, 1024, 1024, 10
9, 7.258328437805176, 10.735122919082642, 8.581685066223145, 6.0252909660339355, 6.95102

'20, 11292, 26776, 15732, 17436, 26632, 15332, 27492, 35832, 27168, 27136, 8868, 36024, 36152,
48, 2048, 1024, 256, 1024, 2048, 256, 2048, 1024, 1024, 2048, 1024, 1024, 2048, 512, 1024, 1024, 4
067199945449829, 6.316716194152832, 3.2718617916107178, 5.160068511962891, 6.1265091896

Sheet1

i, 28984, 32460, 31144, 12360, 12788, 15424, 12564, 8168, 11268, 27576, 17028, 25840, 15432, 37
2048, 1024, 2048, 1024, 1024, 512, 2048, 2048, 4096, 1024, 2048, 1024, 1024, 512, 2048, 2048, 40
9005117416382, 10.649718761444092, 2.6951351165771484, 10.238774299621582, 6.383206129

!2396, 15700, 25992, 26836, 32672, 17820, 23952, 16628, 16908, 28512, 35728, 15196, 13408, 264
2048, 1024, 512, 1024, 2048, 1024, 1024, 512, 2048, 1024, 2048, 4096, 2048, 1024, 2048, 2048, 10
205965042114, 3.57955265045166, 6.578272819519043, 6.661575078964233, 6.544713973999023

!12, 36044, 17968, 27232, 7920, 14744, 15384, 36560, 60080, 14712, 15764, 16304, 12552, 15696,
24, 2048, 2048, 1024, 2048, 2048, 512, 2048, 1024, 4096, 1024, 2048, 1024, 1024, 1024, 1024, 1024
566390752792358, 10.354066610336304, 5.699793338775635, 10.67691445350647, 12.471637487

i088, 15912, 14036, 27876, 27216, 26492, 33812, 16440, 16204, 27664, 16016, 16192, 16176, 2714
048, 2048, 2048, 2048, 2048, 512, 2048, 512, 1024, 4096, 1024, 512, 1024, 1024, 2048, 1024, 2048,
7777681350708, 7.247617721557617, 4.186210870742798, 5.671698570251465, 7.1820342540740

i, 32320, 33596, 26500, 16448, 33864, 32184, 11732, 7164, 27588, 16444, 21516, 32028, 7888, 155
1024, 2048, 512, 2048, 1024, 1024, 2048, 1024, 512, 2048, 1024, 2048, 2048, 512, 1024, 1024, 1024
6.506505966186523, 9.955841302871704, 6.519159555435181, 6.059854984283447, 13.29083752

Sheet1

1348, 16732, 16236, 27108, 13632, 16108, 34548, 16488, 17776, 20180, 8180, 11752, 36096, 7660,
12, 2048, 2048, 1024, 1024, 1024, 1024, 1024, 2048, 512, 512, 2048, 1024, 2048, 2048, 1024, 512, 1
5.8780176639556885, 5.784047365188599, 7.185478448867798, 11.138505935668945, 6.2858707

.2952, 27956, 34052, 16428, 45624, 16500, 35496, 36224, 16824, 12832, 27128, 12912, 23836, 156
1024, 2048, 1024, 1024, 1024, 2048, 1024, 1024, 2048, 512, 2048, 1024, 1024, 2048, 2048, 1024, 2
4, 12.68844985961914, 9.81682014465332, 7.311068773269653, 6.043663740158081, 10.0895023

168, 8180, 31996, 16152, 17628, 16520, 25044, 34608, 12404, 24068, 34860, 17712, 16700, 23452,
024, 1024, 2048]
2071762085, 3.621687412261963, 11.4855055809021, 4.509288787841797, 12.349551677703857,

34732, 15180, 3504, 15960, 32220, 3968, 22628, 20600, 16028, 36872, 16324, 15032, 30888, 5976
4096, 1024, 512]
305713, 10.456401586532593, 10.979308366775513, 9.034629583358765, 5.349491834640503, 5.

Sheet1

7132, 12204, 27728, 16540, 16732, 7376, 25536, 26636, 56540, 16436, 25788, 10400, 12764, 7188, 096, 2048, 1024]
9074097, 5.094231367111206, 6.119553565979004, 3.508593797683716, 5.752472639083862, 6.0

136, 16268, 7944, 17092, 32708, 18008, 10296, 6212, 27648, 12780, 36236, 57104, 27120, 12168, 3
024, 2048, 512, 1024]
3, 10.409682273864746, 5.8602354526519775, 6.402096748352051, 5.309707164764404, 9.75622

32912, 27840, 12208, 23996, 27388, 7696, 29084, 16084, 51772, 16152, 35520, 16500, 13192, 177
4, 1024, 2048, 1024]
7411499, 12.121036767959595, 6.435701608657837, 3.7295186519622803, 8.542652130126953, 1

14, 35964, 22852, 34492, 37128, 7288, 32508, 7876, 16160, 51716, 12496, 7372, 16112, 17560, 274
, 1024, 1024]
097, 7.094220161437988, 13.65881085395813, 7.125669002532959, 7.871948480606079, 5.76892

500, 26860, 7500, 31516, 12568, 16132, 33980, 17352, 7856, 31804, 11620, 32568, 32624, 7208, 16
4, 1024, 2048]
26321411, 6.997174978256226, 6.414942979812622, 6.5052337646484375, 4.804943799972534, 6

Sheet1

30760, 32200, 16636, 14788, 14804, 12436, 14756, 28364, 7128, 8100, 32804, 10868, 36828, 3621
1024, 1024, 1024]
790481567, 3.8491244316101074, 8.887110948562622, 9.429457902908325, 3.763564586639404,

324, 28076, 16164, 16472, 13484, 30556, 16104, 16340, 25944, 7888, 27520, 14492, 20460, 21384,
2048, 2048, 512, 1024]
334594727, 4.584795713424683, 6.4855055809021, 10.250767469406128, 7.2883124351501465, 3

16852, 17080, 15080, 15376, 27496]

7.438298940658569, 6.996234655380249, 9.954366683959961, 3.4668099880218506, 9.06856322

, 16168, 12704, 66320, 12556, 10744]

771878719329834, 7.460788011550903, 10.614437341690063, 6.000998020172119, 10.982058525

35636, 27260, 51652, 32264, 10816]

57738542556763, 10.006327629089355, 9.5809166431427, 7.699509859085083, 10.845929145812

5824, 26932, 16964, 36568, 6976, 12068]

3917007446, 7.58190131187439, 5.9907166957855225, 6.855437994003296, 6.4263410568237305

20, 13376, 19368, 17228, 27060, 16968]

.3.556198120117188, 6.015028476715088, 6.993234157562256, 12.552942752838135, 10.5961537

92, 17956, 28912, 15864, 16584]

0421600342, 9.619827508926392, 13.827587127685547, 9.103008031845093, 9.520983457565308

552, 12324, 15736, 15180, 27840]

0.0398430824279785, 13.018707990646362, 6.289284706115723, 12.127795934677124, 6.5550522

6, 11984, 8936, 16544, 13836, 16696]

, 3.2088654041290283, 11.343246221542358, 11.71742057800293, 5.621025085449219, 7.851440

31168, 12340, 35016, 27096, 7324, 16384]

, 9569876194000244, 5.5800254344940186, 17.471282243728638, 6.8867480754852295, 11.77494

22885132, 8.761558771133423, 2.236842155456543, 6.785333871841431, 18.517486333847046, :

508545, 5.578960418701172, 8.754285097122192, 2.6659817695617676, 10.647541999816895, 8.

2988, 1.996490240097046, 5.4910736083984375, 6.675790548324585, 6.752921104431152, 6.852

5, 5.670691251754761, 6.887295246124268, 11.33761715888977, 5.291830062866211, 5.4178931

736114502, 6.249350070953369, 9.023308753967285, 9.07408857345581, 12.744115352630615, (

8, 7.14337682723999, 9.16488790512085, 7.999446630477905, 5.4684531688690186, 7.29160070

280426025, 3.5786445140838623, 7.621474981307983, 9.688595294952393, 5.404417514801025,

0668106079, 6.490978956222534, 10.333084106445312, 6.351848602294922, 12.3563504219055:

42636489868, 8.929396867752075, 6.269271373748779, 10.838269710540771, 4.6811442375183:

3.855729818344116, 6.0215163230896, 6.296773910522461, 12.022660732269287, 10.4844141001

830103874206543, 6.167696475982666, 6.02457594871521, 9.80918574333191, 6.0016882419581

7069091796875, 3.5746355056762695, 6.4042582511901855, 9.265367269515991, 12.467906713.

71310425, 5.676422357559204, 10.259038209915161, 9.882534980773926, 6.9511332511901855,

5.711276531219482, 3.965315103530884, 12.688254594802856, 5.5153748989105225, 10.213351

4193115, 5.219020843505859, 3.8296055793762207, 5.999814510345459, 8.698182106018066, 7.

7.1224870681762695, 11.268268346786499, 3.402937173843384, 7.090746164321899, 5.901261

L8, 11.483002185821533, 6.235508918762207, 12.75982117652893, 5.732077360153198, 8.30128

L05, 14.021097898483276, 5.547633171081543, 5.4251062870025635, 7.604169130325317, 7.069

646973, 11.17396879196167, 6.925339460372925, 8.254148960113525, 11.944262742996216, 6.5

618, 11.370110511779785, 9.78442120552063, 11.109165906906128, 5.47822117805481, 2.98896

485718, 7.3748414516448975, 13.851794242858887, 6.940191984176636, 11.613077163696289, :

, 8.697909355163574, 6.484880685806274, 7.094208717346191, 3.4826884269714355, 8.0496399

011276245, 11.524885177612305, 6.6071858406066895, 3.492985725402832, 9.96023654937744:

.362161874771118, 11.908814191818237, 5.94252872467041, 8.789497375488281, 7.2800712585

0912323, 6.429199934005737, 9.81227159500122, 6.9467198848724365, 11.081151723861694, 10

788948059, 5.898704767227173, 11.208659172058105, 12.641835927963257, 9.66100215911865:

298505783081, 5.645108222961426, 17.073873281478882, 11.12907361984253, 12.98015737533:

37335157394409, 9.363710165023804, 2.7058193683624268, 9.11347222328186, 10.4088780879

81339263916, 9.885878801345825, 6.0593085289001465, 3.7651546001434326, 8.227109670639

11.484859943389893, 2.0679197311401367, 9.26958703994751, 6.683066129684448, 12.4227385

4026184, 6.412570238113403, 9.638966083526611, 6.717637300491333, 10.023908853530884, 1

1, 9.462106227874756, 6.210046768188477, 8.803619384765625, 7.325270175933838, 11.768738

44922, 6.973624229431152, 7.844379663467407, 6.162385702133179, 7.54810643196106, 4.5073

0.9890615940094, 3.6767241954803467, 10.097791910171509, 6.414197683334351, 4.036192417

2, 11.01617956161499, 9.965530633926392, 5.318904876708984, 7.983683109283447, 5.4915523

5693, 10.822913885116577, 5.972314834594727, 12.210838317871094, 7.411792278289795, 5.75

97437, 12.446897268295288, 6.4800639152526855, 5.461137056350708, 9.414103746414185, 13

038, 5.397191286087036, 10.09649109840393, 8.847490072250366, 10.888633489608765, 6.2833

52093506, 7.685300588607788, 9.56950044631958, 9.990328550338745, 6.981470823287964, 10

1.7729332447052, 9.883008003234863, 7.258033514022827, 11.582833766937256, 6.4611616134

031387329, 10.111249208450317, 11.472014427185059, 5.7842278480529785, 7.5593724250793.

303237915039, 16.33317518234253, 10.294429302215576, 11.826587200164795, 3.953383445739

144775, 9.998112440109253, 8.051684379577637, 5.28587532043457, 11.21336054801941, 8.003

52905273, 6.651350975036621, 7.333140850067139, 10.901238918304443, 4.709774971008301, 1

4186153411865, 6.823001146316528, 6.6279988288879395, 13.583240747451782, 10.791798353

.096091508865356, 10.166210889816284, 12.707325458526611, 5.453268051147461, 12.2094900

320903778076, 8.999225854873657, 9.781660556793213, 9.689610719680786, 6.71785235404968

.317082643508911, 6.9075398445129395, 12.980971574783325, 9.895625352859497, 11.8465390

1643555, 5.083200216293335, 5.400302410125732, 10.030810117721558, 11.428913831710815, 5

46, 4.429387092590332, 8.604024410247803, 17.399827480316162, 5.830336809158325, 5.66409

1746, 7.424290418624878, 4.755977392196655, 13.973055601119995, 10.639146566390991, 2.681

1348588943481, 10.705201625823975, 6.449640989303589, 11.82524847984314, 13.51729130744

6.833882808685303, 7.922277450561523, 4.363246202468872, 11.921024084091187, 6.21373558

19519, 6.990224838256836, 4.258282423019409, 6.292974948883057, 7.038336753845215, 9.580

060806274, 7.0902628898620605, 11.428980350494385, 7.973420143127441, 6.915897130966186

3, 8.753790855407715, 8.47922682762146, 9.580351114273071, 8.50572419166565, 3.378290414

2053833, 6.481114625930786, 2.608980655670166, 6.678708553314209, 6.316041946411133, 4.2

6.19103908538818, 5.955600261688232, 6.328398704528809, 5.270188093185425, 8.4093706607

969329834, 11.340449094772339, 10.042726278305054, 6.0596442222595215, 9.2532558441162

87760162353516, 7.24012017250061, 7.026982069015503, 6.1702282428741455, 4.276038885116

934, 3.7575836181640625, 10.045549392700195, 14.976714134216309, 8.175554990768433, 11.2

0444336, 9.850779056549072, 9.445237636566162, 7.567592144012451, 12.299555540084839, 8

506801605225, 6.884767770767212, 11.987854480743408, 6.866733551025391, 10.50346612930

5, 7.6705968379974365, 11.34370732307434, 7.3782958984375, 7.002355575561523, 7.44698691

48101807, 4.050191164016724, 8.877054691314697, 5.617193937301636, 6.04758882522583, 8.2

264223098754883, 10.828462600708008, 11.256254196166992, 11.019538640975952, 5.21583700

78186, 6.7426300048828125, 9.425923824310303, 10.129871368408203, 12.04772400856018, 7.2

11, 4.92216157913208, 12.004825115203857, 6.996015787124634, 9.401371002197266, 3.808105

3577, 6.792386293411255, 7.082944631576538, 6.092736721038818, 10.60814642906189, 10.175

376847743988037, 11.448161840438843, 11.955967903137207, 9.476080894470215, 6.900771856

1.336557865142822, 6.78370213508606, 6.591211557388306, 9.57337999343872, 5.723425865173

12979, 5.907988548278809, 11.044525623321533, 12.800485849380493, 7.337399959564209, 14.3

L368103, 6.063586473464966, 10.04453182220459, 13.657281160354614, 7.747427463531494, 13

0016098022461, 6.067146301269531, 9.395776748657227, 11.77620267868042, 8.558487176895.

01800537, 5.118495464324951, 6.291743278503418, 5.451822519302368, 3.679354667663574, 4.1

93402433395386, 9.032764196395874, 7.212193489074707, 7.56656289100647, 11.206064701081

546875, 5.707816123962402, 6.276360750198364, 12.416247606277466, 17.972936868667603, 6.1

648927688599, 10.014717817306519, 12.107548475265503, 7.341479778289795, 7.090812921521

5307983, 11.736825227737427, 11.19903039932251, 4.997267484664917, 3.4446685314178467, 9

334, 6.349658966064453, 12.17652177810669, 6.580477237701416, 7.009812116622925, 8.04135

344594478607178, 7.555710077285767, 13.399985551834106, 13.735716581344604, 7.413975954

.3.034760236740112, 6.684778928756714, 9.102146863937378, 5.645005702972412, 6.98154044:

5142, 8.548274278640747, 3.8984973430633545, 11.74194884300232, 11.432386875152588, 11.2

1.680366277694702, 9.520768642425537, 7.272815704345703, 9.042628049850464, 6.5271830558

80322, 12.66964864730835, 6.515488147735596, 5.920485734939575, 9.526694297790527, 7.191

1.041916131973267, 6.5157248973846436, 6.952168703079224, 6.086918354034424, 6.265950918

24048, 10.47917914390564, 6.9824793338775635, 7.008351564407349, 7.264611721038818, 10.2

9.854840278625488, 6.676138162612915, 7.52015233039856, 11.203402280807495, 3.841089010

5799407959, 3.9406776428222656, 4.9453284740448, 12.52664303779602, 3.8164634704589844,

4055786, 5.90722131729126, 10.375797510147095, 5.74669623374939, 9.127998352050781, 6.7,

5130615, 7.7857935428619385, 3.938673973083496, 11.782276153564453, 7.311150312423706, 7.

10886211395264, 5.769169092178345, 1.9137179851531982, 6.085537910461426, 10.6115725040

776855, 12.77036714553833, 4.987724542617798, 9.676269769668579, 6.703418016433716, 6.83

12746925354, 4.1389851570129395, 7.35716700553894, 11.874939918518066, 7.73173785209655

197632, 11.15730905532837, 9.185903310775757, 4.6962175369262695, 8.492681980133057, 10.

18550882339478, 13.41698408126831, 8.353058099746704, 13.27407717704773, 14.08969593048

2386475, 6.147403001785278, 9.603997707366943, 3.6563730239868164, 11.360374450683594, 5

10.57757830619812, 11.388250589370728, 6.742907285690308, 6.08728551864624, 6.070365190

1051406860352, 10.881054878234863, 7.274820804595947, 7.264366149902344, 6.07029175758

7.443938255310059, 7.293353796005249, 9.326589822769165, 13.065448999404907, 5.2246208

043579, 2.102633237838745, 7.20672345161438, 7.221707582473755, 5.708925247192383, 12.04

36374998092651, 3.534405469894409, 8.932247161865234, 9.16619324684143, 18.14955997467

58, 4.190959453582764, 3.20236873626709, 10.537316083908081, 5.513559103012085, 12.62781

0.004250526428223, 3.6407625675201416, 10.660943984985352, 6.5323545932769775, 16.15967

80957, 4.148377418518066, 12.109212875366211, 4.139533758163452, 7.3695313930511475, 17

5.219301223754883, 6.436677932739258, 12.1208016872406, 7.030754327774048, 3.768259763

05059814, 5.017230749130249, 6.270132303237915, 10.160620212554932, 3.626494884490967, .

33618, 11.659209966659546, 6.913285493850708, 7.179102897644043, 10.03187894821167, 4.11

9091797, 9.28177523612976, 12.710632085800171, 7.470829963684082, 7.006109952926636, 8.7

0787935256958, 6.0824010372161865, 5.971467971801758, 11.188423871994019, 3.05673837661

41, 6.649886131286621, 9.123977899551392, 4.296292543411255, 5.128155708312988, 3.379641

3677093506, 18.657715797424316, 9.729983806610107, 5.364821195602417, 12.75481104850769

783447266, 6.788626194000244, 12.035859823226929, 6.980560779571533, 5.665200471878052,

31818675994873, 5.58278226852417, 3.972221612930298, 7.175468683242798, 7.5439195632934

176514, 11.169028282165527, 4.931704044342041, 11.590179681777954, 11.363748550415039, .

.021396636962891, 11.254546165466309, 4.415961503982544, 12.656828165054321, 12.7024013

291481018066, 10.508320093154907, 6.1989336013793945, 8.801491022109985, 7.80649900436.

'45262622833252, 7.3079283237457275, 7.351851224899292, 6.3531317710876465, 6.500426292

74316, 6.156328916549683, 4.938089847564697, 18.366348028182983, 4.979480981826782, 4.3

.532897949, 11.920958995819092, 9.408299207687378, 16.092658519744873, 11.3252079486846

), 9.585770845413208, 7.118511199951172, 13.782710075378418, 3.332719326019287, 5.273720(

, 7.125740051269531, 5.7753026485443115, 7.7225799560546875, 7.277417182922363, 9.418136

!57, 10.736977100372314, 8.026695966720581, 11.1860933303833, 7.1374993324279785, 7.2376:

4.060638666152954, 6.882115364074707, 5.296467304229736, 6.665146589279175, 6.190313577

399612427, 4.788730621337891, 4.256091356277466, 6.652289628982544, 5.712388515472412, 6

4014, 11.860500574111938, 5.660770416259766, 12.850746393203735, 10.563470125198364, 3.8

!419434, 10.7699038982391:

72769832611084]

92, 4.401867866516113]

026016235]

835098267, 7.21982407569]

12724304199]

6519775, 10.188131093978]

i.809105157852173]

i944714069366455, 7.26156.