

Faculty of computers and artificial intelligence  
Cairo University  
Operating System Course

## Assignment # 1

### Description

Given  $N$  numbers and one file, our system simulates a real-life of how buffering is run where a user will decide  $N$  to get the prime numbers from 0 to  $N$ . Somehow, the producer schedules the primes in a queue and consumer will use this queue to write them in the file, so do an application using multiple threads to do multiple actions simultaneously which will reduce the time elapsed.

**Note:** The *Consumer* thread will hold a lock when it start and release it when the ready queue is Empty and must notify all other threads.

The application interface consists of a top section with three input fields and a 'Start Producer' button. The first field is labeled 'N' and contains the value '10000000'. The second field is labeled 'Buffer Size' and contains the value '8'. The third field is labeled 'Output File' and contains the value 'outputFile.txt'. Below these fields is a button labeled 'Start Producer'. The bottom section is a table with two columns. The first column contains labels: 'the largest prime number', '# of elements (prime number) generated', and 'time elapsed since the start of processing'. The second column contains values: '9999991', '664580', and '35004 ms'.

the largest prime number	9999991
# of elements (prime number) generated	664580
time elapsed since the start of processing	35004 ms

### Output File

The output file is a text file named 'outputFile.txt' opened in Notepad. It contains a list of prime numbers, each enclosed in quotes and separated by commas. The list starts with '1', '2', '3', '5', '7', '11', '13', '17', '19', '23', '29', '31', '37', '41', '43', '47', '53', '59', '61', '67', '71', '73', '79', '83', '89', '97', '101', '103', '107', '113', '127', '131', '137', '149', '151', '157', '163', '167', '173', '179', '181', '191', '193', '197', '211', '223', '227', '229', '233', '239', '241', '251', '257', '263', '269', '271', '281', '283', '293', '307', '311', '313', '317', '331', '337', '347', '349', '353', '359', '367', '373', '379', '383', '389', '397', '401', '409', '419', '421', '431', '433', '439', '443', '449', '457', '461', '463', '467', '479', '487', '491', '499', '503', '509', '521', '523', '541', '547', '557', '563', '569', '571', '577', '587', '593', '601', '607', '613', '617', '619', '623', '629', '631', '641', '643', '647', '653', '659', '661', '673', '683', '687', '691', '697', '701', '709', '719', '727', '733', '739', '743', '751', '757', '761', '769', '773', '787', '797', '809', '811', '821', '823', '827', '829', '833', '839', '843', '853', '857', '859', '863', '869', '877', '881', '883', '887', '893', '897', '907', '911', '913', '919', '923', '929', '937', '941', '947', '953', '967', '971', '973', '977', '983', '991', '997', '1009', '1013', '1019', '1021', '1031', '1033', '1039', '1043', '1047', '1049', '1051', '1057', '1063', '1067', '1069', '1073', '1079', '1087', '1091', '1093', '1097', '1103', '1107', '1117', '1123', '1127', '1129', '1133', '1137', '1141', '1147', '1151', '1153', '1157', '1163', '1169', '1171', '1177', '1181', '1183', '1187', '1193', '1197', '1201', '1207', '1213', '1217', '1223', '1229', '1231', '1237', '1241', '1243', '1247', '1249', '1253', '1259', '1261', '1267', '1271', '1273', '1277', '1283', '1287', '1291', '1297', '1301', '1303', '1307', '1313', '1317', '1321', '1327', '1331', '1333', '1337', '1343', '1349', '1351', '1357', '1361', '1363', '1367', '1373', '1377', '1381', '1387', '1391', '1393', '1397', '1403', '1409', '1411', '1417', '1423', '1427', '1429', '1433', '1439', '1443', '1447', '1453', '1457', '1463', '1469', '1471', '1477', '1483', '1489', '1493', '1499', '1501', '1507', '1511', '1513', '1517', '1523', '1529', '1531', '1537', '1543', '1547', '1549', '1553', '1559', '1561', '1567', '1571', '1573', '1577', '1583', '1587', '1591', '1597', '1601', '1603', '1607', '1609', '1613', '1617', '1621', '1627', '1631', '1633', '1637', '1643', '1649', '1651', '1657', '1661', '1663', '1667', '1669', '1673', '1677', '1681', '1687', '1691', '1693', '1697', '1703', '1709', '1711', '1717', '1721', '1723', '1727', '1733', '1739', '1741', '1747', '1751', '1753', '1757', '1763', '1769', '1771', '1777', '1781', '1783', '1787', '1793', '1797', '1801', '1807', '1811', '1813', '1817', '1823', '1827', '1831', '1837', '1841', '1843', '1847', '1849', '1853', '1859', '1861', '1867', '1871', '1873', '1877', '1883', '1887', '1891', '1897', '1901', '1903', '1907', '1913', '1917', '1921', '1927', '1931', '1933', '1937', '1943', '1949', '1951', '1957', '1961', '1963', '1967', '1969', '1973', '1977', '1981', '1987', '1991', '1993', '1997', '2003', '2009', '2011', '2017', '2021', '2023', '2027', '2029', '2033', '2039', '2041', '2047', '2051', '2053', '2057', '2063', '2069', '2071', '2077', '2081', '2083', '2087', '2093', '2099', '2101', '2107', '2111', '2113', '2117', '2123', '2129', '2131', '2137', '2141', '2143', '2147', '2149', '2153', '2159', '2161', '2167', '2171', '2173', '2177', '2179', '2183', '2187', '2191', '2197', '2201', '2203', '2207', '2213', '2219', '2221', '2227', '2231', '2233', '2237', '2239', '2243', '2247', '2251', '2253', '2257', '2263', '2269', '2271', '2277', '2281', '2283', '2287', '2293', '2297', '2301', '2303', '2307', '2311', '2313', '2317', '2321', '2323', '2327', '2329', '2333', '2337', '2339', '2343', '2347', '2351', '2353', '2357', '2359', '2363', '2369', '2371', '2377', '2381', '2383', '2387', '2393', '2397', '2401', '2403', '2407', '2411', '2413', '2417', '2423', '2427', '2431', '2433', '2437', '2439', '2443', '2447', '2449', '2453', '2459', '2461', '2467', '2471', '2473', '2477', '2479', '2483', '2489', '2491', '2497', '2501', '2503', '2507', '2511', '2513', '2517', '2521', '2523', '2527', '2529', '2533', '2537', '2539', '2543', '2547', '2549', '2553', '2557', '2559', '2563', '2569', '2571', '2577', '2581', '2583', '2587', '2593', '2597', '2601', '2603', '2607', '2611', '2613', '2617', '2621', '2623', '2627', '2629', '2633', '2637', '2641', '2643', '2647', '2649', '2653', '2657', '2659', '2663', '2669', '2671', '2677', '2681', '2683', '2687', '2693', '2697', '2701', '2703', '2707', '2711', '2713', '2717', '2719', '2723', '2727', '2729', '2733', '2737', '2739', '2743', '2747', '2749', '2753', '2759', '2761', '2767', '2771', '2773', '2777', '2779', '2783', '2787', '2791', '2793', '2797', '2801', '2803', '2807', '2811', '2813', '2817', '2819', '2823', '2827', '2831', '2833', '2837', '2839', '2843', '2847', '2849', '2853', '2857', '2859', '2863', '2867', '2869', '2873', '2877', '2881', '2883', '2887', '2893', '2897', '2901', '2903', '2907', '2911', '2913', '2917', '2919', '2923', '2927', '2931', '2933', '2937', '2939', '2943', '2947', '2949', '2953', '2957', '2959', '2963', '2967', '2969', '2973', '2977', '2981', '2983', '2987', '2993', '2997', '3001', '3003', '3007', '3009', '3011', '3013', '3017', '3019', '3023', '3027', '3029', '3033', '3037', '3039', '3043', '3047', '3049', '3053', '3057', '3059', '3063', '3067', '3069', '3073', '3077', '3079', '3083', '3087', '3091', '3093', '3097', '3101', '3103', '3107', '3109', '3113', '3117', '3119', '3123', '3127', '3129', '3133', '3137', '3139', '3143', '3147', '3149', '3153', '3157', '3159', '3163', '3167', '3169', '3173', '3177', '3179', '3183', '3187', '3189', '3193', '3197', '3201', '3203', '3207', '3209', '3213', '3217', '3219', '3223', '3227', '3229', '3233', '3237', '3239', '3243', '3247', '3249', '3253', '3257', '3259', '3263', '3267', '3269', '3273', '3277', '3279', '3283', '3287', '3293', '3297', '3301', '3303', '3307', '3309', '3313', '3317', '3319', '3323', '3327', '3329', '3333', '3337', '3339', '3343', '3347', '3349', '3353', '3357', '3359', '3363', '3367', '3369', '3373', '3377', '3379', '3383', '3387', '3391', '3393', '3397', '3401', '3403', '3407', '3409', '3413', '3417', '3419', '3423', '3427', '3429', '3433', '3437', '3439', '3443', '3447', '3449', '3453', '3457', '3459', '3463', '3467', '3469', '3473', '3477', '3479', '3483', '3487', '3489', '3493', '3497', '3501', '3503', '3507', '3509', '3513', '3517', '3519', '3523', '3527', '3529', '3533', '3537', '3539', '3543', '3547', '3549', '3553', '3557', '3559', '3563', '3567', '3569', '3573', '3577', '3579', '3583', '3587', '3593', '3597', '3601', '3603', '3607', '3609', '3613', '3617', '3619', '3623', '3627', '3629', '3633', '3637', '3639', '3643', '3647', '3649', '3653', '3657', '3659', '3663', '3667', '3669', '3673', '3677', '3679', '3683', '3687', '3691', '3693', '3697', '3701', '3703', '3707', '3709', '3713', '3717', '3719', '3723', '3727', '3729', '3733', '3737', '3739', '3743', '3747', '3749', '3753', '3757', '3759', '3763', '3767', '3769', '3773', '3777', '3779', '3783', '3787', '3793', '3797', '3801', '3803', '3807', '3809', '3813', '3817', '3819', '3823', '3827', '3831', '3833', '3837', '3839', '3843', '3847', '3849', '3853', '3857', '3859', '3863', '3867', '3869', '3873', '3877', '3879', '3883', '3887', '3893', '3897', '3901', '3903', '3907', '3909', '3913', '3917', '3919', '3923', '3927', '3929', '3933', '3937', '3939', '3943', '3947', '3949', '3953', '3957', '3959', '3963', '3967', '3969', '3973', '3977', '3979', '3983', '3987', '3991', '3993', '3997', '4001', '4003', '4007', '4009', '4013', '4017', '4019', '4023', '4027', '4029', '4033', '4037', '4039', '4043', '4047', '4049', '4053', '4057', '4059', '4063', '4067', '4069', '4073', '4077', '4079', '4083', '4087', '4091', '4093', '4097', '4101', '4103', '4107', '4109', '4113', '4117', '4119', '4123', '4127', '4129', '4133', '4137', '4139', '4143', '4147', '4149', '4153', '4157', '4159', '4163', '4167', '4169', '4173', '4177', '4179', '4183', '4187', '4189', '4193', '4197', '4201', '4203', '4207', '4209', '4213', '4217', '4219', '4223', '4227', '4229', '4233', '4237', '4239', '4243', '4247', '4249', '4253', '4257', '4259', '4263', '4267', '4269', '4273', '4277', '4279', '4283', '4287', '4289', '4293', '4297', '4301', '4303', '4307', '4309', '4313', '4317', '4319', '4323', '4327', '4329', '4333', '4337', '4339', '4343', '4347', '4349', '4353', '4357', '4359', '4363', '4367', '4369', '4373', '4377', '4379', '4383', '4387', '4393', '4397', '4401', '4403', '4407', '4409', '4413', '4417', '4419', '4423', '4427', '4429', '4433', '4437', '4439', '4443', '4447', '4449', '4453', '4457', '4459', '4463', '4467', '4469', '4473', '4477', '4479', '4483', '4487', '4489', '4493', '4497', '4501', '4503', '4507', '4509', '4513', '4517', '4519', '4523', '4527', '4529', '4533', '4537', '4539', '4543', '4547', '4549', '4553', '4557', '4559', '4563', '4567', '4569', '4573', '4577', '4579', '4583', '4587', '4589', '4593', '4597', '4601', '4603', '4607', '4609', '4613', '4617', '4619', '4623', '4627', '4629', '4633', '4637', '4639', '4643', '4647', '4649', '4653', '4657', '4659', '4663', '4667', '4669', '4673', '4677', '4679', '4683', '4687', '4689', '4693', '4697', '4701', '4703', '4707', '4709', '4713', '4717', '4719', '4723', '4727', '4729', '4733', '4737', '4739', '4743', '4747', '4749', '4753', '4757', '4759', '4763', '4767', '4769', '4773', '4777', '4779', '4783', '4787', '4789', '4793', '4797', '4801', '4803', '4807', '4809', '4813', '4817', '4819', '4823', '4827', '4829', '4833', '4837', '4839', '4843', '4847', '4849', '4853', '4857', '4859', '4863', '4867', '4869', '4873', '4877', '4879', '4883', '4887', '4893', '4897', '4901', '4903', '4907', '4909', '4913', '4917', '4919', '4923', '4927', '4929', '4933', '4937', '4939', '4943', '4947', '4949', '4953', '4957', '4959', '4963', '4967', '4969', '4973', '4977', '4979', '4983', '4987', '4989', '4993', '4997', '5001', '5003', '5007', '5009', '5013', '5017', '5019', '5023', '5027', '5029', '5033', '5037', '5039', '5043', '5047', '5049', '5053', '5057', '5059', '5063', '5067', '5069', '5073', '5077', '5079', '5083', '5087', '5089', '5093', '5097', '5101', '5103', '5107', '5109', '5113', '5117', '5119', '5123', '5127', '5129', '5133', '5137', '5139', '5143', '5147', '5149', '5153', '5157', '5159', '5163', '5167', '5169', '5173', '5177', '5179', '5183', '5187', '5189', '5193', '5197', '5201', '5203', '5207', '5209', '5213', '5217', '5219', '5223', '5227', '5229', '5233', '5237', '5239', '5243', '5247', '5249', '5253', '5257', '5259', '5263', '5267', '5269', '5273', '5277', '5279', '5283', '5287', '5289', '5293', '5297', '5301', '5303', '5307', '5309', '5313', '5317', '5319', '5323', '5327', '5329', '5333', '5337', '5339', '5343', '5347', '5349', '5353', '5357', '5359', '5363', '5367', '5369', '5373', '5377', '5379', '5383', '5387', '5389', '5393', '5397', '5401', '5403', '5407', '5409', '5413', '5417', '5419', '5423', '5427', '5429', '5433', '5437', '5439', '5443', '5447', '5449', '5453', '5457', '5459', '5463', '5467', '5469', '5473', '5477', '5479', '5483', '5487', '5489', '5493', '5497', '5501', '5503', '5507', '5509', '5513', '5517', '5519', '5523', '5527', '5529', '5533', '5537', '5539', '5543', '5547', '5549', '5553', '5557', '5559', '5563', '5567', '5569', '5573', '5577', '5579', '5583', '5587', '5589', '5593', '5597', '5601', '5603', '5607', '5609', '5613', '5617', '5619', '5623', '5627', '5629', '5633', '5637', '5639', '5643', '5647', '5649', '5653', '5657', '5659', '5663', '5667', '5669', '5673', '5677', '5679', '5683', '5687', '5689', '5693', '5697', '5701', '5703', '5707', '5709', '5713', '5717', '5719', '5723', '5727', '5729', '5733', '5737', '5739', '5743', '5747', '5749', '5753', '5757', '5759', '5763', '5767', '5769', '5773', '5777', '5779', '5783', '5787', '5789', '5793', '5797', '5801', '5803', '5807', '5809', '5813', '5817', '5819', '5823', '5827', '5829', '5833', '5837', '5839', '5843', '5847', '5849', '5853', '5857', '5859', '5863', '5867', '5869', '5873', '5877', '5879', '5883', '5887', '5893', '5897', '5901', '5903', '5907', '5909', '5913', '5917', '5919', '5923', '5927', '5929', '5933', '5937', '5939', '5943', '5947', '5949', '5953', '5957', '5959', '5963', '5967', '5969', '5973', '5977', '5979', '5983', '5987', '5989', '5993', '5997', '6001', '6003', '6007', '6009', '6013', '6017', '6019', '6023', '6027', '6029', '6033', '6037', '6039', '6043', '6047', '6049', '6053', '6057', '6059', '6063', '6067', '6069', '6073', '6077', '6079', '6083', '6087', '6089', '6093', '6097', '6101', '6103', '6107', '6109', '6113', '6117', '6119', '6123', '6127', '6129', '6133', '6137', '6139', '6143', '6147', '6149', '6153', '6157', '6159', '6163', '6167', '6169', '6173', '6177', '6179', '6183', '6187', '6189', '6193', '6197', '6201', '6203', '6207', '6209', '6213', '6217', '6219', '6223', '6227', '6229', '6233', '6237', '6239', '6243', '6247', '6249', '6253', '6257', '6259', '6263', '6267', '6269', '6273', '6277', '6279', '6283', '6287', '6289', '6293', '6297', '6301', '6303', '6307', '6309', '6313', '6317', '6319', '6323', '6327', '6329', '6333', '6337', '6339', '6343', '6347', '6349', '6353', '6357', '6359', '6363', '6367', '6369', '6373', '6377', '6379', '6383', '6387', '6389', '6393', '6397', '6401', '6403', '6407', '6409', '6413', '6417', '6419', '6423', '6427', '6429', '6433', '6437', '6439', '6443', '6447', '6449', '6453', '6457', '6459', '6463', '6467', '6469', '6473', '6477', '6479', '6483', '6487', '6489', '6493', '6497', '6501', '6503', '6507', '6509', '6513', '6517', '6519', '6523', '6527', '6529', '6533', '6537', '6539', '6543', '6547', '6549', '6553', '6557', '6559', '6563', '6567', '6569', '6573', '6577', '6579', '6583', '6587', '6589', '6593', '6597', '6601', '6603', '6607', '6609', '6613', '6617', '6619', '6623', '6627', '6629', '6633', '6637', '6639', '6643', '6647', '6649', '6653', '6657', '6659', '6663', '6667', '6669', '6673', '6677', '6679', '6683', '6687', '6689', '6693', '6697', '6701', '6703', '6707', '6709', '6713', '6717', '6719', '6723', '6727', '6729', '6733', '6737', '6739', '6743', '6747', '6749', '6753', '6757', '6759', '6763', '6767', '6769', '6773', '6777', '6779', '6783', '6787', '6789', '6793', '6797', '6801', '6803', '6807', '6809', '6813', '6817', '6819', '6823', '6827', '6829', '6833', '6837', '6839', '6843', '6847', '6849', '6853', '6857', '6859', '6863', '6867', '6869', '6873', '6877', '6879', '6883', '6887', '6893', '6897', '6901', '6903', '6907', '6909', '6913', '6917', '6919', '6923', '6927', '6929', '6933', '6937', '6939', '6943', '6947', '6949', '6953', '6957', '6959', '6963', '6967', '6969', '6973', '6977', '6979', '6983', '6987', '6989', '6993', '6997', '7001', '7003', '7007', '7009', '7013', '7017', '7019', '7023', '7027', '7029', '7033', '7037', '7039', '7043', '7047', '7049', '7053', '7057', '7059', '7063', '7067', '7069', '7073', '7077', '7079', '7083', '7087', '7089', '7093', '7097', '7101', '7103', '7107', '7109', '7113', '7117', '7119', '7123', '7127', '7129', '7133', '7137', '7139', '7143', '7147', '7149', '7153', '7157', '7159', '7163', '7167', '7169', '7173', '7177', '7179', '7183', '7187', '7189', '7193', '7197', '7201', '7203', '7207', '7209', '7213', '7217', '7219', '7223', '7227', '7229', '7233', '7237', '7239', '7243', '7247', '7249', '7253', '7257', '7259', '7263', '7267', '7269', '7273', '7277', '7279', '7283', '7287', '7289', '7293', '7297', '7301', '7303', '7307', '7309', '7313', '7317', '7319', '7323', '7327', '7329', '7333', '73

### Grading Criteria

class producer	1
class consumer	1
Test cases	1
Handling Queue Is Empty	0.5
Save to file	0.5
Calculate prime number	0.5
Using synchronization	0.5
GUI ( <b>real time update of this GUI</b> )	1