Question 1

For the following four variables, identify the option with the incorrect measurement scale.

a) The profession of 200 shoppers at a supermarket is measured on a nominal scale
b) The tutorial group students attend (groups 1, 2 and 3) is measured on an ordinal scale
c) The hours that students spend studying per week is measured on a ratio scale
d) The daily temperature during December is measured on an interval scale

Questions 2 to 4 are based on the following scenario:

A hardware store received a shipment of 480 cans of paint. The manager randomly selected 40 cans to inspect and found the average weight to be 9.8 kg. Properly filled cans weigh 10 kg in total.

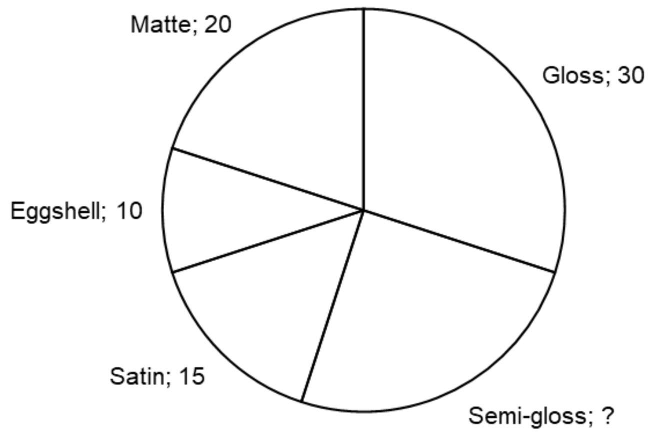
Question 2

Which one of the following statements is correct?

a) The variable of interest is the weight of the cans of paint
b) The sampling unit is a shipment of cans of paint
c) The value of 10 kg is a sample statistic
d) The value of 9.8 kg is a population parameter

Question 3

The cans of paint in the shipment are classified according to the paint finish. The following pie chart shows the percentage of each type of paint finish from the total shipment of cans.

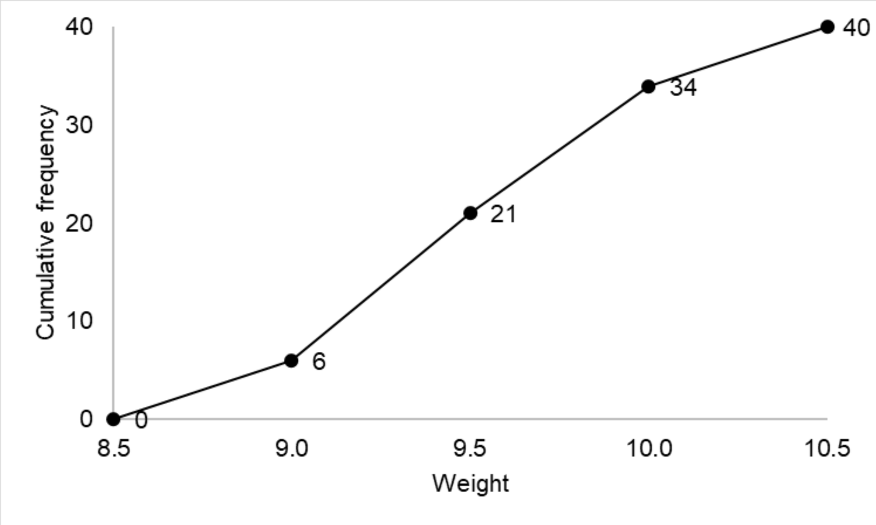


How many of the cans shipped to the hardware store were semi-gloss paint?

a) 10
b) 25
c) 75
d) 120

Question 4

The following ogive shows the cumulative frequencies of the weights of the sample of 40 cans of paint, where the first class interval is (8.5, 9.0].



Which one of the following statements is incorrect?

a) The weights of 15 cans are in the interval (9.0, 9.5]

b) The minimum weight value is greater than 8.5

c) 34% of cans weighed 10 kg or less

d) The estimated range is 2

Questions 5 to 7 are based on the following scenario:

The number of hours per week that a sample of students work at a part-time job is summarised in the following frequency table:

Hours	Frequency	Relative frequency	Percentage	Cumulative frequency	Midpoint
[1, 4)	20	0.4	40	?	2.5
[4, 7)	16	**B**	32	?	5.5
[7, 10)	8	0.16	16	**D**	8.5
[10, 13)	4	?	**C**	48	11.5
[13, 16)	2	0.04	4	?	14.5
Total	**A**	1	100		

Question 5

Calculate the missing values (A to D) in the frequency table and select the incorrect option:

a) A = 50
b) B = 0.32
c) C = 8
d) D = 40

Question 6

The estimated average number of hours per week that the sample of students work at a part-time job, correct to 2 decimal places, is equal to:

a) 5.50
b) 5.62
c) 10.00
d) 10.30

Question 7

The skewness coefficient for this data is equal to 12.4. Therefore, the variable is:

a) Somewhat skewed to the right
b) Extremely skewed to the right
c) Somewhat skewed to the left
d) Extremely skewed to the left

Questions 8 to 11 are based on the following scenario:

A security company collected data for eight weeks about the number of burglaries in an area per week and the security personnel visibility (measured in the hours per week that the security personnel patrolled the area). The data are as follows:

Security visibility (V)	4	8	9	12	13	14	15	16
Number of burglaries (B)	9	7	5	5	4	2	1	2

Question 8

The 40^{th} percentile value of the security visibility variable, to 1 decimal place, is equal to:

a) 3.6
b) 10.5
c) 10.8
d) 12.5

Question 9

Calculate the correlation coefficient between security visibility and number of burglaries, correct to 3 decimal places.

a) −0.640
b) −0.914
c) −0.956
d) −0.978

Question 10

The least squares regression model of B on V is given as $\hat{b} = 11.65 - 0.64v$. Interpret the value of the slope.

a) For every 1 additional burglary in the area, the company will decrease the number of hours on patrol in the area to 11.01
b) For every 1 additional burglary in the area, the company will increase the number of hours on patrol in the area to 11.65
c) For every 1 additional hour that the company spends patrolling the area, number of burglaries is predicted to increase by 11.65
d) For every 1 additional hour that the company spends patrolling the area, number of burglaries is predicted to decrease by 0.64

Question 11

Use the least squares regression model given in Question 10 to predict the number of burglaries in the area if the security company spends 12 hours patrolling the streets in the area, correct to 2 decimal places.

a) 3.97
b) 5.00
c) 7.68
d) 19.33

Questions 12 to 14 are based on the following scenario:

A researcher wants to determine whether age (X) has an impact on the time (Y) taken to complete a certain task. A sample of n = 9 observations yielded the following summary values:

$\sum x = 360$ $\sum x^2 = 14840$ $\sum y = 205$ $\sum y^2 = 4760$ $\sum xy = 8333$

$\min(X) = 30$ $\max(X) = 50$ $\min(Y) = 17.5$ $\max(Y) = 26.5$

Question 12

Calculate the slope of the least squares regression model of time (Y) on age (X). Round off the answer to 2 decimal places.

a) 0.30
b) 0.57
c) 1.47
d) 1.51

Question 13

The correlation coefficient is equal to 0.67. Which one of the following statements is the correct interpretation of the coefficient of determination (rounded to the nearest integer)?

a) Approximately 45% of the variation in age is explained by variation in time
b) Approximately 45% of the variation in time is explained by variation in age
c) Approximately 67% of the variation in age is explained by variation in time
d) Approximately 67% of the variation in time is explained by variation in age

Question 14

Which one of the following statements is correct?

a) It is statistically valid to predict age using a value of time to complete the task equal to 20
b) The minimum possible predicted value of Y, using a valid value of X, is min(Y) = 17.5
c) A predicted value of Y where x = 20 leads to extrapolation of the regression model
d) There is a very strong, positive, linear relationship between a person's age and the time taken to complete the task

Question 15

A family owns two cars. Their respective probabilities of starting on a cold morning are 0.8 and 0.7. Assuming that the cars start independently of one another, then the probability that none of the cars will start on a cold morning is:

a) 0.06
b) 0.14
c) 0.24
d) 0.56

Question 16

The following table shows the cross-tabulation of 200 employees at a company according to gender and job category:

		Gender		
		Male	Female	Total
Job category	Supervisor	15	7	22
	Manual worker	122	56	178
	Total	137	63	200

Which one of the following probabilities is incorrect? Round off all calculations to 2 decimal places.

a) The probability that an employee is a supervisor, is equal to 0.11
b) The probability that an employee is a supervisor or a female, is equal to 0.43
c) The probability that an employee is a male manual worker, is equal to 0.61
d) The probability that a female employee is a manual worker, is equal to 0.89

Question 17

Consider two events *A* and *B*, where $P(A)=0.3$, $P(B)=0.8$ and $P(A\cap B)=0.2$. Which one of the following propabilities is correct? Round off all calculations to 1 decimal place.

a) $P\left(\overline{A\cap\bar{B}}\right)=0.8$

b) $P(A\cup B)=0.8$

c) $P(\bar{A}\cap\bar{B})=0.4$

d) $P(A\cup\bar{B})=0.4$

Questions 18 and 19 are based on the following scenario:

A company has 2 machines that produce widgets. The older machine produces 20% defective widgets, while the new machine produces only 8% defective widgets. The old machine produces 25% of all widgets at the company.

Question 18

What is the probability, to 2 decimal places, that a randomly selected widget is produced by the old machine and it is defective?

a) 0.05
b) 0.20
c) 0.28
d) 0.45

Question 19

A randomly selected widget is tested and found to be defective. What is the probability, to 2 decimal places, that it was produced by the new machine?

a) 0.06
b) 0.08
c) 0.55
d) 0.83

Questions 20 to 22 are based on the following scenario:

A market research company noted that 30% of all invoices sent to their clients are paid within 10 days. The company just sent out invoices to 7 clients.

Question 20

What is the expected value of the number of clients out of 7 who will <u>not</u> pay the invoice within 10 days? Round off the answer to 1 decimal place.

a) 0.3
b) 2.1
c) 4.9
d) 7.0

Question 21

What is the probability that 1 or 2 of the 7 invoices are paid within 10 days? Round off all intermediate and final calculations to 3 decimal places.

a) 0.647
b) 0.565
c) 0.429
d) 0.329

Question 22

What is the probability, to 3 decimal places, that exactly 4 of 7 invoices are <u>not</u> paid within 10 days?

a) 0.097
b) 0.227
c) 0.353
d) 0.874

Questions 23 to 25 are based on the following scenario:

Airline passengers arrive at the check-in counter of a major airline at the O.R. Tambo International Airport at a rate of 4 every 1 minute, according to a Poisson process.

Question 23

Calculate the standard deviation (to 2 decimal places) of the number of passengers arriving at the check-in counter in 90 seconds.

a) 2.45
b) 4.00
c) 6.00
d) 18.97

Question 24

What is the probability, to 3 decimal places, that at least 1 passenger arrive at the check-in counter in 1 minute?

a) 0.018
b) 0.073
c) 0.046
d) 0.982

Question 25

What is the probability, to 3 decimal places, that exactly 9 passengers arrive at the check-in counter in 2-minutes?

a) 0.013
b) 0.075
c) 0.124
d) 0.222

Question 26

For a normal random variable X with a mean of 50 and a variance of 16, which one of the following statements is true?

a) The standardised *z*-score of a value of x = 54, is z = 1
b) The 25^{th} percentile value of X is a negative value
c) Approximately 95% of the distribution of X lies between 18 and 82
d) All three other statements are incorrect

Question 27

For the standard normal random variable Z ~ *N*(0, 1), determine the value of *k* (to 2 decimal places) such that $P(Z < k) = 0.281$.

a) $k = -0.61$
b) $k = -0.58$
c) $k = +0.58$
d) $k = +0.61$

Questions 28 to 30 are based on the following scenario:

It is assumed that the flight times (X) from Johannesburg to Cape Town for a certain airline is normally distributed with a mean of 120 minutes and a standard deviation of 4 minutes.

Question 28

If x = 127, then the standardised z-score is equal to:

a) 0.26
b) 0.96
c) 1.44
d) 1.75

Question 29

What is the probability, to 4 decimal places, that a flight will take longer than 115 minutes?

a) 0.1056
b) 0.3944
c) 0.6056
d) 0.8944

Question 30

Twenty percent of all flights take longer than x minutes. Find the value of x, correct to 2 decimal places.

a) 123.36
b) 123.20
c) 122.32
d) 116.64

Questions 31 to 33 are based on the following scenario:

Consider the following price and price index data of a small microwave sold at a retailer over 3 years.

Day	Year 1 (base)	Year 2	Year 3
Price	820	770	?
Price relative	100	93.90	97.56
Price link relative	-	93.90	103.90

Question 31

How much did the microwave cost in Year 3? Round off your answer to the nearest integer.

a) 720
b) 751
c) 800
d) 869

Question 32

Calculate the average year-on-year percentage change in price, correct to 2 decimal places.

a) 1.10% decrease, on average
b) 1.23% decrease, on average
c) 2.44% decrease, on average
d) 2.88% decrease, on average

Question 33

Which one of the following statements is correct?

a) The price of the microwave in Year 3 decreased by 97.56 units compared to Year 1
b) The price increased by 3.9% from Year 1 to Year 3
c) The price relative of Year 2 implies a 93.9% decrease from Year 1 to Year 2
d) All three other statements are incorrect

Questions 34 and 35 are based on the following scenario:

The following table shows the price (in Rand/gram) and quantity (in 1000 tons) of natural animal fibre exports from South Africa over 2 years.

	Year 1 (base period)		Year 2 (current period)	
	Price	Quantity	Price	Quantity
Merino wool	0.45	70	0.50	80
Lambs wool	0.25	40	0.30	50
Mohair	2.00	10	2.50	20

Question 34

The weighted aggregate base value (to 1 decimal place) of the price of Merino wool, using Laspeyres' weighting method, is equal to:

a) 31.5
b) 36.0
c) 61.5
d) 88.5

Question 35

The following table shows selected values (correct to 1 decimal place) of the weighted average of quantity relatives using Paasche's weighting method.

Basket	Quantity relative	Base value	Weighted average of quantity relative
Merino wool	114.3	?	4000.5
Lambs wool	**A**	12.0	?
Mohair	200	25.0	**C**
	TOTAL	**B**	10500.5
		INDEX	**D**

Which one of the following values of the missing numbers A, B, C and D is correct? Round off all intermediate and final calculations to 1 decimal place.

a) A = 120.0
b) B = 60.0
c) C = 225.0
d) D = 145.8

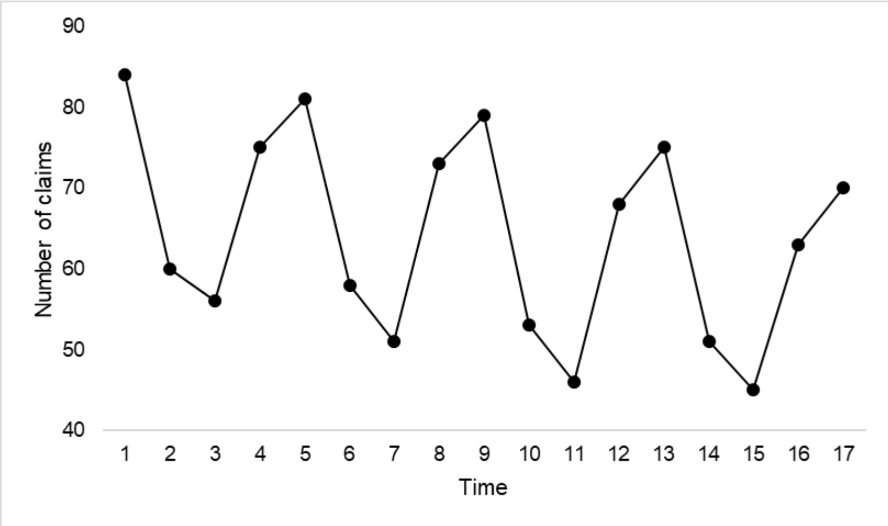
Questions 36 to 40 are based on the following scenario:

The number of claims per quarter on household policies submitted to an insurance company are shown in the following table, with selected values for a time series analysis.

Time	Quarter / Year	Number of claims	4-quarter moving average	Seasonal ratios	Adjusted seasonal index
1	Quarter 1, 2018	84	-	-	**C**
2	Quarter 2, 2018	60	-	-	?
3	Quarter 3, 2018	56	68.38	81.9	?
4	Quarter 4, 2018	75	67.75	**B**	112.4
5	Quarter 1, 2019	81	66.88	121.1	**C**
6	Quarter 2, 2019	58	66.00	87.9	?
7	Quarter 3, 2019	51	**A**	?	?
8	Quarter 4, 2019	73	64.63	113.0	112.4
9	Quarter 1, 2020	79	63.38	124.6	**C**
10	Quarter 2, 2020	53	62.13	85.3	?
11	Quarter 3, 2020	46	61.00	75.4	?
12	Quarter 4, 2020	68	60.25	112.9	112.4
13	Quarter 1, 2021	75	59.88	125.3	**C**
14	Quarter 2, 2021	51	59.13	86.3	?
15	Quarter 3, 2021	45	57.88	77.7	?
16	Quarter 4, 2021	63	-	-	112.4
17	Quarter 1, 2022	70	-	-	**C**

Question 36

The quarterly number of claims are shown in the following graph:



Which of the following components is/are present in this time series?

I. Irregular
II. Linear trend
III. Seasonal

a) Only component I
b) Only component II
c) Only components I and II
d) Only components I and III
e) All three components I, II and III

Question 37

Calculate the missing value for A in the table. Round off all intermediate and final calculations to 2 decimal places.

a) 65.25
b) 65.32
c) 65.50
d) 65.75

Question 38

The missing value for B in the table, correct to 1 decimal place, is equal to:

a) 90.3
b) 101.5
c) 105.3
d) 110.7

Question 39

The median seasonal indices (unadjusted seasonal indices) for Quarter 1 is equal to 124.6 and for Quarter 3 is equal to 77.8, and the adjusted seasonal index for Quarter 4 is equal to 112.4 (as given in the table). Round off the adjustment factor to 3 decimal places and find the missing value for C in the table, correct to 1 decimal place.

a) 123.8
b) 124.1
c) 124.6
d) Not enough information provided to calculate C

Question 40

The estimated trend for the number of claims, based on a least squares regression analysis, is given as $\hat{T} = 70.64 - 0.74x$. Forecast the number of claims for Quarter 4 of 2022 (to 2 decimal places).

a) 62.76
b) 64.43
c) 65.26
d) 69.75

ROUGH WORK

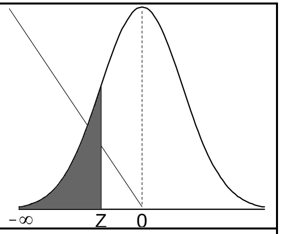
ROUGH WORK

ROUGH WORK

ROUGH WORK

Standard Normal Distribution

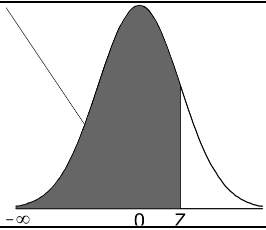
Entry represents area under the cumulative standard normal distribution from $-\infty$ to z



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

Standard Normal Distribution (continued)

Entry represents area under the cumulative standard normal distribution from $-\infty$ to z



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

Arithmetic Mean	$\bar{x} = \frac{1}{n}\sum x$	Variance	$s^2 = \frac{\sum x^2 - n\bar{x}^2}{n-1}$
Geometric mean	$\text{GM} = \sqrt[n]{x_1 \times x_2 \times \ldots \times x_n}$	Coefficient of variation	$CV = \frac{s}{\bar{x}} \times 100$
r^{th} percentile	Position $= \frac{r}{100}(n+1)$ $P_r = x_{(k)} + 0.d\left(x_{(k+1)} - x_{(k)}\right)$	Coefficient of skewness	$SK = \frac{3(\text{mean} - \text{median})}{\text{standard deviation}}$

Correlation	$r = \frac{n\sum xy - (\sum x)(\sum y)}{\sqrt{\left[n\sum x^2 - (\sum x)^2\right]\left[n\sum y^2 - (\sum y)^2\right]}}$		
Linear regression	$b = \frac{n\sum xy - (\sum x)(\sum y)}{n\sum x^2 - (\sum x)^2}$	$a = \frac{\sum y - b\sum x}{n}$	$\hat{y} = a + bx$
Coefficient of determination	$r^2 \times 100\%$		

Complement rule	$P(\bar{A}) = 1 - P(A)$
Addition rule	$P(A \cup B) = P(A) + P(B) - P(A \cap B)$
	$P(A \cup B) = P(A) + P(B)$, if and only if *A* and *B* are mutually exclusive
Conditional probability	$P(A \mid B) = \frac{P(A \cap B)}{P(B)}$
Statistical independence	$P(A \cap B) = P(A) \times P(B)$, if and only if *A* and *B* are independent
Multiplication rule	$P(A \cap B) = P(B)P(A \mid B)$
Bayes' rule	$P(A_j \mid B) = \frac{P(A_j \cap B)}{P(B)} = \frac{P(B \mid A_j)P(A_j)}{\sum_{i=1}^{k} P(B \mid A_i)P(A_i)}$

Distribution	Formula	Mean	Variance
Binomial	$P(X=x)={}_{n}C_{x}p^{x}(1-p)^{n-x}$ for $x=0,1,2,\ldots,n$	np	$np(1-p)$
Poisson	$P(X=x)=\dfrac{e^{-\lambda}\lambda^{x}}{x!}$ for $x=0,1,2,\ldots$	λ	λ
Standard normal	$Z=\dfrac{X-\mu}{\sigma}$	0	1

Price relative	$\dfrac{p_1}{p_0}\times 100\%$
Quantity relative	$\dfrac{q_1}{q_0}\times 100\%$

	Laspeyres	Paasche
Weighted aggregates price index	$\dfrac{\sum(p_1\times q_0)}{\sum(p_0\times q_0)}\times 100\%$	$\dfrac{\sum(p_1\times q_1)}{\sum(p_0\times q_1)}\times 100\%$
Weighted average of relatives price index	$\dfrac{\sum\left[\dfrac{p_1}{p_0}\times 100\times(p_0\times q_0)\right]}{\sum(p_0\times q_0)}$	$\dfrac{\sum\left[\dfrac{p_1}{p_0}\times 100\times(p_0\times q_1)\right]}{\sum(p_0\times q_1)}$
Weighted aggregates quantity index	$\dfrac{\sum(p_0\times q_1)}{\sum(p_0\times q_0)}\times 100\%$	$\dfrac{\sum(p_1\times q_1)}{\sum(p_1\times q_0)}\times 100\%$
Weighted average of relatives quantity index	$\dfrac{\sum\left[\dfrac{q_1}{q_0}\times 100\times(p_0\times q_0)\right]}{\sum(p_0\times q_0)}$	$\dfrac{\sum\left[\dfrac{q_1}{q_0}\times 100\times(p_1\times q_0)\right]}{\sum(p_1\times q_0)}$

Price link relative	$\dfrac{p_i}{p_{i-1}}\times 100\%$
Quantity link relative	$\dfrac{q_i}{q_{i-1}}\times 100\%$

Components	$Y = T \times S \times I$
Least squares trend estimate	$\hat{y} = a + bx$
Number of seasons	k
Seasonal ratio	$\dfrac{\text{actual } y}{\text{moving average } y} \times 100$
Adjustment factor	$\dfrac{k \times 100}{\sum(\text{median seasonal indices})}$
Adjusted seasonal index	$(\text{median seasonal index}) \times (\text{adjustment factor})$
De-seasonalised data	$\dfrac{\text{actual } y}{\text{adjusted seasonal index}} \times 100$
Forecast	$\hat{y} = (a + bx) \times \left(\dfrac{\text{adjusted seasonal index}}{100}\right)$