

BUSINESS ANALYTICS

DATA EXPLORATION, ANALYSIS & VISUALIZATION TECHNIQUES

PRACTICAL 2: DESCRIPTIVE ANALYTICS [MICROSOFT EXCEL]

Contents:

- exploring measure of tendency
- descriptive statistical functions
- working with formulas
- conditional expressions
- number format
- Logics and Boolean Expressions
- Logical Conditionals

1. EXPLORING MEASURE OF TENDENCY

Include: Summation, Median, Mean, Mode, maximum, minimum, Range Deviation, count, variance, standard Deviation

UNIT	NUMBER OF EMPLOYEES
marines	50
air wing	45
dog & horse	38
task force	40
criminal investigation	98
intelligence	76
Information Technology	23
General Duties	150
field force	110
Crime Analysis	26
Budget & Logistics	50
Community Policing	18

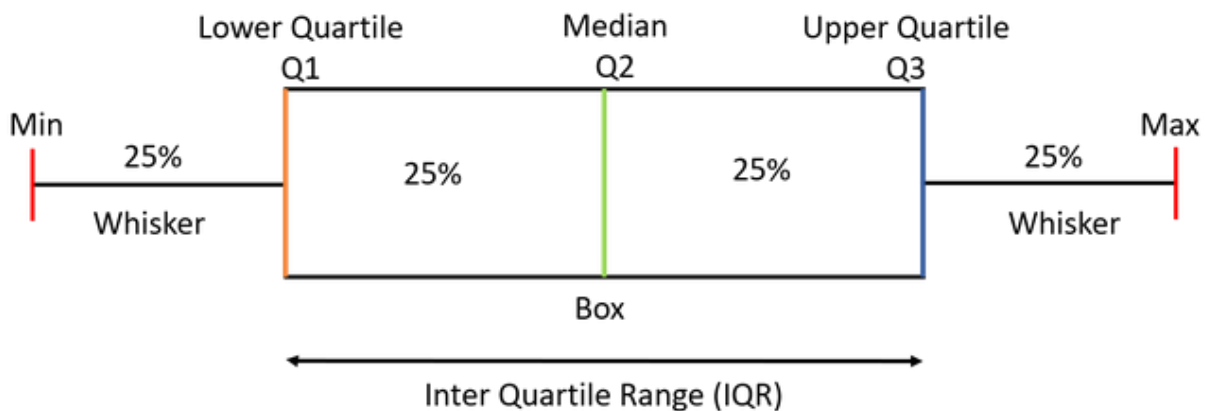
SN	Problems	Descriptive functions	Output
1	Summation of all Employees	=sum(b2:b13)	686
2	The Median	=median(b2:b13)	42.5
3	Total Average of Employees [Mean]	=average(b2:b13)	57.16666667
4	High Frequency Employees [Mode]	=mode.sngl(b2:b13)	50
5	Unit with Maximum Employees [max]	=max(b2:b13)	150
6	Unit with Minimum Employees [min]	=min(b2:b13)	18

7	Differences Max and Min employees [Range Deviation]	=max(b2:b13)-min(b2:b13)	142
8	Count number of Employee [count]	=count(b2:b13)	12

2. EXPLORING MEASURE OF DISPERSION

Percentiles, Quartiles, quartile deviation, standard deviation,

SN	Problems	Descriptive functions	output
1	25 % of all employee [quartile 1]	=quartile.exc(b2:b13,1)	29
2	50 % of all employee [quartile 2]	=quartile.exc(b2:b13,2)	47.5
3	75 % of all employee [quartile 3]	=quartile.exc(b2:b13,3)	92.5
4	Which employee position is about 10 %	=percentile.exc(b2:b13,10%)	15.3
5	Which employee position is about 92 %	=percentile.exc(b2:b13,92%)	148.4
6	Standard Deviation number of employees	=stdev(b2:b13)	40.94082944
		ASSIGNMENT	
7	Find variance number of employees		
8	Which employee position is about 20%		
9	Which employee position is about 50 %		



3. FUNCTION WITH CONDITIONS

Countif, sumif, averageif,
Syntax: *countif(array,condition)*

date	Region	Road Notification	
January 1, 2023	Dodoma	TZS	10,000,000
January 2, 2023	Arusha	TZS	20,000,000
January 3, 2023	Dar es salaam	TZS	10,000,000
January 4, 2023	Tanga	TZS	10,000,000
January 5, 2023	Mwanza	TZS	10,000,000
January 6, 2023	Mwanza	TZS	10,000,000
January 7, 2023	Dodoma	TZS	700,000
January 8, 2023	Arusha	TZS	500,000
January 9, 2023	Mwanza	TZS	350,000
January 10, 2023	Mwanza	TZS	155,000
January 11, 2023	Arusha	TZS	12,000,000
January 12, 2023	Dodoma	TZS	20,000,000
January 13, 2023	Tanga	TZS	1,800,000
January 14, 2023	Dar es salaam	TZS	760,000
January 15, 2023	Pwani	TZS	80,000,000
January 16, 2023	Pwani	TZS	3,400,000
January 17, 2023	Arusha	TZS	560,000
January 18, 2023	Dar es salaam	TZS	10,000,000
January 19, 2023	Dodoma	TZS	12,000,000

SN	Problems	Descriptive functions	output
1	Sum only Dodoma Road Notifications	=SUMIF(B18:B36,"Dodoma",C18:C36)	42,700,000 TZS
2	Sum all Regions Notification Except Dodoma	=SUMIF(B18:B36,"<>Dodoma",C18:C36)	169,525,000 TZS
3	Count Road Notification less than one million	=COUNTIF(C18:C36,">1000000")	13
4	Find sum of Road Notifications for five days between 1/1/2023 and 5/1/2023	=SUMIFS(C18:C36, A18:A36, ">=1/1/2023", A18:A36, "<=1/5/2023")	60,000,000 TZS
5	Find sum of Road Notifications for five days between 1/1/2023 and 5/1/2023 for only Dodoma Region	=SUMIFS(C18:C36, A18:A36, ">=1/1/2023", A18:A36, "<=1/5/2023",B18:B36,"Dodoma")	10,000,000 TZS

		ASSIGNMENT	
6	Find Average of road Notification for only Tanga Region		
7	Find Average of road Notification for only Tanga Region for six days between 1/1/2023 and 6/1/2023		
8	Sum only Tanga Road Notifications		
9	Sum only Arusha Road Notifications		
10	Count Road Notification less than one million and date between 1/1/2023 and 6/1/2023		
11	Count Road Notification less than one million and date start from 6/1/2023		

4. LOGICS & BOOLEAN EXPRESSIONS

Testing whether conditions are true or false and making logical comparisons between expressions are common to many tasks. You can use the AND, OR, NOT, and IF functions to create conditional formulas.

For example, the IF function uses the following arguments.

- formula with the if function
- Formula that uses the IF function
- logical_test: The condition that you want to check.
- value_if_true: The value to return if the condition is True.
- value_if_false: The value to return if the condition is False.

LOGIC AND TRUTH TABLES

A truth table is a tool that helps you analyze statements or arguments in order to verify Whether or not they are logical, or true. There are five basic operations that you will utilize when creating a truth table. These operations are the conjunction, disjunction, negation, conditional, and bi conditional. These operations are also referred to as “and,” “or,” “not,” “if-then,” and “if and only if.” The rules for these operations are as follows:

Logic Operations

AND \wedge (conjunction)		
p	q	$p \wedge q$
T	T	T
T	F	F
F	T	F
F	F	F

And Statements – These statements are true **only** when **both** p and q are true (as the rigorous definition of “and” implies.)

OR \vee (disjunction)		
p	q	$p \vee q$
T	T	T
T	F	T
F	T	T
F	F	F

Or Statements – These statements are false **only** when **both**

NOT \sim (negation)	
p	$\sim p$
T	F
F	T

Not Statements – The “not” is simply the **opposite** or **complement** of its original value.

Example: p = “It is raining”

$\sim p$ = “It is NOT raining”

How to Write a Conditional Formula

The basic syntax of the IF formula in Excel is:

`=IF(logical_test,[value_if_true],[value_if_false])`

logical_test: the condition that you are checking for

[value_if_true]: the result you want if the condition is true

A. LOGICAL AND

=AND(A2>B2,C2>D2)

A	B	C	D	E
number1	number2	number3	number4	logical Test
4	2	8	7	TRUE
4	4	5	6	FALSE
9	0	9	5	TRUE
1	2	4	5	FALSE
6	3	3	2	TRUE
6	4	4	4	FALSE

B. LOGICAL OR

=OR(A19>=B19,C19>=D19)

A	B	C	D	E
number1	number2	number3	number4	logical Test
4	2	8	7	TRUE
4	4	5	6	TRUE
9	0	9	5	TRUE
1	2	4	5	FALSE
6	3	3	2	TRUE
6	4	4	4	TRUE

C. LOGICAL NOT (NEGATION)

=NOT(A28>=B28)

A	B	C	D	E
number1	number2	number3	number4	logical Test
4	2	8	7	FALSE
4	4	5	6	FALSE
9	0	9	5	FALSE
1	2	4	5	TRUE
6	3	3	2	FALSE
6	4	4	4	FALSE

D. LOGICAL NOT | INSIDE AND (NEGATION)

=NOT(AND(A39>=B39,C39>=D39))

A	B	C	D	E
number1	number2	number3	number4	logical Test
4	2	8	7	FALSE
4	4	5	6	TRUE
9	0	9	5	FALSE
1	2	4	5	TRUE
6	3	3	2	FALSE
6	4	4	4	FALSE

LOGICAL AND | MORE EXAMPLES:

EXAMPLE 1:

Basic salary > than Loan

=AND(B2>D2)

A	B	C	D	E	F
Name	Basic Salary	Unit	Loan	status	Boolean
Alice	TZS 100,000	Marines	TZS 50,000	Qualified	TRUE
kim	TZS 250,000	Recruitment	TZS 300,000	Not Qualified	FALSE
whitney	TZS 50,000	Information Technology	TZS 20,000	Qualified	TRUE
eve	TZS 500,000	Performance and Appraisal	TZS 1,000,000	Not Qualified	FALSE
rajah	TZS 230,000	compensation	TZS 250,000	Not Qualified	FALSE
jack	TZS 150,000	Finance and Logistic	TZS 100,000	Qualified	TRUE
irene	TZS 300,000	Survey	TZS 350,000	Not Qualified	FALSE
james	TZS 500,000	Data Science	TZS 100,000	Qualified	TRUE

for basic salary greater than Loan, and the loan is less than 60000

=OR(B2>D2,D2<60000)

EXAMPLE 2:

If is not basic salary + 50000 is greater than requested Loan
=NOT(B3+50000>D3) [negation of true]

A	B	C	D	E	F
Name	Basic Salary	Unit	Loan	status	Boolean
Alice	TZS 100,000	Marines	TZS 50,000	Qualified	FALSE
kim	TZS 250,000	Recruitment	TZS 300,000	Not Qualified	TRUE
whitney	TZS 50,000	Information Technology	TZS 20,000	Qualified	FALSE

5. CONDITIONAL FORMULAS

A. SINGLE CONDITION

=IF(B14>100000,"Maximum","Moderate")

A	B	C
Unit	Loan	Status
Marines	TZS 50,000	Moderate
Recruitment	TZS 300,000	Maximum
Information Technology	TZS 20,000	Moderate
Performance and Appraisal	TZS 1,000,000	Maximum
Compasation	TZS 250,000	Maximum
Finance and Logistic	TZS 100,000	Moderate
Survey	TZS 350,000	Maximum
Data Science	TZS 100,000	Moderate

MORE EXAMPLES OF SINGLE CONDITION

If Basic Salary is greater than requested Loan then status is Qualified otherwise not Qualified
=IF(D6>E6,"Qualified","Not Qualified")

Name	Basic Salary	Loan	status
Alice	100000	50000	Qualified

A	B	C	D	E
Name	Basic Salary	Unit	Loan	status
Alice	TZS 100,000	Marines	TZS 50,000	Qualified
Kim	TZS 250,000	Recruitment	TZS 300,000	Not Qualified

Whitney	TZS 50,000	Information Technology	TZS 20,000	Qualified
eve	TZS 500,000	Performance	TZS 1,000,000	Not Qualified
rajah	TZS 230,000	Compensation	TZS 250,000	Not Qualified
jack	TZS 150,000	Finance and Logistic	TZS 100,000	Qualified
irene	TZS 300,000	Survey	TZS 350,000	Not Qualified
James	TZS 500,000	Data Science	TZS 100,000	Qualified

B. NESTED CONDITIONS

Collection	Day	Status
40,000	January 1, 2023	Fair
4,000	January 2, 2023	Bad
67,000	January 3, 2023	Good
10,000	January 4, 2023	Bad
40,000	January 5, 2023	Fair
500,000	January 6, 2023	Excellent
650,000	January 7, 2023	Excellent
550,000	January 8, 2023	Excellent
400,000	January 9, 2023	Excellent
40,000	January 10, 2023	Fair

=IF(B2<=10000,"Bad",
IF(B2<=50000,"Fair",
IF(B2<=100000,"Good",
IF(B2<=500000,"Excellent",
"Undefined"))))

C. CONDITIONS WITH LOGICAL EXPRESSIONS

EXAMPLE 1:

If basic salary is greater than Loan and basic salary – Loan is greater or equal to 50000
=IF(AND(C2>E2,C2-E2>=50000),"Loan Discount", "No Discount")

Name	Basic Salary	Loan	status	Boolean
Alice	TZS 100,000	TZS 50,000	Qualified	Loan Discount
kim	TZS 250,000	TZS 300,000	Not Qualified	No Discount
whitney	TZS 50,000	TZS 20,000	Qualified	No Discount

eve	TZS 500,000	TZS 1,000,000	Not Qualified	No Discount
rajah	TZS 230,000	TZS 250,000	Not Qualified	No Discount
jack	TZS 150,000	TZS 100,000	Qualified	Loan Discount
irene	TZS 300,000	TZS 350,000	Not Qualified	No Discount
james	TZS 500,000	TZS 100,000	Qualified	Loan Discount

EXAMPLE 2:

Logical AND testing two Variables

Region	Collection	Day	Status
Dodoma	40,000	January 1, 2023	Fear
Mwanza	4,000	January 2, 2023	Bad
Arusha	67,000	January 3, 2023	good
Dodoma	10,000	January 4, 2023	Fear
Kigoma	40,000	January 5, 2023	Fear
Tanga	500,000	January 6, 2023	Excellent
Mwanza	650,000	January 7, 2023	Excellent
Kagera	550,000	January 8, 2023	Excellent
Pwani	400,000	January 9, 2023	Excellent
Kilimanjaro	40,000	January 10, 2023	Fear
Singida	230,000	January 11, 2023	Excellent
Shinyanga	110,000	January 12, 2023	Excellent
Mwanza	120,000	January 13, 2023	Excellent
Dodoma	1,500,000	January 14, 2023	Excellent
Dodoma	120,000	January 15, 2023	Excellent

=IF(AND(B21>=0,B21<10000),"Bad",
IF(AND(B21>=10000,
B21<50000),"Fear",
IF(AND(B21>=50000,
B21<100000),"good",
IF(AND(B21>=100000
) ,"Excellent", "Undefin
ed"))))

ASSIGNMENT

[build a Logical conditional expression of any desired problem and visualize final outputs]

- ✓ Create a Logic conditional Formula IF OR
- ✓ Create a Logic conditional Formula IF NOT
- ✓ Create a Logic conditional Formula IF AND