



## Here or there? STATISTICS

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### Structure of the lesson plan

**Brief summary of the main activities:** Students must agree on the most suitable location of a hospital for 7 cities. In order to do this, they must carry out statistical research that contains a survey, frequency scales, the measure of central tendency parameters and statistical graphs.

**Main methodologies:** The main methodologies used will include collaborative work, frontal lesson and flipped classroom.

**Total time:** The total time for this learning unit should be 8 hours. However, this may be different according to the students' needs.



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### Competences:

#### **Knowledge**

- Learning the concepts of population, data sample and the different types of statistical samples.
- Producing and interpreting frequency tables and statistical graphs.
- Learning, calculating and interpreting central tendency parameters and simple average gap.
- Solving simple statistical problems.

*Mean*

*Mode:* The mode is the value that appears most often in a set of data

*Median:* The median of a set of data is the middlemost number in the set. The median is also the number that is halfway into the set. To find the median, the data should be arranged in order from least to greatest.

It is  $\frac{\sum x}{n}$  if  $n$  is an odd number or the average of  $\frac{\sum x}{n}$  and  $\frac{\sum x}{n}$  if  $n$  is an even number.

*Simple average gap:*



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**Skills**

- able to calculate mode, mean, median and simple average gap;
- able to complete a table with double entry;
- able to compare data distribution.

**Soft skills**

- Collaborative skills
- Respect each other

Learning outcomes:

European Key Competences: that will be developed

1. communication in one's mother tongue;
2. foreign languages;
3. digital skills;
4. basic skills in maths;



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5. learning to learn.

Assessment:

Prerequisites:

*pre requisite assessment*

- reading charts and tables
- calculating percentages
- including the use of logical connectives

**How to assess prerequisites – one test of 30 minutes**

6 short exercises

4 multiple choice tests

1. The cost of papering a wall, £C, is proportional to its area,  $A\text{m}^2$ .  
A wall of area  $18\text{m}^2$  costs £45 to paper.



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What area of wall could be papered for £75?

- 12 square metres
- 30 square metres
- 60 square metres
- 75 square metres

2. George is 12 years old. His sister is 18 years old. What's the ratio of George's age to his sister's age?

- 1:6
- 2:3
- 18:1
- 1:36

3. Find 40s as a percentage of 50s





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- 20%
- 40%
- 60%
- 80%

4. Convert to percentage:  $7/25$

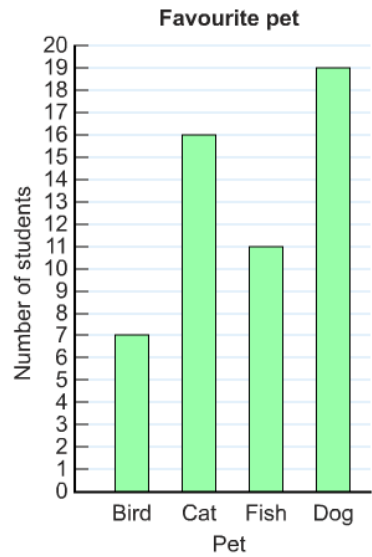
5. What is 85% of 17?

6. Students chose their favourite pet



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How many more students chose a fish than a bird as their favourite pet?





7. Every day of a week students ran (minutes)

	Minutes				
	Andre a	Anna	Marc o	Giorgi a	Mart a
Monday	10	7	8	9	9
Tuesday	7	9	10	8	7
Wednesday	9	10	9	7	8
Thursday	10	10	9	9	7
Friday	8	7	8	10	9

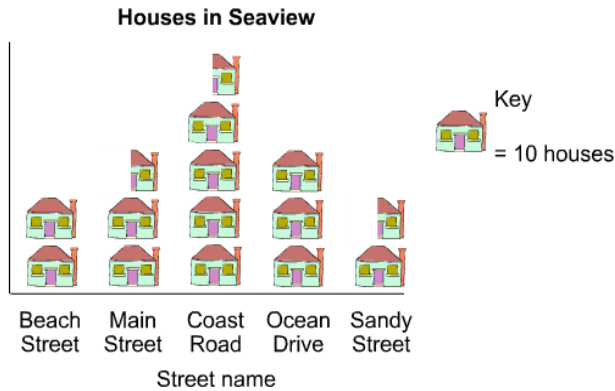
Who did run two more minutes on Friday than Andrea ran on Tuesday?





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8.



How many hoses are there in Main Street and Ocean Drive together?

\_\_\_\_\_

9. Which of the following Pie Graphs best displays the data that is shown in the table below?



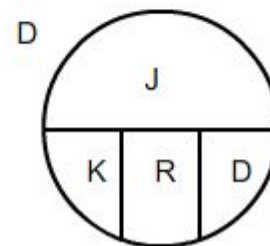
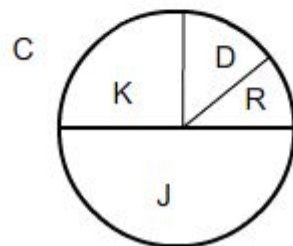
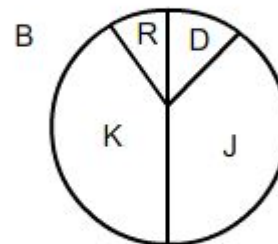
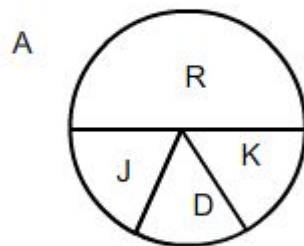


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Number of Points

Name	Number of Points
Kelly	250
Jay	500
Robert	125
Danny	125

K = Kelly  
J = Jay  
R = Robert  
D = Danny



- A
- B
- C
- D



10. Using the data below, approximately what percentage of students buy either hot dogs or hamburgers from the cafeteria at lunchtime?

#Food Bought	#Students
Hamburgers	241
Hotdogs	361
Pizza	129
Salad	45
Sandwich	63
Nothing	84
	Total:923

- A
- B
- C
- D



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**Pre requisites assessment:** it assigns one point to each question.

It is usefully to compare and to discuss data between teachers coming from different Countries

### Final Assessment:

#### Final test

**time: 60 minutes**

- ❖ 4 short exercises
- ❖ 16 multiple choice test

#### **score for the final test :**

- ✓ - multiple choice test: one point for correct answer  
zero points for wrong answer
- ✓ - short exercises: two points for correct answer;  
one point for incorrect answer in part;  
zero points for wrong answer.



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Total score is 24 points.

<u>Score</u>	<u>Assessment</u>
	This score range shows little or no skill in responding to the task
	This score range demonstrates some developing skill in responding to the task.
	This score range demonstrates adequate skill in responding to the task
	This score range demonstrates competent skill in responding to the task
	This score range demonstrates effective skill in responding to the task



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**1. Find the mean, median, mode and range of this data set: 19, 18, 21, 16, 15, 17, 20, 18**

- a mean= 18 median=16 mode=21 range=1
- b mean=18 median= 18 mode=18 range= 6
- c mean=15.75 median=15.5 mode= 19 range=1
- d mean=18 median= 19 mode= 20 range=2.5

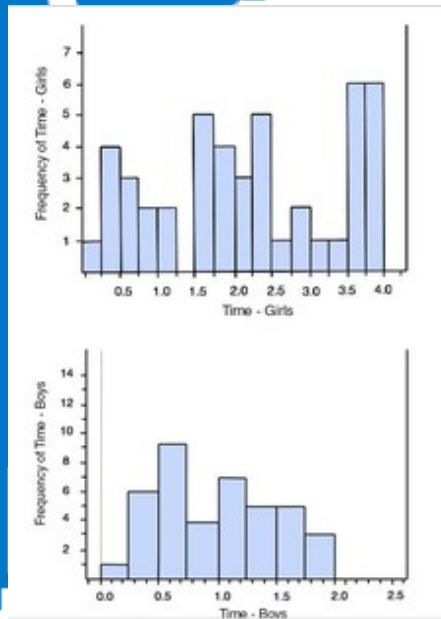
**2. On his first three quizzes, Patrick earned a 15, 18, and 16. (A perfect score would have been 20 points.) What does he need to earn on the next quiz to have a mean score of at least 17?**

- A 20
- B 17
- C 19
- D 18
- E 16



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3. These histograms graph the amount of time (hours per day) that 46 middle school girls and 40 middle school boys in San Francisco spend on the website FaceSpace. 50 boys and 50 girls took the survey but 4 girls and 10 boys did not use those sites at all. Each is graphed with a bin width of 0.25 hours. How many boys spend more than 1.5 hours/day on social networking sites?



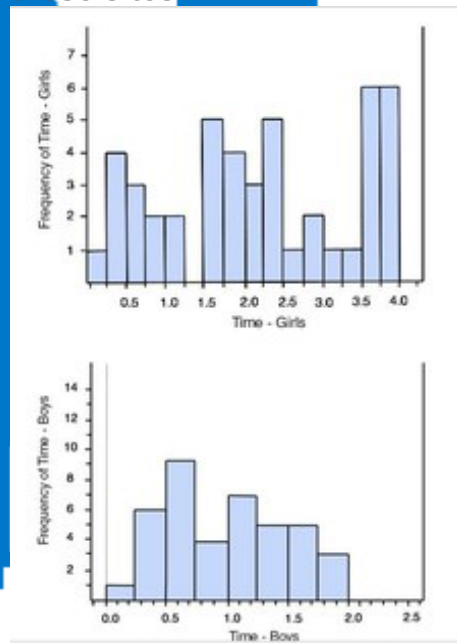
- A 5
- B 3
- C 8



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D 10

4. These histograms graph the amount of time (hours per day) that 46 middle school girls and 40 middle school boys in San Francisco spend on the website FaceSpace. 50 boys and 50 girls took the survey but 4 girls and 10 boys did not use these sites at all. Each is graphed with a bin width of 0.25 hours. Compare the percentage of boys and girls that spend more than zero but less than 1 hour/day on these sites.



- A about 50% of boys and about 22% of girls spend less than 1 hour/day
- B about 40% of boys and about 20% of girls spend less than 1 hour/day

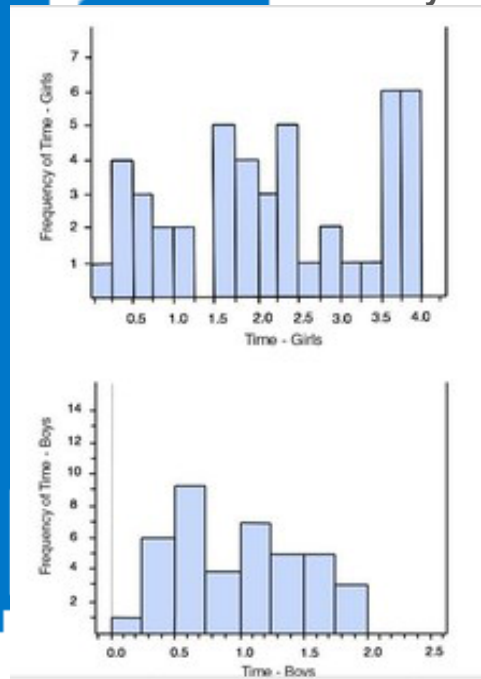




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about 40% of boys and about 24% of girls spend less than 1 hour/day  
 about 50% of boys and about 26% of girls spend less than 1 hour/day

**5. These histograms graph the amount of time (hours per day) that 46 middle school girls and 40 middle school boys in San Francisco spend on the website FaceSpace. 50 boys and 50 girls took the survey but 4 girls and 10 boys did not use these sites at all. Each is graphed with a bin width of 0.25 hours. Find the interval where the median of the boys' data set lies**



A 1.00 – 1.25 hour/day



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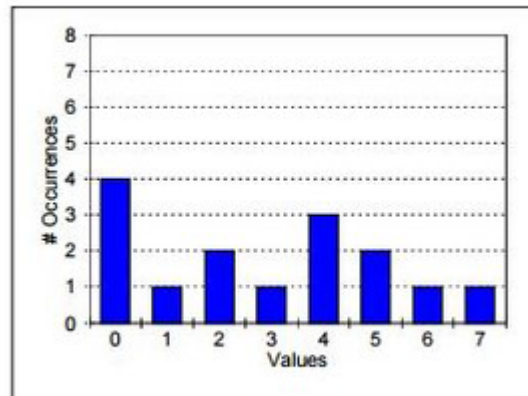
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- B 0.75 – 1.00 hour/day
- C 1.00 – 1.25 hour/day
- D 2.00 – 2.25 hour/day

6. The median of the data in figure is



- A 4
- B 2
- C 3
- D 3.5



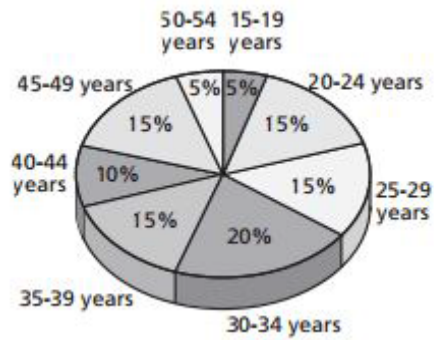
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7. The diagram below represents the age distribution of a group of 200 daily readers. What is the mean age of a reader in the group?



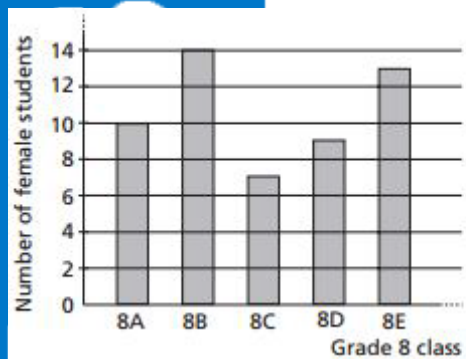
- A 34
- B 27
- C 40
- D 44
- E 39





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8. The graph shows the number of female students in five Grade 8 classes labeled 8A through 8E. The average (mean) number of female students in the five classes is:



- A 10.0
- B 10.7
- C 10.4
- D 10.3
- E 10.6



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9. The following raw data were obtained from the ages of 31 people interviewed at a cinema on last Saturday afternoon:

21, 17, 24, 23, 43, 42, 14, 51, 22, 18, 17, 15, 16, 23, 33, 21, 12, 13, 34, 22, 15, 12, 17, 22, 28, 29, 32, 38, 12, 11, 8.

What is the median for these data?

10. Nine nonnegative numbers have average 10.  
What is the greatest possible value for their median?





11. The time taken for a group of students to complete an examination question is given in the following table: Calculate mean, mode, median and range.

TIME (min)	10	12	14	16	18	20	22	24	26	28	30
FREQUENCY	1	3	3	4	5	6	5	4	4	3	2

- A mean: 20,4 min, mode: 20 min, median: 20 min, range: 20 min]  
B mean: 20,4 min, mode: 2 min, median: 6 min, range: 30 min]  
C mean: 20,4 min, mode: 20 min, median: 20 min, range: 10 min]  
D mean: 20,4 min, mode: 22 min, median: 6 min, range: 10 min]







**12. T George wrote seven tests and each was marked out of 100. No two of his marks were the same. He recorded the seven marks to do a statistical analysis. He accidentally recorded his highest mark higher than it actually was. How many of the following are altered because of his mistake? Mean; median; minimum test score; range.**

- A 0
- B 1
- C 2
- D 3
- E 4

**13. In a class there are 15 males and 10 females. Which of the Following statements is false?**

- A The relative frequency of males is 0.6
- B The percentage of females is 40% frequency.
- C The sum of the relative frequencies of males and females is 1.
- D The sum of the percentages of males and females is 25%.



14. The table shows the votes of tasks in math class of two students: Which of the following statements is true?

	Test1	Test2	Test3	Test4	Test5
Anna	5	6	7	6	5,5
Joseph	7	6	assente	6,5	4,5

- a The average of Anna is equal to the average of Joseph.
- b Average Anna exceeds the average of Joseph.
- c The average of Anna is less than that of Joseph.
- d The two averages cannot be compared.
- e Joseph and the average cannot be calculated.

15. A candidate at the end of a competition comes to know that it has an average score of 50 and knows the scores reported in all subjects except physical. What is the score in physics?

Mathematics	Physics	History	Gym	Geography
38	?	60	57	55





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- A 35
- B 40
- C 45
- D 50
- E 55

**16. In a competition** attended by 300 candidates. To the first question answered **correctly 70%** of the participants, the second 50%, the third 40%. How many **candidates respond well**, respectively, the first, second and third questions?

- A 210, 50, 40.
- B 210, 150, 100.
- C 210, 100, 120.
- D 210, 150, 120.
- E Non si può rispondere perché la somma delle percentuali è maggiore del 100%.

**17. An examination** consists of a laboratory test, an oral test and a written test. The three tests **respectively weight 6, 1 and 3**. A candidate receives 7 in the laboratory testing, **6 in oral exam and 9** in the written test. What is the weighted arithmetic mean?

- A 6,9
- B 7,3.



c 6,7  
d 6,5  
e 7,5

18. The time taken for a group of students to complete an examination question is given in the following table:

TIME (min)	10	12	14	16	18	20	22	24	26	28	30
FREQUENCY	1	3	3	4	5	6	5	4	4	3	2

How many students are in the group?

19. In an automobile factory we were produced 1200 cars in 4 models A, B, C, D  
How many Model B are





type of car	$N$	percentage
A	120	...
B	...	30%
C	300	...
D	...	35%

20. In an automobile factory we were produced 1200 cars in 4 models A, B, C, D The percentage di A is

type of car	$N$	percentage
A	120	...
B	...	30%
C	300	...
D	...	35%





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**The product of learning unit:**

Prezi Presentation OR Impress showing the statistical study and presentation of the study.

**Profile of the teacher; terms of reference**

The teachers must know how to work on Kahoot , Socrative digital platform, Prezi Presentation or Impress and to upload videos .





**MODULE ARTICULATION**

Time	Goal(s)	Learning Activities	Teacher's & Students' Roles	1) Learning Environment 2) Digital Technologies & Tools 3) Collaboration / Individual work 4) Reflection / Assessment
1h	to assess prerequisites			
1h	<ul style="list-style-type: none"> <li>To propose an authentic problem</li> <li>To motivate students to use mathematics as a means to make decisions (or to solve problems)</li> </ul>	<ul style="list-style-type: none"> <li>To propose the authentic problem: <b>You have to build a hospital for 7 cities. The cities are connected by a straight road from A to G.</b></li> <li>The teacher asks students about the criteria to be followed in order to make a decision: this thing creates expectation.</li> </ul>	<p><b>The teacher:</b> facilitator; controls the time; ensures that all the students contribute to the decision; asks some questions; activates their curiosity.</p> <p><b>The students:</b> suggest the ideas and strategies in the classroom and they detect data by using google maps and the websites of cities. (Brainstorming)</p>	<ol style="list-style-type: none"> <li>15 min in the classroom brainstorming and 30 min to research data and complete the following table.</li> <li>Computer or smartphone</li> <li>Collaborative and individual work</li> <li>Informal observation of the group work.</li> </ol>

City	A	...
Km from A		



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- **HOMEWORK:** to search YouTube tutorial videos for statistical unit, population statistics, absolute and relative frequency, mode median and mean, simple average gap

<p><b>2h</b></p> <ul style="list-style-type: none"> <li>• To know formulas and significance of population statistics, absolute and relative frequency, mode median and mean, simple average gap</li> <li>• To use them in simple exercises</li> </ul>	<ul style="list-style-type: none"> <li>• To see videos</li> <li>• To summarize and write formulas on the blackboard and on student's copybook</li> </ul>	<p><b>The students</b> show the videos and explain their doubts; develop exercises on copybook in pairs or solutions on the blackboard</p> <p><b>The teacher</b> writes the formulas on the blackboard and suggests exercises and solutions if it is necessary. It is guide, advisor, stimulator, observer</p>	<ol style="list-style-type: none"> <li>1) 30 min videos and 90 min exercises</li> <li>2) Computer, projector, textbook and copybook</li> <li>3) Flipped-classroom and work in pairs</li> <li>4) Informal observation of the group work. It is also possible to create a rubric of soft skills</li> </ol>
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- **HOMEWORK:** simple but graduated exercises from the textbook







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1h	<ul style="list-style-type: none"> <li>To consolidate knowledge through application</li> <li>To enjoy learning</li> </ul>	<ul style="list-style-type: none"> <li>Correction of exercises</li> <li>Competition with Kahoot</li> </ul>	<p><b>The teacher</b> built a test with Kahoot (Statistics by Olga Caporali) and then uses it; helps the students and explains the solutions, if it is necessary</p> <p><b>The students</b> do the exercises on the blackboard, and use “Kahoot”</p>	<ol style="list-style-type: none"> <li>30 min correction and 30 min competition</li> <li>Textbook, computer, phone</li> <li>Individual work and working in teams</li> <li>Informal assessment: tests with “Kahoot” (Statistics by Olga Caporali or free)</li> </ol>
<ul style="list-style-type: none"> <li><b>HOMEWORK:</b> graduated exercises from the textbook or digital resources</li> </ul>				
1h	<ul style="list-style-type: none"> <li>Retrieval of knowledge</li> </ul>	<ul style="list-style-type: none"> <li>Exercises in teams</li> </ul>	<p><b>The teacher</b> divides the students into teams of four members of different levels; the students work together; the teacher goes around in order to</p>	<ol style="list-style-type: none"> <li>All time</li> <li>Textbook, copybook</li> <li>Collaborative learning</li> <li>Informal observation of the group work</li> </ol>



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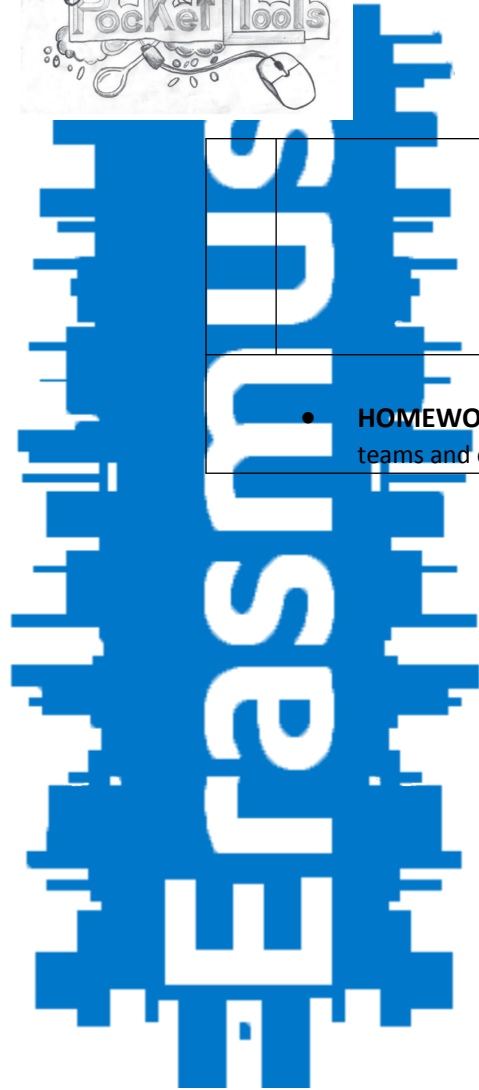


			<p>answer any possible questions. If the same problems come up, the teacher solves them on the blackboard.</p> <p><b>The students</b> help each other to solve the exercises</p>	
1h	<ul style="list-style-type: none"> <li>To assess knowledges and abilities</li> </ul>	<ul style="list-style-type: none"> <li>Final test</li> </ul>	<p><b>The students</b> make final test created with “Socrative”</p>	<ol style="list-style-type: none"> <li>60 min for test</li> <li>Computers</li> <li>Individual work</li> <li>Final Assessment</li> </ol>
<ul style="list-style-type: none"> <li><b>HOMEWORK:</b> to analyse the authentic problem</li> </ul>				
1h	<ul style="list-style-type: none"> <li>To learn discussing their own mistakes</li> <li>To find out the solution</li> <li>To develop self-assessment</li> <li>To share ideas, to listen and to negotiate.</li> </ul>	<ul style="list-style-type: none"> <li>To comment on the test results</li> <li>To discuss together the solution of authentic problem</li> </ul>	<p><b>The teacher</b> analyzes the final test answers with each student</p> <p><b>The students</b> discuss in teams the solution of authentic problem</p>	<ol style="list-style-type: none"> <li>30 min the analysis of final test 30 min discussion of together the solution of authentic problem</li> <li>Blackboard, colored chalks</li> </ol>





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		and then someone writes the solution on the blackboard helping by all the students	<b>3)</b> Collaborative and individual work
<ul style="list-style-type: none"><li>• <b>HOMEWORK:</b> To create with Prezi a Presentation of the learning unit and its realization (students are divided in teams and each team realizes a part of the presentation)</li></ul>			