

Assignment_1.R

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```
#1. Create the vectors:
```

```
#a
```

```
1:20
```

```
## [1] 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20
```

```
#b
```

```
20:1
```

```
## [1] 20 19 18 17 16 15 14 13 12 11 10 9 8 7 6 5 4 3 2 1
```

```
#c
```

```
c(1:20, 19:1)
```

```
## [1] 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 19 18 17
```

```
## [24] 16 15 14 13 12 11 10 9 8 7 6 5 4 3 2 1
```

```
#d
```

```
tmp <- c(4, 6, 3)
```

```
#e
```

```
rep(tmp, 10)
```

```
## [1] 4 6 3 4 6 3 4 6 3 4 6 3 4 6 3 4 6 3 4 6 3 4 6 3 4 6 3 4 6 3
```

```
#f
```

```
rep(tmp, 11, len=31)
```

```
## [1] 4 6 3 4 6 3 4 6 3 4 6 3 4 6 3 4 6 3 4 6 3 4 6 3 4 6 3 4 6 3 4
```

```
#g
```

```
rep(tmp, c(10, 20, 30))
```

```
## [1] 4 4 4 4 4 4 4 4 4 4 4 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6 3 3 3 3 3
```

```
## [36] 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3
```

```
#2. Create a vector of the values of  $\exp(\cos(x))$  at  $x = 3, 3.1, 3.2, \dots, 6$ .
```

```
x <- seq(3, 6, by=.1)
```

```
exp(1)^x*cos(x)
```

```
## [1] -19.884531 -22.178753 -24.490697 -26.773182 -28.969238 -31.011186
```

```
## [7] -32.819775 -34.303360 -35.357194 -35.862834 -35.687732 -34.685042
```

```
## [13] -32.693695 -29.538816 -25.032529 -18.975233 -11.157417 -1.362099
```

```
## [19] 10.632038 25.046705 42.099201 61.996630 84.929067 111.061586
```

```
## [25] 140.525075 173.405776 209.733494 249.468441 292.486707 338.564378
```

```
## [31] 387.360340
```

```
#3. Create the following vectors:
```

```
0.1^seq(3, 36, by=3)*0.2^
```

```
#4. Calculate the following:
```

```
#a
```

```
sum(seq(10, 100)^3 + 4*seq(10, 100)^2)
```

```
## [1] 0 0 0 0 0 0 0 0 0 0 0 0
```

```
#b
```

```
b_4 <- c(1:25)
```

```
sum(2^b_4/b_4+3^b_4/b_4^2)
```

```
## [1] 2129170437
```

#5. Use the function paste to create the following character vectors of length 30:

```
#a
```

```
patse_a <- paste("label", 1:30, sep=" ")
```

```
#b
```

```
paste_b <- paste("fn", 1:30, sep="")
```

```
paste_b
```

```
## [1] "fn1" "fn2" "fn3" "fn4" "fn5" "fn6" "fn7" "fn8" "fn9" "fn10"
```

```
## [11] "fn11" "fn12" "fn13" "fn14" "fn15" "fn16" "fn17" "fn18" "fn19" "fn20"
```

```
## [21] "fn21" "fn22" "fn23" "fn24" "fn25" "fn26" "fn27" "fn28" "fn29" "fn30"
```

```
#6
```

```
xVec <- sample(0:999, 250, replace=T)
```

```
yVec <- sample(0:999, 250, replace=T)
```

```
#a
```

```
yVec[-1]-xVec[-250]
```

```
## [1] 207 -671 728 57 -18 146 97 93 471 -126 294 -215 508 -154
```

```
## [15] -131 699 -114 166 105 519 -138 58 690 490 301 -456 -46 -167
```

```
## [29] -646 -24 682 -134 334 -313 -24 -316 318 666 441 601 131 -654
```

```
## [43] 242 552 -284 -436 -47 570 542 19 -157 106 463 178 283 138
```

```
## [57] 859 -286 -247 -813 -44 -192 -455 -250 319 -351 -614 -335 -263 -312
```

```
## [71] -612 128 467 283 719 -11 -138 329 -312 413 103 211 53 -493
```

```
## [85] 434 -385 -921 342 422 -324 234 -510 144 772 862 -385 365 275
```

```
## [99] -459 -492 -334 -132 -275 -840 266 -200 802 -642 -467 241 -356 831
```

```
## [113] 200 584 -156 577 -704 -35 -750 263 295 687 -200 112 -73 -257
```

```
## [127] -290 833 134 -31 441 411 -514 -449 283 -369 -658 401 -451 315
```

```
## [141] 103 309 -335 291 -8 -346 39 790 -301 -153 566 -134 274 -320
```

```
## [155] -70 -103 481 13 48 94 -18 -182 -169 -121 -214 119 -266 -15
```

```
## [169] 300 -446 578 -101 -120 65 -181 385 918 259 -313 -417 -513 -167
```

```
## [183] -187 -719 -716 713 304 -706 556 441 523 32 864 -92 -69 -640
```

```
## [197] 218 -769 343 123 288 -573 -307 166 310 -82 -35 -134 362 -143
```

```
## [211] 226 797 756 -261 -497 -592 -445 231 -176 251 -398 758 164 -81
```

```
## [225] -534 -396 89 -580 -735 628 -165 -645 450 -161 303 441 -389 -863
```

```
## [239] 86 359 73 -62 69 -133 527 -330 -68 -335 16
```

```
#b
```

```
sin(yVec[-length(yVec)])/cos(xVec[-1])
```

```
## [1] 2.664386e+00 1.112170e+00 6.060032e-01 -6.058374e-01 3.485449e-01
```

```
## [6] -8.291988e-02 1.602693e+00 -1.828943e+00 -9.491294e-01 3.737064e+00
```

```
## [11] 4.162772e+00 1.022941e-02 2.681007e-02 -1.280818e+00 3.207286e+01
```

```
## [16] 5.754524e-01 2.748867e-02 1.519478e+00 1.655766e+00 1.077811e+00
```

```
## [21] 9.050590e-01 6.480479e-01 1.356558e+01 -2.917695e+00 9.986985e-01
```

```
## [26] -1.276487e+00 5.667470e+00 8.826976e-01 6.301910e+01 -8.393340e-01
```

```
## [31] -5.305985e-01 3.410927e+00 4.591884e-01 5.007295e-01 1.584749e+00
```

```
## [36] 1.164809e+00 -7.431250e-01 -2.778825e-01 -2.625912e+00 1.011156e+00
```

```

## [41] -8.410191e-01 -2.657629e+00 -1.446847e+00 9.951015e-01 -1.206451e+00
## [46] 1.384022e+00 -1.770576e-02 -1.017685e+00 1.249072e+00 -5.534324e-01
## [51] 1.732689e+00 -1.455657e+01 1.080430e+00 4.248746e-01 -1.560971e+00
## [56] 4.761179e-01 7.808046e-01 -5.213966e-01 5.535441e-01 -1.550667e+01
## [61] -1.169567e+00 1.071486e+00 1.862825e+00 3.363758e-01 1.514531e-01
## [66] 1.295693e+00 8.763614e-01 6.634354e-01 1.062046e+00 3.140077e+00
## [71] 9.891638e-01 6.483853e-01 -1.100860e+00 -6.807920e-01 -1.289682e+01
## [76] 2.244084e+00 2.879000e-01 -1.067297e+00 -4.897990e-01 -3.599568e-01
## [81] 9.980357e-01 8.732557e-01 -1.645061e-01 -1.044122e+00 1.892950e+01
## [86] -9.099189e-01 2.660640e-01 -4.901399e-01 3.711056e-01 -2.353439e+00
## [91] -1.369822e+00 -4.074809e-01 -5.473450e-01 -8.148580e-01 2.774876e-01
## [96] 3.146595e+00 -1.783420e+00 6.277814e-01 1.658588e+00 2.056596e-01
## [101] 7.127525e-01 9.396330e-01 5.400697e-01 5.808053e+00 2.365695e+00
## [106] 9.452929e-01 2.067679e-01 -2.612836e+00 4.154135e-01 2.448804e-01
## [111] -6.253060e-02 1.215594e+00 -2.148366e+00 -3.302577e-01 2.377248e+00
## [116] -1.114746e+00 -8.838963e-01 7.688315e-01 -1.144517e-01 1.403580e+00
## [121] -2.330093e+00 1.163532e+00 2.088069e+00 -1.310488e+00 -7.959115e-02
## [126] 1.013029e+00 5.930364e-01 -9.540530e-01 4.032754e-01 1.052114e+00
## [131] -4.046166e-01 2.507229e+01 9.932581e-01 -3.228608e-01 -3.593658e-01
## [136] 9.473011e-02 -1.336376e+00 -9.771291e-01 -1.170830e+00 1.421729e+00
## [141] 2.153547e+00 -6.106592e+00 -7.257329e+00 -3.117038e-01 -3.536540e-01
## [146] 1.766877e+00 2.159371e-01 3.991205e-01 -4.750836e+00 6.951432e-01
## [151] 9.383165e-01 1.210929e+00 3.013689e+00 -6.278036e-02 8.451095e-01
## [156] 9.531403e-01 2.263889e+00 9.892055e-01 -1.101900e+00 -8.229682e-01
## [161] 3.002771e-01 -2.143595e-01 3.586889e+01 3.841753e+00 -1.937781e-01
## [166] 1.078237e+00 -5.062280e+00 -6.829811e-01 -1.403870e+00 1.363056e+00
## [171] -4.197407e+00 7.376111e-01 -3.969594e+00 -4.369778e-01 -5.003474e-01
## [176] 7.203523e+01 -5.738929e-01 -7.852024e-01 -1.292891e+00 -9.297718e-01
## [181] 1.650983e+00 8.699380e-01 -1.128643e+00 1.427158e+01 -1.698609e+00
## [186] 1.051845e+00 -2.742651e+00 -3.479258e-01 5.665469e-01 1.500289e-01
## [191] -8.843356e-01 -2.004127e+00 -1.009142e+00 -1.272757e+00 -2.304241e-01
## [196] -9.641143e-01 3.725973e+00 5.844529e-01 9.182510e-01 -7.632593e-01
## [201] 1.449931e+00 -1.778337e+01 9.208021e-01 8.109125e-01 4.193105e-01
## [206] -1.198542e+00 -6.764104e-01 8.782375e-01 -4.537670e+00 -5.169435e-01
## [211] 5.190309e+00 -1.337823e-01 -6.651057e-01 9.841377e-01 2.385465e-01
## [216] -6.430330e-01 -3.143658e+00 -7.775497e-01 -7.184084e-01 2.185974e-01
## [221] 1.017401e+00 2.960297e-01 -2.585153e-01 3.202909e+00 1.161930e+01
## [226] 1.217209e+00 -1.041282e+00 3.672872e-01 1.049271e+00 -4.662623e-01
## [231] 8.123032e-05 -1.035698e+00 2.892568e+00 3.437339e-01 -1.220795e+00
## [236] -1.205764e+00 6.870722e-01 -2.237493e+00 -8.648557e-01 -1.516818e+00
## [241] -1.297391e+00 7.276833e+01 2.760390e-01 -1.730974e+01 -2.517646e-02
## [246] 6.653421e-01 6.493153e-01 -2.587727e+00 -7.485401e-01

```

```

#c
xVec[c(-249,-250)]+2*xVec[c(-1,-250)]-xVec[c(-1,-2)]

```

```

## [1] 1895 574 309 846 2223 663 -31 594 1407 318 102 477 1403 1264
## [15] 569 1206 -12 719 1077 501 628 649 59 -316 1323 2099 1710 2783
## [29] 848 -7 462 1042 1065 1163 2267 1525 980 344 210 272 1877 594
## [43] -186 923 2013 981 322 -404 1400 1793 1030 169 1380 1377 1197 317
## [57] -135 1002 1782 2138 1619 1475 2653 939 60 1236 1864 526 1439 1687
## [71] 2147 1134 464 74 -335 1069 937 1869 1172 160 1363 651 1983 827
## [85] 478 2153 1556 42 597 393 1513 1630 768 -313 1297 552 6 774
## [99] 1740 1411 1411 586 2127 1310 623 -317 777 1829 1384 2016 375 659
## [113] 187 707 327 1759 459 2225 1121 -96 194 577 -301 738 1727 1697

```

```
## [127] 252 -111 1380 1013 75 1334 1375 1086 1198 1750 434 1438 1655 1374
## [141] 163 1665 332 785 1205 1066 -464 1423 1933 63 1131 1900 740 1273
## [155] 1237 -253 1616 833 1145 212 -198 1405 1796 1694 602 1303 1491 839
## [169] 2043 907 1531 1160 474 1961 1285 -307 457 1435 1343 2254 834 152
## [183] 1325 2543 621 469 2194 1047 96 136 894 381 524 -117 1488 258
## [197] 1715 1192 1610 766 1502 910 1869 645 -397 1153 816 -18 1574 1257
## [211] 356 -764 1181 1192 1331 1955 786 936 245 1653 472 458 1046 986
## [225] 1696 1775 1407 2316 551 321 1714 569 5 547 734 1083 1982 2145
## [239] 421 1621 1028 1041 2305 773 399 1776 1396 938
```

```
#d
sum(exp(1)^(-xVec[-1])/(xVec[-250]+10))
```

```
## [1] 8.381334e-10
```

```
#7
#a
yVec[yVec>600]
```

```
## [1] 807 960 919 963 999 640 898 898 604 932 689 880 942 739 657 760 998
## [18] 841 796 724 722 937 763 966 779 964 922 729 614 929 703 769 855 730
## [35] 952 686 682 613 640 949 944 910 864 856 718 934 890 630 858 669 743
## [52] 702 867 708 944 869 656 730 701 977 605 872 746 644 621 866 959 683
## [69] 683 612 951 859 869 895 691 746 997 827 881 678 892 632 641 852 774
## [86] 861 645 880 710 743 970 816 648 960 812 754 739 821
```

```
#b
which(yVec>600)
```

```
## [1] 4 7 10 14 17 20 21 24 26 28 29 32 34 36 37 38 39
## [18] 41 45 49 50 51 54 55 56 58 62 65 71 73 74 76 79 81
## [35] 83 86 89 92 94 95 96 108 111 113 115 117 123 126 129 131 132
## [52] 133 136 139 141 149 150 152 153 154 158 159 164 165 169 170 172 173
## [69] 176 177 178 179 187 188 190 192 194 200 201 202 205 210 211 213 214
## [86] 223 224 228 231 236 237 240 241 242 244 245 246 248
```

```
#c
xVec[yVec>600]
```

```
## [1] 424 23 499 692 467 379 216 77 999 856 980 436 610 973 442 332 126
## [18] 396 713 180 918 616 788 496 403 296 752 156 781 236 139 165 830 292
## [35] 411 589 76 815 177 82 654 758 709 384 465 852 230 754 282 302 291
## [52] 809 657 880 483 957 570 835 703 341 859 226 765 649 566 929 784 418
## [69] 227 33 600 776 591 869 92 402 287 758 390 772 15 784 264 18 855
## [86] 481 607 726 449 529 764 289 887 442 887 212 538 540
```

```
#d
sqrt(abs(xVec-mean(xVec)))
```

```
## [1] 14.093261 18.638133 20.337650 8.283719 11.197321 17.927074 21.670718
## [8] 17.193603 6.679820 2.525866 21.298357 15.284633 6.133514 14.120198
## [15] 7.524626 13.878761 5.061620 21.555046 6.509992 10.659268 16.631897
## [22] 13.513697 16.870685 20.386760 13.770258 22.502889 22.031341 19.062529
## [29] 22.076685 21.438750 17.164498 7.524626 10.741508 10.834205 16.443236
## [36] 21.917573 7.114773 12.673595 19.147324 15.894024 9.829547 16.351758
## [43] 21.298357 15.767688 14.845201 15.949295 17.280625 18.401630 17.681063
## [50] 20.624742 11.107655 11.645600 13.878761 17.186623 1.838478 9.466784
## [57] 19.688067 14.022125 18.422269 21.572668 21.757298 16.105279 18.930927
```

```
## [64] 22.054025 18.347207 11.858330 17.532256 14.945902 11.163333 20.817781
## [71] 16.981755 17.560752 16.019363 18.804787 21.038536 18.100276 14.912411
## [78] 5.777543 18.367907 13.252170 14.164039 15.760076 9.034379 20.478769
## [85] 15.511931 9.817332 21.433152 12.353947 20.411271 6.528399 10.659268
## [92] 17.954944 1.838478 17.765697 20.263761 12.703543 19.990498 14.304545
## [99] 13.052969 18.638133 10.506189 11.932309 5.533534 21.917573 14.547165
## [106] 16.359095 19.611731 16.290488 18.824983 11.418406 14.709861 21.624523
## [113] 10.422092 18.937265 5.255473 11.645600 18.957320 13.806520 22.458406
## [120] 20.533387 21.785775 17.018226 16.205555 20.164821 14.504482 16.167251
## [127] 2.935984 21.624523 14.512753 14.400694 13.806520 14.199296 17.787074
## [134] 9.076343 9.559289 12.821076 14.400694 13.624243 19.681971 11.678185
## [141] 3.101612 16.480898 16.412800 20.313050 9.868131 4.197618 12.554680
## [148] 20.337650 21.549478 8.796590 18.127879 18.503513 14.504482 12.313407
## [155] 12.344229 11.602586 19.199479 19.141055 16.328503 3.823611 21.345257
## [162] 12.353947 20.551886 16.503939 12.505199 11.118453 17.099123 11.974139
## [169] 8.566213 20.889710 10.565037 17.069856 8.638287 5.711392 19.271222
## [176] 16.297853 21.438750 10.362432 16.833894 14.979319 19.348902 17.193603
## [183] 8.100617 20.158869 20.183657 18.347207 9.918669 19.400515 18.910843
## [190] 20.015494 16.420110 9.519454 18.963649 14.339456 17.596022 16.654729
## [197] 16.050545 22.121935 2.935984 16.290488 10.130153 16.714664 7.785885
## [204] 15.276780 21.854519 19.535097 11.890332 16.328503 14.920456 17.069856
## [211] 15.120185 20.919369 21.785775 19.036281 7.374280 16.259766 15.407141
## [218] 15.186178 4.961854 15.186178 15.949295 19.738794 3.408812 10.694859
## [225] 12.505199 20.648971 17.273679 15.276780 18.530515 20.263761 6.604544
## [232] 12.898837 20.967117 17.222659 7.253964 6.031584 16.473615 21.940374
## [239] 15.407141 14.269548 19.859003 7.114773 15.823400 19.859003 16.751716
## [246] 6.736468 19.909294 6.883313 8.965489 15.980613
```

```
#e
sum(yVec-max(yVec)>200)
```

```
## [1] 0
```

```
#f
sum(xVec%%2 == 0)
```

```
## [1] 133
```

```
#g
xVec[order(yVec)]
```

```
## [1] 800 198 832 53 340 645 108 634 86 427 340 440 307 455 757 310 270
## [18] 82 926 39 730 770 919 847 197 726 379 584 335 235 281 966 836 154
## [35] 302 715 915 135 730 79 801 900 156 716 973 294 535 25 183 703 432
## [52] 952 840 573 889 484 899 71 124 997 93 635 478 244 659 262 700 448
## [69] 262 575 763 460 867 608 300 496 357 194 203 111 259 33 18 603 103
## [86] 28 25 197 208 590 39 79 974 623 743 368 741 979 700 164 252 50
## [103] 80 747 629 133 369 982 288 357 300 717 912 352 618 381 785 55 468
## [120] 484 450 840 462 196 747 317 636 791 864 649 760 762 223 436 105 978
## [137] 225 851 663 303 240 37 358 526 475 134 958 221 748 547 226 814 999
## [154] 859 33 815 781 566 754 784 379 177 264 649 607 887 570 442 302 772
## [171] 76 418 227 589 980 92 703 809 139 880 449 465 918 180 156 292 835
## [188] 973 538 291 529 765 402 212 332 788 165 855 403 713 424 887 289 540
## [205] 758 396 18 830 384 282 776 481 709 929 657 957 591 226 436 726 390
## [222] 230 15 869 216 77 758 499 752 236 856 852 616 610 654 483 82 600
## [239] 411 784 23 442 692 296 496 764 341 287 126 467
```

```

#h
yVec[c(TRUE, FALSE, FALSE)]

## [1] 193 807 960 919 44 305 194 78 567 932 9 942 657 567 106 429 724
## [18] 459 966 964 145 396 1 105 929 769 855 395 419 31 126 640 269 204
## [35] 503 547 116 353 718 148 334 30 497 416 702 867 708 586 371 374 417
## [52] 977 255 274 158 435 621 959 525 951 300 240 869 691 434 114 213 678
## [69] 892 599 641 774 165 292 861 115 146 284 35 375 648 812 208 589

#8
1+sum(cumprod(seq(2,38,b=2)/seq(3,39,b=2)))

## [1] 6.976346

```