250000 ┤

200000 ┤

150000 ┤

100000 ┤

50000 ┤

0 ┤

638.125, 227221.

When n is small, the process of program running affects the algorithm running time. But as n increase, the impact is getting smaller and smaller. Obviously, the time complexity of these three algorithms is O(n). So, the running time of these three algorithms are closer for higher values of n.

| #n | Randdom_Select | Count_Sort | Bucket_Sort |
|---|---|---|---|
| 10 | 45755.0 | 3453.0 | 625809.0 |
| 20 | 21176.0 | 2177.0 | 40455.0 |
| 30 | 13856.0 | 2288.0 | 41166.0 |
| 40 | 24875.0 | 2691.0 | 45745.0 |
| 50 | 15592.0 | 2818.0 | 38079.0 |
| 60 | 15582.0 | 2877.0 | 44437.0 |
| 70 | 5078.0 | 2997.0 | 46218.0 |
| 80 | 12651.0 | 3305.0 | 81442.0 |
| 90 | 10561.0 | 4546.0 | 38102.0 |
| 100 | 10493.0 | 3718.0 | 38284.0 |
| 110 | 10286.0 | 3846.0 | 38079.0 |
| 120 | 10626.0 | 9258.0 | 64892.0 |
| 130 | 13326.0 | 4895.0 | 42996.0 |
| 140 | 17892.0 | 6514.0 | 43594.0 |
| 150 | 6805.0 | 7098.0 | 45747.0 |
| 160 | 9402.0 | 4904.0 | 39314.0 |
| 170 | 11869.0 | 5004.0 | 41377.0 |
| 180 | 10978.0 | 6138.0 | 30351.0 |
| 190 | 3500049.0 | 7612.0 | 230977.0 |
| 200 | 31515.0 | 5369.0 | 77591.0 |
| 210 | 54997.0 | 5485.0 | 41081.0 |
| 220 | 19617.0 | 10240.0 | 51250.0 |
| 230 | 21148.0 | 18303.0 | 84712.0 |
| 240 | 23369.0 | 15793.0 | 43886.0 |
| 250 | 13748.0 | 12222.0 | 44861.0 |
| 260 | 26907.0 | 18236.0 | 37697.0 |
| 270 | 11021.0 | 10036.0 | 26762.0 |
| 280 | 7283.0 | 8299.0 | 20215.0 |
| 290 | 6877.0 | 8331.0 | 18630.0 |
| 300 | 9845.0 | 6922.0 | 29188.0 |
| 310 | 8199.0 | 6673.0 | 19562.0 |
| 320 | 6621.0 | 8010.0 | 18049.0 |
| 330 | 13336.0 | 12137.0 | 32067.0 |
| 340 | 13595.0 | 9649.0 | 32865.0 |
| 350 | 11792.0 | 14701.0 | 60589.0 |
| 360 | 7193.0 | 10485.0 | 18521.0 |
| 370 | 5863.0 | 7523.0 | 15813.0 |
| 380 | 7956.0 | 8309.0 | 25933.0 |
| 390 | 5744.0 | 8101.0 | 16856.0 |
| 400 | 6363.0 | 11027.0 | 24278.0 |
| 410 | 11440.0 | 8312.0 | 14603.0 |
| 420 | 9797.0 | 8509.0 | 17445.0 |
| 430 | 5214.0 | 11239.0 | 44239.0 |
| 440 | 10030.0 | 8943.0 | 11619.0 |
| 450 | 10033.0 | 13210.0 | 12845.0 |
| 460 | 15759.0 | 12029.0 | 23057.0 |
| 470 | 24516.0 | 12521.0 | 21292.0 |
| 480 | 4575.0 | 9473.0 | 13921.0 |
| 490 | 7885.0 | 12265.0 | 12556.0 |
| 500 | 8426.0 | 9846.0 | 10805.0 |
| 510 | 6394.0 | 12756.0 | 12542.0 |
| 520 | 8445.0 | 10974.0 | 14738.0 |
| 530 | 6904.0 | 12854.0 | 9978.0 |
| 540 | 6359.0 | 10387.0 | 11774.0 |
| 550 | 6232.0 | 13120.0 | 11028.0 |
| 560 | 7914.0 | 11613.0 | 12521.0 |
| 570 | 6600.0 | 13076.0 | 9861.0 |
| 580 | 9830.0 | 13803.0 | 10104.0 |
| 590 | 6392.0 | 11299.0 | 11369.0 |
| 600 | 8801.0 | 14112.0 | 10832.0 |
| 610 | 6464.0 | 14027.0 | 16991.0 |
| 620 | 10214.0 | 11936.0 | 12547.0 |
| 630 | 8128.0 | 15204.0 | 9428.0 |
| 640 | 7513.0 | 23195.0 | 10992.0 |
| 650 | 12280.0 | 13135.0 | 11096.0 |
| 660 | 6464.0 | 14928.0 | 8949.0 |
| 670 | 6985.0 | 15006.0 | 9115.0 |
| 680 | 4173.0 | 15342.0 | 9111.0 |
| 690 | 10895.0 | 15745.0 | 9950.0 |
| 700 | 7326.0 | 13752.0 | 10471.0 |
| 710 | 6048.0 | 13065.0 | 11111.0 |
| 720 | 7303.0 | 13816.0 | 10309.0 |
| 730 | 3786.0 | 16014.0 | 8410.0 |
| 740 | 12960.0 | 15944.0 | 9294.0 |
| 750 | 7914.0 | 16352.0 | 8736.0 |
| 760 | 9992.0 | 16811.0 | 8886.0 |
| 770 | 2483.0 | 16756.0 | 9118.0 |
| 780 | 5066.0 | 17403.0 | 8915.0 |
| 790 | 3719.0 | 16763.0 | 9530.0 |
| 800 | 3652.0 | 17048.0 | 10441.0 |
| 810 | 13264.0 | 20867.0 | 15844.0 |
| 820 | 4226.0 | 17849.0 | 10968.0 |
| 830 | 4359.0 | 16562.0 | 13024.0 |
| 840 | 3434.0 | 17702.0 | 10362.0 |
| 850 | 3585.0 | 18283.0 | 9148.0 |
| 860 | 3239.0 | 18500.0 | 9441.0 |
| 870 | 5711.0 | 18286.0 | 9056.0 |
| 880 | 10080.0 | 19074.0 | 11159.0 |
| 890 | 3461.0 | 19245.0 | 8716.0 |
| 900 | 8676.0 | 19213.0 | 29018.0 |
| 910 | 8329.0 | 21207.0 | 11852.0 |
| 920 | 3897.0 | 19505.0 | 10448.0 |
| 930 | 2975.0 | 19846.0 | 8467.0 |
| 940 | 4019.0 | 19317.0 | 8792.0 |
| 950 | 2383.0 | 20585.0 | 9776.0 |
| 960 | 3236.0 | 20024.0 | 7483.0 |
| 970 | 2651.0 | 20020.0 | 11339.0 |
| 980 | 14227.0 | 20671.0 | 9213.0 |
| 990 | 1514.0 | 20335.0 | 15951.0 |
| 1000 | 3326.0 | 20434.0 | 7931.0 |

| #n | lucky_num | lucky_prob | unlucky_num | unlucky_prob |
|---|---|---|---|---|
| 10 | 2 | 0.0 | 6 | 0.2 |
| 100 | 12 | 0.03 | 3 | 0.11 |
| 500 | 8 | 0.064 | 12 | 0.092 |
| 1000 | 7 | 0.056 | 13 | 0.092 |

| #n | Randdom_Select | Count_Sort | Bucket_Sort |
| --- | --- | --- | --- |
| 10 | 45755.0 | 3453.0 | 625809.0 |
| 20 | 21176.0 | 2177.0 | 40455.0 |
| 30 | 13856.0 | 2288.0 | 41166.0 |
| 40 | 24875.0 | 2691.0 | 45745.0 |
| 50 | 15592.0 | 2818.0 | 38079.0 |
| 60 | 15582.0 | 2877.0 | 44437.0 |
| 70 | 5078.0 | 2997.0 | 46218.0 |
| 80 | 12651.0 | 3305.0 | 81442.0 |
| 90 | 10561.0 | 4546.0 | 38102.0 |
| 100 | 10493.0 | 3718.0 | 38284.0 |
| 110 | 10286.0 | 3846.0 | 38079.0 |
| 120 | 10626.0 | 9258.0 | 64892.0 |
| 130 | 13326.0 | 4895.0 | 42996.0 |
| 140 | 17892.0 | 6514.0 | 43594.0 |
| 150 | 6805.0 | 7098.0 | 45747.0 |
| 160 | 9402.0 | 4904.0 | 39314.0 |
| 170 | 11869.0 | 5004.0 | 41377.0 |
| 180 | 10978.0 | 6138.0 | 30351.0 |
| 190 | 3500049.0 | 7612.0 | 230977.0 |
| 200 | 31515.0 | 5369.0 | 77591.0 |
| 210 | 54997.0 | 5485.0 | 41081.0 |
| 220 | 19617.0 | 10240.0 | 51250.0 |
| 230 | 21148.0 | 18303.0 | 84712.0 |
| 240 | 23369.0 | 15793.0 | 43886.0 |
| 250 | 13748.0 | 12222.0 | 44861.0 |
| 260 | 26907.0 | 18236.0 | 37697.0 |
| 270 | 11021.0 | 10036.0 | 26762.0 |
| 280 | 7283.0 | 8299.0 | 20215.0 |
| 290 | 6877.0 | 8331.0 | 18630.0 |
| 300 | 9845.0 | 6922.0 | 29188.0 |
| 310 | 8199.0 | 6673.0 | 19562.0 |
| 320 | 6621.0 | 8010.0 | 18049.0 |
| 330 | 13336.0 | 12137.0 | 32067.0 |
| 340 | 13595.0 | 9649.0 | 32865.0 |
| 350 | 11792.0 | 14701.0 | 60589.0 |
| 360 | 7193.0 | 10485.0 | 18521.0 |
| 370 | 5863.0 | 7523.0 | 15813.0 |
| 380 | 7956.0 | 8309.0 | 25933.0 |
| 390 | 5744.0 | 8101.0 | 16856.0 |
| 400 | 6363.0 | 11027.0 | 24278.0 |
| 410 | 11440.0 | 8312.0 | 14603.0 |
| 420 | 9797.0 | 8509.0 | 17445.0 |

| | | | |
|---|---|---|---|
| 430 | 5214.0 | 11239.0 | 44239.0 |
| 440 | 10030.0 | 8943.0 | 11619.0 |
| 450 | 10033.0 | 13210.0 | 12845.0 |
| 460 | 15759.0 | 12029.0 | 23057.0 |
| 470 | 24516.0 | 12521.0 | 21292.0 |
| 480 | 4575.0 | 9473.0 | 13921.0 |
| 490 | 7885.0 | 12265.0 | 12556.0 |
| 500 | 8426.0 | 9846.0 | 10805.0 |
| 510 | 6394.0 | 12756.0 | 12542.0 |
| 520 | 8445.0 | 10974.0 | 14738.0 |
| 530 | 6904.0 | 12854.0 | 9978.0 |
| 540 | 6359.0 | 10387.0 | 11774.0 |
| 550 | 6232.0 | 13120.0 | 11028.0 |
| 560 | 7914.0 | 11613.0 | 12521.0 |
| 570 | 6600.0 | 13076.0 | 9861.0 |
| 580 | 9830.0 | 13803.0 | 10104.0 |
| 590 | 6392.0 | 11299.0 | 11369.0 |
| 600 | 8801.0 | 14112.0 | 10832.0 |
| 610 | 6464.0 | 14027.0 | 16991.0 |
| 620 | 10214.0 | 11936.0 | 12547.0 |
| 630 | 8128.0 | 15204.0 | 9428.0 |
| 640 | 7513.0 | 23195.0 | 10992.0 |
| 650 | 12280.0 | 13135.0 | 11096.0 |
| 660 | 6464.0 | 14928.0 | 8949.0 |
| 670 | 6985.0 | 15006.0 | 9115.0 |
| 680 | 4173.0 | 15342.0 | 9111.0 |
| 690 | 10895.0 | 15745.0 | 9950.0 |
| 700 | 7326.0 | 13752.0 | 10471.0 |
| 710 | 6048.0 | 13065.0 | 11111.0 |
| 720 | 7303.0 | 13816.0 | 10309.0 |
| 730 | 3786.0 | 16014.0 | 8410.0 |
| 740 | 12960.0 | 15944.0 | 9294.0 |
| 750 | 7914.0 | 16352.0 | 8736.0 |
| 760 | 9992.0 | 16811.0 | 8886.0 |
| 770 | 2483.0 | 16756.0 | 9118.0 |
| 780 | 5066.0 | 17403.0 | 8915.0 |
| 790 | 3719.0 | 16763.0 | 9530.0 |
| 800 | 3652.0 | 17048.0 | 10441.0 |
| 810 | 13264.0 | 20867.0 | 15844.0 |
| 820 | 4226.0 | 17849.0 | 10968.0 |
| 830 | 4359.0 | 16562.0 | 13024.0 |
| 840 | 3434.0 | 17702.0 | 10362.0 |
| 850 | 3585.0 | 18283.0 | 9148.0 |
| 860 | 3239.0 | 18500.0 | 9441.0 |

| | | | |
|---|---|---|---|
| 870 | 5711.0 | 18286.0 | 9056.0 |
| 880 | 10080.0 | 19074.0 | 11159.0 |
| 890 | 3461.0 | 19245.0 | 8716.0 |
| 900 | 8676.0 | 19213.0 | 29018.0 |
| 910 | 8329.0 | 21207.0 | 11852.0 |
| 920 | 3897.0 | 19505.0 | 10448.0 |
| 930 | 2975.0 | 19846.0 | 8467.0 |
| 940 | 4019.0 | 19317.0 | 8792.0 |
| 950 | 2383.0 | 20585.0 | 9776.0 |
| 960 | 3236.0 | 20024.0 | 7483.0 |
| 970 | 2651.0 | 20020.0 | 11339.0 |
| 980 | 14227.0 | 20671.0 | 9213.0 |
| 990 | 1514.0 | 20335.0 | 15951.0 |
| 1000 | 3326.0 | 20434.0 | 7931.0 |

| #n | lucky_num | lucky_prob | unlucky_num | unlucky_prob |
|---|---|---|---|---|
| 10 | 2 | 0.0 | 6 | 0.2 |
| 100 | 12 | 0.03 | 3 | 0.11 |
| 500 | 8 | 0.064 | 12 | 0.092 |
| 1000 | 7 | 0.056 | 13 | 0.092 |