

Задание 1.

Исходные данные:

1. Проанализировать скорость и сложность одного любого алгоритма, разработанных в рамках практического задания первых трех уроков.

Решение:

$n = 25$

$m = 45$

$y = 1$

$z = 200$

[[7, 20, 60, 170, 29, 59, 108, 149, 79, 10, 187, 154, 120, 1, 112, 6, 56, 51, 103, 59, 72, 73, 117, 124, 147, 30, 145, 143, 184, 97, 19, 14, 64, 77, 179, 181, 86, 112, 77, 186, 128, 96, 94, 46, 24], [133, 91, 114, 155, 117, 168, 59, 95, 4, 170, 93, 85, 124, 38, 92, 58, 105, 91, 111, 157, 124, 78, 179, 188, 12, 171, 197, 61, 173, 88, 154, 120, 11, 53, 85, 66, 40, 29, 191, 190, 33, 65, 11, 137, 34], [112, 14, 189, 11, 97, 71, 129, 63, 140, 9, 146, 20, 51, 137, 146, 186, 153, 107, 81, 160, 189, 133, 82, 142, 126, 27, 39, 5, 54, 192, 61, 194, 154, 58, 151, 27, 198, 107, 64, 39, 28, 22, 164, 7, 76], [122, 139, 10, 186, 105, 162, 48, 82, 91, 18, 136, 130, 123, 199, 184, 153, 37, 77, 130, 94, 154, 136, 57, 179, 134, 11, 198, 106, 44, 71, 127, 32, 102, 54, 129, 87, 19, 118, 11, 9, 146, 101, 188, 7, 61], [139, 41, 184, 93, 140, 132, 66, 108, 188, 129, 179, 115, 70, 140, 189, 178, 47, 25, 2, 74, 10, 181, 120, 129, 2, 66, 146, 121, 191, 98, 79, 103, 148, 166, 42, 66, 26, 98, 42, 46, 99, 6, 153, 21, 127], [165, 187, 87, 44, 154, 163, 132, 13, 200, 31, 91, 58, 53, 40, 182, 172, 29, 172, 98, 196, 45, 199, 76, 122, 42, 10, 122, 55, 24, 159, 190, 162, 129, 32, 120, 98, 125, 123, 147, 194, 113, 20, 161, 117, 18], [198, 116, 11, 123, 108, 84, 59, 193, 31, 151, 163, 71, 150, 195, 63, 116, 10, 151, 30, 183, 108, 77, 63, 24, 157, 58, 106, 65, 70, 187, 57, 46, 69, 112, 96, 56, 20, 147, 199, 15, 119, 60, 114, 158, 68], [98, 129, 128, 75, 178, 51, 177, 2, 77, 74, 65, 13, 200, 132, 198, 80, 136, 181, 23, 122, 156, 66, 124, 60, 186, 101, 135, 135, 83, 110, 108, 141, 91, 15, 176, 49, 23, 132, 13, 183, 128, 134, 125, 119, 70], [123, 12, 91, 52, 23, 193, 119, 186, 68, 86, 12, 160, 173, 6, 42, 103, 72, 180, 101, 199, 14, 175, 4, 156, 124, 161, 21, 56, 119, 80, 69, 48, 74, 75, 96, 60, 41, 184, 30, 159, 122, 75, 67, 148, 9], [2, 84, 7, 119, 34, 1, 42, 57, 138, 36, 35, 91, 62, 31, 191, 194, 121, 196, 157, 106, 132, 63, 105, 47, 57, 96, 183, 92, 99, 98, 64, 164, 178, 199, 143, 197, 22, 84, 39, 110, 130, 77, 179, 24, 76], [83, 56, 28, 63, 92, 32, 180, 172, 108, 24, 191, 13, 157, 196, 184, 80, 50, 187, 19, 61, 86, 64, 191, 123, 174, 70, 86, 29, 62, 102, 171, 97, 69, 162, 52, 181, 192, 84, 15, 97, 19, 5, 195, 180, 189], [113, 57, 107, 51, 33, 81, 37, 122, 12, 17, 91, 195, 182, 55, 196, 1, 46, 134, 97, 192, 46, 169, 49, 86, 111, 77, 115, 53, 171, 147, 124, 160, 112, 124, 112, 26, 180, 176, 78, 94, 11, 1, 33, 165, 150], [136, 27, 137, 104, 159, 194, 7, 172, 88, 117, 161, 114, 40, 7, 122, 173, 139, 112, 94, 177, 29, 115, 40, 137, 196, 164, 166, 163, 49, 170, 14, 61, 101, 152, 71, 119, 80, 106, 154, 92, 153, 130, 88, 159, 85], [81, 42, 115, 1, 162, 169, 191, 89, 48, 48, 42, 96, 48, 168, 98, 100, 23, 162, 182, 45, 59, 164, 176, 158, 70, 65, 102, 83, 60, 36, 98, 6, 160, 37, 35, 16, 103, 191, 32, 126, 81, 83, 130, 21, 107], [22, 37, 77, 195, 146, 76, 57, 121, 194, 68, 87, 133, 147, 187, 58, 95, 24, 142, 119, 97, 47, 136, 73, 135, 2, 148, 164, 127, 107, 170, 162, 68, 115, 83, 181, 184, 23, 137, 34, 71, 9, 112, 170, 171, 35], [46, 113, 47, 88, 180, 104, 149, 111, 33, 43, 116, 27, 147, 175, 198, 120, 111, 178, 116, 105, 92, 61, 44, 8, 95, 129, 54, 135, 132, 130, 88, 110, 50, 157, 187, 60, 164, 86, 162, 16, 106, 64, 101, 199, 196], [196, 154, 31, 53, 7, 6, 82, 24, 192, 85, 105, 183, 178, 176, 75, 159, 3, 33, 129, 62, 71, 154, 170, 19, 192, 110, 170, 115, 65, 72, 104, 196, 15, 53, 82, 67, 79, 162, 126, 129, 169, 31, 172, 20, 117], [174, 86, 130, 92, 87, 77, 100, 45, 40, 45, 165, 22, 40, 52, 69, 130, 156, 44, 146, 137, 23, 158, 41, 60, 97, 102, 140, 176, 143, 86, 1, 159, 181, 66, 26, 82, 90, 10, 9, 8, 25, 145, 71, 43, 146], [57, 151, 135, 17, 23, 123, 58, 80, 165, 151, 139, 63, 13, 92, 10, 129, 59, 51, 109, 182, 166, 140, 68, 182, 107, 77, 193, 13, 47, 179, 147, 40, 68, 44, 107, 153, 106, 119, 156, 56, 99, 42, 130, 43, 184], [193, 171, 170, 185, 21, 63, 117, 43, 150, 35, 188, 133, 184, 168, 109, 108, 102, 37, 84, 73, 54, 106, 122, 36, 89, 175, 119, 174, 1, 125, 186, 180, 180, 172, 119, 46, 174, 170, 136, 173, 130, 69, 54, 72, 190], [64, 21, 113, 82, 60, 98, 147, 164, 195, 194, 27, 99, 134, 46, 40, 23, 164, 163, 60, 26, 20, 131, 94, 178, 3, 51, 160, 120, 200, 184, 149, 174, 60, 40, 147, 172, 199, 59, 97, 146, 62, 153, 18, 53, 106], [181, 157, 166, 82, 173, 142, 62, 126, 12, 37, 60, 48, 178, 170, 60, 173, 140, 19, 23, 161, 3, 109, 158, 124, 194, 184, 105, 107, 63,

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39 5 54 192 61 194 154 58 151 27 198 107 64 39 28 22 164 7 76
122 139 10 186 105 162 48 82 91 18 136 130 123 199 184 153 37 77 130 94 154 136 57 179 134
11 198 106 44 71 127 32 102 54 129 87 19 118 11 9 146 101 188 7 61
139 41 184 93 140 132 66 108 188 129 179 115 70 140 189 178 47 25 2 74 10 181 120 129 2 66
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83 56 28 63 92 32 180 172 108 24 191 13 157 196 184 80 50 187 19 61 86 64 191 123 174 70 86
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113 57 107 51 33 81 37 122 12 17 91 195 182 55 196 1 46 134 97 192 46 169 49 86 111 77 115 53
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22 37 77 195 146 76 57 121 194 68 87 133 147 187 58 95 24 142 119 97 47 136 73 135 2 148 164
127 107 170 162 68 115 83 181 184 23 137 34 71 9 112 170 171 35
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175 119 174 1 125 186 180 180 172 119 46 174 170 136 173 130 69 54 72 190
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real    0m12,968s
user    0m0,033s
sys      0m0,016s
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Данный алгоритм имеет квадратическую сложность. Данный алгоритм при работе с памятью будет иметь линейную нагрузку.

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n = 10
m = 10
y = 1
z = 200
[[176, 72, 11, 47, 54, 151, 29, 40, 90, 135], [113, 159, 5, 32, 54, 4, 194, 84, 140, 18], [166, 137,
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143, 119, 48, 180, 39], [197, 183, 101, 150, 125, 49, 57, 132, 84, 152], [200, 169, 43, 138, 189, 199,
89, 70, 79, 22], [160, 80, 72, 77, 52, 46, 186, 12, 140, 197]]
176 72 11 47 54 151 29 40 90 135
113 159 5 32 54 4 194 84 140 18
166 137 169 191 64 110 23 191 29 147
185 172 154 39 12 174 146 21 177 171
69 74 21 140 91 124 31 7 154 23
102 28 151 63 152 168 186 193 134 175
10 144 44 48 1 143 119 48 180 39
197 183 101 150 125 49 57 132 84 152
200 169 43 138 189 199 89 70 79 22
160 80 72 77 52 46 186 12 140 197
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```

real 0m9,811s
user 0m0,039s
sys 0m0,011s

n = 10
m = 10
y = 1
z = 200

[[123, 13, 144, 162, 48, 170, 17, 10, 150, 138], [132, 32, 27, 54, 189, 75, 192, 145, 55, 65], [61, 176, 167, 48, 14, 132, 3, 42, 55, 165], [141, 94, 33, 167, 157, 127, 102, 187, 105, 65], [145, 39, 127, 42, 145, 77, 20, 76, 106, 6], [61, 111, 79, 195, 44, 15, 46, 195, 147, 193], [26, 172, 100, 144, 154, 132, 22, 71, 171, 156], [147, 113, 41, 10, 118, 69, 172, 171, 99, 20], [102, 44, 48, 103, 7, 155, 159, 64, 82, 36], [109, 139, 66, 13, 178, 18, 183, 151, 123, 138]]

123 13 144 162 48 170 17 10 150 138
132 32 27 54 189 75 192 145 55 65
61 176 167 48 14 132 3 42 55 165
141 94 33 167 157 127 102 187 105 65
145 39 127 42 145 77 20 76 106 6
61 111 79 195 44 15 46 195 147 193
26 172 100 144 154 132 22 71 171 156
147 113 41 10 118 69 172 171 99 20
102 44 48 103 7 155 159 64 82 36
109 139 66 13 178 18 183 151 123 138
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real 0m8,062s
user 0m0,037s
sys 0m0,005s

Данный алгоритм имеет квадратическую сложность. Данный алгоритм при работе с памятью будет иметь линейную нагрузку.

Над данным алгоритмом была произведена небольшая оптимизация.

Задание 2.

Исходные данные:

Написать два алгоритма нахождения i -го по счёту простого числа.

- Без использования Решета Эратосфена

Решение:

n = 1
k = 100

real 0m5,017s

```
user 0m0,072s
sys 0m0,016s
n = 1
k = 1000
```

```
real 0m5,041s
user 0m0,038s
sys 0m0,004s
```

Данный алгоритм является квадратичным, данный алгоритм имеет линейную нагрузку по памяти. При увеличении исходных данных, возрастает время обработки данного алгоритма, что может потребовать оптимизации исходных данных.

Использовать алгоритм решето Эратосфена

Решение:

Введите число максимума: 75

23571113171923293137414347535961677173

```
real 0m2,856s
user 0m0,044s
sys 0m0,004s
```

Данный алгоритм является линейным, так как мы используем только диапазон чисел, который мы подаём на вход, следовательно с увеличением верхней границы данного диапазона, мы будем получать большее время для обработки данного алгоритма.