Question - 3

low 42 ~~96~~ 33

$$M: \text{low} \begin{cases} 42 & 9\cdot & 37 & 29 & 35 & 40 & 32 \end{cases}$$

$$H: \begin{cases} -M: & 36 & 35 & 32 & 38 & 39 & 42 & 34 \\ H: & 33 & 44 & 40 & 36 & 44 & 37 & 45. \end{cases}$$

$$\bar{Y}_{1\cdot} = 36.5714, \quad \bar{Y}_{2\cdot} = 36.571, \quad \bar{Y}_{3\cdot} = 39.857$$

$$\bar{Y} = 37.666.$$

→ $H_0 =$ All the α_i are same.

H_1 not All the α_i are equal.

SS_A $n = 7.$ $m = 3.$

$\boxed{m = \text{फ़ैक्टर्स}}$

$$SS_A = \sum_{i=1}^{m} n_i (\bar{Y}_i - \bar{Y})$$

$$= 7 \left\{ 2(36.5714 - 37.666)^2 + \cancel{(36.)} + (39.857 - 37.666)^2 \right\}$$

$$= 50.0377.$$

$$F = \dfrac{\dfrac{SS_A}{m-1}}{\dfrac{SS_E}{N-m}} = \dfrac{\dfrac{50.377}{3-1}}{\dfrac{340.2781}{18}}$$

$$= \cancel{0.8883}.$$

$$= 1.3324$$

$$SS_E = \sum_{i=1}^{n_i} \sum_{j=1}^{n_i} (Y_{ij} - \bar{Y}_i)^2$$

$$\ne SS_T = \sum_{i=1}^{m} \sum_{j=1}^{n} (Y_{ij} - \bar{Y})^2$$

$$= (42 - 37.666)^2 + (41 - 37.66)^2 + (37 - 37.66)^2$$
$$(29 - 37.666)^2 + (35 - 37.666)^2 + (40 - 3766)^2$$
$$(32 - 37.666)^2 + (36 - 37.66)^2 + (35 - 37.666)^2$$
$$+ (32 - 37.666)^2 + (38 - 37.666)^2 + (39 - 37.66)^2$$
$$+ (42 - 37.666)^2 + (34 - 37.666)^2 + (33 - 37.6666)^2$$
$$+ (44 - 37.6666)^2 + (40 - 37.666)^2 + (36 - 37.466)^2$$
$$+ (44 - 37.6666)^2 + (37 - 37.6666)^2 + (45 - 37.66)^2$$

$$SS_T = 390.6555$$

$$\boxed{m-1}$$

$$SS_E = SS_T - SS_A$$
$$= 390.6555 - 50.377$$
$$= 340.2781$$

$$f_{0.05, 20, 18} = \underline{3.5546.}$$

শুরুতে : 1 এর

F (ব্রাকরা) $<$ (tro

Patadin Max   কালা ফিরতে হবেনা

let   n = number of zeros = 13

   m = 11   4   one = 12

Run = R = 10

$$E(R) = \mu = \frac{2mn}{m+n} + 1$$

$$= 13.48$$

$$v(R) = \sigma^2 = \frac{13.48 \cdot (\mu-1)(\mu-2)}{m+n-1}$$

$$= \frac{(13.48-1)(13.48-2)}{25-1}$$

$$= 5.9696$$

$$\sigma = 2.4432$$

hene $R < \mu$ so,

p value ; $2\phi((R-\mu)/\sigma)$

$$= 2\phi\left(13.48 \frac{(10-13.48)}{2.4432}\right)$$

$$= 2\phi(-1.4243)$$

$$= 2 \times (0.0778)$$

$$= \boxed{1.556.}$$

P > 0.05   so

null rejected

Question — 10

H_0 : the sample is random.

H_1 : the sample is not random.

sorted data :-

| 45 | 75 | 88 | 96 | 99 | 99 |

| 100 | 105 | 110 | 111 | 117 | 121 |

| (122) | 126 | 132 | 133 | 142 | 142 |

| 143 | 150 | 153 | 154 | 155 | 161 |

211

Now, Median = 122.

here, is, $x_i <$ median ; $x_i = 0$

  otherwise $x_i = 1$

| 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 1 |

| 1 | 1 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 0 | 1 |

| 0 | 1 | |

$$V(T) = \sigma^2 = \frac{mn\,(n+m+1)}{12}$$

$$= \frac{8 \times 7\,(8+7+1)}{12}$$

$$= 74.6667 .$$

p value $= P(T \leq 66)$

$$= P\left(\phi \leq \frac{66 - 64}{74.6667}\right)$$

$$= P(\phi \leq 0.026785)$$

$$= 0.5080 .$$

p value > 0.05.

So, we cannot reject the null

hypothesis.

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P value > ⪆ 0.05

So, we cannot reject null hypothesis.

Question · 9

H_0 : has no effect.

H_1 : has effect.

	19	31	39	45	47	66	78	81
Rank	1	3	5	7	8	13	14	~15.

	28	36	44	49	52	52	60.
Rank	2	4	6	9	10.5	10.5	12

Ranks : 1   2   3   4   5   6   7

⇒ $T_0 = 66$ [Treatment group का rank टोटल].

$n = 8$ $m = 7$.

$$E(T_0) = \mu = \frac{8 \times (8 + 7 + 1)}{2}$$

$$= 64.$$

$$\sum rank_- = 6 + 1.5 + 18 + 12 + 14 + 10$$
$$+ 8.5 + 15 + 6 + 17 + 16 + 13 + 11 = \underline{148}$$

$$T_- = \sum_{i=1}^{n} i I_i = \boxed{148}.$$

$$E(T_-) = \frac{n(n+1)}{4} = \frac{18 \times 19}{4 \; 2}$$

$$= 85.5.$$

$$V(T_-) = \frac{n(n+1)(2n+1)}{24}$$

$$= \frac{18 \times 19 \times (18 \times 2 + 1)}{24}$$

$$= 527.25.$$

$$P \text{ value} = P(T_- \geq t) \quad \frac{t}{\leq} \leq \left(\frac{1}{6} \rightarrow\right)$$

$$= 1 - P(T_- \leq t_\infty)$$

$$= 1 - P\left(\cancel{t} \leq \frac{148 - 85.5}{527.25}\right)$$

$$= 1 - P(\cancel{\emptyset} \leq 0.11854)$$

$$1 - \cancel{0.847} \; 0.5478 \text{Moxibac}$$

$$= 0.4522$$

Question - 8

Signed rank test

$H_0 : m = m_0$

$H_1 : m < m_0$

-5	-1	2	8	-25	1	5	-12	-16
-9	-8	-18	-5	-22	4	-21	-15	-11

absolute differences are:

5	1	2	8	25	1	5	12	16
9	8	18	5	22	4	21	15	11

5	1	2	8	25	1	5	12	16
9	8	18	5	22	4	21	15	11

1	2	4	5	6	7	8	9	10	11

12	15	16	18	21	22	25
12	13	14	15	16	17	18

ranky

1.5	1.5	3	4	6	6	6	8.5	8.5
10	11	12	13	14	15	16	17	18

standard value

$n = 18$ বীরেনিতা median $= 0$.

| (-5) | -1 | +2 | +8 | -25 | +1 | +5 | -12 | -16 |
| -9 | -8 | -18 | -5 | -22 | +4 | -21 | -15 | -11 |

| 1 | 1 | 0 | 0 | 1 | 0 | 0 | 1 | 1 |
| 1 | 1 | 1 | 1 | 1 | 0 | 1 | 1 | 1 |

$$\sum_{i=1}^{n} I_i = 13.$$

Under the null, $\sum_{i=1}^{18} I_i \sim$ binomial $(18, \frac{1}{2})$

thus,

$$\text{P value} = P\left(\sum_{i=1}^{18} I_i \leq 13 \right)$$

$$\Rightarrow \left({}^{18}C_{13} + {}^{18}C_{12} + {}^{18}C_{11} + {}^{18}C_{10} + {}^{18}C_{9} + {}^{18}C_{8} + \right.$$

$${}^{18}C_{7} + {}^{18}C_{6} + {}^{18}C_{5} + {}^{18}C_{4} + {}^{18}C_{3} + {}^{18}C_{2} +$$

$$\left. {}^{18}C_{1} + {}^{18}C_{0} \right) \times \left(\frac{1}{2} \right)^{18}.$$

$$P \Rightarrow 0.984558.$$

$$P > 0.05$$

So, Null cannon be reject.

$$\chi^2_{obj} = \frac{(20-37.26)^2}{37.26} + \frac{(38-30.884)^2}{30.884}$$

$$+ \frac{(28-21.856)^2}{21.856} + \frac{(50-36.74)^2}{36.74} +$$

$$\frac{(27-34.126)^2}{34.116} + \frac{(18-24.144)^2}{24.114}.$$

$$= 16.4867.$$

$$\chi^2_{0.95, 2} = \cancel{12.592} \; 5.991$$
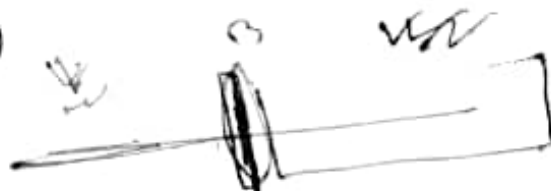
$$\chi^2_{obj} > \chi^2_{0.95, 2}$$

we reject the null hypothesis.

Question 7

$H_0 : \boxed{m = m_0} \Rightarrow \boxed{NTR}$

$H_1 : \boxed{m < m_0}$

Conclution

~~There~~ are no' any effact of medicine.

$$X^2_{0.95, 2} = \underline{5.991}$$

$$X^2_{obj} < X^2_{0.95, 2}$$

we cannot reject the null hypothesis

Question: 6

(*)

(6)

	Nonsmo	Moderate smoke	Havy Smoker	Total
Hypertension	20 (33.26)	38 (30.884)	28 (21.856)	86
No Hypertension	50 (36.74)	27 (34.1160)	18 (24.1436)	95.
total	70	65	646.	181

$$\chi^2 = \sum_{i=1}^{n} \sum_{j=1}^{c} \frac{(O_{ij} - E_{ij})^2}{E_{ij}}$$

H_0: there is no a relation between hypertention and smokers.

H_1: there is not a relation between hypertention and smoker.

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$$F_{0.95, \, m-1, \, (m-1)(n-1)}$$

$$\Rightarrow F_{0.95, \, 3, \, 6} = \cancel{3.2888} \quad 4.76.$$

~~Always~~ · in Both case.

Null rejected.

Question - 5

	obj. frau.	probability	Expected fres
white	141	$\frac{1}{4}$	141
pink	291	$\frac{1}{2}$	282
hed	132	$\frac{1}{4}$	141
	total = 564		

- H_0 : The distribution fits the data.

H_1 : The distribution does not fit the data.

$$\chi^2 = \sum_{i=1}^{n} \left(\frac{(obj_i - E_i)^2}{E_i} \right)$$

$$= \frac{(141-141)^2}{141} + \frac{(282-291)^2}{282} + \frac{(132-141)^2}{141}$$

$$= \frac{27}{94} + \frac{27}{47} = 0.86170$$

Question - 4

2 factor ANOVA

Hypothesis for method

A) H_0: All α_i are zero.

H_1: Not α_i " zero.

" for storage condition!

(B) H_0: All β_i are zero.

H_1: Not All β_i " " .

	A	B	C	D
1	1.35	1.13	1.06	0.98
2	1.40	1.23	1.26	1.22
3	1.49	1.43	1.40	1.35

$\bar{Y}_1. = 1.13$.

$\bar{Y}_2. = 1.2775$.

$\bar{Y}_3. = 1.4275$.

$\bar{Y} = 1.2775$

$\bar{Y}_{.1} = 1.413 \quad \bar{Y}_{.2} = 1.2433 \quad \bar{Y}_{.3} = 1.24 \quad \bar{Y}_{.4} = 1.1833$

$$SS_A = n \sum_{j=1}^{m} \Big((1.13 - 1.2775)^2 + (1.2775 - 1.2775)^2 + (1.425 - 1.2775)^2 \Big)$$

$4 \times$

$= \boxed{0.17405}$

$n = 3$

$m = 4$

$$SS_B = m \sum_{i=1}^{n} (\bar{Y}_{.j} - \bar{Y})^2$$

$= 3 \times \{ (1.913 - 2.2775)^2 + (1.2633 - 1.2775)^2$

$\qquad + (1.24 - 1.2775)^2 + (1.1833 - 1.2775)^2 \}$

$= \underline{0.08652}$

$$SS_T = \sum_{i=1}^{n} \sum_{j=m}^{m} (Y_{ij} - \bar{Y})^2$$

$= (1.35 - 1.2775)^2 + (1.13 - 1.2775)^2 +$
$(1.06 - 1.2775)^2 + (0.98 - 1.2775)^2 + (1.40 - 1.2775)^2 +$
$(1.23 - 1.2775)^2 + (1.26 - 1.2775)^2 + (1.22 - 1.2775)^2 +$
$(1.49 - 1.2775)^2 + (1.43 - 1.2775)^2 + (1.40 - 1.2785)^2 +$
$(1.35 - 1.2775)^2$

$\Rightarrow SS_T = \boxed{0.272375}$

$SS_E = SS_T - (SS_A + SS_B) = \underline{0.011805.}$

$F_A = \dfrac{\dfrac{SS_A}{m-1}}{\dfrac{SS_E}{(m-1)(n-1)}} = \underline{22.90}$

$F_B = \underline{750}$

$F_{0.95, 2, 8}$
$= 34131$

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t Table

cum. prob	$t_{.50}$	$t_{.75}$	$t_{.80}$	$t_{.85}$	$t_{.90}$	$t_{.95}$	$t_{.975}$	$t_{.99}$	$t_{.995}$	$t_{.999}$	$t_{.9995}$
one-tail	0.50	0.25	0.20	0.15	0.10	0.05	0.025	0.01	0.005	0.001	0.0005
two-tails	1.00	0.50	0.40	0.30	0.20	0.10	0.05	0.02	0.01	0.002	0.001
df											
1	0.000	1.000	1.376	1.963	3.078	6.314	12.71	31.82	63.66	318.31	636.62
2	0.000	0.816	1.061	1.386	1.886	2.920	4.303	6.965	9.925	22.327	31.599
3	0.000	0.765	0.978	1.250	1.638	2.353	3.182	4.541	5.841	10.215	12.924
4	0.000	0.741	0.941	1.190	1.533	2.132	2.776	3.747	4.604	7.173	8.610
5	0.000	0.727	0.920	1.156	1.476	2.015	2.571	3.365	4.032	5.893	6.869
6	0.000	0.718	0.906	1.134	1.440	1.943	2.447	3.143	3.707	5.208	5.959
7	0.000	0.711	0.896	1.119	1.415	1.895	2.365	2.998	3.499	4.785	5.408
8	0.000	0.706	0.889	1.108	1.397	1.860	2.306	2.896	3.355	4.501	5.041
9	0.000	0.703	0.883	1.100	1.383	1.833	2.262	2.821	3.250	4.297	4.781
10	0.000	0.700	0.879	1.093	1.372	1.812	2.228	2.764	3.169	4.144	4.587
11	0.000	0.697	0.876	1.088	1.363	1.796	2.201	2.718	3.106	4.025	4.437
12	0.000	0.695	0.873	1.083	1.356	1.782	2.179	2.681	3.055	3.930	4.318
13	0.000	0.694	0.870	1.079	1.350	1.771	2.160	2.650	3.012	3.852	4.221
14	0.000	0.692	0.868	1.076	1.345	1.761	2.145	2.624	2.977	3.787	4.140
15	0.000	0.691	0.866	1.074	1.341	1.753	2.131	2.602	2.947	3.733	4.073
16	0.000	0.690	0.865	1.071	1.337	1.746	2.120	2.583	2.921	3.686	4.015
17	0.000	0.689	0.863	1.069	1.333	1.740	2.110	2.567	2.898	3.646	3.965
18	0.000	0.688	0.862	1.067	1.330	1.734	2.101	2.552	2.878	3.610	3.922
19	0.000	0.688	0.861	1.066	1.328	1.729	2.093	2.539	2.861	3.579	3.883
20	0.000	0.687	0.860	1.064	1.325	1.725	2.086	2.528	2.845	3.552	3.850
21	0.000	0.686	0.859	1.063	1.323	1.721	2.080	2.518	2.831	3.527	3.819
22	0.000	0.686	0.858	1.061	1.321	1.717	2.074	2.508	2.819	3.505	3.792
23	0.000	0.685	0.858	1.060	1.319	1.714	2.069	2.500	2.807	3.485	3.768
24	0.000	0.685	0.857	1.059	1.318	1.711	2.064	2.492	2.797	3.467	3.745
25	0.000	0.684	0.856	1.058	1.316	1.708	2.060	2.485	2.787	3.450	3.725
26	0.000	0.684	0.856	1.058	1.315	1.706	2.056	2.479	2.779	3.435	3.707
27	0.000	0.684	0.855	1.057	1.314	1.703	2.052	2.473	2.771	3.421	3.690
28	0.000	0.683	0.855	1.056	1.313	1.701	2.048	2.467	2.763	3.408	3.674
29	0.000	0.683	0.854	1.055	1.311	1.699	2.045	2.462	2.756	3.396	3.659
30	0.000	0.683	0.854	1.055	1.310	1.697	2.042	2.457	2.750	3.385	3.646
40	0.000	0.681	0.851	1.050	1.303	1.684	2.021	2.423	2.704	3.307	3.551
60	0.000	0.679	0.848	1.045	1.296	1.671	2.000	2.390	2.660	3.232	3.460
80	0.000	0.678	0.846	1.043	1.292	1.664	1.990	2.374	2.639	3.195	3.416
100	0.000	0.677	0.845	1.042	1.290	1.660	1.984	2.364	2.626	3.174	3.390
1000	0.000	0.675	0.842	1.037	1.282	1.646	1.962	2.330	2.581	3.098	3.300
z	0.000	0.674	0.842	1.036	1.282	1.645	1.960	2.326	2.576	3.090	3.291
	0%	50%	60%	70%	80%	90%	95%	98%	99%	99.8%	99.9%

Confidence Level

Table of Standard Normal Probabilities for Negative Z-scores
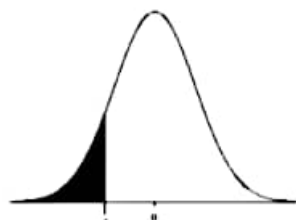
z	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
-3.4	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0002
-3.3	0.0005	0.0005	0.0005	0.0004	0.0004	0.0004	0.0004	0.0004	0.0004	0.0003
-3.2	0.0007	0.0007	0.0006	0.0006	0.0006	0.0006	0.0006	0.0005	0.0005	0.0005
-3.1	0.0010	0.0009	0.0009	0.0009	0.0008	0.0008	0.0008	0.0008	0.0007	0.0007
-3.0	0.0013	0.0013	0.0013	0.0012	0.0012	0.0011	0.0011	0.0011	0.0010	0.0010
-2.9	0.0019	0.0018	0.0018	0.0017	0.0016	0.0016	0.0015	0.0015	0.0014	0.0014
-2.8	0.0026	0.0025	0.0024	0.0023	0.0023	0.0022	0.0021	0.0021	0.0020	0.0019
-2.7	0.0035	0.0034	0.0033	0.0032	0.0031	0.0030	0.0029	0.0028	0.0027	0.0026
-2.6	0.0047	0.0045	0.0044	0.0043	0.0041	0.0040	0.0039	0.0038	0.0037	0.0036
-2.5	0.0062	0.0060	0.0059	0.0057	0.0055	0.0054	0.0052	0.0051	0.0049	0.0048
-2.4	0.0082	0.0080	0.0078	0.0075	0.0073	0.0071	0.0069	0.0068	0.0066	0.0064
-2.3	0.0107	0.0104	0.0102	0.0099	0.0096	0.0094	0.0091	0.0089	0.0087	0.0084
-2.2	0.0139	0.0136	0.0132	0.0129	0.0125	0.0122	0.0119	0.0116	0.0113	0.0110
-2.1	0.0179	0.0174	0.0170	0.0166	0.0162	0.0158	0.0154	0.0150	0.0146	0.0143
-2.0	0.0228	0.0222	0.0217	0.0212	0.0207	0.0202	0.0197	0.0192	0.0188	0.0183
-1.9	0.0287	0.0281	0.0274	0.0268	0.0262	0.0256	0.0250	0.0244	0.0239	0.0233
-1.8	0.0359	0.0351	0.0344	0.0336	0.0329	0.0322	0.0314	0.0307	0.0301	0.0294
-1.7	0.0446	0.0436	0.0427	0.0418	0.0409	0.0401	0.0392	0.0384	0.0375	0.0367
-1.6	0.0548	0.0537	0.0526	0.0516	0.0505	0.0495	0.0485	0.0475	0.0465	0.0455
-1.5	0.0668	0.0655	0.0643	0.0630	0.0618	0.0606	0.0594	0.0582	0.0571	0.0559
-1.4	0.0808	0.0793	0.0778	0.0764	0.0749	0.0735	0.0721	0.0708	0.0694	0.0681
-1.3	0.0968	0.0951	0.0934	0.0918	0.0901	0.0885	0.0869	0.0853	0.0838	0.0823
-1.2	0.1151	0.1131	0.1112	0.1093	0.1075	0.1056	0.1038	0.1020	0.1003	0.0985
-1.1	0.1357	0.1335	0.1314	0.1292	0.1271	0.1251	0.1230	0.1210	0.1190	0.1170
-1.0	0.1587	0.1562	0.1539	0.1515	0.1492	0.1469	0.1446	0.1423	0.1401	0.1379
-0.9	0.1841	0.1814	0.1788	0.1762	0.1736	0.1711	0.1685	0.1660	0.1635	0.1611
-0.8	0.2119	0.2090	0.2061	0.2033	0.2005	0.1977	0.1949	0.1922	0.1894	0.1867
-0.7	0.2420	0.2389	0.2358	0.2327	0.2296	0.2266	0.2236	0.2206	0.2177	0.2148
-0.6	0.2743	0.2709	0.2676	0.2643	0.2611	0.2578	0.2546	0.2514	0.2483	0.2451
-0.5	0.3085	0.3050	0.3015	0.2981	0.2946	0.2912	0.2877	0.2843	0.2810	0.2776
-0.4	0.3446	0.3409	0.3372	0.3336	0.3300	0.3264	0.3228	0.3192	0.3156	0.3121
-0.3	0.3821	0.3783	0.3745	0.3707	0.3669	0.3632	0.3594	0.3557	0.3520	0.3483
-0.2	0.4207	0.4168	0.4129	0.4090	0.4052	0.4013	0.3974	0.3936	0.3897	0.3859
-0.1	0.4602	0.4562	0.4522	0.4483	0.4443	0.4404	0.4364	0.4325	0.4286	0.4247
-0.0	0.5000	0.4960	0.4920	0.4880	0.4840	0.4801	0.4761	0.4721	0.4681	0.4641

Table of Standard Normal Probabilities for Positive Z-scores

z	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
0.0	0.5000	0.5040	0.5080	0.5120	0.5160	0.5199	0.5239	0.5279	0.5319	0.5359
0.1	0.5398	0.5438	0.5478	0.5517	0.5557	0.5596	0.5636	0.5675	0.5714	0.5753
0.2	0.5793	0.5832	0.5871	0.5910	0.5948	0.5987	0.6026	0.6064	0.6103	0.6141
0.3	0.6179	0.6217	0.6255	0.6293	0.6331	0.6368	0.6406	0.6443	0.6480	0.6517
0.4	0.6554	0.6591	0.6628	0.6664	0.6700	0.6736	0.6772	0.6808	0.6844	0.6879
0.5	0.6915	0.6950	0.6985	0.7019	0.7054	0.7088	0.7123	0.7157	0.7190	0.7224
0.6	0.7257	0.7291	0.7324	0.7357	0.7389	0.7422	0.7454	0.7486	0.7517	0.7549
0.7	0.7580	0.7611	0.7642	0.7673	0.7704	0.7734	0.7764	0.7794	0.7823	0.7852
0.8	0.7881	0.7910	0.7939	0.7967	0.7995	0.8023	0.8051	0.8078	0.8106	0.8133
0.9	0.8159	0.8186	0.8212	0.8238	0.8264	0.8289	0.8315	0.8340	0.8365	0.8389
1.0	0.8413	0.8438	0.8461	0.8485	0.8508	0.8531	0.8554	0.8577	0.8599	0.8621
1.1	0.8643	0.8665	0.8686	0.8708	0.8729	0.8749	0.8770	0.8790	0.8810	0.8830
1.2	0.8849	0.8869	0.8888	0.8907	0.8925	0.8944	0.8962	0.8980	0.8997	0.9015
1.3	0.9032	0.9049	0.9066	0.9082	0.9099	0.9115	0.9131	0.9147	0.9162	0.9177
1.4	0.9192	0.9207	0.9222	0.9236	0.9251	0.9265	0.9279	0.9292	0.9306	0.9319
1.5	0.9332	0.9345	0.9357	0.9370	0.9382	0.9394	0.9406	0.9418	0.9429	0.9441
1.6	0.9452	0.9463	0.9474	0.9484	0.9495	0.9505	0.9515	0.9525	0.9535	0.9545
1.7	0.9554	0.9564	0.9573	0.9582	0.9591	0.9599	0.9608	0.9616	0.9625	0.9633
1.8	0.9641	0.9649	0.9656	0.9664	0.9671	0.9678	0.9686	0.9693	0.9699	0.9706
1.9	0.9713	0.9719	0.9726	0.9732	0.9738	0.9744	0.9750	0.9756	0.9761	0.9767
2.0	0.9772	0.9778	0.9783	0.9788	0.9793	0.9798	0.9803	0.9808	0.9812	0.9817
2.1	0.9821	0.9826	0.9830	0.9834	0.9838	0.9842	0.9846	0.9850	0.9854	0.9857
2.2	0.9861	0.9864	0.9868	0.9871	0.9875	0.9878	0.9881	0.9884	0.9887	0.9890
2.3	0.9893	0.9896	0.9898	0.9901	0.9904	0.9906	0.9909	0.9911	0.9913	0.9916
2.4	0.9918	0.9920	0.9922	0.9925	0.9927	0.9929	0.9931	0.9932	0.9934	0.9936
2.5	0.9938	0.9940	0.9941	0.9943	0.9945	0.9946	0.9948	0.9949	0.9951	0.9952
2.6	0.9953	0.9955	0.9956	0.9957	0.9959	0.9960	0.9961	0.9962	0.9963	0.9964
2.7	0.9965	0.9966	0.9967	0.9968	0.9969	0.9970	0.9971	0.9972	0.9973	0.9974
2.8	0.9974	0.9975	0.9976	0.9977	0.9977	0.9978	0.9979	0.9979	0.9980	0.9981
2.9	0.9981	0.9982	0.9982	0.9983	0.9984	0.9984	0.9985	0.9985	0.9986	0.9986
3.0	0.9987	0.9987	0.9987	0.9988	0.9988	0.9989	0.9989	0.9989	0.9990	0.9990
3.1	0.9990	0.9991	0.9991	0.9991	0.9992	0.9992	0.9992	0.9992	0.9993	0.9993
3.2	0.9993	0.9993	0.9994	0.9994	0.9994	0.9994	0.9994	0.9995	0.9995	0.9995
3.3	0.9995	0.9995	0.9995	0.9996	0.9996	0.9996	0.9996	0.9996	0.9996	0.9997
3.4	0.9997	0.9997	0.9997	0.9997	0.9997	0.9997	0.9997	0.9997	0.9997	0.9998

Note that the probabilities given in this table represent the area to the LEFT of the z-score.
The area to the RIGHT of a z-score = 1 – the area to the LEFT of the z-score

DF2	1	2	3	4	5	6	7	8	9	10	12	15	20	24	30	40	60	120	Inf
1	161.45	199.5	215.71	224.58	230.16	233.99	236.77	238.88	240.54	241.88	243.91	245.95	248.01	249.05	250.1	251.14	252.2	253.25	254.31
2	18.513	19	19.164	19.247	19.296	19.33	19.353	19.371	19.385	19.396	19.413	19.429	19.446	19.454	19.462	19.471	19.479	19.487	19.496
3	10.128	9.5521	9.2766	9.1172	9.0135	8.9406	8.8867	8.8452	8.8123	8.7855	8.7446	8.7029	8.6602	8.6385	8.6166	8.5944	8.572	8.5494	8.5264
4	7.7086	6.9443	6.5914	6.3882	6.2561	6.1631	6.0942	6.041	5.9988	5.9644	5.9117	5.8578	5.8025	5.7744	5.7459	5.717	5.6877	5.6581	5.6281
5	6.6079	5.7861	5.4095	5.1922	5.0503	4.9503	4.8759	4.8183	4.7725	4.7351	4.6777	4.6188	4.5581	4.5272	4.4957	4.4638	4.4314	4.3985	4.365
6	5.9874	5.1433	4.7571	4.5337	4.3874	4.2839	4.2067	4.1468	4.099	4.06	3.9999	3.9381	3.8742	3.8415	3.8082	3.7743	3.7398	3.7047	3.6689
7	5.5914	4.7374	4.3468	4.1203	3.9715	3.866	3.787	3.7257	3.6767	3.6365	3.5747	3.5107	3.4445	3.4105	3.3758	3.3404	3.3043	3.2674	3.2298
8	5.3177	4.459	4.0662	3.8379	3.6875	3.5806	3.5005	3.4381	3.3881	3.3472	3.2839	3.2184	3.1503	3.1152	3.0794	3.0428	3.0053	2.9669	2.9276
9	5.1174	4.2565	3.8625	3.6331	3.4817	3.3738	3.2927	3.2296	3.1789	3.1373	3.0729	3.0061	2.9365	2.9005	2.8637	2.8259	2.7872	2.7475	2.7067
10	4.9646	4.1028	3.7083	3.478	3.3258	3.2172	3.1355	3.0717	3.0204	2.9782	2.913	2.845	2.774	2.7372	2.6996	2.6609	2.6211	2.5801	2.5379
11	4.8443	3.9823	3.5874	3.3567	3.2039	3.0946	3.0123	2.948	2.8962	2.8536	2.7876	2.7186	2.6464	2.609	2.5705	2.5309	2.4901	2.448	2.4045
12	4.7472	3.8853	3.4903	3.2592	3.1059	2.9961	2.9134	2.8486	2.7964	2.7534	2.6866	2.6169	2.5436	2.5055	2.4663	2.4259	2.3842	2.341	2.2962
13	4.6672	3.8056	3.4105	3.1791	3.0254	2.9153	2.8321	2.7669	2.7144	2.671	2.6037	2.5331	2.4589	2.4202	2.3803	2.3392	2.2966	2.2524	2.2064
14	4.6001	3.7389	3.3439	3.1122	2.9582	2.8477	2.7642	2.6987	2.6458	2.6022	2.5342	2.463	2.3879	2.3487	2.3082	2.2664	2.2229	2.1778	2.1307
15	4.5431	3.6823	3.2874	3.0556	2.9013	2.7905	2.7066	2.6408	2.5876	2.5437	2.4753	2.4034	2.3275	2.2878	2.2468	2.2043	2.1601	2.1141	2.0658
16	4.494	3.6337	3.2389	3.0069	2.8524	2.7413	2.6572	2.5911	2.5377	2.4935	2.4247	2.3522	2.2756	2.2354	2.1938	2.1507	2.1058	2.0589	2.0096
17	4.4513	3.5915	3.1968	2.9647	2.81	2.6987	2.6143	2.548	2.4943	2.4499	2.3807	2.3077	2.2304	2.1898	2.1477	2.104	2.0584	2.0107	1.9604
18	4.4139	3.5546	3.1599	2.9277	2.7729	2.6613	2.5767	2.5102	2.4563	2.4117	2.3421	2.2686	2.1906	2.1497	2.1071	2.0629	2.0166	1.9681	1.9168
19	4.3807	3.5219	3.1274	2.8951	2.7401	2.6283	2.5435	2.4768	2.4227	2.3779	2.308	2.2341	2.1555	2.1141	2.0712	2.0264	1.9795	1.9302	1.878
20	4.3512	3.4928	3.0984	2.8661	2.7109	2.599	2.514	2.4471	2.3928	2.3479	2.2776	2.2033	2.1242	2.0825	2.0391	1.9938	1.9464	1.8963	1.8432
21	4.3248	3.4668	3.0725	2.8401	2.6848	2.5727	2.4876	2.4205	2.366	2.321	2.2504	2.1757	2.096	2.054	2.0102	1.9645	1.9165	1.8657	1.8117
22	4.3009	3.4434	3.0491	2.8167	2.6613	2.5491	2.4638	2.3965	2.3419	2.2967	2.2258	2.1508	2.0707	2.0283	1.9842	1.938	1.8894	1.838	1.7831
23	4.2793	3.4221	3.028	2.7955	2.64	2.5277	2.4422	2.3748	2.3201	2.2747	2.2036	2.1282	2.0476	2.005	1.9605	1.9139	1.8648	1.8128	1.757
24	4.2597	3.4028	3.0088	2.7763	2.6207	2.5082	2.4226	2.3551	2.3002	2.2547	2.1834	2.1077	2.0267	1.9838	1.939	1.892	1.8424	1.7896	1.733
25	4.2417	3.3852	2.9912	2.7587	2.603	2.4904	2.4047	2.3371	2.2821	2.2365	2.1649	2.0889	2.0075	1.9643	1.9192	1.8718	1.8217	1.7684	1.711
26	4.2252	3.369	2.9752	2.7426	2.5868	2.4741	2.3883	2.3205	2.2655	2.2197	2.1479	2.0716	1.9898	1.9464	1.901	1.8533	1.8027	1.7488	1.6906
27	4.21	3.3541	2.9604	2.7278	2.5719	2.4591	2.3732	2.3053	2.2501	2.2043	2.1323	2.0558	1.9736	1.9299	1.8842	1.8361	1.7851	1.7306	1.6717
28	4.196	3.3404	2.9467	2.7141	2.5581	2.4453	2.3593	2.2913	2.236	2.19	2.1179	2.0411	1.9586	1.9147	1.8687	1.8203	1.7689	1.7138	1.6541
29	4.183	3.3277	2.934	2.7014	2.5454	2.4324	2.3463	2.2783	2.2229	2.1768	2.1045	2.0275	1.9446	1.9005	1.8543	1.8055	1.7537	1.6981	1.6376
30	4.1709	3.3158	2.9223	2.6896	2.5336	2.4205	2.3343	2.2662	2.2107	2.1646	2.0921	2.0148	1.9317	1.8874	1.8409	1.7918	1.7396	1.6835	1.6223
40	4.0847	3.2317	2.8387	2.606	2.4495	2.3359	2.249	2.1802	2.124	2.0772	2.0035	1.9245	1.8389	1.7929	1.7444	1.6928	1.6373	1.5766	1.5089
60	4.0012	3.1504	2.7581	2.5252	2.3683	2.2541	2.1665	2.097	2.0401	1.9926	1.9174	1.8364	1.748	1.7001	1.6491	1.5943	1.5343	1.4673	1.3893
120	3.9201	3.0718	2.6802	2.4472	2.2899	2.175	2.0868	2.0164	1.9588	1.9105	1.8337	1.7505	1.6587	1.6084	1.5543	1.4952	1.429	1.3519	1.2539
Inf	3.8415	2.9957	2.6049	2.3719	2.2141	2.0986	2.0096	1.9384	1.8799	1.8307	1.7522	1.6664	1.5705	1.5173	1.4591	1.394	1.318	1.2214	1