

## Calculate Sums, Averages, Percentages and Rates in Excel

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In this lab, you will practice basic data analysis in Excel and explore some of the most common calculations used by data journalists.

After completing this lab, you will be able to use Excel to:

- Calculate sums
- Calculate percentages
- Calculate Averages
- Calculate percentage change
- Calculate rates

### Hypothesis

Balochistan and Khyber Pakhtunkhwa have been neglected for years by the education budget, especially in funding for tertiary education and while they are catching up, the focus is on primary education.

- **Question 1:** What was Pakistan's total education budget from 2011 to 2015?
- **Question 2:** What percentage of the total budget did each province receive?
- **Question 3:** Which province allocates the largest percentage of its budget to tertiary education?
- **Question 4:** Which province allocates the largest percentage of its budget to primary education?
- **Question 5:** Which province allocated the most to development spending?
- **Question 6:** Which province experienced the biggest percentage change in Total Education Budget from 2010-2011 to 2014-2015?
- **Question 7:** Which province received the most funding per capita in from 2011 to 2015? (have to add population)
- **Question 8:** Which province received the most funding per capita in 2014-2015? (have to add population)

### Task 1: Calculating Sums

A basic step for analyzing a dataset is to calculate sums.

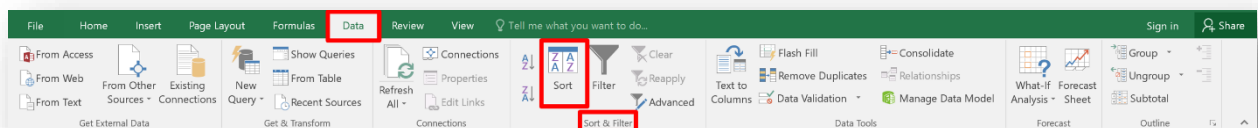
To calculate sums, you can use the SUM formula.

**Question 1:** What was Pakistan's total education budget from 2011 to 2015?

1. Preparing the Excel file to work
  - a. Open **PakistanEducationBudget201011to201415.xlsx**
  - b. **Rename Sheets:** Rename Sheet 1 by right clicking on tab and use the Rename function. Rename as Original.
  - c. **Make a copy:** Right click on Original sheet use the Move or Copy function, click on move to the end and create a copy.
  - d. **Rename the copy:** Rename Original (2) Sheet as Education Budget.
  - e. Save changes.

Country	Province/Territory/District/Ag	Region Type	Unit	Indicator	Revised Budget 2013-14	Revised Estimate	Revised Budget 2013-14	Revised Budget 2013-14	Budget Estimate 2014-15
Pakistan	Sindh	Sindh	Province	Percentage Primary	0.7	26.1	39.7	42.2	36.2
Pakistan	Punjab	Punjab	Province	Percentage Secondary	57.6	53.6	41.0	48.1	57.5
Pakistan	Balochistan	Balochistan	Province	Percentage Tertiary	2.9	18.8	21.5	15.8	24.8
Pakistan	Balochistan	Balochistan	Province	Percentage Other	0.0	19.9	21.6	15.6	20.8
Pakistan	Balochistan	Balochistan	Province	PKR Million Total Education	19283.5	24118.0	25572.5	35530.9	40673.7
Pakistan	Balochistan	Balochistan	Province	Percentage Current Education	90.9	85.5	90.0	79.0	71.1
Pakistan	Punjab	Punjab	Province	Percentage Development	31.6	39.2	14.7	44.9	47.1
Pakistan	Khyber Pakhtunkhwa	Khyber Pakhtunkhwa	Province	Percentage Primary	9.6	10.5	12.3	42.0	30.9
Pakistan	Khyber Pakhtunkhwa	Khyber Pakhtunkhwa	Province	Percentage Secondary	34.5	28.6	22.7	36.2	47.4
Pakistan	Islamabad Capital Territory	Islamabad Capital Territory	Territory	Percentage Tertiary	83.1	78.8	79.2	81.2	80.8
Pakistan	Islamabad Capital Territory	Islamabad Capital Territory	Territory	Percentage Other	3.0	4.9	5.1	5.5	2.0
Pakistan	Islamabad Capital Territory	Islamabad Capital Territory	Territory	PKR Million Total Education	55181.0	61355.0	69424.0	86014.0	84156.0
Pakistan	Islamabad Capital Territory	Islamabad Capital Territory	Territory	Percentage Current Education	73.1	73.7	75.4	71.7	73.3
Pakistan	Balochistan	Balochistan	Province	Percentage Development	9.1	14.5	10.0	21.0	28.9
Pakistan	Balochistan	Balochistan	Province	Percentage Primary	95.1	26.7	23.9	22.4	21.4
Pakistan	Balochistan	Balochistan	Province	Percentage Secondary	1.9	34.5	33.0	46.1	33.0
Pakistan	Khyber Pakhtunkhwa	Khyber Pakhtunkhwa	Province	Percentage Tertiary	53.0	55.7	59.2	19.9	19.9
Pakistan	Khyber Pakhtunkhwa	Khyber Pakhtunkhwa	Province	Percentage Other	2.9	5.1	5.8	2.0	1.9
Pakistan	Khyber Pakhtunkhwa	Khyber Pakhtunkhwa	Province	PKR Million Total Education	18575.5	24379.5	30595.9	98363.8	117416.3
Pakistan	Khyber Pakhtunkhwa	Khyber Pakhtunkhwa	Province	Percentage Current Education	33.5	36.0	36.7	76.5	74.6
Pakistan	Islamabad Capital Territory	Islamabad Capital Territory	Territory	Percentage Development	26.9	26.3	24.6	28.3	26.7
Pakistan	Islamabad Capital Territory	Islamabad Capital Territory	Territory	Percentage Primary	5.9	7.2	6.9	6.6	7.5
Pakistan	Sindh	Sindh	Province	Percentage Secondary	0.6	22.7	24.8	26.1	25.8
Pakistan	Punjab	Punjab	Province	Percentage Tertiary	39.5	38.3	48.4	43.4	37.7
Pakistan	Punjab	Punjab	Province	Percentage Other	1.0	6.7	8.4	6.8	0.6
Pakistan	Punjab	Punjab	Province	PKR Million Total Education	41355.6	55195.8	48242.7	63456.0	81106.7
Pakistan	Punjab	Punjab	Province	Percentage Current Education	68.4	60.8	85.3	55.1	52.9
Pakistan	Khyber Pakhtunkhwa	Khyber Pakhtunkhwa	Province	Percentage Development	66.5	64.0	63.3	23.5	25.4
Pakistan	Punjab	Punjab	Province	Percentage Primary	1.9	1.4	2.2	1.8	4.2
Pakistan	Islamabad Capital Territory	Islamabad Capital Territory	Territory	Percentage Secondary	8.0	9.1	8.9	6.6	9.7

2. **ALWAYS, ALWAYS MAKE SURE YOU UNDERSTAND THE DATA.** Data comes in different formats, uses abbreviation, includes obscure indicators and could have a variety of data entry errors. Sometimes you can find the explanation in the **Source** tab of the dataset or you may have to search for it. What we have here:
  - a. A column for country (A), it might not be necessary because we are analyzing just Pakistan, unless we are going to make a map, in which case it will be useful for geo-location.
  - b. A Province and District column (B, C). Check to make sure each province and district name is typed correctly.
  - c. Column (D), which specifies province or region.
  - d. In column (E) we have the unit of measure.
  - e. In column (F), the indicator column, there are 3 kinds of indicators: first, the level of Education (Primary, Secondary, and Tertiary). Second, a currency value. Third, two percentage indicator with the Current Education Budget as a Percentage of Total Education Budget and Development Education Budget as a Percentage of Total Education Budget.
  - f. Columns (G, H, I, J, and K) are the data, again in percentage and currency.
3. Sorting the data in the dataset may help to understand the structure. In the Main Menu go to Data Sort and Filters – Sort



4. In the Sort window in Sort by select Province/Territory. Then, Add Level, in Then by select indicator

The image displays two sequential screenshots of a 'Sort' dialog box, illustrating the steps to sort data by Province/Territory and then by Indicator.

**First Screenshot:**

- Sort by:** The dropdown menu is open, showing a list of columns. 'Province/Territory' is selected and highlighted in blue.
- Sort On:** Set to 'Values'.
- Order:** Set to 'A to Z'.
- Buttons:** 'Add Level', 'Delete Level', 'Copy Level', 'Options...', 'OK', and 'Cancel' are visible.
- Checkbox:** 'My data has headers' is checked.

**Second Screenshot:**

- Sort by:** Set to 'Province/Territory'.
- Then by:** The dropdown menu is open, showing a list of columns. 'Indicator' is selected and highlighted in blue.
- Sort On:** Set to 'Values'.
- Order:** Set to 'A to Z'.
- Buttons:** 'Add Level', 'Delete Level', 'Copy Level', 'Options...', 'OK', and 'Cancel' are visible. The 'OK' button is highlighted with a red box.
- Checkbox:** 'My data has headers' is checked.

5. As you see now the data set is easier to read and understand: region by region with the associated indicator.

Country	Province/Territory/District/Ag/Region	Typ	Unit	Indicator	Revised Budget 2	Revised Estimate	Revised Budget 20	Revised Budget 20	Budget Estimate 2014-15
Pakistan	Balochistan	Balochistan Province	Percentage	Current Education Budget as a Percentage of Total Education Budget	90.9	85.5	90.0	79.0	71.1
Pakistan	Balochistan	Balochistan Province	Percentage	Development Education Budget as a Percentage of Total Education Budget	9.1	14.5	10.0	21.0	28.9
Pakistan	Balochistan	Balochistan Province	Percentage	Other	0.0	19.9	21.6	15.6	20.8
Pakistan	Balochistan	Balochistan Province	Percentage	Primary	95.1	26.7	23.9	22.4	21.4
Pakistan	Balochistan	Balochistan Province	Percentage	Secondary	1.9	34.5	33.0	46.1	33.0
Pakistan	Balochistan	Balochistan Province	Percentage	Tertiary	2.9	18.8	21.5	15.8	24.8
Pakistan	Balochistan	Balochistan Province	PKR Million	Total Education Budget (PKR Million)	19283.5	24118.0	25572.5	35530.9	40673.7
Pakistan	Islamabad	Islamabad Territory	Percentage	Current Education Budget as a Percentage of Total Education Budget	73.1	73.7	75.4	71.7	73.3
Pakistan	Islamabad	Islamabad Territory	Percentage	Development Education Budget as a Percentage of Total Education Budget	26.9	26.3	24.6	28.3	26.7
Pakistan	Islamabad	Islamabad Territory	Percentage	Other	3.0	4.9	5.1	5.5	2.0
Pakistan	Islamabad	Islamabad Territory	Percentage	Primary	5.9	7.2	6.9	6.6	7.5
Pakistan	Islamabad	Islamabad Territory	Percentage	Secondary	8.0	9.1	8.9	6.6	9.7
Pakistan	Islamabad	Islamabad Territory	Percentage	Tertiary	83.1	78.8	79.2	81.2	80.8
Pakistan	Islamabad	Islamabad Territory	PKR Million	Total Education Budget (PKR Million)	55181.0	61355.0	69424.0	86014.0	84156.0
Pakistan	Khyber Pak	Khyber Pak Province	Percentage	Current Education Budget as a Percentage of Total Education Budget	33.5	36.0	36.7	76.5	74.6
Pakistan	Khyber Pak	Khyber Pak Province	Percentage	Development Education Budget as a Percentage of Total Education Budget	66.5	64.0	63.3	23.5	25.4
Pakistan	Khyber Pak	Khyber Pak Province	Percentage	Other	2.9	5.1	5.8	2.0	1.9
Pakistan	Khyber Pak	Khyber Pak Province	Percentage	Primary	9.6	10.5	12.3	42.0	30.9
Pakistan	Khyber Pak	Khyber Pak Province	Percentage	Secondary	34.5	28.6	22.7	36.2	47.4
Pakistan	Khyber Pak	Khyber Pak Province	Percentage	Tertiary	53.0	55.7	59.2	19.9	19.9
Pakistan	Khyber Pak	Khyber Pak Province	PKR Million	Total Education Budget (PKR Million)	18575.5	24379.5	30595.9	98363.8	117416.3
Pakistan	Punjab	Punjab Province	Percentage	Current Education Budget as a Percentage of Total Education Budget	68.4	60.8	85.3	55.1	52.9
Pakistan	Punjab	Punjab Province	Percentage	Development Education Budget as a Percentage of Total Education Budget	31.6	39.2	14.7	44.9	47.1
Pakistan	Punjab	Punjab Province	Percentage	Other	1.0	6.7	8.4	6.8	0.6
Pakistan	Punjab	Punjab Province	Percentage	Primary	1.9	1.4	2.2	1.8	4.2
Pakistan	Punjab	Punjab Province	Percentage	Secondary	57.6	53.6	41.0	48.1	57.5
Pakistan	Punjab	Punjab Province	Percentage	Tertiary	39.5	38.3	48.4	43.4	37.7
Pakistan	Punjab	Punjab Province	PKR Million	Total Education Budget (PKR Million)	41355.6	55195.8	48242.7	63456.0	81106.7
Pakistan	Sindh	Sindh Province	Percentage	Current Education Budget as a Percentage of Total Education Budget	77.4	87.0	95.6	94.9	92.5
Pakistan	Sindh	Sindh Province	Percentage	Development Education Budget as a Percentage of Total Education Budget	22.6	13.0	4.4	5.1	7.5

- Make a copy of Education Budget sheet by right clicking on the Education Budget sheet and using the Move or Copy function. Click on move to the end and create a copy.
- Rename Education Budget (2) as Q1
- Select row 1 by clicking on Row 1

Country	Province/Territory/District/Ag/Region	Typ	Unit	Indicator	Revised Budget 2	Revised Estimate	Revised Budget 20	Revised Budget 20	Budget Estimate 2014-15
Pakistan	Sindh	Sindh Province	Percentage	Primary	0.7	26.1	39.7	42.2	36.2
Pakistan	Punjab	Punjab Province	Percentage	Secondary	57.6	53.6	41.0	48.1	57.5

- In the Main Menu go to Home – Editing – Sort & Filter – Filter. Now all columns have a small arrow on the right side. This is the filter tool.

Country	Province	District	Region	Unit	Indicator	Revised Budget 2	Revised Estim	Revised Budget 20	Revised Budget 20	Budget Estim	2014-15
Pakistan	Sindh	Sindh	Province	Percentage	Primary	0.7	26.1	39.7	42.2	36.2	
Pakistan	Punjab	Punjab	Province	Percentage	Secondary	57.6	53.6	41.0	48.1	57.5	
Pakistan	Balochistan	Balochistan	Province	Percentage	Tertiary	2.9	18.8	21.5	15.8	24.8	
Pakistan	Balochistan	Balochistan	Province	Percentage	Other	0.0	19.9	21.6	15.6	20.8	

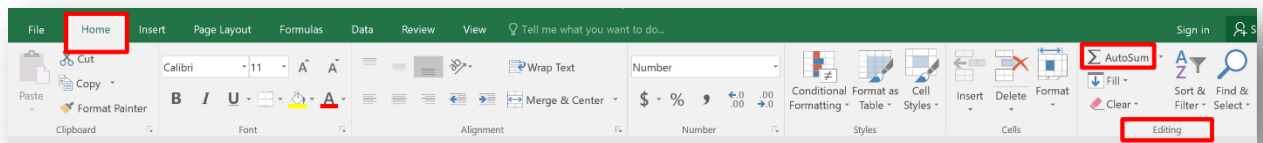
10. Question 1 the total education Budget. First we need a total by region. Go to the column Indicator (F) and click on the small arrow to filter this column. Then, unselect all categories and leave Total Education Budget or Click on Select all and Total Education Budget. Click OK

E	F	G	H	I
Unit	Indicator	Revised Budget	Revised Estim	Revised Budget
Percentage	Current Education Budget as a Percentage of Total Education Budget			90.0
Percentage	Development Education Budget as a Percentage of Total Education Budget			10.0
Percentage	Other			21.6
Percentage	Primary			23.9
Percentage	Secondary			33.0
Percentage	Tertiary			21.5
PKR Million	Total Education Budget (PKR Million)			25572.5
Percentage	Current Education Budget as a Percentage of Total Education Budget			75.4
Percentage	Development Education Budget as a Percentage of Total Education Budget			24.6
Percentage	Other			5.1
Percentage	Primary			6.9
Percentage	Secondary			8.9
Percentage	Tertiary			79.2
PKR Million	Total Education Budget (PKR Million)			69424.0
Percentage	Current Education Budget as a Percentage of Total Education Budget			36.7
Percentage	Development Education Budget as a Percentage of Total Education Budget			63.3
Percentage	Other			5.8
Percentage	Primary			12.3
Percentage	Secondary			22.7
Percentage	Tertiary			59.2
PKR Million	Total Education Budget (PKR Million)			30595.9
Percentage	Current Education Budget as a Percentage of Total Education Budget	68.4	60.8	85.3
Percentage	Development Education Budget as a Percentage of Total Education Budget	31.6	39.2	14.7

11. Go to cell F40 and name it Total Budget per year. Why, three rows down? Because if you just go one row down, Excel will add the row to the dataset.
12. To sum Revised Budget 2010-2011
- Select data in column G

Formula Bar		F	G
Indicator	Revised Budget 2010-11	Revised	
n Total Education Budget (PKR		19283.5	
n Total Education Budget (PKR		55181.0	
n Total Education Budget (PKR		18575.5	
n Total Education Budget (PKR		41355.6	
n Total Education Budget (PKR		26387.9	
Total Budget per year			

- b. In the Main Menu go to Home – Editing – AutoSum



- c. Move the calculation you just made to cell G40
- d. Sometime Excel displays a small green arrow in the upper-left corner of a cell. It means than may be a problem with a formula. If you hover over the arrow Excel will display a warning icon. Click on it and Excel will explain the possible mistake, in this case “Formula Omits Adjacent Cells”. When filters are used, Excel hides rows and the formula also skipped those rows. That also why on the left the row numbers are no longer consecutive. In this exercise, we want to skip all rows except the Total Education Budget rows, so you can ignore the error message.

	A	B	C	D	E	F	G	
1	Country	Province	District/	Region	Unit	Indicator	Revised Budget 2010-11	Revised
8	Pakistan	Balochistan	Balochistan	Province	PKR Million	Total Education Budget (PKR M	19283.5	
15	Pakistan	Islamabad	Islamabad	Territory	PKR Million	Total Education Budget (PKR M	55181.0	
22	Pakistan	Khyber Pak	Khyber Pak	Province	PKR Million	Total Education Budget (PKR M	18575.5	
29	Pakistan	Punjab	Punjab	Province	PKR Million	Total Education Budget (PKR M	41355.6	
36	Pakistan	Sindh	Sindh	Province	PKR Million	Total Education Budget (PKR M	26387.9	
37								
38								
39								
40						Total Budget per year	160783.598	
41								
42								
43								
44								
45								
46								
47								
48								

Formula Omits Adjacent Cells  
 Update Formula to Include Cells  
 Help on this error  
 Ignore Error  
 Edit in Formula Bar  
 Error Checking Options...

- e. Instead of typing in the formula for each column, you can copy the formula across. Go to the right-bottom corner of cell G40 until a thick black cross appears. Click and drag across the row until K40.

	F	G	H	I	J	K
Indicator	Revised Budget 2010-11	Revised Estimates 2011-12	Revised Budget 2012-13	Revised Budget 2013-14	Budget Estimate 2014-15	
n Total Education Budget (PKR M	19283.5	24118.0	25572.5	35530.9	40673.7	
n Total Education Budget (PKR M	55181.0	61355.0	69424.0	86014.0	84156.0	
n Total Education Budget (PKR M	18575.5	24379.5	30595.9	98363.8	117416.3	
n Total Education Budget (PKR M	41355.6	55195.8	48242.7	63456.0	81106.7	
n Total Education Budget (PKR M	26387.9	64649.6	109859.7	113557.4	145267.1	
Total Budget per year	160783.598					

13. But question 1 is asking for Pakistan's total education budget from 2011 to 2015. Go to Row L and label L1 as Pakistan's total education budget and in L40 type =SUM(G40:K40). This adds together the value of all cells from G40 to K40. You also can see the formula in the Formula bar.

14. **Question 1:** What was Pakistan's total education budget from 2011 to 2015? **Answer:** Pakistan's total education budget from 2011 to 2015 is PKR 1.539.718

**Question 2:** What percentage of the total budget did each province receive?

15. Make a copy of the Education Budget sheet by right clicking on Education Budget sheet use Move or Copy function, click on move to the end and create a copy.
16. Rename Education Budget (2) as Q2
17. Select row 1 by clicking on Row 1

18. In the Main Menu go to Home – Editing – Sort & Filter – Filter.
19. Filter column F Indicator leaving just the Total Education Budget category

E	F	G	H
Unit	Indicator	Revised Budget	Revised Estimate
Percentage	Current Education Budget as a Percentage of Total Education Budget		85.5
Percentage	Development Education Budget as a Percentage of Total Education Budget		14.5
Percentage	Other		19.9
Percentage	Primary		26.7
Percentage	Secondary		34.5
Percentage	Tertiary		18.8
PKR Million	Total Education Budget (PKR Million)		118.0
Percentage	Current Education Budget as a Percentage of Total Education Budget		73.7
Percentage	Development Education Budget as a Percentage of Total Education Budget		26.3
Percentage	Other		4.9
Percentage	Primary		7.2
Percentage	Secondary		9.1
Percentage	Tertiary		78.8
PKR Million	Total Education Budget (PKR Million)		355.0
Percentage	Current Education Budget as a Percentage of Total Education Budget		36.0
Percentage	Development Education Budget as a Percentage of Total Education Budget		64.0
Percentage	Other		5.1
Percentage	Primary		10.5
Percentage	Secondary		28.6
Percentage	Tertiary		55.7
PKR Million	Total Education Budget (PKR Million)	53.0	
		18575.5	24379.5

20. Rename cell L1 as Total Budget by District, now add together the Total Education Budgets from each district from 2010 to 2015. In L2 type =SUM( and select the cells to add then close the parenthesis. =SUM(G8:K8)

G8		=SUM(G8:K8)											
	A	B	C	D	E	F	G	H	I	J	K	L	M
1	Country	Province	District/	Region	Unit	Indicator	Revised Budget	Revised Estim	Revised Budget	Revised Budget	Budget Estim	Total Budget by District	
8	Pakistan	Balochistan	Balochistan	Province	PKR Million	Total Education Budget (PKR Million)	19283.5	24118.0	25572.5	35530.9	40673.7	=SUM(G8:K8)	
15	Pakistan	Islamabad	Islamabad	Territory	PKR Million	Total Education Budget (PKR Million)	55181.0	61355.0	69424.0	86014.0	84156.0		
22	Pakistan	Khyber Pak	Khyber Pak	Province	PKR Million	Total Education Budget (PKR Million)	18575.5	24379.5	30595.9	98363.8	117416.3		
29	Pakistan	Punjab	Punjab	Province	PKR Million	Total Education Budget (PKR Million)	41355.6	55195.8	48242.7	63456.0	81106.7		
36	Pakistan	Sindh	Sindh	Province	PKR Million	Total Education Budget (PKR Million)	26387.9	64649.6	109859.7	113557.4	145267.1		
37													

21. Extend the formula to all districts

A	B	C	D	E	F	G	H	I	J	K	L
Country	Province	District/	Region	Unit	Indicator	Revised Budget	Revised Estimate	Revised Budget	Revised Budget	Budget Estimate	Total Budget by District
1	Pakistan	Balochistan	Balochistan Province	PKR Million	Total Education Budget (PKR Million)	19283.5	24118.0	25572.5	35530.9	40673.7	145178.6
15	Pakistan	Islamabad	Islamabad Territory	PKR Million	Total Education Budget (PKR Million)	55181.0	61355.0	69424.0	86014.0	84156.0	356130.0
22	Pakistan	Khyber Pak	Khyber Pak Province	PKR Million	Total Education Budget (PKR Million)	18575.5	24379.5	30595.9	98363.8	117416.3	289331.0
29	Pakistan	Punjab	Punjab Province	PKR Million	Total Education Budget (PKR Million)	41355.6	55195.8	48242.7	63456.0	81106.7	289356.7
36	Pakistan	Sindh	Sindh Province	PKR Million	Total Education Budget (PKR Million)	26387.9	64649.6	109859.7	113557.4	145267.1	459721.8

22. Rename K40 as Budget Total



## 23. Calculate the sum of Total Budget by Districts

Country	Province	District	Region	Unit	Indicator	Revised Budget	Revised Estimate	Revised Budget	Revised Budget	Budget Estimate	Total Budget by District
Pakistan	Balochistan	Balochistan	Province	PKR Million	Total Education Budget (PKR Million)	19283.5	24118.0	25572.5	35530.9	40673.7	145178.6
Pakistan	Islamabad	Islamabad	Territory	PKR Million	Total Education Budget (PKR Million)	55181.0	61355.0	69424.0	86014.0	84156.0	356130.0
Pakistan	Khyber Pakhtunkhwa	Khyber Pakhtunkhwa	Province	PKR Million	Total Education Budget (PKR Million)	18575.5	24379.5	30595.9	98363.8	117416.3	289331.0
Pakistan	Punjab	Punjab	Province	PKR Million	Total Education Budget (PKR Million)	41355.6	55195.8	48242.7	63456.0	81106.7	289356.7
Pakistan	Sindh	Sindh	Province	PKR Million	Total Education Budget (PKR Million)	26387.9	64649.6	109859.7	113557.4	145267.1	459721.8
Budget Total											1539718.1

24. Rename M1 as Budget percentage by district. Percentage are the division of the part by the total. In this exercise, the part is the Total Budget by District and the total is the Budget Total. So, the formula to get the percentage looks like  $=L8/ \$L\$40$ . The \$ symbol means that the second part of the equation is locked on cell L40. This prevents the bottom half of the equation from moving as you copy down the formula.

25. Extend the formula down in Column M

	A	B	C	D	E	F	G	H	I	J	K	L	M
1	Country	Province	District	Region	Unit	Indicator	Revised Budget	Revised Estimate	Revised Budget	Revised Budget	Budget Estimate	Total Budget by District	Budget percentage by district
8	Pakistan	Balochistan	Balochistan	Province	PKR Million	Total Education Budget (F	19283.5	24118.0	25572.5	35530.9	40673.7	145178.6	0.094289067
15	Pakistan	Islamabad	Islamabad	Territory	PKR Million	Total Education Budget (F	55181.0	61355.0	69424.0	86014.0	84156.0	356130.0	0.231295582
22	Pakistan	Khyber Pak	Khyber Pak	Province	PKR Million	Total Education Budget (F	18575.5	24379.5	30595.9	98363.8	117416.3	289331.0	0.187911691
29	Pakistan	Punjab	Punjab	Province	PKR Million	Total Education Budget (F	41355.6	55195.8	48242.7	63456.0	81106.7	289356.7	0.187928385
36	Pakistan	Sindh	Sindh	Province	PKR Million	Total Education Budget (F	26387.9	64649.6	109859.7	113557.4	145267.1	459721.8	0.298575274
37													
38													
39													
40													
										Budget Total		1539718.1	

26. Change column M to a percentage by selecting column M, then right-clicking on the column, click on Format Cell and then in format cell window click on Percentage.

M1

fx

Budget percentage by district

Format Cells

Number

Alignment

Font

Border

Fill

Protection

Category:

General

Number

Currency

Accounting

Date

Time

Percentage

Fraction

Scientific

Text

Special

Custom

Sample

Budget percentage by district

Decimal places: 2

Percentage formats multiply the cell value by 100 and displays the result with a percent symbol.

OK

Cancel

K

L

M

Budget Estimat

Total Budget by District

Budget percentage by district

40673.7

145178.6

0.094289067

84156.0

356130.0

0.231295582

117416.3

289331.0

0.187911691

81106.7

289356.7

0.187928385

145267.1

459721.8

0.298575274

Budget Total

1539718.1

Calibri

11

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Cut

Copy

Paste Options:

Paste Special...

Insert

Delete

Clear Contents

Format Cells...

Column Width...

Hide

Unhide

27. Question 2: What percentage of the total budget did each province receive?

Budget percentage by district
9.43%
23.13%
18.79%
18.79%
29.86%

**Question 3:** Which province allocates the largest percentage of its budget to tertiary education?

28. Make a copy of Education Budget sheet by right-clicking on Education Budget sheet and use the Move or Copy function, click on move to the end and create a copy.
29. Rename Education Budget (2) as Q3
30. Select row 1 by click on Row 1
31. In the Main Menu go to Home – Editing – Sort & Filter – Filter.
32. Filter column F Indicator leaving just Tertiary.
33. Rename L1 as Tertiary Average
34. Excel provides you a simple formula to calculate the numerical average or 'mean' = **AVERAGE(First cell # : Last cell#)** in these case =AVERAGE(G7:K7)
35. Extend the formula to all districts
36. **Question 3:** Which province allocates the largest percentage of its budget to tertiary education?

	A	B	C	D	E	F	G	H	I	J	K	L
1	Country	Province/Territory	District/	Region 1	Unit	Indicator	Revised Budget	Revised Estimate	Revised Budget	Revised Budget	Budget Estimate	Tertiary Average
7	Pakistan	Balochistan	Balochistan	Province	Percentage	Tertiary	2.9	18.8	21.5	15.8	24.8	16.8
14	Pakistan	Islamabad Capital Territory	Islamabad	Territory	Percentage	Tertiary	83.1	78.8	79.2	81.2	80.8	80.6
21	Pakistan	Khyber Pakhtunkhwa	Khyber Pak	Province	Percentage	Tertiary	53.0	55.7	59.2	19.9	19.9	41.5
28	Pakistan	Punjab	Punjab	Province	Percentage	Tertiary	39.5	38.3	48.4	43.4	37.7	41.4
35	Pakistan	Sindh	Sindh	Province	Percentage	Tertiary	53.8	23.3	15.9	14.8	15.3	24.6

**Question 4:** Which province allocates the largest percentage of its budget to primary education?

37. Make a copy of Education Budget sheet by right-click on Education Budget sheet.
38. Rename Education Budget (2) as Q4
39. Select row 1 by clicking on Row 1
40. In the Main Menu go to Home – Editing – Sort & Filter – Filter.
41. Filter column F Indicator leaving just Primary
42. Rename L1 as Primary Average
43. Excel provides you a simple formula to calculate the numerical average or 'mean' = **AVERAGE(First cell # : Last cell#)** in these case =AVERAGE(G7:K7)
44. Extend the formula to all districts
45. **Question 4:** Which province allocates the largest percentage of its budget to primary education?

=AVERAGE(G5:K5)												
1	A	B	C	D	E	F	G	H	I	J	K	L
	Country	Province	District/	Region 1	Unit	Indicat	Revised Budget	Revised Estim	Revised Budget	Revised Budget	Budget Estim	Primary Average
5	Pakistan	Balochistan	Balochistan	Province	Percentage	Primary	95.1	26.7	23.9	22.4	21.4	37.9
12	Pakistan	Islamabad	Islamabad	Territory	Percentage	Primary	5.9	7.2	6.9	6.6	7.5	6.8
19	Pakistan	Khyber Pak	Khyber Pak	Province	Percentage	Primary	9.6	10.5	12.3	42.0	30.9	21.1
26	Pakistan	Punjab	Punjab	Province	Percentage	Primary	1.9	1.4	2.2	1.8	4.2	2.3
33	Pakistan	Sindh	Sindh	Province	Percentage	Primary	0.7	26.1	39.7	42.2	36.2	29.0
37												

**Question 5:** Which province allocated the most to development spending?

46. Make a copy of Education Budget sheet.
47. Rename Education Budget (2) as Q5
48. Select row 1 by click on Row 1
49. In the Main Menu go to Home – Editing – Sort & Filter – Filter.
50. Filter column F Indicator leaving just Development Education Budget as a Percentage of Total Education Budget
51. Rename L1 as Primary Average Development
52. Excel provides you a simple formula to calculate the numerical average or ‘mean’ = **AVERAGE(First cell # : Last cell#)** in these case =AVERAGE(G3:K3)
53. Extend the formula to all districts
54. Which province allocated the most to development spending?

Province/Territory	Indicator	Average Development
Balochistan	Development Education Budget as a Percentage of Total Education Budget	16.7
Islamabad Capital Territory	Development Education Budget as a Percentage of Total Education Budget	26.6
Khyber Pakhtunkhwa	Development Education Budget as a Percentage of Total Education Budget	48.5
Punjab	Development Education Budget as a Percentage of Total Education Budget	35.5
Sindh	Development Education Budget as a Percentage of Total Education Budget	10.5

**Question 6:** Which province experienced the biggest percentage change in Total Education Budget from 2010-2011 to 2014-2015?

55. Make a copy of Education Budget sheet.
56. Rename Education Budget (2) as Q6
57. Select row 1 by click on Row 1
58. In the Main Menu go to Home – Editing – Sort & Filter – Filter.
59. Filter column F Indicator leaving just Development Education Budget as a Percentage of Total Education Budget
60. Rename L1 as Percentage change 2010 to 2014
61. In general, to calculate the percentage change between two numbers – you need to first work out the change between the two numbers you are comparing. Then, divide the changed amount by the original number and right click, format cells and select percentage to change from a decimal to

percentage. In these case you need to type  $=(K8-G8)/G8$ , means the last Budget 2014-15 minus Budget 2010-11 divided by the original than is Budget 2010-11.

AVERAGE		X ✓ fx		=(K8-G8)/G8						
	C	D	E	F	G	H	I	J	K	L
1	District/	Region Type	Unit	Indicator	Revised Bu	Revised Es	Revised Bu	Revised Bu	Budget Est	Percentage change 2010 to 2014
8	Balochistan Province	PKR Million	Total Education Budget		19283.5	24118.0	25572.5	35530.9	40673.7	=(K8-G8)/G8
15	Islamabad Territory	PKR Million	Total Education Budget		55181.0	61355.0	69424.0	86014.0	84156.0	
22	Khyber Pak Province	PKR Million	Total Education Budget		18575.5	24379.5	30595.9	98363.8	117416.3	
29	Punjab Province	PKR Million	Total Education Budget		41355.6	55195.8	48242.7	63456.0	81106.7	
36	Sindh Province	PKR Million	Total Education Budget		26387.9	64649.6	109859.7	113557.4	145267.1	
37										

62. Extend the formula to all districts
63. Change column L as a percentages by select column L, then right-click on the select column, click on Format Cell and then in format cell window click on Percentage.
64. **Question 6:** Which province experienced the biggest percentage change in Total Education Budget from 2010-2011 to 2014-2015?

Province/Territory	Indicator	Percentage change 2010 to 2014
Balochistan	Total Education Budget (PKR Million)	110.92%
Islamabad Capital Territory	Total Education Budget (PKR Million)	52.51%
Khyber Pakhtunkhwa	Total Education Budget (PKR Million)	532.10%
Punjab	Total Education Budget (PKR Million)	96.12%
Sindh	Total Education Budget (PKR Million)	450.51%

**Question 7:** Which province received the most funding per capita in 2014-2015? (have to add population)

65. First of all, we need population data to compare which province is allocating the largest budget per student. We are controlling for the size of the population to be able to compare how much each region invests per student.
66. Make a copy of Education Budget sheet.
67. Rename Education Budget (2) as Q7
68. Select row 1 by click on Row 1
69. In the Main Menu go to Home – Editing – Sort & Filter – Filter.
70. Filter column F Indicator leaving just Total Education Budget (PKR Million)
71. To answer Question 7 is necessary to:
  - a. Add Population by province
  - b. Calculate with the Population Groups of 100,000. We are choosing 100,000 because each region has a population of over a million.
  - c. Calculate Total Budget from 2010 to 2015
  - d. And finally, calculate the budget per capita.
72. **Add population by province:**
  - a. Rename cell L1 in Q7 sheet as Population
  - b. Open **Population Statistics 2012.xlsx**
  - c. Copy and paste the data from **Population Statistics 2012.xlsx** column B cell by cell.  
NOTE: Copying cell by cell is NOT the best way to copy information into a dataset, it could be

introduce a lot of mistakes. We are doing it in this case because there are only five cells. The correct function to join two datasets is VLOOKUP.

	A	B	C	D	E	F	G	H	I	J	K	L
1	Country	Province	District	Region	Unit	Indicator	Revised	Revised	Revised	Revised	Budget	Population
8	Pakistan	Balochistan	Balochistan	Province	PKR Million	Total Education Budget	19283.5	24118.0	25572.5	35530.9	40673.7	13,162,222
15	Pakistan	Islamabad Capital	Islamabad	Territory	PKR Million	Total Education Budget	55181.0	61355.0	69424.0	86014.0	84156.0	1,151,868
22	Pakistan	Khyber Pakhtunkhwa	Khyber Pakhtunkhwa	Province	PKR Million	Total Education Budget	18575.5	24379.5	30595.9	98363.8	117416.3	26,896,829
29	Pakistan	Punjab	Punjab	Province	PKR Million	Total Education Budget	41355.6	55195.8	48242.7	63456.0	81106.7	91,379,615
36	Pakistan	Sindh	Sindh	Province	PKR Million	Total Education Budget	26387.9	64649.6	109859.7	113557.4	145267.3	55,245,497
37												

73. Calculate Total Budget from 2010 to 2015
  - a. Rename cell N1 in Q7 sheet as Total Budget Education
  - b. In N2 type =SUM(G8:K8), which means add everything from G8 to K8 to sum budgets for all years.
  - c. Extend the formula to all districts
74. And finally, calculate the budget per capita.
  - a. Rename cell O1 in Q7 sheet as Education Budget Per Capita
  - b. In O2 type =N8/M8, which divides the Total Budget Education by the number of people in the province.
  - c. Extend the formula to all districts
75. We get a very small decimal because the budget was calculated in MILLIONS of Rupees. To get the amount spent per citizen in Rupees, we need to add another column, label it Education Budget Per Capital Rupees and calculate =O2\*1000000.
76. **Question 7:** Which province received the most funding per capita in 2014-2015? (have to add population)

Province/Territory	Education Budget Per Capita (Rupees)
Islamabad Capital Territory	309176.0514
Balochistan	11029.94502
Khyber Pakhtunkhwa	10757.06869
Sindh	8321.434071
Punjab	3166.53491