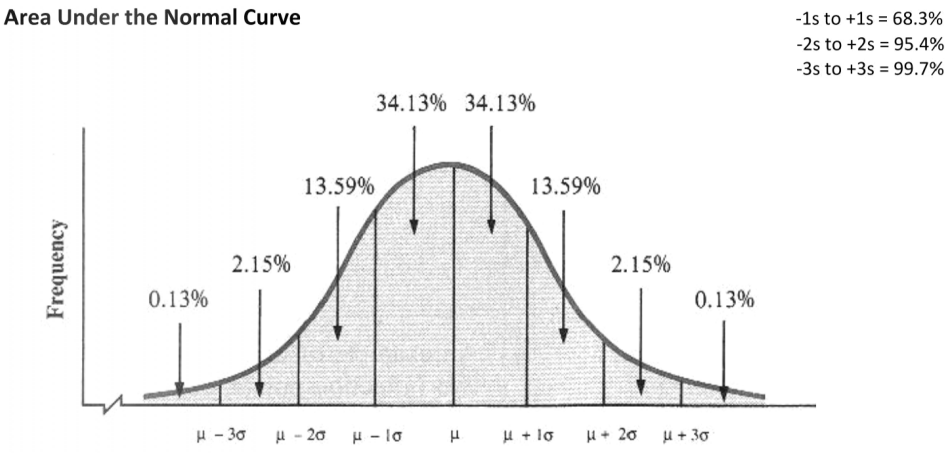
Formulas:

	Sample	Population
Characteristic	Statistic	Parameter
Mean	$\bar{X} = \frac{\sum X}{n}$	$\mu = \frac{\sum X}{N}$
Variance	$s^2 = \frac{n\sum X^2 - (\sum X)^2}{n(n-1)}$	$\sigma^2 = \frac{\sum (X-\mu)^2}{N}$
Standard Deviation	$s = \sqrt{\frac{n\sum X^2 - (\sum X)^2}{n(n-1)}}$	$\sigma = \sqrt{\frac{\sum (X-\mu)^2}{N}}$
Coefficient of Variation (Cvar)	$\text{CVar} = \frac{s}{\bar{x}} \cdot 100$	$\text{CVar} = \frac{\sigma}{\mu} \cdot 100$
Z-scores or Z-transform	$z = \frac{x - \bar{x}}{s}$	$z = \frac{x - \mu}{\sigma}$
Z-scores or Z-transform by Central Limit Theorem		$z = \frac{\bar{X} - \mu}{\sigma / \sqrt{n}}$

Characteristic	Formula
Weighted Mean	$\bar{X} = \frac{\sum wX}{\sum w}$
Interquartile range (IQR)	$\text{IQR} = Q_3 - Q_1$ $Q_1 - 1.5(\text{IQR})$ and $Q_3 + 1.5(\text{IQR})$
Midrange	$\text{MR} = \frac{\text{lowest.value} + \text{highest.value}}{2} = \frac{L.v + H \cdot v}{2}$



Number of sample space N(S)	K^n
Classical probability	$P(E) = \dfrac{n(E)}{n(S)} = \dfrac{\text{Number of desired outcomes}}{\text{Total number of possible outcomes}}$
Complementary events	1. $P(E) + P(\bar{E}) = 1$ 2. $P(\bar{E}) = 1 - P(E)$ 3. $P(E) = 1 - P(\bar{E})$
Empirical probability	$P(E) = \dfrac{f}{n} = \dfrac{\text{Frequency of desired class}}{\text{Sum of all frequencies}}$
Addition rules of probability	1. $P(A \text{ or } B) = P(A) + P(B)$ 2. $P(A \text{ or } B) = P(A) + P(B) - P(A \cap B)$
Multiplication rules of probability	1. $P(A \text{ and } B) = P(A) \cdot P(B)$ 2. $P(A \text{ and } B) = P(A) \cdot P(B \mid A)$
Conditional probability	INDEPENDENT DEPENDENT 1. $P(B \mid A) = \dfrac{P(A \cap B)}{P(A)}$) 2. $P(A \mid B) = \dfrac{P(A \cap B)}{P(B)}$
Probabilities for (At Least)	$P(E) = 1 - P(\bar{E})$
Sequence of n events	$k_1 \cdot k_2 \cdot k_3 \cdots k_n$
Factorial	$n! = n(n-1)(n-2)\cdots 3 \cdot 2 \cdot 1$ $0! = 1$
Permutation	${}_nP_r = \dfrac{n!}{(n-r)!}$
Combination	${}_nC_r = \dfrac{n!}{(n-r)!r!}$

num of tries

shift + Factorial

with order

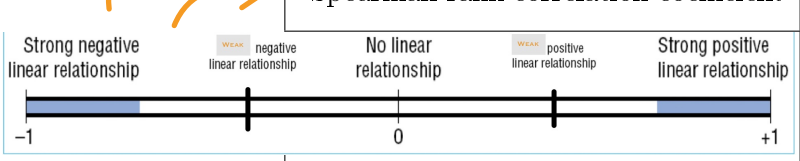
shift + nPr

bigger than R

shift + nCr

No order

Mean or expectation of discrete probability distributions	$E(X) = \mu = \sum X.P(X)$
Variance of discrete probability distributions	$\sigma^2 = \sum \left[X^2 \cdot P(X)\right] - \mu^2$
Standard Deviation (SD) of discrete probability distributions	$\sigma = \sqrt{\sum \left[X^2 \cdot P(X)\right] - \mu^2}$
The probability of Binomial distribution	$P(X) = \frac{n!}{(n-X)!X!} \cdot p^X \cdot q^{n-X}$ *or* $P(X) = {}_nC_x \cdot p^X \cdot q^{n-X}$
Mean of Binomial distribution	$\mu = np$
Variance of Binomial distribution	$\sigma^2 = npq$
Standard Deviation (SD) of Binomial distribution	$\sigma = \sqrt{npq}$



QUANTITATIVE Pearson correlation coefficient	number of Variables $r = \frac{n\left(\sum xy\right) - \left(\sum x\right)\left(\sum y\right)}{\sqrt{\left[n\left(\sum x^2\right) - \left(\sum x\right)^2\right]\left[n\left(\sum y^2\right) - \left(\sum y\right)^2\right]}}$
QUANTITATIVE OR QUALITATIVE Spearman rank correlation coefficient	$r_s = 1 - \frac{6\sum d^2}{n\left(n^2 - 1\right)}$
Regression equation	$y' = a + bx$ $a = \frac{\left(\sum y\right)\left(\sum x^2\right) - \left(\sum x\right)\left(\sum xy\right)}{n\left(\sum x^2\right) - \left(\sum x\right)^2}$ $b = \frac{n\left(\sum xy\right) - \left(\sum x\right)\left(\sum y\right)}{n\left(\sum x^2\right) - \left(\sum x\right)^2}$

Table E The Standard Normal Distribution

Cumulative Standard Normal Distribution

z	.00	.01	.02	.03	.04	.05	.06	.07	.08	.09
−3.4	.0003	.0003	.0003	.0003	.0003	.0003	.0003	.0003	.0003	.0002
−3.3	.0005	.0005	.0005	.0004	.0004	.0004	.0004	.0004	.0004	.0003
−3.2	.0007	.0007	.0006	.0006	.0006	.0006	.0006	.0005	.0005	.0005
−3.1	.0010	.0009	.0009	.0009	.0008	.0008	.0008	.0008	.0007	.0007
−3.0	.0013	.0013	.0013	.0012	.0012	.0011	.0011	.0011	.0010	.0010
−2.9	.0019	.0018	.0018	.0017	.0016	.0016	.0015	.0015	.0014	.0014
−2.8	.0026	.0025	.0024	.0023	.0023	.0022	.0021	.0021	.0020	.0019
−2.7	.0035	.0034	.0033	.0032	.0031	.0030	.0029	.0028	.0027	.0026
−2.6	.0047	.0045	.0044	.0043	.0041	.0040	.0039	.0038	.0037	.0036
−2.5	.0062	.0060	.0059	.0057	.0055	.0054	.0052	.0051	.0049	.0048
−2.4	.0082	.0080	.0078	.0075	.0073	.0071	.0069	.0068	.0066	.0064
−2.3	.0107	.0104	.0102	.0099	.0096	.0094	.0091	.0089	.0087	.0084
−2.2	.0139	.0136	.0132	.0129	.0125	.0122	.0119	.0116	.0113	.0110
−2.1	.0179	.0174	.0170	.0166	.0162	.0158	.0154	.0150	.0146	.0143
−2.0	.0228	.0222	.0217	.0212	.0207	.0202	.0197	.0192	.0188	.0183
−1.9	.0287	.0281	.0274	.0268	.0262	.0256	.0250	.0244	.0239	.0233
−1.8	.0359	.0351	.0344	.0336	.0329	.0322	.0314	.0307	.0301	.0294
−1.7	.0446	.0436	.0427	.0418	.0409	.0401	.0392	.0384	.0375	.0367
−1.6	.0548	.0537	.0526	.0516	.0505	.0495	.0485	.0475	.0465	.0455
−1.5	.0668	.0655	.0643	.0630	.0618	.0606	.0594	.0582	.0571	.0559
−1.4	.0808	.0793	.0778	.0764	.0749	.0735	.0721	.0708	.0694	.0681
−1.3	.0968	.0951	.0934	.0918	.0901	.0885	.0869	.0853	.0838	.0823
−1.2	.1151	.1131	.1112	.1093	.1075	.1056	.1038	.1020	.1003	.0985
−1.1	.1357	.1335	.1314	.1292	.1271	.1251	.1230	.1210	.1190	.1170
−1.0	.1587	.1562	.1539	.1515	.1492	.1469	.1446	.1423	.1401	.1379
−0.9	.1841	.1814	.1788	.1762	.1736	.1711	.1685	.1660	.1635	.1611
−0.8	.2119	.2090	.2061	.2033	.2005	.1977	.1949	.1922	.1894	.1867
−0.7	.2420	.2389	.2358	.2327	.2296	.2266	.2236	.2206	.2177	.2148
−0.6	.2743	.2709	.2676	.2643	.2611	.2578	.2546	.2514	.2483	.2451
−0.5	.3085	.3050	.3015	.2981	.2946	.2912	.2877	.2843	.2810	.2776
−0.4	.3446	.3409	.3372	.3336	.3300	.3264	.3228	.3192	.3156	.3121
−0.3	.3821	.3783	.3745	.3707	.3669	.3632	.3594	.3557	.3520	.3483
−0.2	.4207	.4168	.4129	.4090	.4052	.4013	.3974	.3936	.3897	.3859
−0.1	.4602	.4562	.4522	.4483	.4443	.4404	.4364	.4325	.4286	.4247
−0.0	.5000	.4960	.4920	.4880	.4840	.4801	.4761	.4721	.4681	.4641

For z values less than −3.49, use 0.0001.

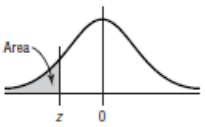


Table E *(continued)*

Cumulative Standard Normal Distribution

z	.00	.01	.02	.03	.04	.05	.06	.07	.08	.09
0.0	.5000	.5040	.5080	.5120	.5160	.5199	.5239	.5279	.5319	.5359
0.1	.5398	.5438	.5478	.5517	.5557	.5596	.5636	.5675	.5714	.5753
0.2	.5793	.5832	.5871	.5910	.5948	.5987	.6026	.6064	.6103	.6141
0.3	.6179	.6217	.6255	.6293	.6331	.6368	.6406	.6443	.6480	.6517
0.4	.6554	.6591	.6628	.6664	.6700	.6736	.6772	.6808	.6844	.6879
0.5	.6915	.6950	.6985	.7019	.7054	.7088	.7123	.7157	.7190	.7224
0.6	.7257	.7291	.7324	.7357	.7389	.7422	.7454	.7486	.7517	.7549
0.7	.7580	.7611	.7642	.7673	.7704	.7734	.7764	.7794	.7823	.7852
0.8	.7881	.7910	.7939	.7967	.7995	.8023	.8051	.8078	.8106	.8133
0.9	.8159	.8186	.8212	.8238	.8264	.8289	.8315	.8340	.8365	.8389
1.0	.8413	.8438	.8461	.8485	.8508	.8531	.8554	.8577	.8599	.8621
1.1	.8643	.8665	.8686	.8708	.8729	.8749	.8770	.8790	.8810	.8830
1.2	.8849	.8869	.8888	.8907	.8925	.8944	.8962	.8980	.8997	.9015
1.3	.9032	.9049	.9066	.9082	.9099	.9115	.9131	.9147	.9162	.9177
1.4	.9192	.9207	.9222	.9236	.9251	.9265	.9279	.9292	.9306	.9319
1.5	.9332	.9345	.9357	.9370	.9382	.9394	.9406	.9418	.9429	.9441
1.6	.9452	.9463	.9474	.9484	.9495	.9505	.9515	.9525	.9535	.9545
1.7	.9554	.9564	.9573	.9582	.9591	.9599	.9608	.9616	.9625	.9633
1.8	.9641	.9649	.9656	.9664	.9671	.9678	.9686	.9693	.9699	.9706
1.9	.9713	.9719	.9726	.9732	.9738	.9744	.9750	.9756	.9761	.9767
2.0	.9772	.9778	.9783	.9788	.9793	.9798	.9803	.9808	.9812	.9817
2.1	.9821	.9826	.9830	.9834	.9838	.9842	.9846	.9850	.9854	.9857
2.2	.9861	.9864	.9868	.9871	.9875	.9878	.9881	.9884	.9887	.9890
2.3	.9893	.9896	.9898	.9901	.9904	.9906	.9909	.9911	.9913	.9916
2.4	.9918	.9920	.9922	.9925	.9927	.9929	.9931	.9932	.9934	.9936
2.5	.9938	.9940	.9941	.9943	.9945	.9946	.9948	.9949	.9951	.9952
2.6	.9953	.9955	.9956	.9957	.9959	.9960	.9961	.9962	.9963	.9964
2.7	.9965	.9966	.9967	.9968	.9969	.9970	.9971	.9972	.9973	.9974
2.8	.9974	.9975	.9976	.9977	.9977	.9978	.9979	.9979	.9980	.9981
2.9	.9981	.9982	.9982	.9983	.9984	.9984	.9985	.9985	.9986	.9986
3.0	.9987	.9987	.9987	.9988	.9988	.9989	.9989	.9989	.9990	.9990
3.1	.9990	.9991	.9991	.9991	.9992	.9992	.9992	.9992	.9993	.9993
3.2	.9993	.9993	.9994	.9994	.9994	.9994	.9994	.9995	.9995	.9995
3.3	.9995	.9995	.9995	.9996	.9996	.9996	.9996	.9996	.9996	.9997
3.4	.9997	.9997	.9997	.9997	.9997	.9997	.9997	.9997	.9997	.9998

For z values greater than 3.49, use 0.9999.