

### Measures of central tendency and variability

1. Randomly generate 500 data from 1 to 1000 and then find the AM, GM, HM, median, first quartile, third quartile, fourth quartile, etc.

#code

```
> a=sample(1:1000,500)
> l=length(a)
> am=mean(a)
> hm=1/mean(1/a)
> gm=prod(a)^(1/l)
> q=quantile(a)
> a
[1] 282 941 36 453 503 264 755 965 370 615 105 377 890 325 335 279 97 115 167 363 889
[22] 989 574 147 495 502 106 647 938 27 867 545 742 141 605 766 504 332 906 855 592 198
[43] 610 26 140 275 319 816 480 988 672 753 710 696 56 854 688 930 449 932 416 644 157
[64] 274 256 237 159 300 825 869 269 356 180 127 645 490 160 781 182 543 267 606 715 483
[85] 61 99 612 922 112 357 822 718 693 109 223 856 213 908 450 224 359 950 422 754 230
[106] 475 168 628 542 905 334 201 814 627 487 266 348 322 38 473 557 16 285 32 603 378
[127] 151 685 158 815 604 842 741 477 461 136 763 344 810 637 304 154 276 425 239 485 812
[148] 345 756 642 187 591 508 389 795 899 798 52 172 83 626 418 177 50 986 883 46 826
[169] 962 265 870 968 958 287 694 53 426 857 845 655 517 716 129 183 876 192 369 227 653
[190] 934 286 623 904 750 609 769 676 497 522 207 430 229 828 706 211 188 800 254 547 724
[211] 217 584 519 80 499 778 723 540 674 226 762 476 608 37 110 948 773 921 146 513 491
[232] 907 990 460 660 789 652 541 166 564 687 771 813 47 844 533 361 634 95 531 25 650
[253] 735 72 714 171 730 675 658 125 149 794 819 620 327 590 323 152 427 206 589 559 671
[274] 40 625 465 431 788 996 471 381 58 8 19 772 553 649 248 944 917 387 874 284 523
[295] 711 569 241 23 367 717 823 94 67 455 507 537 24 131 496 385 4 721 761 978 749
[316] 616 767 830 699 919 42 858 561 386 436 882 568 520 54 488 911 836 22 622 392 581
[337] 931 17 887 736 365 309 86 900 979 897 69 341 779 734 567 864 500 729 299 951 847
[358] 759 940 111 725 100 399 74 101 12 202 611 901 528 251 776 77 314 169 493 244 862
[379] 775 283 181 337 909 619 665 93 633 49 478 107 737 689 894 638 150 448 13 733 659
[400] 878 311 993 994 521 407 593 91 293 428 482 404 445 538 661 44 64 982 388 599 554
[421] 582 134 839 802 947 417 447 782 572 961 114 243 666 484 682 268 709 728 489 959 249
[442] 313 498 203 429 330 768 758 732 469 21 981 566 588 68 273 33 272 59 262 640 966
[463] 200 843 594 631 170 102 598 829 764 446 956 583 280 865 70 548 132 218 260 691 861
[484] 14 648 915 96 51 43 703 991 415 235 505 747 618 135 281 573 277
```

```

> am
[1] 498.194
> gm
[1] Inf
> hm
[1] 172.1971
> q
  0%  25%  50%  75% 100%
4.0 247.0 510.5 738.0 996.0

```

```

Console Terminal x
~/
> a=sample(1:1000,500)
> n=length(a)
> hm=1/mean(1/a)
> am=mean(a)
> gm=prod(a)^(1/n)
> q=quartile(a)
Error in quartile(a) : could not find function "quartile"
> q=quantile(a)
> a
 [1] 370 961 313 1000 172 777 876 952 422 603 732 265 933 803
[15] 522 528 336 515 223 105 910 72 902 448 83 335 95 827
[29] 151 3 384 110 58 866 987 205 492 936 463 452 704 140
[43] 488 457 645 699 598 369 303 367 706 347 650 345 996 41
[57] 959 14 93 197 649 493 840 828 65 717 314 775 636 429
[71] 723 516 797 589 273 871 853 663 496 805 51 253 318 626
[85] 195 686 576 55 427 180 357 716 192 160 300 585 292 380
[99] 702 63 447 119 456 604 632 860 681 631 166 614 127 914
[113] 135 320 824 963 371 437 42 252 94 355 986 943 642 925
[127] 592 913 276 761 801 726 274 363 809 825 372 44 267 117
[141] 107 875 687 763 122 894 950 898 788 503 70 193 333 510
[155] 862 980 258 414 301 134 836 518 756 612 711 286 1 900
[169] 538 282 806 644 430 998 958 906 256 227 956 418 415 142
[183] 921 174 940 471 524 674 742 784 690 288 124 768 319 657
[197] 609 183 80 838 383 358 839 387 102 556 284 762 820 815
[211] 208 527 82 200 654 24 96 7 361 807 989 436 48 571
[225] 353 878 641 198 948 974 5 656 260 790 486 392 655 760
[239] 949 305 602 511 390 647 10 879 975 373 774 534 705 98
[253] 268 394 453 259 59 923 222 157 466 438 964 543 4 944
[267] 919 846 76 834 727 536 889 164 832 16 67 424 973 962
[281] 550 694 922 750 279 254 396 269 131 81 90 331 366 594
[295] 109 916 808 517 29 813 869 203 290 884 621 22 443 229
[309] 665 329 497 799 535 487 219 605 769 272 501 441 573 863
[323] 184 262 340 830 965 129 979 145 785 165 291 247 13 678
[337] 597 897 432 75 401 311 161 791 841 412 658 485 883 680
[351] 667 97 426 376 942 988 475 187 209 341 185 718 983 850
[365] 590 186 178 572 721 408 449 226 754 981 755 77 52 251
[379] 512 133 104 47 231 955 191 103 158 893 707 128 470 249
[393] 413 653 459 927 551 79 759 752 547 821 162 740 402 118
[407] 334 882 342 348 771 696 627 196 725 600 558 108 136 248
[421] 74 460 480 552 873 179 123 859 417 502 728 870 643 69

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[435] 891 504 664 947 154 213 530 101 78 575 984 206 714 68
[449] 670 845 766 141 994 596 798 679 539 199 148 446 113 420
[463] 211 941 782 381 352 793 489 393 673 669 625 182 218 970
[477] 697 54 783 930 310 606 816 280 915 202 315 45 176 278
[491] 814 715 37 60 751 121 26 557 929 939
> am
[1] 497.712
> gm
[1] Inf
> hm
[1] 119.5376
> q
      0%      25%      50%      75%     100%
      1.00 226.75 490.50 762.25 1000.00
> m=median(a)
> m
[1] 490.5
\

```

2. Calculate the mean, variance and standard deviation of the following distribution:

$x$	$f$
5-10	12
10-20	28
20-30	65
30-40	121
40-50	175
50-60	198
60-70	176
70-80	120
80-90	66
90-100	27
100-115	9
115-120	3

```

#code
> x<-c(7.5,15,25,35,45,55,65,75,85,95,107.5,117.5)
> f<-c(12,28,65,121,175,198,176,120,66,27,9,3)
> b=rep(x,f)#replicate values f times
> m=mean(b)
> sd=sqrt(((sum(f*(x^2)))/sum(f))-mean^2)
> var=sd^2
> mean
[1] 55.07
> sd
[1] 20.02486
> var
[1] 400.9951

```

```

> x<-c(7.5,15,25,35,45,55,65,75,85,95,107.5,117.5)
> f<-c(12,28,65,121,175,198,176,120,66,27,9,3)
> b=rep(x,f)#replicate values f times
> m=mean(b)
> sd=sqrt(((sum(f*(x^2)))/sum(f))-mean^2)
> var=sd^2
> mean
[1] 55.07
> sd
[1] 20.02486
> var
[1] 400.9951

```

3. From the following data, find the first four central moments and using them calculate the coefficients of skewness ( $\beta_1$ ) and kurtosis ( $\beta_2$ ):

$x$	1-10	11-20	21-30	31-40	41-50	51-60
$f$	2	7	10	6	13	8

```

> xmid<-c(5,15,25,35,45,55)
> f<-c(2,7,10,6,13,8)
> a<-data.frame(xmid,f)
> weighted.mean(xmid,f)
[1] 34.78261
> y=xmid-weighted.mean(xmid,f)
> b=data.frame(xmid,f,y)
> u1=sum(f*y)/sum(f)
> u2=sum(f*y^2)/sum(f)
> u3=sum(f*y^3)/sum(f)
> u4=sum(f*y^4)/sum(f)
> b1=(u3^3)/(u2^2)
> b2=u4/(u2^2)
> a
  xmid f
1   5  2
2  15  7
3  25 10
4  35  6
5  45 13
6  55  8
> y
[1] -29.7826087 -19.7826087 -9.7826087  0.2173913 10.2173913 20.2173913

```

```
> u1
[1] 1.85359e-15
> u2
[1] 219.518
> u3
[1] -791.6084
> u4
[1] 91640.7
> b1
[1] -10294.17
> b2
[1] 1.901728
```

```
Console Terminal x
~/
> xmid<-c(5,15,25,35,45,55)
> f<-c(2,7,10,6,13,8)
> a<-data.frame(xmid,f)
> weighted.mean(xmid,f)
[1] 34.78261
> y=xmid-weighted.mean(xmid,f)
> b=data.frame(xmid,f,y)
> u1=sum(f*y)/sum(f)
> u2=sum(f*y^2)/sum(f)
> u3=sum(f*y^3)/sum(f)
> u4=sum(f*y^4)/sum(f)
> b1=(u3^3)/(u2^2)
> b2=u4/(u2^2)
> a
  xmid  f
1    5  2
2   15  7
3   25 10
4   35  6
5   45 13
6   55  8
> y
[1] -29.7826087 -19.7826087 -9.7826087  0.2173913 10.2173913 20.2173913
> u1
[1] 1.85359e-15
> u2
[1] 219.518
> u3
[1] -791.6084
> u4
[1] 91640.7
> b1
[1] -10294.17
> b2
[1] 1.901728
```