Mid-term 2, 통계처리입문, 2023F

Your Name:

Email:

- 읽는 사람이 답안의 유도 과정에 동의할 수 있도록 풀이 과정을 명시할 것
- 여러가지의 답안을 제시한 경우에 더 낮은 점수를 받을 수 있는 답안으로 채점함
- 계산기 사용이 허용됨

Sum
1
2
3
4
5
6
7
8

Problem 1

다음 진술의 참/거짓을 판별하고, 이에 대해서 논하시오.[5pts]

> "신뢰구간의 길이를 반으로 줄이려면 실험 횟수를 두 배로 늘려야 한다."

Problem 2

$\{X_i, 1 \leq i \leq 100\}$의 평균이 5이고 분산이 4일때, $\overline{X} = \frac{\sum_{i=1}^{100} X_i}{100}$의 분포를 적으시오.[5pts]

Problem 3

중심극한 정리를 서술하시오. (짧고 정확하게 적을 것, 틀린 진술은 감점함)[5pts]

Problem 4

관찰값 1,3,5,7,9가 있을 때에 표본표준편차(sample standard deviation)를 계산하시오.[5pts]

Problem 5

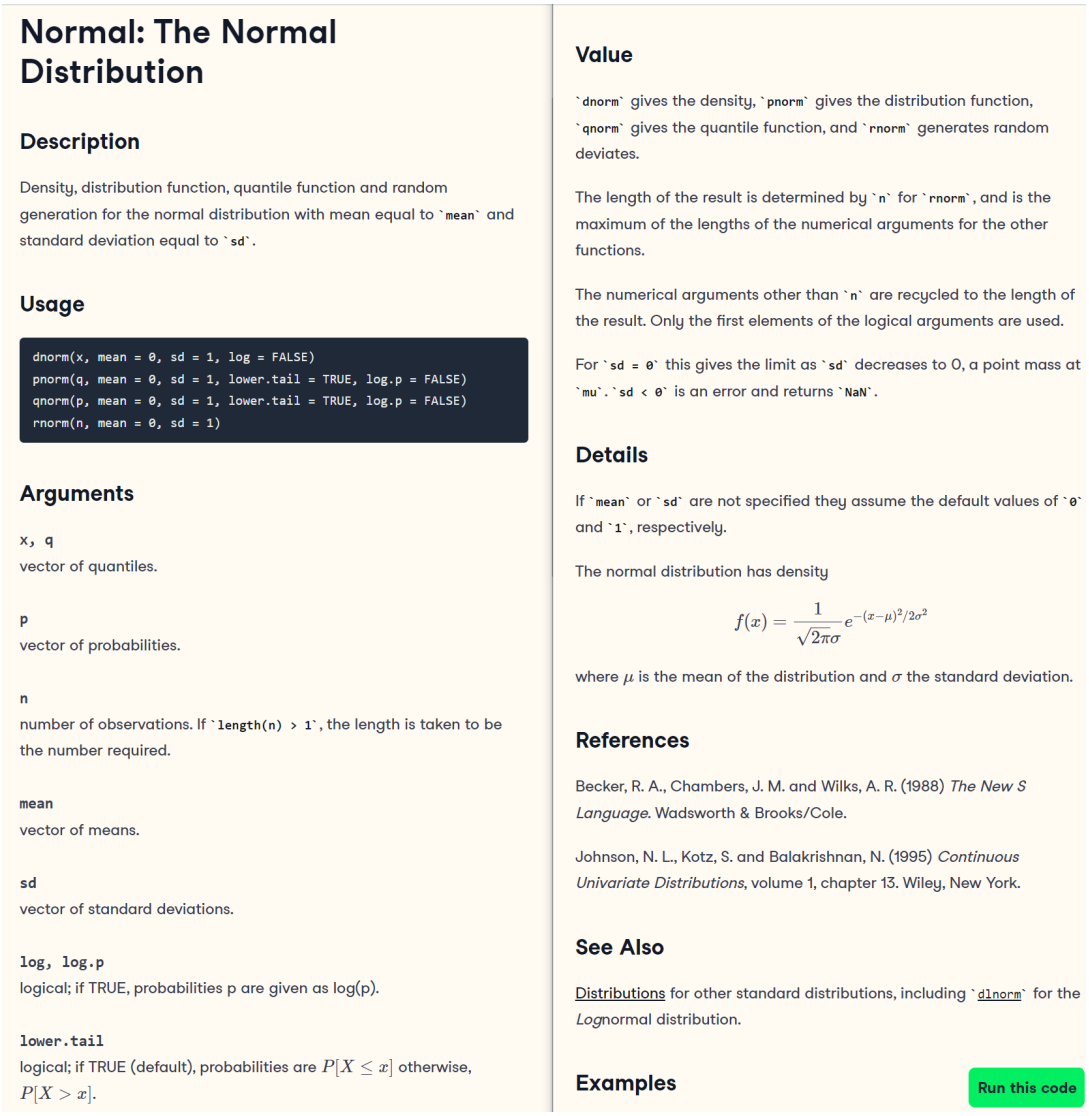
어느 병원의 의료기록을보면 이 병원을 방문한 환자 전체의 수축기 혈압 X는 평균이 100, 표준편차가 10인 정규분포를 따른다. 매주 30명씩의 환자를 임의로 뽑아 표본을 만들었을 때, 표본들로부터 측정한 혈압의 평균과 분산을 구하시오.[10pts]

Problem 6

생산공장에서 무작위로 추출한 20개의 제품의 성능평균이 56.84, 표본표준편차가 2.63으로 나타났다. 이 제품의 모평균의 95% 신뢰구간의 길이를 2이하로 하려고 할 경우 몇 개의 샘플을 더 추출해야 하는가?[10pts]

Problem 7

It is known that a sales person Amir's amount of closed deals follows a normal distribution with a mean 5000 dollars and a standard deviation of 2000 dollars. Write a code block using the R built-in function `pnorm()` to calculate the probability of Amir closing a deal worth between $3000 and $7500.`[5pts]`



Normal: The Normal Distribution

Description

Density, distribution function, quantile function and random generation for the normal distribution with mean equal to `mean` and standard deviation equal to `sd`.

Usage

```
dnorm(x, mean = 0, sd = 1, log = FALSE)
pnorm(q, mean = 0, sd = 1, lower.tail = TRUE, log.p = FALSE)
qnorm(p, mean = 0, sd = 1, lower.tail = TRUE, log.p = FALSE)
rnorm(n, mean = 0, sd = 1)
```

Arguments

`x, q`
vector of quantiles.

`p`
vector of probabilities.

`n`
number of observations. If `length(n) > 1`, the length is taken to be the number required.

`mean`
vector of means.

`sd`
vector of standard deviations.

`log, log.p`
logical; if TRUE, probabilities p are given as log(p).

`lower.tail`
logical; if TRUE (default), probabilities are $P[X \leq x]$ otherwise, $P[X > x]$.

Value

`dnorm` gives the density, `pnorm` gives the distribution function, `qnorm` gives the quantile function, and `rnorm` generates random deviates.

The length of the result is determined by `n` for `rnorm`, and is the maximum of the lengths of the numerical arguments for the other functions.

The numerical arguments other than `n` are recycled to the length of the result. Only the first elements of the logical arguments are used.

For `sd = 0` this gives the limit as `sd` decreases to 0, a point mass at `mu`. `sd < 0` is an error and returns `NaN`.

Details

If `mean` or `sd` are not specified they assume the default values of `0` and `1`, respectively.

The normal distribution has density

$$f(x) = \frac{1}{\sqrt{2\pi}\sigma} e^{-(x-\mu)^2/2\sigma^2}$$

where μ is the mean of the distribution and σ the standard deviation.

References

Becker, R. A., Chambers, J. M. and Wilks, A. R. (1988) *The New S Language*. Wadsworth & Brooks/Cole.

Johnson, N. L., Kotz, S. and Balakrishnan, N. (1995) *Continuous Univariate Distributions*, volume 1, chapter 13. Wiley, New York.

See Also

Distributions for other standard distributions, including `dlnorm` for the *Log*normal distribution.

Examples

Run this code

Problem 8

다음은 R Markdown의 chunk option의 사용예시와 그 결과이다. 1),2),3)과 a),b),c)를 대응시켜라.[5pts]

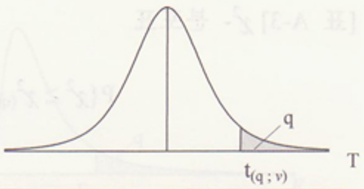
1) `include=FALSE`
2) `echo=FALSE`
3) `eval=FALSE`

a) Code runs but does not appear in report, results appear.
b) Code appears in report but does not run, results do not appear.
c) Code runs but does not appear in report, results do not appear.

"The following is a table for t-distribution"

[표 A-2] t-분포표

$P\{T \geq t_{(q\,;\,\nu)}\} = q$



자유도	꼬리확률 q									
ν	0.4	0.25	0.1	0.05	0.025	0.01	0.005	0.0025	0.001	0.0005
1	0.325	1.000	3.078	6.314	12.706	31.821	63.657	127.32	318.31	636.62
2	0.289	0.816	1.886	2.920	4.303	6.965	9.925	14.089	23.326	31.598
3	0.277	0.765	1.638	2.353	3.182	4.541	5.841	7.453	10.213	12.924
4	0.271	0.741	1.533	2.132	2.776	3.747	4.604	5.598	7.173	8.610
5	0.267	0.727	1.476	2.015	2.571	3.365	4.032	4.773	5.893	6.869
6	0.265	0.718	1.440	1.943	2.447	3.143	3.707	4.317	5.208	5.959
7	0.263	0.711	1.415	1.895	2.365	2.998	3.499	4.029	4.785	5.408
8	0.262	0.706	1.397	1.860	2.306	2.896	3.355	3.833	4.501	5.041
9	0.261	0.703	1.383	1.833	2.262	2.821	3.250	3.690	4.297	4.781
10	0.260	0.700	1.372	1.812	2.228	2.764	3.169	3.581	4.144	4.587
11	0.260	0.697	1.363	1.796	2.201	2.718	3.106	3.497	4.025	4.437
12	0.259	0.695	1.356	1.782	2.179	2.681	3.055	3.428	3.930	4.318
13	0.259	0.694	1.350	1.771	2.160	2.650	3.012	3.372	3.852	4.221
14	0.258	0.692	1.345	1.761	2.145	2.624	2.977	3.326	3.787	4.140
15	0.258	0.691	1.341	1.753	2.131	2.602	2.947	3.286	3.733	4.073
16	0.258	0.690	1.337	1.746	2.120	2.583	2.921	3.252	3.686	4.015
17	0.257	0.689	1.333	1.740	2.110	2.567	2.898	3.222	3.646	3.965
18	0.257	0.688	1.330	1.734	2.101	2.552	2.878	3.197	3.610	3.922
19	0.257	0.688	1.328	1.729	2.093	2.539	2.861	3.174	3.579	3.883
20	0.257	0.687	1.325	1.725	2.086	2.528	2.845	3.153	3.552	3.850
21	0.257	0.686	1.323	1.721	2.080	2.518	2.831	3.135	3.527	3.819
22	0.256	0.686	1.321	1.717	2.074	2.508	2.819	3.119	3.505	3.792
23	0.256	0.685	1.319	1.714	2.069	2.500	2.807	3.104	3.485	3.767
24	0.256	0.685	1.318	1.711	2.064	2.492	2.792	3.091	3.467	3.745
25	0.256	0.684	1.316	1.708	2.060	2.485	2.787	3.078	3.450	3.725
26	0.256	0.684	1.315	1.706	2.056	2.479	2.779	3.067	3.435	3.707
27	0.256	0.684	1.314	1.703	2.052	2.473	2.771	3.057	3.421	3.690
28	0.256	0.683	1.313	1.701	2.048	2.467	2.763	3.047	3.408	3.674
29	0.256	0.683	1.311	1.699	2.045	2.462	2.756	3.038	3.396	3.659
30	0.256	0.683	1.310	1.697	2.042	2.457	2.750	3.030	3.385	3.646
40	0.255	0.681	1.303	1.684	2.021	2.423	2.704	2.971	3.307	3.551
60	0.254	0.679	1.296	1.671	2.000	2.390	2.660	2.915	3.232	3.460
120	0.254	0.677	1.289	1.658	1.980	2.358	2.617	2.860	3.160	3.373
∞	0.253	0.674	1.282	1.645	1.960	2.326	2.576	2.807	3.090	3.291