New communication technologies

Eustat
EUSKAL ESTATISTIKA ERAKUNDEA
INSTITUTO VASCO DE ESTADÍSTICA

New communication technologies

Activity 230201(v2)
PROBLEMS
Absolute and relative data
Difficulty:

❖ Read the following text carefully and answer the questions.

INFORMATION SOCIETY SURVEY – FAMILIES (4th quarter 2008)

More than half of Basque household had Internet access in 2008

Basque and English grow significantly as Internet browsing languages

The number of Internet users aged 15 and over in the Basque Country stood at 929,300 in the fourth quarter of 2008, 50.5% of the total Basque population in that age bracket, according to Eustat data. This percentage was up 6.4% on the fourth quarter of 2007.

By province, the increase in number of users was highest in Alava. It was up 3.8% compared to the second quarter of 2008 and moved into first position in terms of the percentage of Internet users, with 51.5%. Bizkaia, with an increase of 3.6%, had 50.4% of the Internet users in the last three months, which puts it in second place. There was a slight downturn (0.6%) in Gipuzkoa, with 50% of the population aged 15 and over using Internet.

By age group, there was a notable increase (11.2%) among users aged 55 to 64 with respect to the second quarter of 2008, and among users over 65, with an 18.8% increase with respect to the second quarter of the same year and 64.1% compared to the fourth quarter of 2007. The use of Internet also increased (3.6%) among people in the 25.34 age bracket. 88.2% of people aged between 15 and 24 had used the Internet in the last three months, which was 4.5% down on the second quarter of the same year.

1/ According to this data, how many inhabitants aged 15 and over does the Basque Country have?

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2/ Name, in ascending order, the percentage of users by province in the second quarter of 2008.

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Digital media still first on most visited website list for second quarter of 2008

In second place, tourism sites were preferred in Alava, banking sites in Gipuzkoa and mail services in Bizkaia

Frequent Internet users in the Basque Country preferred digital media, followed by entertainment, public institutions, online banking and tourism-related sites, according to Eustat data for the second quarter of 2008.

The most visited website was still "elcorreodigital.com", with 12.2% of Internet users visiting it and a total of 102,400 hits recorded. The next most popular media were "diariovasco.com", with a percentage of 6.2% and "marca.es" with 3.9%.

Media was followed by entertainment-related mail services such as "hotmail.com", mentioned by 4.4% of Internet users.

3/ According to the data, how many hits were recorded?

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4/ According to the data, how many times was the newspaper "Marca" mentioned?

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5/ Do these figures reflect how you use the Internet? Which one is your most visited website?

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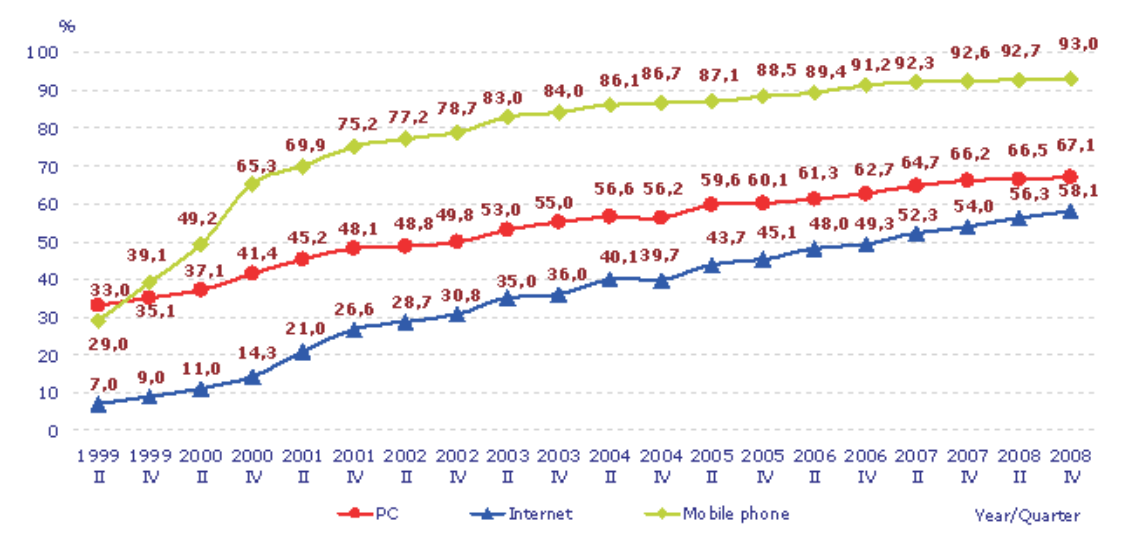
❖ Look at the data in the following diagram carefully and answer the questions below.

Development of population aged 15 and over by access to ICT equipment at home by quarter. 1999-2008. %



1/ What was the percentage increase of Internet use in 2005?

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2/ What was the percentage increase of mobile phone use in 2007?

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3/ Which increased by the highest percentage in 2007: Internet, PC or mobile?

.....

4/ Which increased by the highest percentage in 2008: Internet, PC or mobile?

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5/ Compare the increased percentage of mobile phone use in 2000 and 2008. What conclusions do you draw from your comparison?

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6/ Compare the increased percentage of Internet access in 2000 and 2008. What conclusions do you draw from your comparison?

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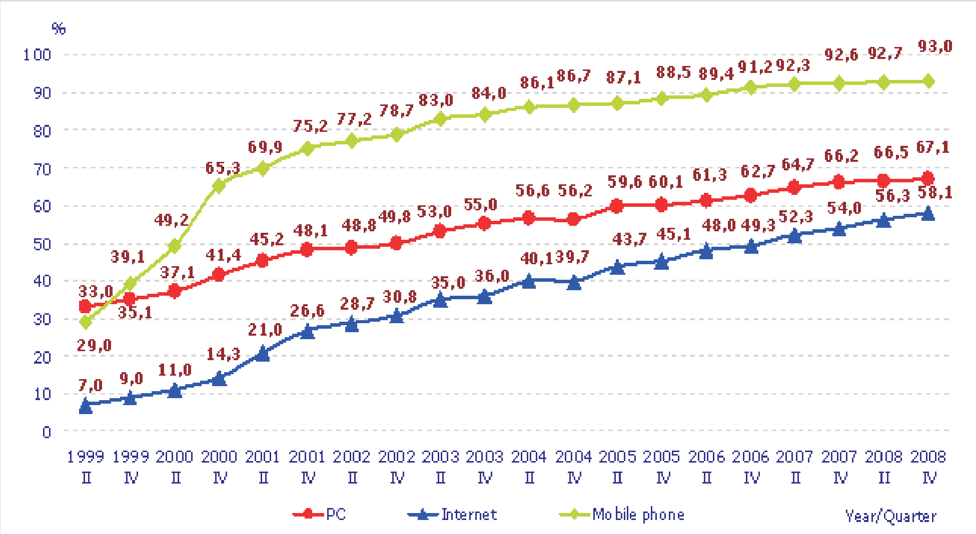
Activity 230203(v2)
RESEARCH
Reading diagrams
Difficulty:

❖ Look at the following graph carefully and write a brief report on its data.

Development of population aged 15 and over by access to ICT equipment at home by quarter. 1999-2008. %



Guidelines for writing a report:

- Which are the most or least used types of technology? Quote some figures on their use.
- Which type of technology is increasing in use? And decreasing?
- Which types of technology are already being used by more than half of the population? Which ones are not?
- Which types of technology are unlikely to increase in use? Which ones still have potential for growth?
- Comment on any data that you think is noteworthy.
- How do you or your family use this technology? Is that in line with the average data?

REPORT

TITLE: ....

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The "profile" is one of the most common ways of interpreting statistical information. In this case, you are considering the "Internet user's profile". The aim is to describe the group of people with the highest average in the different variables.

Internet user population aged 15 and over by province, sex, age and quarter (%). 2008

	Province				Sex		Age			
	Basque Country	Alava	Bizkaia	Gipuzkoa	Male	Female	15-24	25-34	35-44	45 and more
Total (thousands) Last quarter	**929.3**	**135.6**	**500.1**	**293.6**	**492**	**437.3**	**167.4**	**251.4**	**243.1**	**267.3**
2007										
IV Quarter	47.4	47.5	47.7	46.8	50.6	44.4	91.4	75.9	62.6	23.6
2008										
II Quarter	49.3	49.7	48.7	50.2	53.0	45.9	90.9	75.4	69.7	25.3
IV Quarter	50.5	51.5	50.4	50.0	55.0	46.2	88.2	79.2	70.1	27.1

Source: EUSTAT. Family – Information Society Survey

❖ According to this data, what is the profile of the average Internet user by age, sex and province?

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Internet user population aged 15 and over by level of education, activity and quarter (%). 2008

	Level of education			Activity		
	Primary	Secondary	Higher	Students	Professional	Inactive and unemployed
Total (thousands) Last quarter	**35.1**	**530.9**	**363.3**	**148.5**	**649.4**	**131.4**
2007						
IV Quarter	5.6	56.7	85.7	95.5	64.0	15.3
2008						
II Quarter	5.9	58.8	88.3	96.3	66.9	16.7
IV Quarter	6.3	60.7	88.7	95.4	68.7	17.7

Source: EUSTAT. Information Society Survey - Families

❖ According to this data, what is the profile of the average Internet user by level of education and type of activity?

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❖ Read the following table carefully. Work out the broadband percentage for each country. Copy this data into a spreadsheet.

	2003	2004	2005	2006	2007
UE 27	**:**	**:**	**:**	**:**	**18.2**
Germany	4.8	6.7	10.2	**15.3**	21.1
Austria	6.6	8.7	11.6	**15.8**	18.4
Belgium	10.1	14	17.4	**20.7**	23.9
Bulgary	:	:	:	:	5.7
Cyprus	:	2	2.7	**6.6**	11.1
Denmark	10.4	15.6	22	**29.6**	37.2
Slovakia	:	0.4	1.5	**4**	6.9
Slovenia	:	3.8	7.8	**11.4**	15.3
Spain	4.3	6.7	10	**13.2**	16.8
Estonia	:	7.6	11.1	**16.6**	20
Finland	6.6	11	18.7	**24.9**	28.8
France	4	8.2	13.9	**18**	22.3
Greece	0	0.2	0.8	**2.7**	6.8
Netherlands	9.8	14.7	22.4	**29**	33.1
Hungary	:	2.2	4.5	**7.5**	11.6
Ireland	0.2	1.7	4.4	**8.8**	15.5
Italy	2.8	6.1	9.5	**13.1**	15.9
Latvia	:	1.5	3.7	**6.8**	11.6
Lithuania	:	2.5	5	**8.4**	12.7
Luxembourg	2.3	5.7	11.7	**17.4**	24.6
Malta	:	3.5	10.4	**12.8**	13.9
Poland	:	0.5	1.9	**3.9**	6.8
Portugal	3.6	6.4	10.1	**12.9**	14.8
United Kingdom	3.7	7.4	13.5	**19.2**	23.8
Czech Republic	:	0.7	4.3	**8.4**	12.2
Romania	:	:	:	:	6.6
Sweden	8.6	12.1	17.1	**22.9**	28.3
Basque Country	**3.8**	**6.7**	**10**	**14.7**	**18.7**

(:) No data available

One of the most common ways of studying a distribution such as this one is to use position parameters, sometimes also known as percentiles.

In order to calculate percentiles, first decide in how many parts you want to divide the sample. Let us assume that you want to divide it into four parts. In this case, you would be dividing it in "quartiles".

Let us begin with the data for the year 2006, ordered from lowest to highest:

2.7; 3.9; 4; 6.6; 6.8; 7.5; 8.4; 8.4; 8.8 ; 11.4; 12.8; 12.9; 13.1; 13.2; 14.7; 15.3; 15.8; 16.6; 17.4; 18; 19.2; 20.7; 22.9; 24.9; 29; 29.6.

The median for this distribution is 13.15, which is the average between positions 13 and 14, from a total of 26 values.

The distribution is thus divided in two halves:

2.7; 3.9; 4; 6.6; 6.8; 7.5; 8.4; 8.4; 8.8 ; 11.4; 12.8; 12.9; 13.1;
and
13.2; 14.7; 15.3; 15.8; 16.6; 17.4; 18; 19.2; 20.7; 22.9, 24.9; 29; 29.6.

The median for the first half is 8.4, since it is in seventh place from a total of 13. That is the first quartile.
The second quartile is the median, 13.
The median for the second half is 18, in 7th place out of a total of 13. This value is the third quartile.

The countries are thus in this order:
First quartile:
Greece, Polands, Slovakia, Cyprus, Latvia, Hungary, Lithuania and Czech Republic.
Second quartile:
Ireland, Slovenia, Malta, Portugal and Italy.
Third quartile:
Spain, Basque Country, Germany, Estonia, Luxembourg and France.
Fourth quartile:
United Kingdom, Belgium, Sweden, Finland, Netherlands and Denmark.

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❖ Repeat the process (define quartiles and put countries in order) for the year 2007. Explore to find out how you can use the spreadsheet's statistical tools to do calculations more quickly.

❖ Do a comparative study and explain which countries' position improved or worsened their position between 2006 and 2007.

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Read the data in this table carefully and study the statistical exercise that follows.

Families (*) with Internet access at home, by country and year. Annual average (%). 2002-2006					
	2002	2003	2004	2005	2006
Germany	46	54	60	62	67
Austria	33	37	45	47	52
Belgium	:	:	:	50	54
Bulgary	:	:	10	:	17
Cyprus	24	29	53	32	37
Denmark	56	64	69	75	79
Slovakia	:	:	23	23	27
Slovenia	:	:	47	48	54
Spain	:	28	34	36	39
Estonia	:	:	31	39	46
Finland	44	47	51	54	65
France	23	31	34	:	41
Greece	12	16	17	22	23
Netherlands	58	61	:	78	80
Hungary	:	:	14	22	32
Ireland	:	36	40	47	50
Italy	34	32	34	39	40
Latvia	3	:	15	31	42
Lithuania	4	6	12	16	35
Luxembourg	40	45	59	65	70
Malta	:	:	:	:	53
Poland	11	14	26	30	36
Portugal	15	22	26	31	35
United Kingdom	50	55	56	60	63
Czech Republic	:	15	19	19	29
Romania	:	:	6	:	14
Sweden	:	:	:	73	77
Basque Country	**:**	**33.3**	**38.3**	**41.4**	**.....**

(*) Families with members between 16 and 74 years old

Source: http://www.eustat.es/estadisticas/idioma_i/tema_133/opt_0/temas.html
(You will find a table exactly like this or updated)

If you want to analyse how Internet access has developed in Europe as a whole, you can use the arithmetic average of the countries over the years. Here is a relative calculation for 2002, 2003 and 2004.

- 2004: 34%
- 2005: 42%

In order to work out these calculations, the countries with no available data for that year have not been included.

❖ Work out the average for the year 2006.

2006 average: .....

❖ What is happening to the average percentage of Internet access? Is it increasing or decreasing?:

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The increase in average use does not tell us anything about whether the differences between countries are increasing or decreasing, because an arithmetic average does not provide that information. In order to discover whether or not the differences between countries are increasing, you have to use dispersion parameters, which are the ones used to measure whether a value distribution is homogeneous (whether the values are close to the average).

The average deviation is an often-used deviation parameter that determines the average in absolute values of the difference between each value and the arithmetic average.

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If you want to calculate the average deviation, you should use that function in the spreadsheet. Here are the average deviations for 2004 and 2005 (the countries with no available data have been excluded).

The spreadsheet function used for this parameter is: DESVPROM. Follow these steps:

a) **Select a box.**
b) **Choose "Insert" then "Function" and then "DESVPROM".**
c) **Select the group of data (matrix) for which you want to work out the average deviation.**

Average deviation for 2004: 14.54
Average deviation for 2005: 15.76

❖ Find out the average deviation for 2006.
Average deviation for 2006:.....

❖ Produce two bar diagrams to represent the development of the arithmetic average and the average deviation for 2004, 2005 and 2006. Then comment briefly on the data.

❖ Comment:

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The average deviation is a parameter indicating whether a distribution's values are grouped around the average or are further away.

In other words, if one average deviation is higher than the other for two distributions with similar variables, you can deduce that values are not as closely grouped around the average.

Follow these steps to calculate an average deviation:

a) **Calculate the distribution's average.**
b) **Calculate the absolute value of the deviation of each value from the average.**
c) **Calculate the arithmetic average of the absolute values of the deviations.**

For example:
If the distribution is : 5,6,3,5,7,3,5,8,9,10

x	f	fx	[d]	
3	2	6	3.1	6.2
4	0	0	2.1	0
5	3	15	1.1	3.3
6	1	6	0.1	0.1
7	1	7	0.9	0.9
8	1	8	1.9	1.9
9	1	9	2.9	2,9
10	1	10	3.9	3.9
	N=10	61		19.2

X_m = 61/10 = 6.1
Average deviation = 19.2 /10 = 1.92

When using spreadsheets, the "DESVPROM" function calculates that value for a data distribution.

❖ Study the following chart carefully.

INFORMATION SOCIETY SURVEY - FAMILIES

Population between 16-74 who use Internet by age.
European Countries. 2nd quarter 2003. (%)

	Aged 16-24	Aged 25-34	Aged 35-44	Aged 45-54	Aged 55-64	Aged 65-74
Sweden	92	86	76	67	61	20
Iceland	90	84	83	76	52	25
Norway	85	79	73	72	44	19
Denmark	80	77	73	68	47	24
Germany	72	63	54	42	_	_
Basque Country	71	49	40	23	12	3
United Kingdom	60	61	53	47	30	_
EU 15	59	52	44	35	20	8
Portugal	47	32	20	15	_	_
Euro Area	_	48	40	29	15	6
Spain	_	43	31	21	9	3
Italy	41	40	30	21	8	3
Greece	33	23	16	7	4	1
Ireland	30	36	29	19	11	3

Source: ESIF. Eustat. Eurostat

❖ Take two distributions from the 25-34 and 35-44 table. From this set of values, remove those for the EU-15 and the Euro Area.

❖ Find out the average value of these distributions and compare them to those for the EU-15 and the Euro Area. What conclusions can you draw from your comparison?.....
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❖ Calculate the average deviation for these distributions and compare your data. Try to reach some conclusions about their properties.
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❖ Repeat the task with another age bracket of your choice.

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II Quarter Ranking 2008	IV Quarter Ranking 2008	Websites	Number of hits (thousands) IV Quarter 2008
		TOTAL	**950.5**
1	**1**	ELCORREODIGITAL.COM	117.1
2	**2**	DIARIOVASCO.COM	67.0
4	**3**	YOUTUBE.COM	54.4
7	**4**	EUSKADI.NET	42.7
3	**5**	HOTMAIL.COM	41.2
5	**6**	MARCA.ES	36.3
6	**7**	KUTXA.NET	36.2
9	**8**	ELPAIS.ES	28.4
13	**9**	WIKIPEDIA.ORG	26.7
11	**10**	BBK.ES	20.4
-	**11**	TUENTI.COM	18.6
15	**12**	EHU.ES	16.1
14	**13**	CAJALABORAL.ES	15.9
8	**14**	GIPUZKOA.NET	14.9
22	**15**	GARA.NET	14.2
20	**16**	INFOJOB.COM	13.7
34	**17**	SOLODEPORTE.COM	12.9

❖ The following text refers to data from 2008. Three mistakes have been intentionally included. The winner is the first one to find them all.

"As for the websites mentioned as 'last visited', news still leads the way as the five most mentioned are digital newspapers. ELCORREODIGITAL.COM is in first place, followed by DIARIVASCO.COM and YOUTUBE. The first non-press website is HOTMAIL.COM. It should be noted that the WIKIPEDIA.ORG website climbed four places while EUSKADI.NET fell by 3. EHU.ES has only dropped one."

The mistakes are:

1.- .....

2.- .....

3.- .....

II Quarter Ranking 2008	IV Quarter Ranking 2008	Portal	Number of hits (thousands) IV Quarter 2008	Development from II Quarter 2008
		Total	**942.1**	
1	**1**	GOOGLE	919.3	+
2	**2**	YAHOO	18.9	=
3	**3**	TERRA	1.4	-
9	**4**	GUAY	0.6	+
10	**5**	KAIXO	0.6	+
8	**6**	ALLTHEWEB	0.5	+
6	**7**	ELEBILA	0.5	+
11	**8**	OPERA	0.3	+

❖ Three mistakes have been intentionally included. The winner is the first one to find them all.

"When it comes to the most used search engines, Google, in keeping with its trend over the last few years, was the portal that was most visited by Internet users in the Basque Country in the fourth quarter of 2008, an was also in second place for that year as a whole. It should be pointed out that GUAY climbed four places. Google had just under twice as many hits as the second entry. Yahoo remained in second position, slightly under twice as many hits as Terra, in third place".

The mistakes are:

1.-.....

2.- .....

3.- .....

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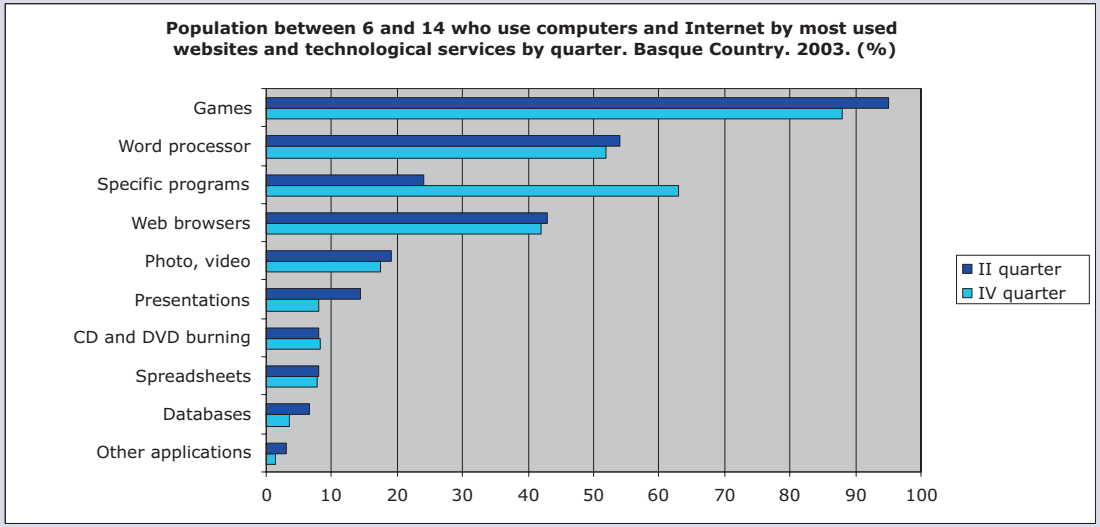

Source: ESIF. Eustat

❖ Prepare a table to compile this data in an estimated fashion. Assume that the Basque Country has a population of 2,100,000 people, 5% of whom are between 6 and 14 years old.

	II quarter 2003 (Relative value)	IV quarter 2003 (Relative value)	II quarter 2003 (Absolute value)	IV quarter 2003 (Absolute value)
Games				
Word processors				
Specific programs				
Web browsers				
Photo, video				
Presentations				
CD or DVD burning				
Spreadsheets				
Databases				
Other applications				

❖ According to our data, has the number of children aged 6 to 14 who download games increased or decreased during the above periods? By how many people?

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❖ According to our data, has the number of children aged 6 to 14 who burn CDs or DVDs increased or decreased during the above periods? By how many people?

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❖ Pick another value and estimate the difference between the number of users on one date and another.

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Statistical parameters are numerical values that characterise certain properties of a distribution of values. Some of the most simple and best-known types of parameters are central parameters, that is to say, the median and the average. We assume that you already know their definition and meaning, so we will refer to the other kinds of parameters, namely position parameters.

The median is a position parameter as well as a central parameter, since it is in the middle of a distribution.

Let us assume that the following figures represent the number of hours per week that a group of users spends browsing the web:
4,8,3,5,6,7,8,2,10,5,6,9,2,4,6,10,8,7,6,8
Let us put this distribution in order so that it will be easier to study: 2,3,3,4,4,5,5,6,6,6,6,7,7,8,8,8,8,9,10,10
The median for this distribution is 6, because it is the average between the values that occupy positions tenth and eleventh in the distribution:
2,3,3,4,4,5,5,6,6,6 ---- 6,7,7,8,8,8,8,9,10,10

A quartile is the median of each half of this distribution:
1st quartile: median of 2, 3, 3, 4, 4 ---- 5, 5, 6, 6, 6; in this case the average of 4 and 5, that is, 4.5
2nd quartile: the median of the distribution is: 6
3rd quartile: the median of 6, 7, 7, 8, 8 --- 8, 8, 9, 10, 10; in this case the average of 8 and 8, that is, 8.

The average for this distribution is: (2 + 3.2 + 4.2 + 5.2 + 6.4 + 7x2 + 8x4 + 9 +10 x 2)/20 = 125/20 = 6.25

- Make a histogram with this data and place the arithmetic average on it, as well as the 1st, 2nd and 3rd quartiles.

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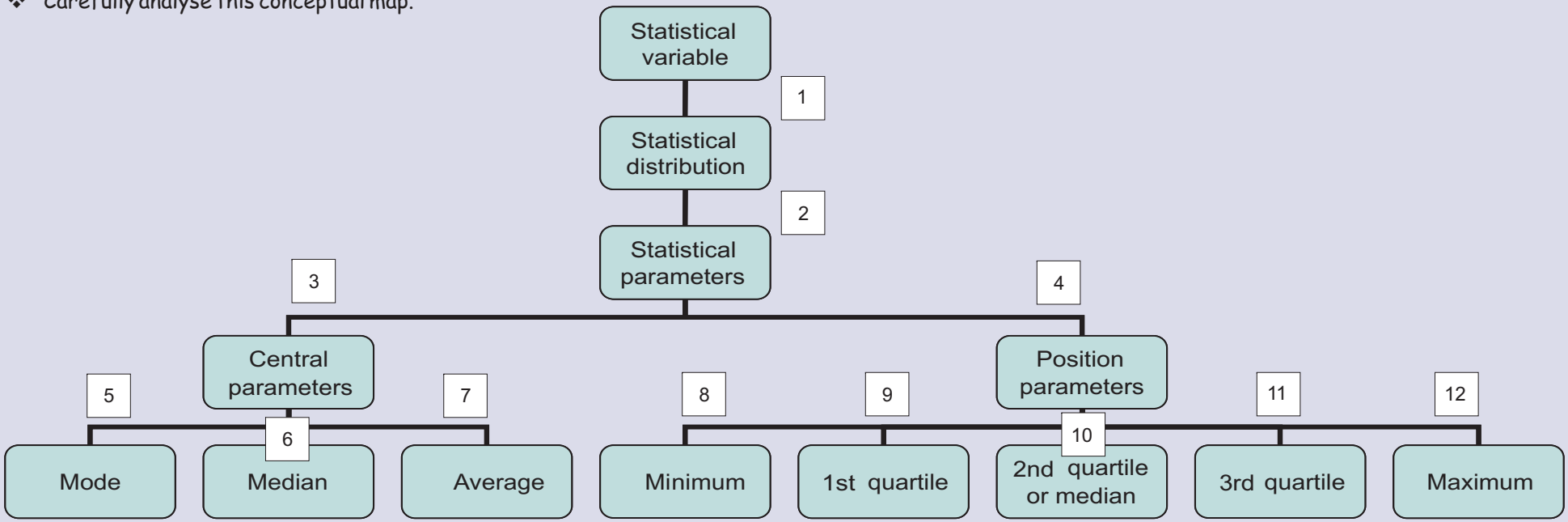
Activity 230210-2(v2)
SYNTHESIS
Statistic parameters
Difficulty:

❖ Carefully analyse this conceptual map.



❖ Define each of the 12 relations in this map. For instance:

1/ A statistical distribution is a group of values of the statistical variable.
2/ .....
3/ .....
4/ .....
5/ .....
6/ .....
7/ .....
8/ .....
9/ .....
10/.....
11/.....
12/.....

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+ The number of Basque Internet users aged 15 and over was 908,700 for the second quarter of 2008, 49.3% of the population within that age bracket, according to Eustat data. This percentage was a 4.1% increase over the fourth quarter of 2007.

1/ In the fourth quarter of 2007, the percentage of users aged 15 and over was:

a) 48% b) 47.36%
c) 47.33% d) 47.1%

2/ The total Basque population aged 15 and over is:

a) 1,765,879 b) 436,176
c) 1,843,204 d) 1,156,786

IT equipment at home (by thousands) by quarter, type of equipment, province and period

		2000	2001	2002	2003
Annual average	Basque Country	386.3	456.5	507.5	528.1
TV with teletext	Alava	52.2	63.5	68.0	72.0

3/ The arithmetic average in the Basque Country between 2000 and 2003 was:

a) 469.6 b) 467.8
c) 561.8 d) 341.1

	2006
Germany	67
Austria	52
Belgium	54
Bulgary	17
Cyprus	37
Denmark	79
Slovakia	27
Slovenia	54
Spain	39
Estonia	46
Finland	65
France	41
Greece	23
Netherlands	80
Hungary	32
Ireland	50
Italy	40
Latvia	42
Lithuania	35
Luxembourg	70
Malta	53
Poland	36
Portugal	35
United Kingdom	63
Czech Republic	29
Romania	14
Sweden	77

+ This chart shows the percentage of families who have Internet access at home in each country in 2006.

4/ The median of this distribution is:

a) 34 b) 41
c) 45 d) 42

5/ Slovakia is in:

a) The first quartile b) The second quartile
c) The third quartile d) The fourth quartile

6/ The average deviation is:

a) 14.6 b) 12.8
c) 15.21 d) 13.9

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+ In a survey on the degree of satisfaction regarding a customer support service, these results were obtained on a scale of one to five:

	Number of answers for this value
1	3
2	6
3	7
4	7
5	2

7/ The average assessment that matches the arithmetic average of this distribution is:

a) 2.9 b) 2.96
c) 3 d) 1.5

8) The average deviation is:

a) 2 b) 3.1
c) 1.3 d) 0.93

+ Only one of these sentences is true. Which one?

9/

a) The arithmetic average is a dispersion parameter.
b) The average deviation increases if the average increases.
c) A high average deviation indicates that the values are not close to the arithmetic average.
d) A high average deviation indicates that the values are close to the arithmetic average.

+ Only one of these sentences is false. Which one?

10/

a) The arithmetic average is a central parameter.
b) The arithmetic average is higher than the lowest value and lower than the highest value of a distribution.
c) The mode is the highest value of a distribution.
d) The mode indicates one value of a distribution.

Eustat
EUSKAL ESTATISTIKA ERAKUNDEA
INSTITUTO VASCO DE ESTADÍSTICA

New communication technologies

Test solutions:

1.b
2.c
3.a
4.d
5.a
6.c
7.b
8.d
9.c
10.c