SD - Aug 30

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2022-08-30

Question: Draw 50 random sample of size 25 each from the following distributions:

(i) Rectangular(0, 1)

(ii) Nomal(0, 1)

(iii) Cauchy(0, 1)

Compute the statistics below for each sample:

(i) $\bar{X}_n$, **(ii)** $X_{(1)}$, **(iii)** $X_{(n)}$, **(iv)** $Med(X)$

```
set.seed(30)
library(ggplot2)
```

The Rectangular (0, 1) distribution:

Drawing 50 random samples:

```
samp1 <- replicate(50, runif(25, 0, 1))
samp1
```

```
##             [,1]      [,2]       [,3]        [,4]       [,5]      [,6]
##  [1,] 0.09878282 0.2973978 0.13645145 0.395779653 0.19794849 0.4357022
##  [2,] 0.48823179 0.4763574 0.16730515 0.984985246 0.80378294 0.3857202
##  [3,] 0.36403673 0.2563579 0.29659443 0.882247154 0.54903277 0.3594613
##  [4,] 0.42061913 0.8106153 0.41316954 0.001670874 0.61189834 0.9425587
##  [5,] 0.30096439 0.4693751 0.07762887 0.094879959 0.26773305 0.3251900
##  [6,] 0.14763513 0.6058477 0.88565553 0.159730863 0.13038539 0.8013029
##  [7,] 0.89857491 0.2333836 0.10698215 0.484631268 0.04328997 0.4495942
##  [8,] 0.22355651 0.4921895 0.07899135 0.878909588 0.83419952 0.1789526
##  [9,] 0.96596330 0.6071742 0.59170621 0.795814868 0.76295112 0.4197278
## [10,] 0.14106704 0.2998100 0.85000749 0.315599537 0.64596295 0.6556245
## [11,] 0.06535501 0.6686493 0.04224549 0.098180273 0.17995765 0.5759580
## [12,] 0.39725471 0.0793686 0.09535451 0.047571812 0.48125640 0.6384687
## [13,] 0.54399676 0.4103161 0.73067664 0.047516478 0.99531705 0.6138759
## [14,] 0.87963113 0.0333278 0.56602656 0.871602137 0.86108949 0.9513179
## [15,] 0.22338939 0.2747117 0.76634877 0.621060567 0.30446102 0.5853048
## [16,] 0.92094417 0.4371046 0.60961343 0.375395771 0.53469872 0.8675296
## [17,] 0.25146172 0.6206256 0.48317353 0.134578747 0.19314806 0.7498351
## [18,] 0.83046382 0.7747034 0.19993850 0.569797243 0.29127136 0.2294632
## [19,] 0.60815737 0.4851259 0.58550682 0.654165118 0.65070246 0.3818295
## [20,] 0.43135087 0.1808502 0.98846726 0.265818339 0.83008782 0.9778312
## [21,] 0.15308963 0.6901507 0.96161447 0.995261409 0.83498573 0.5440337
```

```
## [22,] 0.58556296 0.7881247 0.03811624 0.050551693 0.58363913 0.4897843
## [23,] 0.03442537 0.2748119 0.58720106 0.075601726 0.65512150 0.1465837
## [24,] 0.32988994 0.9319606 0.62571272 0.250955993 0.26920039 0.4660419
## [25,] 0.25213389 0.1649692 0.70245644 0.010477407 0.63617399 0.5842838
##             [,7]       [,8]      [,9]      [,10]      [,11]      [,12]
##  [1,] 0.692021806 0.84496502 0.6955628 0.07277298 0.77010700 0.72370103
##  [2,] 0.289385920 0.23255791 0.3091034 0.02951835 0.08064415 0.10842686
##  [3,] 0.234163941 0.14725974 0.1232451 0.01136248 0.18508206 0.49358280
##  [4,] 0.051134567 0.67383079 0.8774552 0.91084470 0.96645063 0.21281199
##  [5,] 0.865500215 0.14374284 0.7491301 0.61299291 0.57374567 0.43444714
##  [6,] 0.151273756 0.71376553 0.7261369 0.10962091 0.70326575 0.01971062
##  [7,] 0.263506581 0.95611736 0.2918561 0.32805381 0.11934085 0.10817603
##  [8,] 0.930298233 0.41224375 0.4913098 0.65776352 0.02140614 0.36677609
##  [9,] 0.421836107 0.92724681 0.3679289 0.35030832 0.34383348 0.99949264
## [10,] 0.004004411 0.31942295 0.7907357 0.19155336 0.73368451 0.42280594
## [11,] 0.802764247 0.83955466 0.5458015 0.22329389 0.40620436 0.63797663
## [12,] 0.954157097 0.71657280 0.8297549 0.85201816 0.12287562 0.24056558
## [13,] 0.285644288 0.17463708 0.2139297 0.74431942 0.45159445 0.75656125
## [14,] 0.469624718 0.09796882 0.3717849 0.91153499 0.74424168 0.93345296
## [15,] 0.439502541 0.46960682 0.6879379 0.05955640 0.13985608 0.88441077
## [16,] 0.674009262 0.60308014 0.9173555 0.30808086 0.63671048 0.06786013
## [17,] 0.333993289 0.80900927 0.5959598 0.33668941 0.93603420 0.53997199
## [18,] 0.957794233 0.53989606 0.3071337 0.02486925 0.76923553 0.11263237
## [19,] 0.986746531 0.12306094 0.5473485 0.89081715 0.84278787 0.18192331
## [20,] 0.702242127 0.60624939 0.2788492 0.95537335 0.21856648 0.04165444
## [21,] 0.020996978 0.24412915 0.4526890 0.19972966 0.96089413 0.88588319
## [22,] 0.815329046 0.58391438 0.7055959 0.69792332 0.94799822 0.10294309
## [23,] 0.143222455 0.23347346 0.5713688 0.92172704 0.88258693 0.55297433
## [24,] 0.900612770 0.08322308 0.5329214 0.03141096 0.37373876 0.15940196
## [25,] 0.942039193 0.80947109 0.2543833 0.37381262 0.14121825 0.43712100
##            [,13]      [,14]       [,15]     [,16]      [,17]      [,18]
##  [1,] 0.22195921 0.89030099 0.338600985 0.6003906 0.42129555 0.11452322
##  [2,] 0.97325657 0.72381253 0.095665211 0.6636447 0.45788055 0.27914954
##  [3,] 0.44972098 0.18551558 0.250598309 0.5275241 0.65635253 0.13794890
##  [4,] 0.66591407 0.13518944 0.554320173 0.2462430 0.96121626 0.17156126
##  [5,] 0.17032431 0.48510523 0.858856739 0.3540606 0.86768899 0.65297969
##  [6,] 0.71050789 0.04642570 0.599453649 0.0089029 0.87150560 0.80949441
##  [7,] 0.28366301 0.05119415 0.548733333 0.1986179 0.39775045 0.72911179
##  [8,] 0.16717404 0.51860728 0.156667443 0.9445149 0.91226587 0.02552564
##  [9,] 0.61915059 0.31575681 0.432355981 0.5139751 0.89539333 0.82580260
## [10,] 0.13782779 0.16599924 0.318859533 0.9031082 0.32043654 0.24367859
## [11,] 0.05340944 0.47176338 0.950332988 0.6193075 0.07277936 0.13310983
## [12,] 0.97126520 0.01004325 0.001377158 0.6089844 0.17562269 0.80563828
## [13,] 0.04657108 0.44922264 0.037994377 0.9953839 0.68999758 0.91149100
## [14,] 0.33409237 0.18140094 0.970445728 0.3002348 0.94983026 0.41402115
## [15,] 0.65585573 0.03216818 0.117516203 0.1968216 0.63117686 0.59905752
## [16,] 0.46988378 0.59196233 0.015774151 0.4382741 0.19976297 0.91048721
## [17,] 0.02002500 0.55678626 0.920887904 0.7544148 0.13331506 0.09205075
## [18,] 0.71082238 0.35426583 0.994959084 0.3924943 0.52927172 0.39939335
## [19,] 0.19646000 0.36367295 0.719795119 0.1198882 0.52597929 0.09722963
## [20,] 0.53028791 0.02836102 0.312087854 0.7391164 0.96324012 0.98444160
## [21,] 0.86917857 0.14234072 0.898161637 0.3599746 0.76389148 0.40298082
## [22,] 0.23633955 0.37938796 0.618978276 0.1011689 0.51267767 0.97093580
## [23,] 0.44016330 0.29270269 0.135893565 0.4632031 0.54496063 0.50766174
```

```
## [24,] 0.56039413 0.05981305 0.293934692 0.4353388 0.81168334 0.91197132
## [25,] 0.77081281 0.99328463 0.072332910 0.2781692 0.82940078 0.19875491
##           [,19]       [,20]      [,21]       [,22]       [,23]       [,24]
##  [1,] 0.29408054 0.311778182 0.23371977 0.140295117 0.002523081 0.442409225
##  [2,] 0.24779042 0.144438945 0.41466086 0.357329789 0.703200192 0.448565430
##  [3,] 0.78361957 0.950417558 0.89589626 0.601600691 0.168903483 0.555024537
##  [4,] 0.92274413 0.780230260 0.42267745 0.992589954 0.036175763 0.335922234
##  [5,] 0.29308329 0.731204654 0.22681910 0.688944571 0.932342545 0.769074283
##  [6,] 0.18580017 0.040930673 0.70568604 0.213524386 0.529006831 0.478981720
##  [7,] 0.39609163 0.056601550 0.75330500 0.977344373 0.716931635 0.561561592
##  [8,] 0.19697373 0.148751318 0.13692213 0.951613500 0.290582908 0.477952700
##  [9,] 0.94510859 0.442900970 0.60829967 0.024130482 0.853192323 0.535023910
## [10,] 0.05911431 0.768673621 0.41823938 0.085238743 0.491982570 0.814692287
## [11,] 0.22635133 0.792308825 0.39692283 0.585878141 0.317625932 0.091447619
## [12,] 0.55308646 0.109910481 0.64089145 0.880217842 0.512529559 0.815768319
## [13,] 0.57417748 0.727027005 0.18886555 0.005918184 0.700121480 0.774776843
## [14,] 0.10634544 0.849044108 0.76316497 0.390972439 0.398606442 0.301657159
## [15,] 0.29071622 0.964650379 0.19210122 0.702037414 0.141272729 0.483891945
## [16,] 0.74470414 0.180267791 0.83241123 0.237828817 0.115988636 0.252828720
## [17,] 0.31383967 0.565645968 0.11289691 0.527150075 0.587711293 0.919860395
## [18,] 0.96211532 0.686360021 0.01816265 0.382302124 0.317692986 0.425786042
## [19,] 0.21449216 0.544901679 0.34645791 0.571707363 0.042413462 0.842307801
## [20,] 0.56870566 0.239301624 0.76381245 0.240712078 0.441417954 0.780012067
## [21,] 0.51155953 0.529253500 0.04211637 0.114867788 0.349124721 0.800752893
## [22,] 0.33380417 0.007755061 0.01741369 0.464718077 0.251548364 0.948441539
## [23,] 0.98507899 0.243613814 0.07992041 0.483778921 0.609875458 0.169576000
## [24,] 0.81644494 0.390909684 0.36839629 0.688967616 0.891015803 0.034971510
## [25,] 0.34163974 0.100562136 0.62828754 0.827096262 0.996273146 0.001138356
##           [,25]      [,26]     [,27]       [,28]      [,29]       [,30]
##  [1,] 0.22430510 0.70182615 0.6979170 0.638379752 0.54828852 0.988755857
##  [2,] 0.44744544 0.86114730 0.3284509 0.833529117 0.81388016 0.011906762
##  [3,] 0.57617682 0.80742664 0.2745280 0.845036386 0.12036259 0.186018289
##  [4,] 0.78300349 0.03154611 0.7525333 0.981749326 0.98171036 0.003329883
##  [5,] 0.92151400 0.54481680 0.6555585 0.684297744 0.57208251 0.374704920
##  [6,] 0.02426103 0.48269100 0.5447201 0.801647214 0.73225618 0.182790284
##  [7,] 0.48751974 0.20725718 0.5862766 0.731230332 0.31078984 0.270007835
##  [8,] 0.47458255 0.71247625 0.2193005 0.110689448 0.96643583 0.743639232
##  [9,] 0.95704982 0.53259469 0.2878961 0.894142610 0.16926626 0.651583354
## [10,] 0.58130966 0.07441521 0.7739067 0.277469387 0.09906288 0.679616107
## [11,] 0.27247687 0.91260408 0.8339184 0.267030181 0.43025874 0.836636999
## [12,] 0.14140404 0.55520098 0.5276322 0.861100549 0.10505288 0.375852058
## [13,] 0.72323325 0.02822487 0.4577087 0.544924249 0.08177472 0.689197883
## [14,] 0.86445043 0.81668628 0.8155624 0.387598166 0.55956367 0.969238055
## [15,] 0.55643007 0.12342621 0.3644800 0.231062325 0.59123819 0.815624179
## [16,] 0.26824204 0.73860036 0.1336865 0.271626313 0.34662501 0.961664900
## [17,] 0.19043913 0.84522428 0.1404868 0.316376099 0.73696628 0.938272316
## [18,] 0.74483573 0.55794817 0.3544226 0.974022008 0.84062658 0.444735781
## [19,] 0.54885578 0.36757361 0.6474187 0.941739990 0.06340573 0.463708312
## [20,] 0.65793842 0.13289883 0.8918689 0.005325485 0.43370922 0.109877445
## [21,] 0.14981974 0.17056128 0.9750785 0.866459585 0.04302924 0.401949235
## [22,] 0.78313099 0.76525246 0.1480687 0.431438042 0.79133036 0.613156848
## [23,] 0.64331024 0.86148586 0.8419956 0.470394799 0.56643381 0.195325563
## [24,] 0.21386901 0.13610607 0.6225040 0.153448379 0.71203103 0.504338674
## [25,] 0.93299062 0.47515572 0.4694915 0.536352560 0.13112496 0.642743037
```

```
##           [,31]      [,32]       [,33]        [,34]      [,35]       [,36]
##  [1,] 0.9516199 0.21441015 0.000650994 0.9159515155 0.89357406 0.418307451
##  [2,] 0.3137542 0.76512301 0.344416323 0.6830185989 0.09098538 0.681078823
##  [3,] 0.7532431 0.08654085 0.667466387 0.0528826369 0.08584761 0.049999142
##  [4,] 0.5786835 0.22193493 0.211487222 0.7311529121 0.27067759 0.004346256
##  [5,] 0.4977007 0.16800178 0.972796772 0.9305858128 0.04906291 0.848449549
##  [6,] 0.9787163 0.79842413 0.699442412 0.5731677625 0.85749543 0.010320184
##  [7,] 0.4002913 0.64605565 0.998254652 0.0903098816 0.46003577 0.261627201
##  [8,] 0.1933602 0.21780751 0.006467780 0.5877454171 0.39897562 0.687559162
##  [9,] 0.8294406 0.94811648 0.201937143 0.9194327882 0.78421562 0.537168685
## [10,] 0.9930752 0.20606211 0.510632197 0.7227278876 0.01568811 0.089830031
## [11,] 0.7200510 0.09044462 0.521428020 0.1945894591 0.06889243 0.091815122
## [12,] 0.5552021 0.02807093 0.698261563 0.8521334073 0.55135509 0.811797715
## [13,] 0.4460849 0.24630528 0.754551927 0.9686448707 0.76548353 0.233904565
## [14,] 0.8791966 0.94880020 0.947019577 0.6875784164 0.71842509 0.154771921
## [15,] 0.9496184 0.26150966 0.772988017 0.7568100218 0.59175775 0.841242276
## [16,] 0.7731587 0.56890443 0.950224898 0.0001352641 0.74641201 0.854456792
## [17,] 0.2240990 0.89575364 0.669055003 0.1087737761 0.96692832 0.533747477
## [18,] 0.3820063 0.96716475 0.205376261 0.5330054769 0.34674714 0.407434175
## [19,] 0.2042817 0.69115355 0.316888799 0.0238596904 0.19502703 0.422317875
## [20,] 0.1632326 0.14340754 0.259843213 0.4513600988 0.76710708 0.905097357
## [21,] 0.6279583 0.29597732 0.031769275 0.9043137820 0.03288380 0.731062069
## [22,] 0.8919962 0.89410296 0.273115210 0.7024052353 0.95928931 0.366684634
## [23,] 0.9276193 0.35409248 0.314627938 0.6427455551 0.33402801 0.443111462
## [24,] 0.5756935 0.09009547 0.274502333 0.3925404469 0.12906298 0.880401264
## [25,] 0.4968500 0.24315592 0.065947107 0.6504013503 0.99035152 0.868453018
##           [,37]       [,38]      [,39]     [,40]      [,41]      [,42]
##  [1,] 0.94456209 0.357606173 0.30381990 0.3190106 0.81343641 0.25290196
##  [2,] 0.26923494 0.294294079 0.47307796 0.1397403 0.57330458 0.69508540
##  [3,] 0.35221977 0.391752410 0.58198443 0.4799231 0.85680220 0.45345906
##  [4,] 0.51695056 0.633910292 0.54094185 0.2063539 0.37977533 0.17298793
##  [5,] 0.53033226 0.529288011 0.43666576 0.1004529 0.13425752 0.10880252
##  [6,] 0.62308381 0.319243054 0.68151551 0.3773391 0.31465596 0.13681436
##  [7,] 0.00952775 0.787027872 0.19743712 0.8305240 0.71633688 0.62316956
##  [8,] 0.03151089 0.722309563 0.02418926 0.6372843 0.04714883 0.14910642
##  [9,] 0.55208796 0.836486696 0.94702925 0.1477464 0.39016005 0.94402299
## [10,] 0.71795120 0.911931055 0.85398087 0.1846938 0.81628961 0.31453155
## [11,] 0.16092177 0.002249812 0.45753939 0.2403049 0.62492932 0.15342701
## [12,] 0.81221268 0.879739488 0.11625999 0.6364739 0.16397134 0.25829341
## [13,] 0.98903296 0.692129708 0.78236240 0.3219120 0.96407202 0.08059727
## [14,] 0.86048363 0.567899579 0.96196811 0.4582701 0.38950933 0.71035187
## [15,] 0.02897580 0.082477422 0.14547020 0.6614586 0.33545601 0.18480475
## [16,] 0.70479089 0.667754014 0.51643788 0.5278304 0.45116759 0.49334658
## [17,] 0.54617169 0.999843023 0.43393624 0.9304231 0.99127839 0.47359772
## [18,] 0.96482702 0.493124211 0.28566912 0.7189614 0.23037063 0.85798235
## [19,] 0.83813145 0.138362033 0.32217127 0.3707934 0.20523008 0.31036662
## [20,] 0.13596448 0.836900318 0.48355956 0.5889265 0.16386444 0.94457944
## [21,] 0.38287509 0.689958882 0.85589249 0.5432043 0.31629181 0.30586078
## [22,] 0.37739719 0.483939623 0.73230579 0.4837839 0.82640682 0.01157267
## [23,] 0.38621286 0.371952861 0.95499755 0.4865244 0.04108188 0.60116121
## [24,] 0.01418721 0.416868865 0.23180395 0.8258671 0.32288796 0.95079146
## [25,] 0.15373332 0.179966519 0.31804636 0.4255709 0.10153656 0.29202308
##           [,43]      [,44]      [,45]      [,46]      [,47]     [,48]
##  [1,] 0.84259881 0.77676651 0.80864264 0.14974247 0.99136840 0.6877329
```

```
##  [2,] 0.11282887 0.82665878 0.17495515 0.67421270 0.23317506 0.1892408
##  [3,] 0.67534040 0.56396821 0.84426747 0.96350861 0.92269940 0.7173697
##  [4,] 0.19390484 0.68897016 0.13653873 0.75435498 0.30713896 0.7708146
##  [5,] 0.78674603 0.81639548 0.72885648 0.53037414 0.75036572 0.6967160
##  [6,] 0.97826477 0.06281172 0.26524376 0.37593875 0.21299405 0.6508152
##  [7,] 0.75975398 0.31052858 0.98620106 0.48192488 0.64945459 0.5967672
##  [8,] 0.40866943 0.42988873 0.14545790 0.20824573 0.30522818 0.9122680
##  [9,] 0.02994009 0.84626286 0.70929675 0.42232568 0.04310857 0.2802713
## [10,] 0.42448971 0.65388395 0.61507502 0.85383652 0.36367181 0.2247707
## [11,] 0.73219554 0.84137500 0.28778724 0.86110210 0.34533710 0.6387120
## [12,] 0.31132588 0.23509840 0.22264660 0.20618495 0.19560035 0.4332023
## [13,] 0.08532719 0.96326992 0.67356443 0.19701098 0.58796162 0.2421155
## [14,] 0.19410138 0.45079829 0.64305452 0.98431348 0.95616945 0.1849660
## [15,] 0.64143895 0.16224306 0.53861996 0.90852686 0.34974103 0.1987029
## [16,] 0.18616073 0.75110790 0.09449500 0.47639161 0.92553835 0.3127301
## [17,] 0.58519453 0.85281524 0.48490277 0.92940966 0.78186062 0.6238281
## [18,] 0.41447300 0.80608902 0.70018179 0.48544934 0.36532833 0.9250960
## [19,] 0.76968759 0.12220329 0.08590316 0.17501270 0.87824003 0.4532865
## [20,] 0.26411429 0.92890716 0.95192979 0.68265351 0.47362448 0.2413260
## [21,] 0.25394757 0.71199183 0.49395141 0.12673660 0.60939709 0.4258400
## [22,] 0.96352172 0.55606255 0.02282222 0.10761578 0.28592079 0.6944911
## [23,] 0.99478139 0.30131675 0.29904184 0.76791182 0.85678857 0.2644468
## [24,] 0.10955078 0.20229025 0.43074029 0.80705671 0.09455955 0.5524170
## [25,] 0.70151346 0.77247716 0.27593128 0.02297501 0.49470240 0.8805130
##           [,49]     [,50]
##  [1,] 0.82368279 0.4891343
##  [2,] 0.11526344 0.3967687
##  [3,] 0.34703619 0.3592841
##  [4,] 0.94203395 0.6786118
##  [5,] 0.10902410 0.1724208
##  [6,] 0.52979553 0.2016020
##  [7,] 0.86588062 0.7798039
##  [8,] 0.52784045 0.0808286
##  [9,] 0.97380013 0.9816547
## [10,] 0.53559211 0.5157456
## [11,] 0.28904488 0.9695043
## [12,] 0.33791675 0.9699722
## [13,] 0.43426482 0.9364704
## [14,] 0.64901260 0.2526310
## [15,] 0.08593573 0.1946434
## [16,] 0.93985540 0.5025675
## [17,] 0.59301489 0.9077823
## [18,] 0.39422985 0.9312351
## [19,] 0.27869431 0.7905641
## [20,] 0.11871959 0.1460613
## [21,] 0.94689232 0.1944843
## [22,] 0.70295368 0.9814702
## [23,] 0.91430335 0.4452738
## [24,] 0.86905086 0.9042947
## [25,] 0.11407775 0.6335137
```

Calculating mean for the above sample:

```
samp1_mean <- replicate(50, mean(runif(25, 0, 1)))
samp1_mean
```

```
##  [1] 0.4242015 0.5200406 0.5017782 0.4902966 0.4670296 0.4265392 0.4972424
##  [8] 0.4946778 0.4290083 0.4922050 0.5490255 0.4485942 0.5079615 0.4451926
## [15] 0.5362271 0.4315300 0.4957183 0.5023440 0.5014595 0.6067149 0.4994223
## [22] 0.5466601 0.4139500 0.5060135 0.3668918 0.5173425 0.3997405 0.4508578
## [29] 0.5770198 0.5876233 0.5483592 0.4182377 0.3710242 0.5436938 0.4641644
## [36] 0.3946543 0.4436471 0.5508089 0.4460531 0.4519154 0.4985648 0.5323046
## [43] 0.4250067 0.5620196 0.4952670 0.4649322 0.4512556 0.5805571 0.4962565
## [50] 0.5399272
```

Calculating minimum for each of the above samples:

```
samp1_min <- replicate(50, min(runif(25, 0, 1)))
samp1_min
```

```
##  [1] 0.003689917 0.105844652 0.072148430 0.024065241 0.006919096 0.040734239
##  [7] 0.055408920 0.014543394 0.036304511 0.011940632 0.070607972 0.073674982
## [13] 0.067236380 0.002631008 0.055728340 0.001808006 0.043558556 0.003462068
## [19] 0.037358899 0.133136444 0.168777044 0.003483265 0.044110296 0.039450905
## [25] 0.029509597 0.047041128 0.010190208 0.001805829 0.005312536 0.030717315
## [31] 0.014488494 0.022903054 0.014523079 0.038127724 0.025270938 0.003029816
## [37] 0.023421920 0.014239904 0.004028954 0.037418598 0.046825035 0.009141473
## [43] 0.040813657 0.012714515 0.023348854 0.038002664 0.003324724 0.077604079
## [49] 0.012343351 0.023700084
```

Calculating maximum for each of the above samples:

```
samp1_max <- replicate(50, max(runif(25, 0, 1)))
samp1_max
```

```
##  [1] 0.9940864 0.9443692 0.8671208 0.9943593 0.9223705 0.9102514 0.9696273
##  [8] 0.9991450 0.9655174 0.9117923 0.9848463 0.9993197 0.9829833 0.9431326
## [15] 0.9750815 0.8474711 0.9703309 0.9667354 0.9810141 0.9681867 0.9699511
## [22] 0.9575549 0.9668233 0.9266872 0.9774207 0.9165798 0.9658592 0.9925993
## [29] 0.9810713 0.9589875 0.9497282 0.9887019 0.9907580 0.9096894 0.9796691
## [36] 0.9894741 0.8920092 0.9732112 0.9358926 0.9943915 0.9808538 0.9848268
## [43] 0.9407670 0.9486007 0.9984547 0.9165140 0.9546213 0.9799196 0.9704686
## [50] 0.9357774
```

Calculating median for each of the above samples:

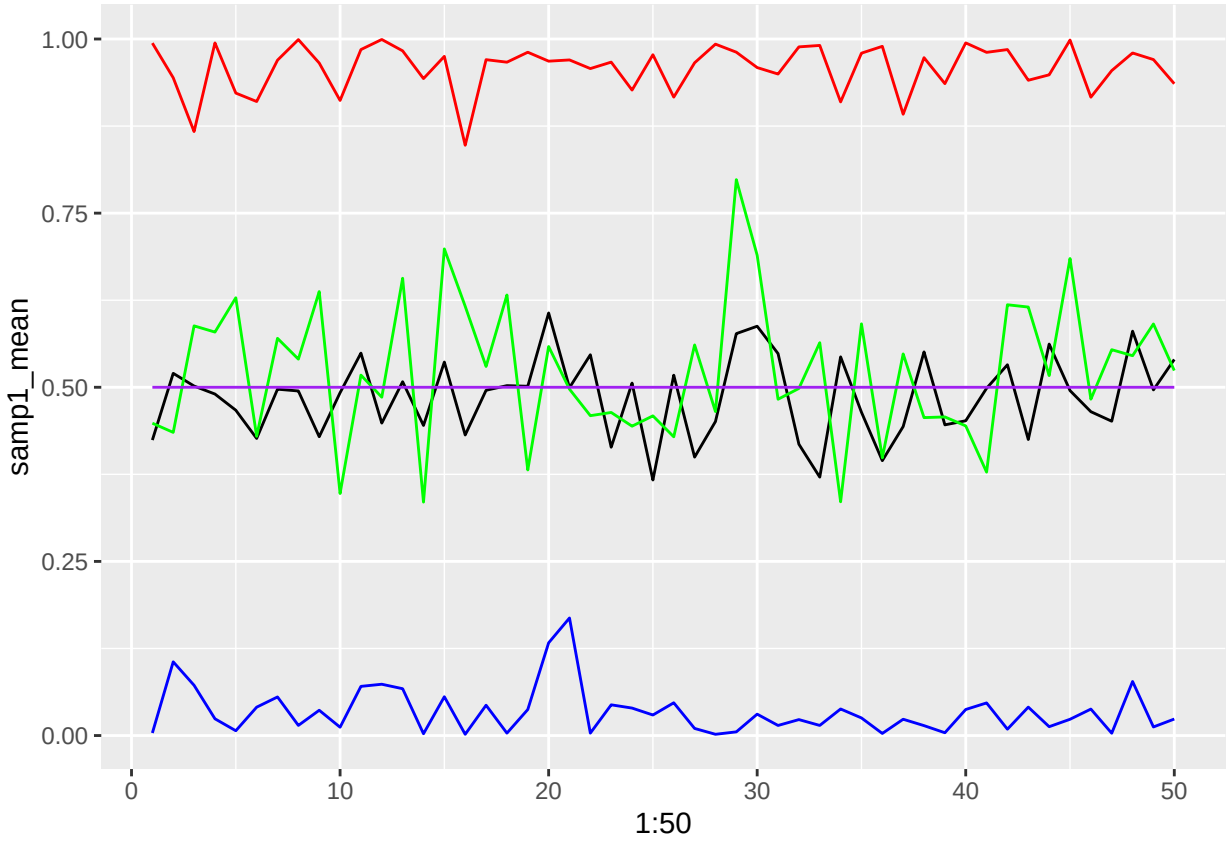
```
samp1_mid <- replicate(50, median(runif(25, 0, 1)))
samp1_mid
```

```
##  [1] 0.4484540 0.4352211 0.5881784 0.5792439 0.6284931 0.4295968 0.5702661
##  [8] 0.5403792 0.6374086 0.3474937 0.5174726 0.4857749 0.6564957 0.3351414
## [15] 0.6986765 0.6162572 0.5298832 0.6324712 0.3813259 0.5585472 0.4973086
## [22] 0.4592361 0.4638133 0.4441378 0.4589612 0.4288996 0.5608110 0.4651315
## [29] 0.7980895 0.6894594 0.4827991 0.4983421 0.5640077 0.3356282 0.5910946
## [36] 0.3987274 0.5478936 0.4564261 0.4574427 0.4445859 0.3781859 0.6184745
```

```
## [43] 0.6151763 0.5167851 0.6848569 0.4828917 0.5539644 0.5453286 0.5909060
## [50] 0.5240244
```

Plotting these 4 statistics:

```
ggplot(NULL,aes(1:50))+geom_line(aes(y =samp1_mean), color = "black") +
     geom_line(aes(y =samp1_max), color = "red") +
    geom_line(aes(y = samp1_mid), color = "green") +
    geom_line(aes(y = samp1_min), color = "blue") + geom_line(aes(y = 0.5), color = "purple")
```



The Normal (0, 1) distribution:

Drawing 50 random samples:

```
samp2 <- replicate(50, rnorm(25, 0, 1))
samp2
```

```
##              [,1]        [,2]        [,3]         [,4]        [,5]        [,6]
##  [1,] -0.157165079 -1.05107125 -4.48321385  0.367008206  0.27378755  0.22717701
##  [2,] -1.101688171 -0.42562741 -0.05270364 -0.009165949  1.02152550 -0.09413663
##  [3,] -0.796675750  0.62006701  1.18202246 -0.430416421 -0.16747753  0.50769704
##  [4,]  0.005729214  0.08649163 -0.49535475  0.009559083 -0.25965106 -1.02770936
##  [5,]  1.376738235  1.85458597 -0.56988105  0.636848558 -1.57240490 -1.82485320
##  [6,]  1.347774499  2.15215047  2.54242481  0.452841768  1.05451156 -1.05592298
##  [7,] -0.537242032  0.98882483 -0.46645347  0.654150543 -1.62954796 -1.43104756
##  [8,]  0.684765805 -0.11401333 -0.42314493  1.340323129  0.21935186  1.22877743
```

```
##  [9,] -1.823733193 -0.40379221  0.91764748  0.643678049 -0.97800570  0.12540878
## [10,]  0.692806439 -0.55505717  0.94614267 -0.086571639 -0.38638812  0.94165077
## [11,]  0.561837377 -0.72774615 -0.35322599  1.070840308 -0.08564649  0.43402847
## [12,] -0.337906180 -0.07586157  0.84397878  0.112304365 -0.17847459 -1.54317676
## [13,]  1.004786214 -0.81827161  0.36627932 -0.235210287 -0.73232325  0.74788115
## [14,]  0.869192263  0.49660246  0.88050247  0.920772564  0.14829670  0.58646824
## [15,] -1.372505083 -0.02333126  0.51097999  0.564791988  1.15655161  0.02606438
## [16,] -0.557798005 -0.10197637  0.96689605 -0.847832931  0.77555784 -0.12732929
## [17,] -1.190051907 -0.35448765 -0.09666309 -0.725721476  0.18873835  1.29588972
## [18,]  0.976318261 -0.43218582 -0.91581804  0.753963708 -0.30721715 -0.39371165
## [19,] -0.363032637  1.22678027 -1.33275001  1.233740185  0.43893403  0.60396767
## [20,]  0.100241594 -0.71082659  0.43563352 -0.635893859  0.12690591  0.61002905
## [21,]  1.648602023 -0.37283663 -0.76684423  1.122940188 -0.52842147  0.95872691
## [22,] -0.462678536  1.07638912  0.28439241 -1.169775405 -1.47265066  0.89089756
## [23,]  0.491703335  0.08247336  0.43284267 -1.649549210 -0.94544107 -0.09984537
## [24,]  0.228507373 -1.00395144 -0.14968890 -0.710369327 -0.41484014 -1.81401793
## [25,]  0.686162988 -0.74020953 -0.79436979  0.262624189  0.78574580 -0.26646770
##              [,7]        [,8]       [,9]       [,10]       [,11]       [,12]
##  [1,] -0.50091945  2.00047392 -1.0368885  0.76238548  0.88177552  0.31308940
##  [2,]  1.89180053  1.20563890  0.9405297 -0.86570585  0.24777592  1.20548998
##  [3,] -0.30507606 -0.79411707  0.5443181  1.09796231 -3.29524849 -1.39777916
##  [4,] -0.48281825  1.14786560 -0.8424091 -0.08038888  0.30229541 -0.01900567
##  [5,]  0.46807824 -0.48732190  1.9766817 -0.37878770 -0.42260567  0.26675584
##  [6,] -0.29817682  0.57376256  0.7911632 -1.40287548  0.17644428  1.78324284
##  [7,] -0.40414192  0.19337581  0.5030862 -0.11216004 -0.57712057  1.14767567
##  [8,]  0.11179456  1.20959510  0.4863586 -0.24276021  1.89174439 -1.49928446
##  [9,]  2.74436797 -0.14538024 -0.9258424  0.76421607  0.01184916  1.33129624
## [10,] -1.41769096  1.39146737  0.4117123  3.28504389  0.78809915 -0.82953651
## [11,]  1.98039137  0.56011679  0.6399530  0.16853412  1.38896292 -0.99045551
## [12,]  0.59942363  0.32594843  1.1865812 -0.44555047  0.88815424  0.21973436
## [13,]  0.91448859  0.57768626  1.3443289  0.10237772 -0.16606704 -0.16090884
## [14,] -0.19462063 -1.06767045  0.2145542 -0.10960851  0.64500650 -0.98614445
## [15,] -0.56002645  1.35079321 -0.1594200  0.81315305  0.26069874 -0.20657838
## [16,] -0.67576743  0.75817073  1.0507171 -0.15209490  0.09088487  0.22810448
## [17,] -0.85926540 -0.50844169  1.5467545 -0.78616659 -0.25523471  0.16170447
## [18,]  0.33197562  0.40995623 -0.8236284 -1.55889369  0.44529163  0.19216928
## [19,]  0.18279626 -1.40652044  1.2742950  0.76643305 -0.40433212  1.31184711
## [20,] -1.53811284  0.96494444 -0.5882519 -2.81591054 -0.66841103 -0.05370367
## [21,]  0.02689055  0.33477930  0.9314568  0.01528244 -1.30672407 -0.10164148
## [22,] -0.30624612  0.68397741 -1.7690223 -0.04732809 -0.09574621 -2.44616192
## [23,] -0.06539965  1.54485564  0.9873141  0.43704696  0.43567971  0.88397362
## [24,] -0.15311099 -0.03081351  1.1010061  1.93019165 -0.64200259 -0.12736770
## [25,] -0.59437693 -0.90108485  1.3436009  1.10193146  1.56082437  0.86876540
##             [,13]       [,14]      [,15]       [,16]       [,17]       [,18]
##  [1,] -1.29499203  3.401045394 -0.8366054  0.91340057  0.04259349 -0.66892604
##  [2,]  0.12726555  0.211068157  0.1175786  0.73957287 -0.18918845  0.33754348
##  [3,]  0.88218278  2.448753519 -1.1959169 -1.37542714 -0.72767870 -2.01235375
##  [4,]  0.07088568 -0.212925631  0.1237483 -1.52852731  0.93502185  0.24950686
##  [5,]  1.53607022  1.620825087  1.7830813 -0.41620448 -0.09043330 -0.38002852
##  [6,] -0.90554287  1.068058994 -0.2377112 -1.41330722 -0.62851290 -0.19477465
##  [7,] -0.75522895 -0.918623271 -1.4541535 -0.43544352  0.05112854 -1.04745978
##  [8,]  0.17199158 -0.068926758 -1.4566576 -0.69593187  0.82960249 -0.25738733
##  [9,] -1.33723116  0.218269702 -1.8300269  0.54084011 -0.69503379 -0.43943926
## [10,] -0.82219320  0.009434709  0.8460547  1.37060827 -0.60384195  1.91913326
```

```
## [11,] -1.01635563 -0.237390979 -0.2510309 -1.08878410 -0.21996804  0.76231067
## [12,]  1.37279322  0.773281150 -0.6859658  0.85140335  0.67363297  0.15724058
## [13,] -0.29757979  0.815338784  2.7773200 -0.31494224  1.66956365 -0.85361506
## [14,] -1.15433824 -0.231360990  2.3376603 -0.14560675 -0.59875668  0.58966348
## [15,]  0.91118057  0.953583683  1.0991234  0.83991683 -0.37139332 -0.32143136
## [16,]  0.18613766  2.297839509 -0.2549753 -0.88655022 -0.69992097  0.50988201
## [17,] -0.98417690  0.633109945  0.2346176  0.80819016  1.27657965 -0.08604882
## [18,]  0.18451891 -0.741049976 -0.4942565  0.42029928  1.56145054 -0.03159373
## [19,]  0.20395627 -0.320962274  0.4246028 -1.41697455  0.47955237  0.69035746
## [20,] -0.45908954  0.372978568 -0.8001368 -2.30274675  0.02738079 -2.48375456
## [21,] -0.04102047 -0.540082331 -1.4395131 -0.05748058 -0.02951012 -0.69539674
## [22,]  1.18489332  0.429577219 -0.1783301  0.17054938 -0.50202491 -0.52476754
## [23,] -0.27290098 -0.848775163 -0.6537093  0.91716519  0.26931890  0.50743546
## [24,]  0.87890718  1.475605879  0.7887432  0.15745554  0.89560159  0.03620666
## [25,] -0.73354165 -1.418272045  0.4795460 -1.63933914 -1.22319487  0.57727225
##             [,19]       [,20]       [,21]       [,22]       [,23]       [,24]
##  [1,] -0.89294580 -0.80698734 -1.27031363  1.19079530  0.65280507  0.27868660
##  [2,] -1.48671386  0.60483840  1.64307086  0.12918181 -0.92579487 -0.29318819
##  [3,]  2.71557128 -0.26796724 -0.31670063  0.01351031 -0.48121764  0.48187435
##  [4,] -0.26521740  0.12557275 -0.89577142 -0.77045930 -2.68021791  0.16703469
##  [5,] -0.55539049 -1.19401969 -0.93480955 -0.86886193  0.26326563  2.21045395
##  [6,]  0.50725511 -0.80276100 -1.10005709 -0.11170818  0.24065102 -0.23305870
##  [7,]  1.12040799  2.02475428  1.06550829 -1.26890246  0.59630533 -2.21352733
##  [8,]  0.80074820  0.68550333 -0.84296931  0.09278781 -0.46256664  0.21392165
##  [9,] -0.04512243 -1.32841586  0.14610929 -0.31903461 -0.28330741 -1.41482783
## [10,] -1.84002489  0.01010205 -0.93727126 -0.90099062  0.07460006  0.66833204
## [11,] -1.17768010 -1.12375069  0.12156692 -0.27660394 -0.12205934  0.09472429
## [12,] -0.79774393  0.43992775  1.21249624  0.01266146 -0.36902514  1.46836814
## [13,] -0.32474911  1.61587767  1.13887377 -0.72244300 -0.62148214 -0.82939864
## [14,]  1.31851902 -0.37286688 -1.00086120  0.85701087  0.57065687 -0.22474008
## [15,] -0.79064839  0.45466643 -0.41245541 -2.61294983 -0.42514208  0.19099082
## [16,]  0.71430818 -1.47496964  0.44521810 -1.49857876 -1.04836907  1.58773201
## [17,]  0.31168959 -0.78812103  0.37895709 -0.58385367  0.94372808  0.90101003
## [18,]  0.73671082  0.32382943  0.43587251  1.42590717 -1.04199451 -0.22591140
## [19,] -1.44913772  0.70559267 -0.42637992 -0.58929273  2.22396280  0.08486415
## [20,] -2.13717832  1.12138849 -1.47177867 -1.92822720  1.25856062 -1.00446749
## [21,]  1.31269051 -2.08538157 -0.19707160 -0.49284075 -0.25979938  0.47559472
## [22,]  0.17000283  1.29043416  0.94417782 -0.82526793  0.30117242 -0.78520987
## [23,]  0.14177822 -1.08968841  1.22869269 -1.63039881  0.58176396 -0.54801594
## [24,]  0.24354081  0.06613051  1.20963319 -1.81022362 -0.51979081 -0.93333610
## [25,]  1.68579559 -0.07246143 -0.05429993  1.18673736 -0.19262280  0.42693046
##             [,25]      [,26]        [,27]       [,28]        [,29]      [,30]
##  [1,] -0.2083785 -0.1781990  0.066528073 -0.81325997 -2.057694145  0.5127033
##  [2,]  1.1193905 -0.5423456 -1.002493862  1.46751133 -0.877201805 -0.4713157
##  [3,]  1.0469607 -0.9862883  0.042015380  0.16482832  0.311772528 -0.7443993
##  [4,] -1.1201164 -0.8527057 -0.421793491 -0.84870143 -0.537405212 -0.4889800
##  [5,] -0.4867866  0.9409770 -1.150199950  0.69856321 -0.430077247 -0.2845931
##  [6,] -0.3663055 -0.8483458 -0.259061348  0.22953469  0.816138506 -0.5204499
##  [7,]  1.1714034 -1.2078539 -1.433673433 -3.21955847 -1.047160263  0.5184304
##  [8,]  1.5629233 -0.2672346  0.007730724  0.05034718  0.272863540  0.9539263
##  [9,] -0.5033041 -0.8947188 -0.215982135 -0.73170665  0.003160043  0.3563087
## [10,]  1.9204751  0.6355432 -1.695620721 -0.05294474 -0.240805941 -1.1601005
## [11,]  0.8097028 -1.3099218  0.934852347 -0.29655164  1.669347672 -0.2106277
## [12,] -0.9462463 -1.2100277  0.337907565  0.67860472  0.847441549  0.6403305
```

```
## [13,] -0.8186920  1.0339297 -0.517430803 -0.09825421 -0.505331059 -0.3462702
## [14,]  2.6627882  0.4782981  0.754552839 -0.23360443  1.444564731  0.6258638
## [15,] -1.0099017 -1.4090139 -0.795103655  0.50420188 -1.375829683 -1.4627315
## [16,] -0.4196535 -0.6085244 -0.254161079  1.24378381  0.410811811  2.1925332
## [17,]  0.1296194 -0.2067844 -0.513200876  0.80621545  0.416607339 -0.2216212
## [18,] -2.2051943 -0.6530495  0.638384603  0.60493716  0.569814184 -1.3665115
## [19,]  0.6875386 -1.5371696 -0.158006871  1.65438757  0.851680768 -0.9417173
## [20,]  1.0936103 -0.9815714 -0.153781761 -0.28923553  0.412281897  0.6657738
## [21,] -0.7949704 -1.1356096 -0.529258313  0.06662475  0.436717615  0.5392061
## [22,]  1.2989360  0.8540797  1.947677300 -0.20533001 -0.811939571 -1.1700903
## [23,]  0.6133207  0.6997419  0.494571918  0.45902253  0.296009022 -1.2714092
## [24,] -0.8846486  0.8131396 -0.534218604 -1.66390422 -0.573679448 -1.5948186
## [25,]  0.4024096  0.1766598 -2.589492470 -0.11859761 -1.417237114  0.5227795
##             [,31]        [,32]       [,33]       [,34]      [,35]        [,36]
##  [1,]  0.28462823  1.435955538 -1.28576769  1.04495522 -1.8162750  1.207849892
##  [2,]  0.30579710 -1.063894481 -2.05940779 -0.27896844  2.1910621  0.904622911
##  [3,]  0.67194317 -0.741716853 -0.06052267 -1.28927385  1.2939766 -1.212112937
##  [4,]  0.52834306 -0.179882749 -2.29180767 -0.08313792 -1.1013977 -0.322546760
##  [5,]  0.44087491 -1.083106214  0.52788664  0.10357541  0.5997957 -0.949463152
##  [6,] -0.38341087  0.583981378 -0.96884869 -1.45908676 -0.3340396 -0.719004954
##  [7,]  0.07407137 -1.981997565  2.17406100  0.45241601 -1.3086230  0.578367685
##  [8,]  0.37665919  0.455285161 -0.03097747  1.08135941  0.3214944  0.994826715
##  [9,]  1.30094940  0.194050016 -0.53630346  2.79477709 -0.5847118 -1.286178021
## [10,]  0.23013162  0.907278392  0.72103267  0.18054752 -1.8696083  0.358016400
## [11,]  0.03575538  1.125250753 -0.18013589 -0.25272770 -1.1579139 -0.778819696
## [12,]  1.06136188  1.532900024 -1.34599568 -0.38030586  0.6138782  0.373555137
## [13,]  0.86095443  0.373065675  1.59713215 -1.24548369 -0.5610597  1.084411311
## [14,]  0.61575158 -0.007452553 -0.74933871  0.77265430 -0.4522569 -0.917529659
## [15,]  1.65748210 -0.197061159  1.43501988 -0.43274437 -0.6597148 -0.603445185
## [16,] -1.44557036 -0.140489448  1.08654598  1.06387133  1.0390014  0.689937602
## [17,]  1.63205693  1.399397055  1.37739227 -0.99462504 -0.9834481  0.004389165
## [18,] -0.58512505 -0.192847922 -0.48980599 -0.39546012  0.9503031  1.345420045
## [19,] -0.71922535 -0.544758434  0.08400927 -0.11226980 -1.4179447  1.925116650
## [20,] -1.56590097  0.494569141 -0.97074512 -0.61710478  0.3792782  1.215557496
## [21,]  0.34551735  0.264846538 -0.16640310  0.20602707 -1.5299815 -1.365558216
## [22,] -1.13839726  2.310844441  0.76622369  0.20083000 -0.2311466  0.019364101
## [23,]  1.47195055  1.611441628 -0.14443948 -1.53279046  0.2009428  0.100540479
## [24,] -1.33440343 -0.089180847  0.18503231  1.31319067 -0.1345385 -0.213192963
## [25,] -0.93364612 -0.183311103  0.32399336 -1.59326422 -1.5645663 -0.749991494
##             [,37]       [,38]        [,39]       [,40]       [,41]       [,42]
##  [1,]  0.2195779  0.51049499  0.205422751  1.39254621  0.81622334 -0.65631872
##  [2,]  0.2480374  0.44193604  0.925096645  0.16353777 -0.57103417  1.04748631
##  [3,]  1.4953637  0.26347861  1.421693192  1.39031224  1.47796027  0.05319752
##  [4,] -1.0427956  1.34379504 -0.577589146 -0.39098452  1.53417534 -1.74652612
##  [5,] -0.5153262 -0.67550745  1.080017083 -0.25531940 -0.44127923  0.37631733
##  [6,] -1.1481512  0.53308666  1.079989579 -0.38960173 -0.87122271 -1.96000951
##  [7,]  0.6740339 -0.47161844 -1.764995625  0.93607833  0.81048486 -0.47941408
##  [8,] -1.2128392  0.75656264  0.109248450 -0.52882551  0.71187071 -0.65877755
##  [9,] -1.6052609  0.83244674 -0.362484038 -0.81343559  0.39726341 -2.12138002
## [10,]  0.3371754 -0.79296781 -0.124297905  0.36412907 -0.85641586 -0.68498503
## [11,]  0.4315097  0.89443045 -0.254579011  0.27171822 -0.49435269  1.54983426
## [12,] -0.7418913  1.52110402 -0.521932081  1.64977679 -0.34872776  0.60559764
## [13,]  1.2364650  0.17923547  0.647668211 -1.06230960  0.19691697 -0.74564406
## [14,]  1.0651155 -1.05149606  0.991606962 -0.09718064  0.96358345  0.97432206
```

```
## [15,]  0.3807213  1.78004873 -1.577717068 -2.13293855 -2.38286786 -1.21827666
## [16,] -0.2163689 -0.36941244 -0.005526195 -0.12050984  1.56576319 -0.78155167
## [17,] -0.4549696  1.04842627 -1.489500033  1.51852104  0.56583424 -2.18928848
## [18,]  0.7850767  1.58766928  0.675728105  0.67954701  0.95776486  0.14875257
## [19,] -0.3273333  1.29164985 -1.104514081  0.46993138  0.07904168 -1.05047338
## [20,] -1.9201315 -1.90985831  0.924590302  0.56342911 -0.34942111  0.75016575
## [21,]  0.1243218 -0.36180203 -0.844546234  1.06096018  0.76051007  0.92051070
## [22,]  1.3434945 -1.05536148  0.453114040  2.19822870  0.35896073 -0.40338218
## [23,] -1.9181619 -1.37954292  0.809493473  0.03559199  0.98226164  0.32291756
## [24,]  0.1057962 -0.06165629 -0.858666173  0.96232123  0.63139284 -1.12006118
## [25,] -0.6625431  0.32080461 -0.977063866 -0.50320378 -0.27559551 -0.07070709
##             [,43]       [,44]       [,45]        [,46]       [,47]       [,48]
##  [1,]  0.52356247 -0.77146750  0.24130833 -0.460865476 -1.05470330  1.34464847
##  [2,] -1.07496750 -0.16550267 -1.70680799 -1.686397797 -0.70465675  0.79315853
##  [3,]  0.86495280 -0.54056082 -0.04426055  0.951267444  0.73933299 -2.15592947
##  [4,]  0.40000393  1.31158742  0.46487715  0.977164071 -1.33083922 -0.82542968
##  [5,]  1.02223148 -0.48246962 -0.41475583  0.225168777  0.44604941  0.03965802
##  [6,] -1.76567986 -0.45685706  0.08320470 -0.564156311 -1.19037562 -0.64899000
##  [7,]  0.79513032 -0.49882773  0.14615313 -0.960489479 -0.79549349 -0.59742274
##  [8,]  0.78817728 -0.49104937  0.22704160  0.292439128 -0.60801437 -1.12960984
##  [9,]  0.66106549 -0.04625656 -0.35167908 -0.771799943  0.33354844 -0.75401744
## [10,] -0.94955941  0.20193720 -0.82346213  2.383161485  0.06065837 -0.01043044
## [11,]  0.05263522  0.51681304  0.48692598 -2.034443836 -0.32134571 -0.96943371
## [12,]  0.08676866 -0.08364944 -0.73422198 -1.111517023  0.61667645 -0.80402602
## [13,]  0.83932398  0.22708583  0.12352309  0.864711519 -0.57828854  0.35284106
## [14,] -0.88173222 -0.99274562  0.77225387  1.032021681  0.89122290 -0.69372094
## [15,]  0.92648091  0.26978051 -0.24068413  0.829850424 -0.01583543  0.07213318
## [16,]  1.32252168 -1.53642727  0.22374330 -1.581255569  0.76739075  1.24060688
## [17,]  0.11621358 -0.97195527  0.14949326  0.145065912  1.51041438 -1.42428326
## [18,]  0.47725232  0.38706293  0.02449655 -1.423858054 -0.02992355  0.22378470
## [19,] -0.55007761 -0.25936654 -0.07838071  0.787869818 -0.51753652  0.11855724
## [20,]  0.75929533  0.04226360 -0.16396029 -2.719127808  1.28750879  1.15980747
## [21,] -1.25773325  0.37167963 -0.30004761 -1.099330203 -0.48780313  0.20995009
## [22,] -0.87940355 -0.46839461  1.30954508  1.033051326 -0.46077809  1.62040257
## [23,]  0.53192467 -1.98022712  0.62810472 -3.278798916  1.02854737 -0.48263756
## [24,] -1.22018765 -0.73843847  0.43470324 -0.100831167  1.77208848  0.70625346
## [25,]  0.34739667  0.21072159 -1.19534562  0.008836008  0.65580827  0.95207048
##             [,49]        [,50]
##  [1,] -0.28624343  0.576588559
##  [2,]  2.19381984  0.221767303
##  [3,] -1.22577257 -0.009135614
##  [4,]  0.34909993  1.011930381
##  [5,]  1.10827090  2.454683522
##  [6,] -0.47761208  0.848281770
##  [7,]  0.83761056  0.672980487
##  [8,] -0.94610383  1.775315654
##  [9,]  1.70822669  0.788218099
## [10,] -0.86677004 -1.739010818
## [11,] -0.20737582  1.778082721
## [12,] -1.31393527  0.328437002
## [13,] -0.95998707  0.548371587
## [14,]  0.06882298  0.262119354
## [15,]  0.21489998 -0.675561478
## [16,]  1.29908423  0.352065641
```

```
## [17,] -0.37656275  0.419643576
## [18,]  0.37345634  0.266613832
## [19,]  0.62252143  1.044461269
## [20,] -0.72918440  0.509800124
## [21,]  1.72759612  1.389826575
## [22,]  0.29561129 -0.350170390
## [23,]  0.93560363  0.163302711
## [24,]  0.67469318  0.020300760
## [25,] -1.70142942 -2.003212586
```

Calculating mean for the above sample:

```
samp2_mean <- replicate(50, mean(rnorm(25, 0, 1)))
samp2_mean
```

```
##  [1] -0.215361182  0.286070885 -0.137913158 -0.078460761  0.461717133
##  [6] -0.030122600  0.008544982  0.211976856  0.586361301 -0.298348810
## [11] -0.022755942  0.510428849  0.206004331 -0.107430113 -0.001617816
## [16]  0.355162709 -0.046321362 -0.133155771  0.087762727 -0.173604281
## [21]  0.398638523  0.233167473  0.326149158 -0.008259064  0.038234746
## [26] -0.115392087  0.400855141  0.167021969  0.316761981 -0.087923039
## [31] -0.116510939  0.143417074  0.212592953 -0.028471158  0.205375248
## [36] -0.212884050 -0.103540125 -0.115424716  0.087910225 -0.017087571
## [41]  0.123906927 -0.081894760 -0.297265483  0.404775262 -0.438967023
## [46] -0.187673817  0.108004032 -0.351818326  0.036420864  0.001730972
```

Calculating minimum for each of the above samples:

```
samp2_min <- replicate(50, min(rnorm(25, 0, 1)))
samp2_min
```

```
##  [1] -0.8799941 -1.9312839 -1.0877639 -1.1388401 -2.0192164 -2.8346501
##  [7] -1.4832714 -2.1353210 -2.7374942 -1.4571395 -1.9133943 -1.2183526
## [13] -1.5173347 -1.6131079 -2.4188486 -1.1774608 -1.4782943 -1.8272874
## [19] -1.5909965 -2.2088316 -2.1615354 -1.1480573 -1.3366186 -1.7729477
## [25] -1.7575891 -2.0302766 -1.3592238 -1.9394025 -1.6613809 -2.1885141
## [31] -1.9748600 -2.1798477 -2.3549865 -2.4293668 -1.6013633 -1.7621738
## [37] -1.6634193 -1.2559628 -1.6401215 -2.0677227 -2.4340628 -1.2596262
## [43] -2.2802102 -2.6060920 -2.2845763 -1.3930710 -1.8398801 -1.8113108
## [49] -2.3052418 -1.0993483
```

Calculating maximum for each of the above samples:

```
samp2_max <- replicate(50, max(rnorm(25, 0, 1)))
samp2_max
```

```
##  [1] 2.892517 2.158661 1.606470 1.994791 1.292425 2.254764 2.338164 1.214242
##  [9] 2.266771 1.369280 1.918971 1.871587 2.042418 2.297186 1.781088 1.758692
## [17] 1.917733 1.432253 1.501084 1.362703 1.936739 2.614130 3.162368 2.220821
## [25] 2.037150 2.208530 2.074212 2.065867 2.434250 1.528484 1.388842 3.205089
## [33] 1.608914 1.051026 2.072090 2.478604 1.826188 2.598734 1.943017 3.486931
## [41] 2.009507 2.922449 2.427460 1.598070 1.821917 1.888597 1.103632 1.674961
## [49] 2.322979 1.645287
```

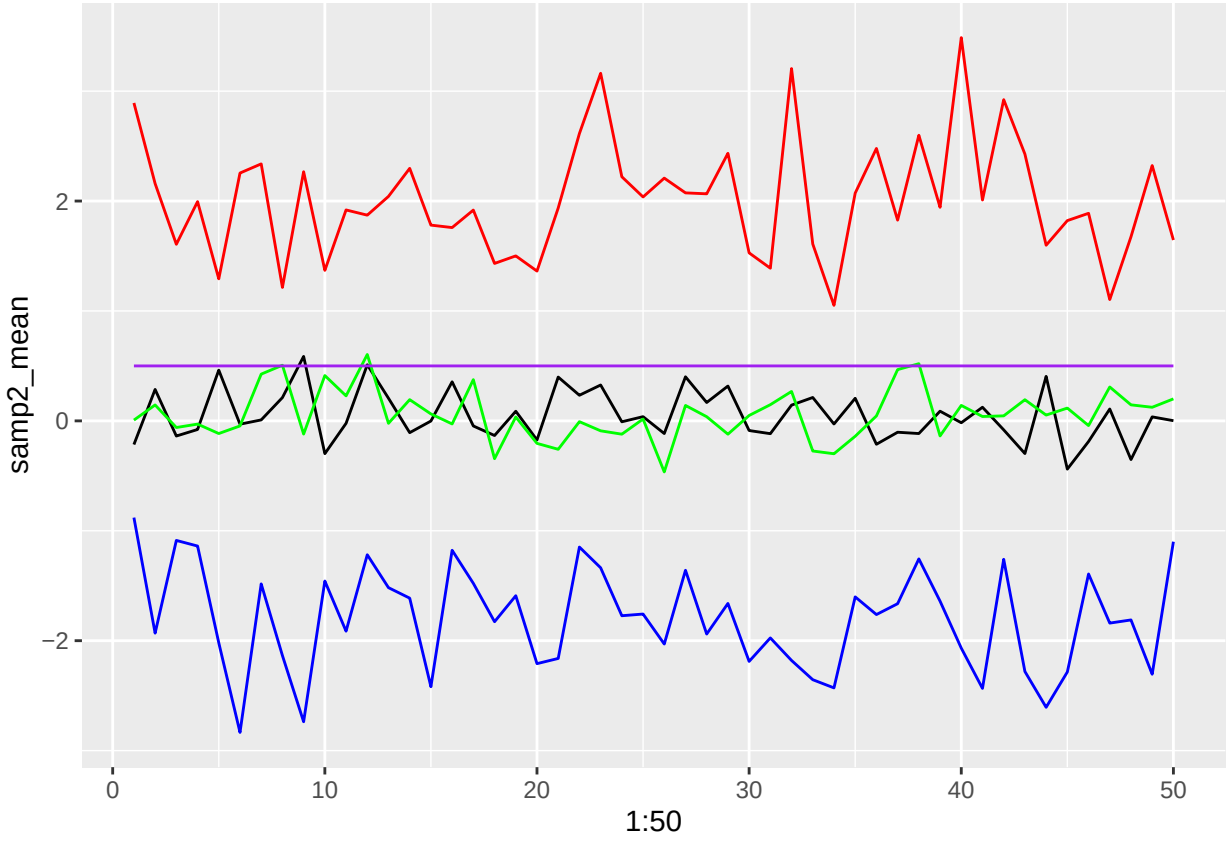
Calculating median for each of the above samples:

```
samp2_mid <- replicate(50, median(rnorm(25, 0, 1)))
samp2_mid
```

```
##  [1]  0.006915858  0.144810987 -0.060503576 -0.029511061 -0.115375527
##  [6] -0.046171703  0.425221608  0.506256002 -0.120126752  0.412475615
## [11]  0.227496514  0.603824493 -0.022304803  0.193070990  0.063284553
## [16] -0.028057850  0.375012940 -0.344062054  0.035239774 -0.204843466
## [21] -0.258763724 -0.007440941 -0.090492415 -0.121156559  0.016684706
## [26] -0.464372346  0.140424590  0.037673031 -0.121202266  0.049008796
## [31]  0.147100797  0.267857895 -0.274300197 -0.299242222 -0.140089651
## [36]  0.045160089  0.466536365  0.520014011 -0.136812423  0.140683983
## [41]  0.039623202  0.045645150  0.192343548  0.052545199  0.116314653
## [46] -0.042857603  0.308209900  0.145810083  0.123720124  0.200051673
```

Plotting these 4 statistics:

```
ggplot(NULL,aes(1:50))+geom_line(aes(y =samp2_mean), color = "black") +
     geom_line(aes(y =samp2_max), color = "red") +
    geom_line(aes(y = samp2_mid), color = "green") +
    geom_line(aes(y = samp2_min), color = "blue") + geom_line(aes(y = 0.5), color = "purple")
```



The Cauchy (0, 1) distribution:

Drawing 50 random samples:

```
samp3 <- replicate(50, rcauchy(25, 0, 1))
samp3
```

```
##               [,1]       [,2]        [,3]         [,4]        [,5]        [,6]
##  [1,]   0.278761326 -0.3847469  1.75576144  0.287490176 -0.38705626  -0.3277274
##  [2,]  -4.276741027 -0.1556373  0.45147699  1.403018521 -3.01962209   3.4059936
##  [3,]   1.041007403  0.2737653  0.20004815  0.093152976 -1.41161064   5.9830163
##  [4,]  -0.809799537  3.1919829  0.46780191 -1.066420918  0.14597361   0.2620174
##  [5,]  -0.474532070 -0.7339769 -0.38749506 -1.316490734 -4.96954818  -0.3774137
##  [6,]   6.059216931  7.7458984 -3.29537951  1.159306557  5.23632301  -1.3978367
##  [7,]   0.522545154  1.2339418 -5.48728871 -0.057161480 -0.97080454   3.4374525
##  [8,]  -0.099017488  0.4705693  5.40357582  0.193166036  5.32121584   2.0004521
##  [9,]  -0.004720126 -0.1820592 -3.81483258  1.104764154  0.11823453  -3.9512509
## [10,]  -0.602123827  0.2413327  0.60524312 -0.081266294 -0.36349666  -1.4937217
## [11,]  -0.939452626  2.5218418  5.46221838 -0.126499779 -2.53411565  -2.5120058
## [12,]  -0.343035450  3.9157016  1.23041804  2.189036542 -0.83563364  -0.4051656
## [13,] -15.296345684 -0.2218550  1.04687151  2.570020476  1.13921767   1.3480029
## [14,]  20.051485495  0.1152689 -4.58199607  1.658136370 -1.08543520   3.2379347
## [15,]   0.125471028 -2.9943105  0.27812210  0.292183270 -5.37015113  -0.4723875
## [16,]   0.331953112 -2.6683787 -0.14737307 -0.324013830  1.66116555   3.6842996
## [17,]   3.602964032 -8.0054685  0.08019741  0.882632516  0.30728126  -1.0088965
## [18,]  -1.794416442 -1.5058916 -7.90365462  1.634811531 -0.07118328   1.1015947
## [19,]   1.704346736  2.3680521  9.98709822 -1.951195831 -0.10415668   0.5482349
## [20,]  -1.938402472 -1.9491743 -0.27496470  0.792093497  0.14246347  -0.8848706
## [21,]   0.097926441 -2.6456579  0.04684382  0.006109949 -7.01949192   0.8119719
## [22,]   2.363750578  0.7042117  2.16560563  4.794960650 -0.71166002 -24.7694095
## [23,]  -0.933242865  0.5179760 -0.31989025 -0.423693670  0.27795946  -1.0685263
## [24,]  -7.392941435  0.5160146  2.14130154 -0.262928741 -0.31551247   0.3781279
## [25,]   0.030938961 -0.7799148 -0.65885953 -0.083570756  1.31988947   3.9086698
##               [,7]        [,8]         [,9]        [,10]       [,11]
##  [1,]   -1.20795669  0.16279647   0.13612166  -1.06552886 -1.18143712
##  [2,]   -7.80153650 -2.40480810  -0.34840094  -5.83848499 10.50589869
##  [3,]    0.42461275  0.96014649  -0.45894458   0.01109498 -1.79644172
##  [4,]  -11.95091743  0.81976867   0.10632429   1.89764437 -0.31315046
##  [5,]   -0.18827640  1.90545379  -0.64207466  -0.08702104  0.58751799
##  [6,]  -27.05177258  0.27005840  -0.54665885  -0.42555773 -0.90721939
##  [7,]   -1.54611701 -1.16293192  -0.35856791   0.55361665 -0.09324211
##  [8,]   -2.62854200 -0.45393103   6.91768447   0.54567627  2.52450560
##  [9,]   -0.60070484  1.85631136  -0.23895967   2.53444459 -1.02165209
## [10,]    0.15602528  4.28206727   1.16940801  -0.09324582  1.19714668
## [11,]    0.84751306  1.18251989  -4.04247807   0.27846756  0.86950239
## [12,] -296.16818121 -0.88266618   5.10882140  -1.79949563  3.47379740
## [13,]    0.62575386 -0.21523271  -1.31497417  -7.69905192  0.97923248
## [14,]   -0.36168599  0.13124512   0.64782586   0.26168543 -0.20389774
## [15,]    1.09276490 -0.06132453   0.06102988  -0.22195334  1.07807744
## [16,]  -15.91385886  1.27849215  -0.38197653 -16.51889749  3.19262019
## [17,]    0.03760635  0.28002104  -0.70596627   0.73792507 -0.79053424
## [18,]    1.04515572  4.86504936  -1.31450566   5.49619629 -0.54042734
## [19,]   -0.77995904  0.52245526 -24.98297820   0.24609001 12.13206960
## [20,]   -0.19683914 -3.74255683  12.34852050   0.84611168 -0.58211678
## [21,]    0.23811821 10.65703097  -0.35229293   1.67808216  0.75734287
```

```
## [22,]   -1.18485743 -0.36782719  -1.39062518  -0.43840197  1.79755143
## [23,]   -0.62636114 -0.63847724   0.02290524  -0.74476021  0.02759001
## [24,]   -0.91309030 -0.97690005  -0.21205869   1.42823836 -0.52721591
## [25,]   -0.27419058  0.35616442   4.50787627   0.29190940  1.08308411
##              [,12]       [,13]       [,14]        [,15]        [,16]
##  [1,]  -0.05615688  -1.9897186 21.36381805   0.41573995  -0.08340240
##  [2,]  -0.79591791  -0.6840475 -1.00940974  -1.92743158  -3.24376529
##  [3,]   0.35410312   0.2176623  0.06684169   0.05126856  -2.48570265
##  [4,]  -1.28817526 -46.6817620  0.31889187   1.97508207   0.06659890
##  [5,]   0.28212524   1.0342245 -3.75070932  -0.91033997   4.84515781
##  [6,]  -0.49492615   0.1564969 -0.49812963  14.86997064   0.38275385
##  [7,]  -1.37642450  -1.0584684 -0.64235379   0.38119977  -0.10245294
##  [8,]   0.53362744  -0.6381857 -0.64314487 -18.43728070   8.16287456
##  [9,]   0.47902469  -1.8491877  0.09687797   1.60688387   0.01184437
## [10,]  28.51008208   1.6786184  0.83795853   1.87213777  17.14269840
## [11,] -22.25460389  -0.3406572 14.77658971   0.30210910 324.75821889
## [12,]  -0.09615425  -0.6129357 -4.56242961  -1.19672105  -5.07923798
## [13,]   0.47061528  -1.9925589  0.11137096  -4.05542472  -0.09046474
## [14,]   1.13002577  -0.6325945 34.14013572  -0.73189837  -0.19632156
## [15,]   2.43744784  -0.2029828 -1.34308242  -1.60485290  -4.04384467
## [16,]   1.51515521   0.7642894 -0.61216336  37.84083079  -1.10893297
## [17,]  -4.14230801   0.5863067  2.71620660  -0.86760540  -5.99940136
## [18,]   0.97594235  -0.7237004 -0.13862118   8.05021971   0.37121819
## [19,]   0.27863488   0.4468914  0.11882731  -1.04625673   0.37765956
## [20,]   1.00349608   0.4676772 -0.16965417  -0.70686430  -1.19962671
## [21,]   0.07101741  -0.3746888  8.60631229  -0.20562390   3.41022359
## [22,]   0.39844135  -0.2728303  0.79827585   0.36869068   1.16533401
## [23,]   4.63445803  -3.5455897  1.72804220  -0.10685433   2.05818783
## [24,]   2.12253722  -0.1054989 -0.74390991   4.17665826  -1.05867152
## [25,]   0.70375098   1.3316300  0.62557919  -0.68325846   1.16277516
##              [,17]        [,18]        [,19]         [,20]         [,21]
##  [1,]  1.253340302   1.20172400  -0.44792393  -0.854751222    1.99519212
##  [2,] -0.701925958   0.10649580  -0.26050373   1.043610275    8.20011857
##  [3,] 17.224847782  -3.67247110  -0.91759426   0.461601266    1.99034149
##  [4,]  7.369349983  -3.74670394   0.02727540  -0.203082631    0.92838444
##  [5,] -1.044134190   1.37839086   0.24634011  -4.827428112   -0.15653855
##  [6,] -3.811754736   0.21512127   0.19166486   1.356328413 -139.88899031
##  [7,]  1.564095352   0.31091158  -0.08468807 -12.390411695    0.22893811
##  [8,] -1.746617053   3.59390662  -0.20486039  -2.734258416    1.36471309
##  [9,]  0.698510533  -7.11858644  -0.03412965   2.868792011   -4.54143919
## [10,] -0.093343956  -0.25891750  -0.69955100  -1.928900857    6.16693311
## [11,] -0.112267819   1.64053728   2.45728798   1.864458474   -0.56266974
## [12,]  0.213887757   1.80116742  -0.91377438  -0.317585265    0.03527263
## [13,] -7.951789658  -2.89270218   3.18944646   2.322101045   -1.10322471
## [14,]  6.587394429   3.93092218  -0.08545551  -0.009227332    1.26759473
## [15,] -0.003810426  -3.62623814 -14.79371339  -0.558178963   -0.36152023
## [16,] -0.481992110  -0.05085981  -0.16073740  -4.848007256    1.47758741
## [17,] -0.437331175   1.11388167  -0.33448165   0.720155057   -0.12473679
## [18,]  5.917676238  -1.24083911  -1.78212257  -0.598700653    0.52144730
## [19,] -1.986835647  -0.90975731   2.31457015  -0.391796113   21.83340537
## [20,]  0.012327282 -13.43994828   0.43345438   0.076866497   -3.15168977
## [21,]  0.173880282  -2.76967289   2.12819700   0.280155973    4.44709890
## [22,] -0.496188500  -1.12891297  46.75135212  -0.959294234   -7.05219895
## [23,] -0.508411828  -1.89421782  -0.06438179  -1.531552587    5.38645436
```

```
## [24,] -0.346224054   0.13399768  -1.62168965   0.203812476    0.53739713
## [25,]  0.298934260  -1.19122595   0.16026164   1.135598238   -3.18246741
##             [,22]        [,23]       [,24]       [,25]        [,26]
##  [1,] -1.48073074  -0.64069031   3.7123139  0.07958023   0.07145464
##  [2,]  0.80577359  -0.29990724   0.1090273  1.44606253   4.55329769
##  [3,]  0.58015441   0.34202698   3.8452098 -3.76289663   1.11238470
##  [4,] -1.56995204   0.83963065  -2.2475303 -0.50578513  -0.21828784
##  [5,]  0.26097570  -1.26540650   0.5195736  0.53718589  -0.84483348
##  [6,]  1.39418405  -0.88218613  -1.1156468 -0.48134452   3.36620430
##  [7,] -7.55978208  -0.31363728 -11.4988333  0.59587780  -0.53874285
##  [8,]  0.76430562  -0.05763678  -0.8897565  7.49600651 -30.43969010
##  [9,] -0.31322530  -0.53256725  22.0940273 -1.22770544   0.94809732
## [10,] -0.20470414  -2.58831804   0.5698926  1.13279500  -0.14197777
## [11,]  0.46111238   0.24908509  -2.5863825 -2.88855369  -1.77057796
## [12,] -0.19137218   0.61539307   2.1389030 -0.73498428 -43.79902936
## [13,] -2.13734269   2.00875116   3.0688191 -6.24222619   0.86587634
## [14,]  1.76993175 -15.15086568   1.5623124 -1.07613940   1.71981548
## [15,]  1.31842856   0.11562677  -0.7527667 -0.26833278   0.62866528
## [16,] 10.47890267   2.13239707  -2.0283974 -0.38647089   0.86889473
## [17,] -2.13137468   4.10586871   1.2693115  0.37466143  -0.11566134
## [18,] -0.14325589  -1.26559514  -0.6977066 -6.52743371  -0.88908121
## [19,]  0.12864054  -0.46168037   1.8461679 -0.24259636   0.60062041
## [20,] -5.91906751   6.19172493   3.4217206  0.42475231   0.67958940
## [21,] -0.28979628   0.60541617   0.2323484 -0.96682077   0.42414238
## [22,] -0.08992801   1.39053215   1.6271152  4.57225396  -0.64570460
## [23,]  0.05739711  -1.21883669   0.5772202  0.94238181   0.49826913
## [24,]  1.07076906  -0.22842411  -3.4853333  1.65813257  -1.45170892
## [25,] -0.90221144   1.76884017  -5.3067239  0.34166462   0.14833056
##             [,27]        [,28]       [,29]       [,30]      [,31]        [,32]
##  [1,]   -1.0462670   1.07537166  4.27428641 -0.35951728  0.4344089 -11.3884120
##  [2,] 1735.3136275  -0.53804693  0.58954044  1.40320898  3.5359859   0.3937694
##  [3,]    8.7348184   1.41458270 -4.82767777  5.29441211 -1.7888889   3.6470047
##  [4,]   -2.1719957   1.10600159 -0.56169405  0.65232727 -3.5569729   2.5032690
##  [5,]    0.5196913   3.31468183 -0.30852146 -1.00459298 -0.1285699   1.6166110
##  [6,]   -9.0292840 -22.97451759 -2.64686957  7.91278709  1.7280994  -4.9687729
##  [7,]    1.8852053  -2.58716567  1.16675700 -0.76900110 -3.0711153   3.4848689
##  [8,]    0.5543719   0.87916858 -2.57035224 -1.47259404  0.4124887   0.8105176
##  [9,]   -2.3710555   0.51525589  3.56054798 -0.05520933 -0.5613078  -0.6096194
## [10,]   -6.7200246  -0.77668809 -0.35238927  0.59663118 -0.3204136  -0.2445123
## [11,]    2.9175333  -0.04217065  0.29056966 -5.90615565  1.8782202  -0.4921359
## [12,]   -6.2185133 -14.99608870 -2.70380855  0.13143430 -1.0627909  -3.2252291
## [13,]    4.1252451  -0.54288975 -0.84519514 -2.13324044  0.1406002  -0.2241890
## [14,]   -2.0341693  -3.60626371  7.81266328  0.54123367 -0.1137663   1.0892733
## [15,]   -0.1632140   0.14685398  0.62018323  3.44432084  0.1603288   2.2458771
## [16,]    2.3849510   3.07156993 -1.18506218  0.40505683 -0.5479560   1.2197507
## [17,]    2.9233786  11.88509545 -1.91402676  1.38901042  3.7706302  -1.3574181
## [18,]    1.3136320  -0.28929214 -8.61699430 -1.63471433  0.5367538   1.0993338
## [19,]    3.0289828  -0.19194532  1.91632891 -0.14038360  0.8055744   1.4988337
## [20,]    0.7444108  -8.26991285 -0.60277720  1.94673345 22.7243102   0.2070922
## [21,]    0.1097764  -0.61878587 -0.12714505  0.47993057 -0.7713611  -4.7555365
## [22,]    5.5609277  -1.73250404  0.02741955  0.08966680 -0.6257540  -1.0666117
## [23,]  -13.4587198   1.72168304 -1.45205914  2.16397935 -1.9140776  13.9172907
## [24,]    0.0781392  -4.57677594 -0.59300470  1.01928652 -0.1048745   0.3972354
## [25,]   -1.1713485   7.84962263 -3.43366320 -0.08401663 -1.1476766  -7.2933515
```

```
##             [,33]         [,34]        [,35]       [,36]       [,37]
##  [1,]  -2.60601722 -0.4444881888   0.17755172  -4.3721237 -1.05742950
##  [2,]   2.76105099 -1.1716736807  -0.57796267   2.0337029  0.05745371
##  [3,] -38.62997312  0.7461557356  -1.06050589  -0.4349451 -0.76476044
##  [4,]  -0.14527342  1.0590210920   0.23338544   2.2073660 -1.93374729
##  [5,]  -0.45439188  0.8119267722  -1.26219122  -0.5025863  1.45403717
##  [6,]   0.52279089 -0.0009050726   0.82144890   0.8725312 -5.19440276
##  [7,]  -0.19533801  0.3073084698   0.56080431  12.0991456  0.76826018
##  [8,]  -0.11881014  0.1801739055  -0.59422492   4.2810517  0.26630611
##  [9,]   6.53868046  0.2904933542  -0.15612096   1.6182171  2.32587788
## [10,]  -0.34133125  1.5937059044   1.07899769   0.2602880  0.48823316
## [11,]   0.31563860  0.8182796607  -0.90803456  -0.5389251 28.66158829
## [12,]  -0.54494452 -4.7998317000   2.18740938   9.1948361 -0.83372898
## [13,]   0.84828422 -0.0435891209   7.59383395   0.4951213  2.06513105
## [14,]  -1.33292594  0.1526715024 -41.91638763  -1.0774251  0.50574523
## [15,]   0.08962170  0.2450558207  -0.05906051   4.3560030 -1.25729524
## [16,]   0.28081544 -2.7784965323   8.61731511   1.8987685 -0.26266064
## [17,]  -4.71624188 -2.9484705041 -13.64056585   0.1328520 -0.63107845
## [18,]  -1.28401566 -1.1199203001  -9.18603703  -1.1326883  1.20209000
## [19,]  -0.12595893 -0.2994988014   0.61748046   0.7820745  0.61533516
## [20,]  -0.99331042  0.0167660831   0.23413045  -0.3927470  2.23470432
## [21,]  -0.31669415 -0.6378121977  -1.11628028   1.2393223 -0.25542125
## [22,]  -1.06000700  0.1801725265  -4.65969408   1.0599552  0.79723792
## [23,]   0.29771015 -0.2730585885   1.81536445   1.3347198 -0.04549124
## [24,]   0.05728559  0.3752619907  -2.36995827  11.8580352  1.57390988
## [25,]   0.66963414  3.7482080428  -0.16570481 -30.0722614 17.76290641
##             [,38]       [,39]         [,40]        [,41]       [,42]
##  [1,] -11.19946185  0.97056024   1.259802389   1.73679969  -0.8632981
##  [2,]   1.62041735 -0.74220460  -1.762793607   0.09309885  -0.2636115
##  [3,]  -1.90728870 -2.76344229  -0.014530442  -1.85372399   1.4220871
##  [4,]  40.81402115  9.26498120  -1.617082739  -1.44935883  -3.3840455
##  [5,]   4.34042296 -1.62950865   1.635459193  -0.89946280  -5.6512060
##  [6,]  -3.94329227  9.33922984  -1.034284429  -5.86204409  -0.6745434
##  [7,] -57.11064726 -0.02774297   1.006458841  -0.02518466  -0.5435180
##  [8,]  18.06383754 -0.85639600   4.681476625  -3.16592511   0.7051544
##  [9,]   0.51286791 -1.76698321   2.483724149  -0.87849684   0.7929257
## [10,]   0.01902882  2.18699221   1.692633837   1.05335489   0.3929764
## [11,]   1.35607837 -0.24091964  -3.086977856   1.26506480   0.3363215
## [12,]  -0.96730727  6.24014407 -31.644670189   0.41240747  -1.3609885
## [13,]   6.08961732 -1.12481354   2.959274143   2.05740094   0.6892125
## [14,]   0.04330767 -1.41609203   4.733831276  -1.08765870  -2.1847107
## [15,]   1.60804662 -0.50978446  18.909937451  -1.97945389   0.1564603
## [16,]  -0.57124565 -2.41085482   0.111490348   1.95322139   1.0471332
## [17,]   1.78177589  0.75555279   0.169676145  -0.55019288  -3.9623409
## [18,]   0.35104827  0.99401172  -0.007884146  -3.76976172  -1.2132013
## [19,]   0.32043831 -2.39673950   1.155479325  -0.87588028   0.6985199
## [20,]   0.47975125 -0.47871641  -1.020321815  -1.09726440   0.5594373
## [21,]  -0.30214923 -0.91193011   0.362128437   2.56773496 -21.6101535
## [22,]  -0.09336694  0.99322530  -0.179020314   9.15461496   1.4471445
## [23,]  -0.86415797 -0.72265189  -4.565001482   0.73245332   0.8468590
## [24,]  -0.08711669  0.40613364   2.993700633 -62.23579810  -1.6686420
## [25,]  -0.68153814 20.11448175  -4.873588132   0.35210363   0.5824236
##             [,43]      [,44]       [,45]        [,46]       [,47]
##  [1,]   4.89064533 -1.3464780   0.2703612 -12.90204989 -0.21624638
```

```
##  [2,]   0.88802520  0.6097487   1.6085148   0.82884470 -1.90434335
##  [3,]   2.30637603 -0.2615437   4.9784923   0.36146119 -0.11005508
##  [4,]  -0.17216984 -0.2030485   1.4879787  -0.62554638 -0.83489907
##  [5,]  -0.28886633 -0.1233564   2.1623576  -0.35282268  0.47152057
##  [6,]   1.29283680 -3.6713532  33.2084987   2.72306663 -3.50972342
##  [7,]   1.06410073 -1.3800848   1.0878948   0.23935010  2.16800914
##  [8,]  -0.05630305  0.5821719  -0.3071689  -2.05606982 -0.94286574
##  [9,]   0.74739494 -3.9096814  -0.6570428   6.92869698 -0.09464746
## [10,]  -0.79553577  0.8719903  -0.4776656  -0.47957535 -0.71486335
## [11,]  -1.18904018 -0.2378484  -1.1216568   1.09582342  2.46333144
## [12,] -21.63753853  0.3842553   0.3819082   3.94907998  0.21202540
## [13,] -12.99713379  0.4153756  -0.7556294  -0.23613903 -8.71656303
## [14,]   1.11165489  1.4985960   0.1153394  -0.16402725 -0.50441451
## [15,]   5.34038772  0.3405517  -0.5538997   8.68575316 -0.28440396
## [16,]   0.38043863  0.4613996  -2.7647630   1.27306916  7.13848861
## [17,]   3.64404445 -0.5188132   0.5059657  -2.10332511 -1.19030604
## [18,]  -0.83018979 -1.0247575 -10.4431722   2.52568902  0.04975206
## [19,]  -0.37536622  3.5100832  -1.0058101  -0.29151599 -1.49809577
## [20,]  -1.76610986  0.6351492   0.1300558  -0.60260083 -7.27211111
## [21,]   0.29625309  0.9568594   0.1639851   4.90580473  0.43415645
## [22,]   1.11329562 13.9226252   3.2003010  -0.02096475  0.26926946
## [23,]   0.78931159  0.5213105   1.1396507   0.02090706  1.84163992
## [24,]  -0.54458484 -0.4312384  15.9918871  11.84627496 -0.88417335
## [25,]  -0.07362209 -0.4755580  -0.2973035  -0.05264331 -1.13896972
##               [,48]       [,49]       [,50]
##  [1,]   6.967136485  -1.5703199  0.26451102
##  [2,]  -0.002637138 132.0469016  1.43552368
##  [3,]  -2.410661616   0.5869404 -3.15597602
##  [4,]   2.324330159   0.3224476  2.70904958
##  [5,]  -1.466381386  -6.0767862  0.48579315
##  [6,]  -0.085043162   0.4141890 -3.06083018
##  [7,]  -0.229645779   0.6480610 -2.90649706
##  [8,]  -2.457168734   1.2016668  1.10298931
##  [9,]   0.945771605   0.2752185  0.08010101
## [10,]   7.334595812   7.3020329  3.40797060
## [11,]   1.532952769   1.1145167  0.42101816
## [12,]  -0.879990383  -0.2838799  0.53531811
## [13,]  -0.592237140   4.6226423 -0.45890778
## [14,]   2.940847220   0.6489980  0.13098320
## [15,]  -0.095474114  -1.1202903 -0.36766142
## [16,] -18.186112044  15.2337040  0.14637586
## [17,]  -0.510726769   1.1098213  1.38293079
## [18,]   0.878522601   1.0029844  0.10969917
## [19,]  -1.102226977 -20.1549967 -0.15726647
## [20,]   0.671338544  -0.5279281  1.32290734
## [21,]   4.493129174  -1.3163921 -3.21158253
## [22,]  -6.790805424  -0.6964072  0.18499751
## [23,]   0.738427989  -0.2578525 -0.11079481
## [24,]  -1.901202626   0.1459617 -0.07707384
## [25,]  -0.804429413   0.8135950 -0.01748014
```

Calculating mean for the above sample:

```
samp3_mean <- replicate(50, mean(rcauchy(25, 0, 1)))
samp3_mean
```

```
##  [1]  10.60540111   0.17580826  45.08518278   0.30970705   0.11871822
##  [6]   0.31109963   0.81890460 -12.98426015 -13.73533581  -1.59564998
## [11]   0.04048490   0.74043617  -0.02504744  -0.43948835  -1.63800729
## [16]  -0.14480717   3.93396266  -0.75220236   0.58832701   1.66100518
## [21]  -0.35303556   2.70703831  -1.28620514  -1.79988243   0.21496578
## [26]   0.30781538  -2.28844608   2.31675213  -1.62631271   0.57537983
## [31]   1.34317360   2.82182540  -0.88997205  -2.26039442   0.13875088
## [36]  26.61599258   5.45532443  -0.05782822   0.15416727   0.51599983
## [41]   0.71134724 -11.52216813   1.38221668   1.01610078  -1.89567282
## [46]   1.25935158  -1.91795764  -0.24734063  13.31732796   0.42127376
```

Calculating minimum for each of the above samples:

```
samp3_min <- replicate(50, min(rcauchy(25, 0, 1)))
samp3_min
```

```
##  [1]  -10.892500   -9.874914  -22.760627   -7.567045  -58.599954   -3.984514
##  [7]  -14.060826  -28.381999   -7.646513  -20.594932  -42.169496  -21.185816
## [13]  -24.178804  -38.951214   -7.735813  -14.665276 -297.075108  -29.528985
## [19]  -23.579924   -5.920546  -12.902788   -4.632523  -17.380445  -21.845295
## [25]  -12.338575   -6.846647  -25.183095   -5.964571  -13.403662   -6.300439
## [31]   -5.294006   -5.237055 -159.125313  -62.770444   -4.181435   -4.855082
## [37]  -11.754150 -180.377968  -11.420862   -7.421176   -9.637843   -6.416297
## [43]  -17.114307   -3.462034  -19.348138   -6.618833   -3.139000   -4.261080
## [49]   -8.457381  -31.071273
```

Calculating maximum for each of the above samples:

```
samp3_max <- replicate(50, max(rcauchy(25, 0, 1)))
samp3_max
```

```
##  [1]  10.410015 191.786222  10.289752  15.355463  35.431619   6.151836
##  [7]   9.835686   5.046289   2.740874   7.509404   6.091772 518.744907
## [13]   8.788717   3.438673  35.262464 137.270370  18.007531   5.172403
## [19] 117.154595  17.787057   3.580094  15.893513   7.126428   8.874548
## [25]   1.644631   2.861025  16.264516  42.255806 174.259291  11.323687
## [31]  11.085073  17.228088  22.898692  18.208739  19.917855   4.005289
## [37]  25.658333   7.424817  11.137992  15.390476   4.276890   9.299606
## [43]  12.381957  26.334448  12.097685  11.070314  17.459538 189.267719
## [49]  58.689126   4.918791
```

Calculating median for each of the above samples:

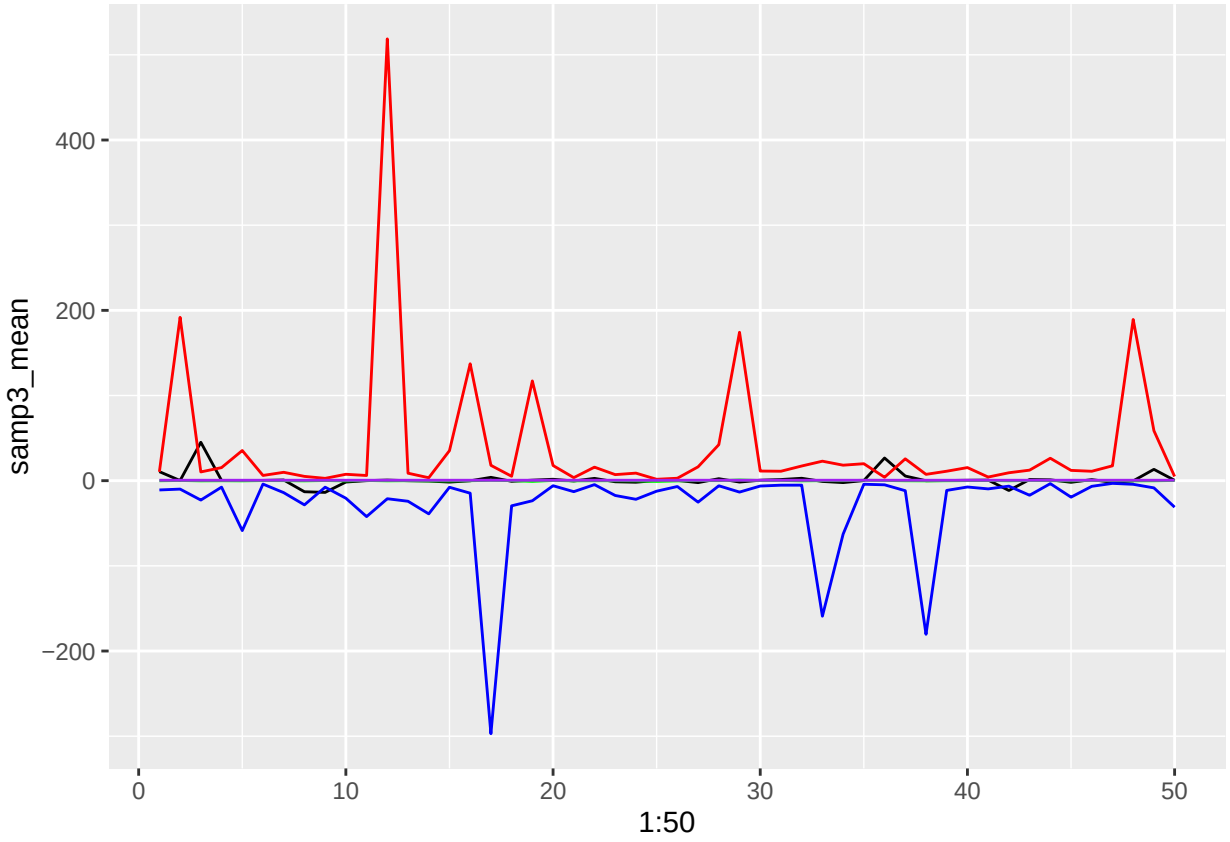
```
samp3_mid <- replicate(50, median(rcauchy(25, 0, 1)))
samp3_mid
```

```
##  [1] -0.132687642  0.260170128 -0.257878289 -0.075394656 -0.235539447
##  [6]  0.127764825  0.036887459 -0.243005163  0.189176401 -0.280433247
## [11]  0.263661813 -0.226708396 -0.024084979 -0.224875980 -0.306193953
```

```
## [16] -0.021383089  0.416401327  0.085566961 -0.890576817  0.284821084
## [21] -0.211184686 -0.069623938 -0.045620180 -0.192170102 -0.919912408
## [26] -0.274004936  0.145486022  0.072963961  0.858196527  0.254191115
## [31]  0.367953294 -0.242204626  0.044118556 -0.006749242  0.458313267
## [36]  0.296201173 -0.114415257 -0.240919015 -0.082558725  0.095924371
## [41]  0.268962610 -0.134328438  0.277272018  0.081571043 -0.136502375
## [46]  0.337707486 -0.145503850 -0.195537173 -0.131645385  0.264998458
```

Plotting these 4 statistics:

```
ggplot(NULL,aes(1:50))+geom_line(aes(y =samp3_mean), color = "black") +
     geom_line(aes(y =samp3_max), color = "red") +
    geom_line(aes(y = samp3_mid), color = "green") +
    geom_line(aes(y = samp3_min), color = "blue") + geom_line(aes(y = 0.5), color = "purple")
```




```
#A = matrix(replicate(50, rnorm(25, 0, 1)))
#A1 = apply(A, 2, mean)
#A2 = apply(A, 2, median)
#A3 = apply(A, 2, min)
#A4 = apply(A, 2, max)
#matplot(1:50, cbind(A1, A2, A3, A4), type = "l", col = 1:4, x = "sample number", y = "Statistics")
#alt+ctrl+i for a R block
```