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Lab 3 - Integer Matrix Multiplication

Function	Matrix Size	Frequency (GHz)	# of instructions	Instructions Per Cycle	Time Elapsed (sec)
Matmul w/ Mul Instruction	16	0.241	1,107,870	0.76	0.011686656
Matmul w/ Mul Instruction	64	0.666	48,162,254	0.91	0.087219727
Matmul w/ Mul Instruction	256	1.166	2,892,692,814	0.89	2.830218137
Matmul w/ Mul Instruction	1024	1.192	177,395,226,317	0.49	306.927449446
Matmul w/ intmul implementation	16	0.802	3,617,926	0.83	0.008600445
Matmul w/ intmul implementation	64	1.187	228,207,729	0.86	0.230856473
Matmul w/ intmul implementation	256	1.198	15,348,423,941	0.85	15.194191812
Matmul w/ intmul implementation	1024	1.197	1,053,601,396,357	0.74	1183.120829

*Theoretical Time = Instructions / (Frequency * IPC)*

Matmul-mul.s

	16	64	256	1024
Measured Time	0.011686656	0.087219727	2.830218137	306.927449446
Theoretical Time	0.006048646	0.079467799	2.787492834	303.7173441
Percentage Difference	93.21 %	9.75 %	1.53 %	1.06 %

Matmul.s

	16	64	256	1024
Measured Time(s)	0.008600445	0.230856473	15.194191812	1183.120829
Theoretical Time	0.005435995	0.223553348	15.07259544	1189.461713
Percentage Difference	58.24%	3.27%	0.807 %	0.533 %

Speedup = Execution without Enhancement / Execution with Enhancement

$$Average\ Speedup = \sum_{i=4}^{1024} Speedup_{i*4} = 3.92_{1024} + 5.41_{256} + 2.81_{64} + 1.11_{16} = 3.31253_{avg}$$

*E = F * (S / (1 + S * F - S)) where F = 0.95 & S = 3.31253*

Enhancement = 3.772