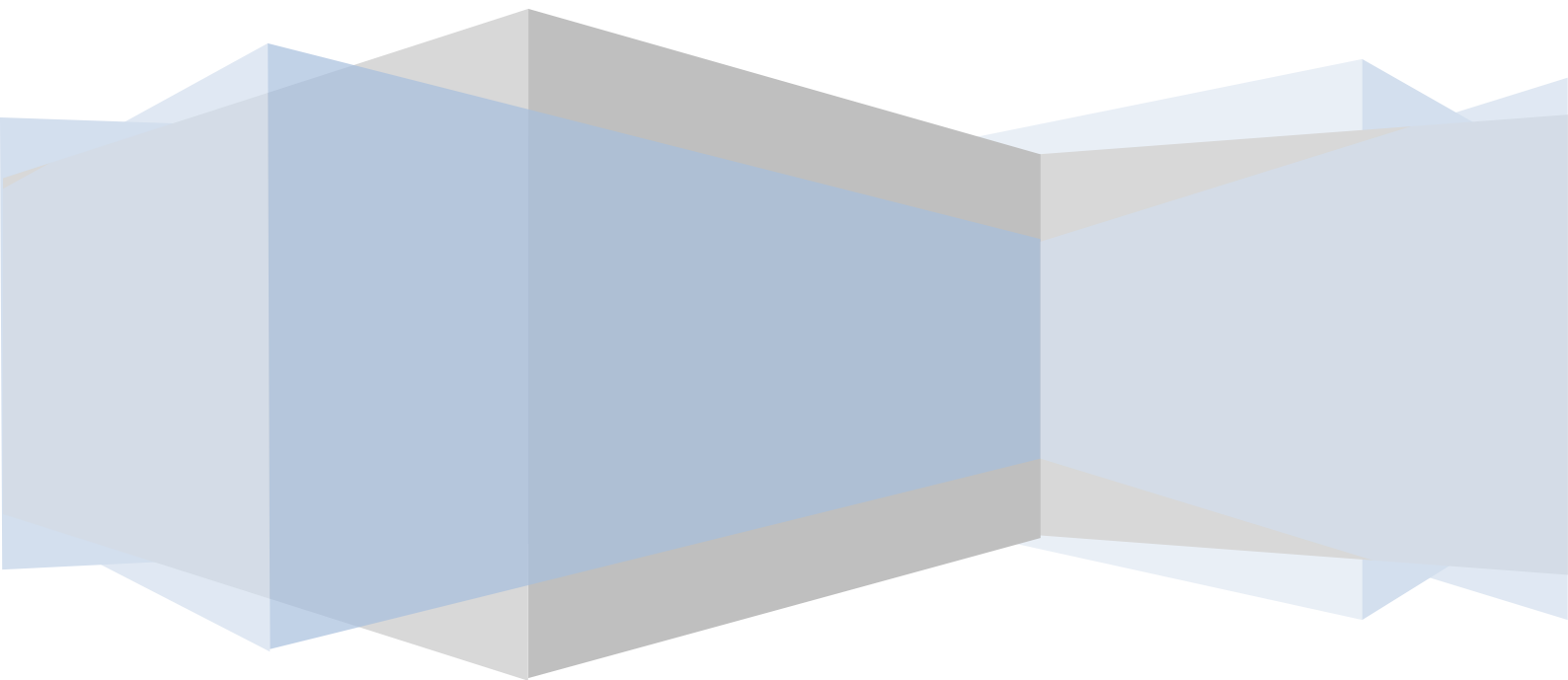


LEARNING / ASSESSMENT SCENARIOS

Deliverable 7.6 – Products from students

Demetra Pitta-Pantazi, Constantinos Christou,
Maria Kattou, Marios Pittalis, Paraskevi Sophocleous



CONTENTS

LEARNING/ASSESSMENT SCENARIO 1: COMPARING AND ORDERING FOUR-DIGIT NUMBERS - GRADE 3	2
LEARNING/ASSESSMENT SCENARIO 2: NETS - GRADE 5.....	10
LEARNING/ASSESSMENT SCENARIO 3: ESTIMATING AND MEASURING LENGTH USING STANDARD UNITS (CENTIMETERS) - GRADE 1.....	14
LEARNING/ASSESSMENT SCENARIO 4: PROBLEM SOLVING WITH ALGEBRAIC EXPRESSIONS - GRADE 6.....	21
LEARNING/ASSESSMENT SCENARIO 5: MEAN - GRADE 6.....	28



This project has been funded with support from the European Commission. This publication [communication] reflects the views only of the author, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

LEARNING/ASSESSMENT SCENARIO 1: COMPARING AND ORDERING FOUR-DIGIT NUMBERS – GRADE 3

INTRODUCTION

Student name: Raphaella Ioannou
Grade/Age of pupils: C' / 8-9 years old
Number of pupils: 20
Lesson duration: 40 minutes
Unit: 7 – Natural numbers up to 10 000

MAIN BODY

Lesson plan rationale:

The lesson is related to the strand of “Numbers”, since its major goal is to help students understand the decimal number system and natural numbers up to 10000. The goal of the lesson is the following: “N2.2. Compare and order natural numbers up to 10 000”. The particular goal is closely related to this lesson, because the learning goals of the lesson are based on comparing and ordering four-digit numbers.

Learning goals /Learning outcomes:

By the end of the lesson, students will be able to:

- Compare and order four-digit numbers.

Prerequisites-prior knowledge:

According to the Mathematics Curriculum, 1st graders are taught numbers up to 100, while 2nd graders are taught numbers up to 1000. In addition, pupils possess understanding of place value for ones, tens and hundreds. They can also order numbers, by using the symbols of $>$, $<$ and $=$. Finally, pupils are able to manipulate abacuses and cubes.

Mathematical practices:

- Make sense of problems and persevere in solving them
- Attend to precision
- Use appropriate tools strategically
- Model with mathematics

Activities:

Introductory activity – Orientation – Evoking interest and curiosity (10 minutes):

Pupils open their textbook (see Appendix 1) and the teacher asks a few questions, as follows:

- Why were the data collected?
- Which options are offered for the music event?
- Which theatre has less capacity: the theater of Kourion or Eleftheria Stadium?
- Which hotel is the most affordable?

Then, the teacher prompts students to read question A, which asks them to compare the two options (the theater of Kourion and Eleftheria Stadium) and decide which is the best for the music event. Pupils should take into account factors such as geographical position, hotel price, singer's performance cost and ticket price. Their answers should be based on calculations and appropriate arguments. Question B requires students to mention other factors such as place availability etc.

Activity 1 (8 minutes):

The teacher gives students the opportunity to manipulate the abacuses, in pairs. Later, the teacher asks students to represent the following four-digit numbers, by using the abacus: 1523, 3014, 6205, 9860 and 3000.

Students are given a worksheet (see Appendix 2) and write down the numbers being represented by the abacuses. After that, they are encouraged to assess the answers of their partner (peer assessment). During this activity, the teacher asks questions, in order to guide students:

- What is the value of each rod of beads?
- How many units, tenths, hundreds and thousands do the numbers have?

Activity 2 (5 minutes):

In this activity, students are required to compare and order four-digit numbers on a number line, using the following applet: (http://nlvm.usu.edu/en/nav/frames_asid_334_g_1_t_1.html?from=search.html - see Appendix 3).

Activity 3 (7 minutes):

This activity is described in Appendix 4. Students are asked to write down different four-digit numbers, using the digits 1, 2, 3 and 4 and place them on a number line. Once the activity is completed, students will undertake peer assessment.

Concluding activity - Reflection (10 minutes):

Students are given the worksheet shown in Appendix 5. The worksheet consists of three tasks. In the first task, students are confronted with four mathematical inequalities and are required to use one of the signs $<$, $>$ and $=$, in order to indicate which side is bigger. The second task involves four mathematical inequalities and students should find the missing digit which makes the inequalities true statements. In the third task, students need to use the digits 3, 4, 7 and 8 only once and compose a number larger than the given one. The teacher provides constructive feedback on students' work. This task can serve as a final assessment tool that can gauge students' ability to order and compare natural numbers using the $>$, $<$ and $=$ signs.

Appendix 1 – Introductory activity:

7&8 Lessons 7 & 8

EXPLORATION

The "Viston" office will organise a music event with a famous singer in Cyprus. The following information has been collected.



KOURION ANCIENT THEATRE

LIMASSOL

Capacity: 3000 seats

Rent: €1500



"ELEFThERIA" STADIUM

NICOSIA

Capacity: 6000 seats

Rent: €3000



"APHRODITE" HOTEL

LIMASSOL

Special offer: €90 per night



"CITY" HOTEL

NICOSIA

Special offer: €100 per night



Singer's performance cost:

At theatre: €3000

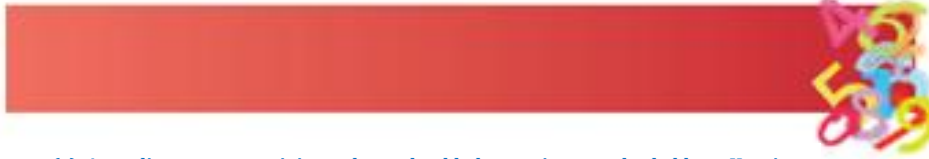
At stadium: €4000

Ticket price:

At theatre: €15 or €20, depending on the seat location

At stadium: €12

It is expected that 9000 people will attend the music event.



(a) According to your opinion, where should the music event be held: at Kourion Ancient Theatre or at “Eleftheria” Stadium?



(b) Should the organisers take into account any other factors in order to choose the most appropriate place for the music event ?

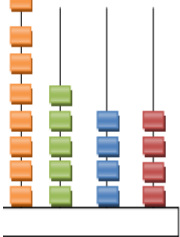
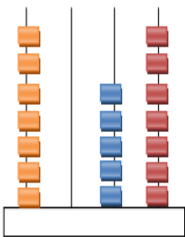



Appendix 2 a - Activity 1 :


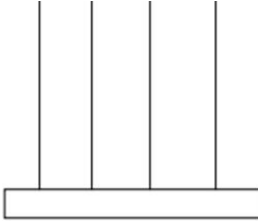


Appendix 2 b - Activity 1 :

Write down the numbers being represented by the abacuses:

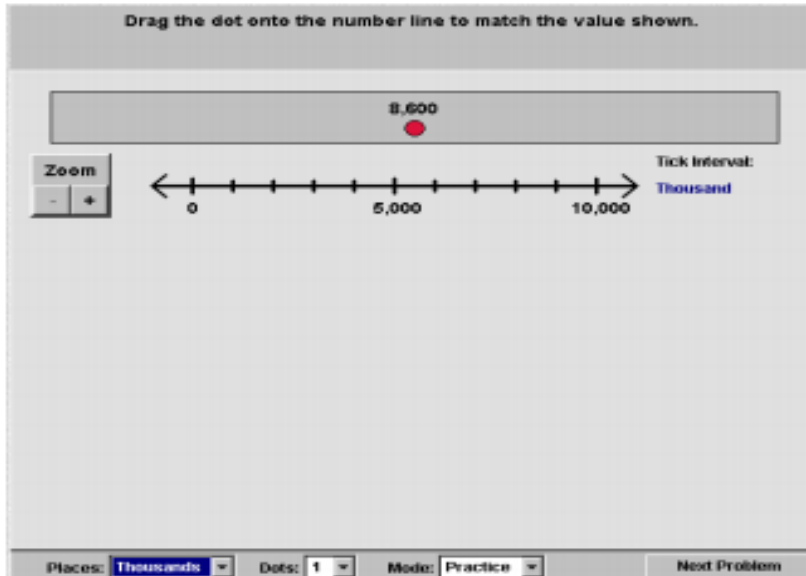
		
<input type="text"/>	<input type="text"/>	<input type="text"/>

Represent the following four-digit numbers, by using the abacus:

	
<input type="text" value="8.906"/>	<input type="text" value="9.990"/>

Appendix 3 – Activity 2 :

http://nlvm.usu.edu/en/nav/frames_asid_334_g_1_t_1.html?from=search.html



Appendix 4 – Activity 3:

INVESTIGATION

Theodoros used the digits 1, 2, 3, 4

In order to compose three different four-digit numbers. Then, he placed each number on a number line.

(a) Write down the numbers being composed by him.

(b) Which other four-digit numbers could be composed?

1000 1500 2000 2500 3000

32

The investigation page features a red header with a magnifying glass icon. The title 'INVESTIGATION' is in red. Below it, the text says 'Theodoros used the digits 1, 2, 3, 4' with the digits in colored boxes. A cartoon boy in a green shirt and cap points to the right. The main text asks to write down three different four-digit numbers composed of these digits and to place them on a number line. The number line ranges from 1000 to 3000 with major tick marks every 500 units. Three empty boxes are placed above the number line, with arrows pointing to specific points: one between 1000 and 1500, one between 2000 and 2500, and one between 2500 and 3000. A large empty box is provided for part (b). A small blue box with the number '32' is in the bottom left corner.

Appendix 5 – Concluding activity – Reflection:

1. Compare the numbers below using the symbols $<$, $>$ and $=$.

- ✓ 9583 9499
- ✓ 3968 1988
- ✓ 6895 8651
- ✓ 2368..... 5245

2. Complete the numbers with the missing digit to make the inequalities correct statements.

- ✓ $9875 < 9...74$
- ✓ $6354 > 6...55$
- ✓ $5437 < ...436$
- ✓ $4864 > 453...$

3. Write down a number that is larger than the numbers provided, by using the digits 3, 4, 7 and 8. Each digit can be used only once.

- ✓ $5183 < \dots\dots\dots$
- ✓ $8699 < \dots\dots\dots$
- ✓ $7989 < \dots\dots\dots$
- ✓ $6421 < \dots\dots\dots$

LEARNING/ASSESSMENT SCENARIO 2: NETS – GRADE 5

INTRODUCTION

Student name: Spyros Koutis
Grade/Age of pupils: E' / 10-11 years old
Number of pupils: 20
Lesson duration: 40 minutes
Unit: 8 – Stereometry

MAIN BODY

Lesson plan rationale:

The goal of the lesson is the following: “G3.11: Students will be able to recognize and construct the net of a cube, a rectangular prism, a square pyramid and a prism, using manipulatives and geometry software”.

Learning goals /Learning outcomes:

Students will be able to:

- Recognize the net of a cube, a rectangular prism, a square pyramid and a prism.
- Construct the nets of solids.
- Design the nets of a cube, a rectangular prism, a square pyramid and a prism.

Prerequisites-prior knowledge:

Students are able to recognize, name, describe and classify 3D shapes (cube, rectangular prism, pyramid, sphere, cylinder, cone, prism) and use the appropriate mathematical terms (faces, edges, vertices).

Mathematical practices:

- Construct viable arguments and critique the reasoning of others
- Use appropriate tools strategically
- Attend to precision

Activities:

Introductory activity – Orientation – Evoking interest and curiosity (10 minutes):

Each pair of students is given 8 geometrical solids (2 cubes, 2 rectangular prisms, 2 prisms and 2 pyramids) and some magnetic geometric nets (see Appendix 1). The teacher asks students to describe and recognize each solid. Then, students are encouraged to construct geometrical solids using the magnetic geometric nets.

Activity 1 (20 minutes):

Students are asked to unfold the faces of the aforementioned solids and observe their net. Students should demonstrate their work through a drawing and by writing down the number of faces that each solid has.

During a whole-class discussion, the teacher guides students in order to conclude that the net of a solid is a 2D shape that can be cut and folded to construct this solid.

Activity 2 (7 minutes):

Students complete the worksheet shown in Appendix 2, Part A. In particular, they have to choose the net that can't construct the given solids (a cube and a square pyramid) and explain their reasoning. The teacher asks questions to elicit students' knowledge and provides appropriate feedback.

Concluding activity – Reflection (3 minutes):

Students are prompted to complete the second part of the worksheet which is illustrated in Appendix 2. In this activity, students need to match each solid with the appropriate net.

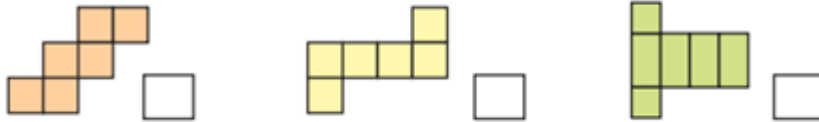
Appendix 1:



Appendix 2: Worksheet

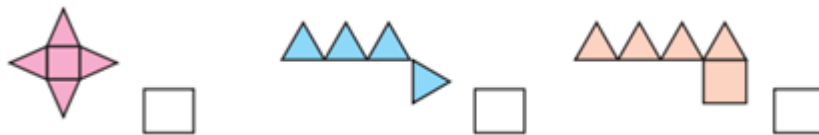
Part A:

Which of the nets below can't construct a cube? Select the right answer.



Explain your reasoning: _____

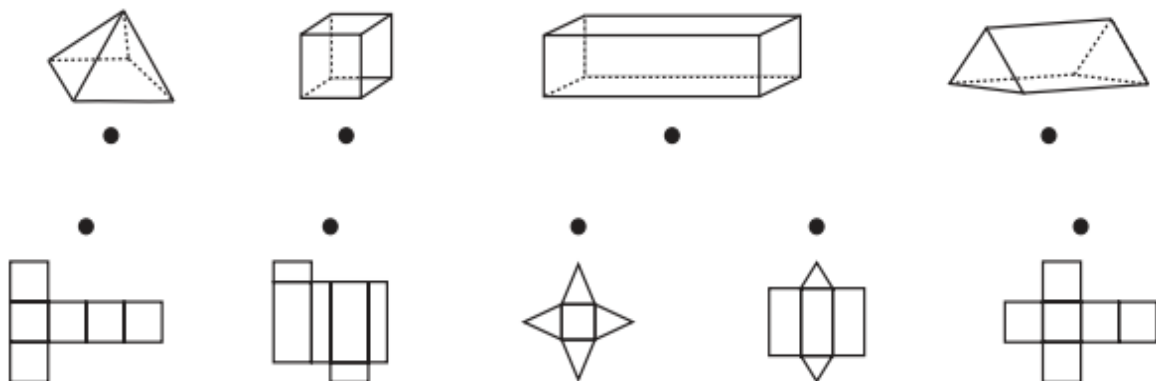
Which of the nets below can't construct a square pyramid? Select the right answer.



Explain your reasoning: _____

Part B

Match each solid with the appropriate net.



LEARNING/ASSESSMENT SCENARIO 3: ESTIMATING AND MEASURING LENGTH USING STANDARD UNITS (CENTIMETERS) – GRADE 1

INTRODUCTION

Pupil name: Nicole Vasileiou
Grade/Age of pupils: A' / 6-7 years old
Number of pupils: 20
Lesson duration: 40 minutes
Unit: 13 – Measuring length using standards units

MAIN BODY

Lesson plan rationale:

The present lesson is based on the learning goal M1.2: Pupils will be able to estimate and measure the mass and length of objects using standards units (kilograms (Kg), centimeters (cm)).

Learning goals /Learning outcomes:

By the end of the lesson, pupils will be able to:

- estimate the length of objects using standards units (centimeters (cm))
- measure the length of objects using a ruler

Prerequisites-prior knowledge:

1st graders are familiar with ordering and directly comparing objects, based on their height and length. They can also read, write and recognize numbers up to 100.

Mathematical practices:

- Make sense of problems and persevere in solving them
- Construct viable arguments and critique the reasoning of others
- Use appropriate tools strategically
- Attend to precision
- Look for and make use of structure

Activities:

Introductory activity – Orientation – Evoking interest and curiosity (6 minutes):

The teacher evokes students' interest through an exploration activity (see Appendix 1). In this activity, pupils are required to imagine how objects around them would look like, if they were only one centimeter tall. This activity reinforces creative and divergent thinking, since there are multiple correct answers.

Activity 1 (9 minutes):

The teacher asks pupils to think of other objects that are taller or shorter than a particular object. After that, pupils complete the activity in Appendix 2. This activity requires them to find two other objects whose height is double the height of the given figure. Pupils demonstrate their answers to their classmates during a whole-class discussion. The rest pupils have the opportunity to critique these answers.

Activity 2 (14 minutes):

Pupils are given a brush and a pencil and are encouraged to estimate the length of the brush, taking into account that the pencil is 10 cm long. They present their estimations and discuss about the reasonableness of each answer. After that, they measure the actual length of the brush and compare it with the estimated one. The teacher demonstrates pupils how to measure an object in centimeters using a ruler and assesses if they use the ruler properly.

Activity 3 (7 minutes):

Pupils should decide which pair of glasses can be placed in the given glasses case, by estimating the length of each pair. Once pupils estimate the length of each pair of glasses, considering that the glasses case is 11 cm long, they will be encouraged to measure these lengths using a ruler.

Concluding activity – Reflection (4 minutes):

In the concluding activity, pupils use a math applet shown in Appendix 5. They need to find out the length of several pencils by reading the scale on a ruler. Finally, pupils are required to estimate the length of their chairs' legs and explain their reasoning.

Appendix 1:

Imagine what would happen if Alice was 1 cm tall.



Appendix 2:

Panos has a card that shows the figure below.



Find two objects in your classroom whose height is double the height of the figure above.

Two horizontal blue lines are provided for writing the answer.

Appendix 3:

The pencil below is 10 cm long. How long is the brush?



Estimation: _____ cm

Measurement: _____ cm

Measurement: _____ cm



Appendix 4:



Which pair of glasses can be placed in the following glasses case?



Appendix 5:

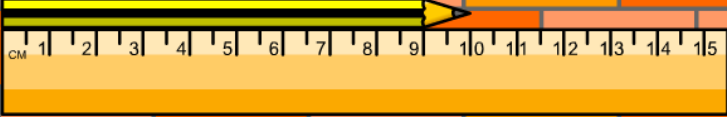

<http://www.bgfl.org/bgfl/custom/resources ftp/client ftp/ks2/maths/measures/index.htm>

MENU

READING LENGTH

How long is the pencil?
Read the scale on the ruler and write your answers out in full.
Remember to spell the unit of measurement carefully.

Click on me if you need to check your spellings!



length unit of measurement

check ?

LEARNING/ASSESSMENT SCENARIO 4: PROBLEM SOLVING WITH ALGEBRAIC EXPRESSIONS – GRADE 6

INTRODUCTION

Pupil name: Antonis Tampouras
Grade/Age of pupils: St'/ 11-12 years old
Number of pupils: 20
Lesson duration: 40 minutes
Unit: 5 – Algebra

MAIN BODY

Lesson plan rationale:

The main goal of this lesson is as follows: A3.10: Pupils will be able to write mathematical expression or equations with variables, to represent mathematical relations and solve problems.

Learning goals /Learning outcomes:

Pupils will be able to:

1. Represent variables using mathematical (algebraic) and verbal expressions.
2. Solve and pose additive and multiplicative problems, using algebraic expressions.

Prerequisites-prior knowledge:

Students are able to:

- Identify and describe quantitative relations, verbally and symbolically.
- Understand the concept of variable as a means for representing a mathematical situation.
- Investigate and represent arithmetic stories and situations, using variables, drawings, graphs and equations.
- Pose problems, using data from tables, pictures and graphs.
- Simplify mathematical expressions and solve mathematical equations.

Mathematical practices:

- Make sense of problems and persevere in solving them
- Reason abstractly and quantitatively
- Attend to precision
- Look for and make use of structure

Activities:

Introductory activity – Orientation – Evoking interest and curiosity (10 minutes):

Investigation: The teacher presents a mathematical applet on function machines (see Appendix 1). Pupils are required to record the output number that falls out of the machine for each input number that goes into the machine. The teacher asks the following questions, so as to help pupils execute this activity:

- Can you identify the function for each machine and write it down?
- Can the particular output be extracted by other operations?

Then, pupils are given the opportunity to communicate their ideas with their peers and instructor and reflect on their reasoning.

Activity 1: (8 minutes)

During this activity, pupils complete a worksheet (see Appendix 2). This worksheet involves 2 mathematical problems (one additive and one multiplicative problem) and pupils need to identify and algebraically express the relationship between two variables. It is expected that pupils will recognize the additive and multiplicative structure of these mathematical problems.

Activity 2: (8 minutes)

The teacher urges pupils to formulate the algebraic expression of five multiplicative and additive problems. This task is illustrated in Appendix 3. Pupils share their answers with their classmates and the teacher coordinates the discussion and offers them suitable feedback.

Activity 3: (10 minutes)

In activity 3, the teacher presents 4 algebraic expressions, either additive or multiplicative, shown in Appendix 4. Pupils work individually and pose 4 problems based on these expressions. Finally, they are encouraged to compare their problems to those of their peers.

Concluding activity – Reflection: (4 minutes)

Pupils are given several statements along with an algebraic expression and they should examine the correctness of each expression (see Appendix 5). In the case of a mismatch, they have to write down the suitable algebraic expression. This activity enables teacher to assess if the learning goals of the lesson have been reached.

Appendix 1:

<http://www.explorelearning.com/index.cfm?method=cResource.dspDetail&ResourceID=1040>

Function Machines 3 (Functions and Problem Solving)

Drop a number into a function machine, and see what number comes out! You can use one of the six pre-set function machines, or program your own function rule into one of the blank machines. Stack up to three function machines together. Input and output can be recorded in a table and on a graph.

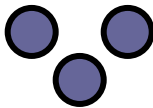
The screenshot shows the 'Function Machines 3' Gizmo interface. At the top, there are tabs for 'Lesson Info' and 'Gizmo®'. Below this, a yellow banner indicates 'Time remaining to use this Gizmo: 3:14' and 'Extend your five minute free pass.' The main workspace features a row of ten numbered input slots (0-10) and a '10' output slot. A vertical toolbar on the left includes icons for 'screen shot', 'arrows', 'tool tips', 'sound', and 'demo'. On the right, there is a grid of six function machines labeled A through F. Below the grid is a control panel for 'FMP 500' with an 'Add' dropdown, a '0' output field, and a 'Show function' checkbox. A text prompt says 'Drag a machine here to program it.' At the bottom, there are buttons for 'Clear stands' and 'Reprogram A-F', and a checkbox for 'Extend legs'.

Appendix 2:

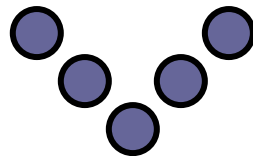
1. A scientist observed how quickly a bacterium multiplies and he assigned the data in the following table. It is your duty to find a rule that describes the bacterial growth and fill in the blanks.

Time (seconds)	Number of bacteria
1	1
2	4
3	9
4	
5	
6	
	81
	121

2. A few species of birds conduct flocking behavior in flight or while foraging. They fly in V-shaped formation. The strongest bird is the leader of the flock. In the figure below, every circle represents a bird of the flock.



1st flock



2nd flock

Fill in the blanks of the table.

Flock	Number of birds
1 st	3
2 nd	5
3 rd	
10 th	
	37
	45

Appendix 3:

Write an algebraic expression that represents each of the following mathematical problems.

☞ *Today is the birthday of Thanasis. If a is his present age, how old was he 12 years ago?*

☞ *The side of a regular hexagon is b cm. What is its perimeter?*

☞ *Georgia is half Christopher's age. If she is m years old, how old is Christopher?*

☞ *The height of a flower increases 15 cm per month. If today it is d cm tall, what will its height be on the 1st of May?*

☞ *The perimeter of a square is y cm. What is the length of its side?*

Appendix 4:

12•b

y+49

a-10

h/4

Appendix 5:

Read the following statements carefully and assess if there are any errors in the algebraic expressions.

Statements	Algebraic expression	Correct expression
Add 3 to the number k	$k+3$	
Four sweets more than g	$4\cdot g$	
Twice the number k	$5\cdot f$	
Add 15 to the number d	$d:15$	
Eleven times the number m	$11\cdot m$	
3 more than twice the number r	$3+2\cdot r$	
9 more than six times the number a	$6+9\cdot a$	
5 more than half the number g	$\frac{1}{2} + 5\cdot g$	
6 children will divide d sweets	$6:d$	
Mike is k years old and is four times older than Photini. How old is Photini?	$4+k$	
M litres of water are divided between 12 plastic bottles	$M:12$	
Apostolos had bought f sweets. The next day, he bought 10 sweets more. How many sweets he has now?	$10+f$	
Angelos is five years older than Maria. If Maria is 2k years old, how old is Angelos?	$2k+5$	

MEAN – GRADE 6

INTRODUCTION

Pupil name: Florentia Paraskeva
Grade/Age of pupils: St'/ 11-12 years old
Number of pupils: 20
Lesson duration: 40 minutes
Unit: 5

MAIN BODY

Lesson plan rationale:

Pupils are required to describe and compare data sets using the concept of mean through explorative and investigative activities.

Learning goals /Learning outcomes:

By the end of the lesson, pupils will be able to:

- Compute the mean using data from tables and bar charts.
- Solve and pose problems related to mean.

Prerequisites-prior knowledge:

Pupils have the ability to compute the mean of a given set of numbers and can also interpret bar charts and data tables.

Mathematical practices:

- Make sense of problems and persevere in solving them
- Reason abstractly and quantitatively
- Construct viable arguments and critique the reasoning of others

Introductory activity – Orientation – Evoking interest and curiosity (5 minutes):

The teacher presents the following problem to the pupils: Mrs Maria has a shoe shop. The takings of this week are shown in chart of the Appendix 1. What is the average of the total takings? Pupils should judge the opinion of two people about this problem, and construct proper arguments to justify their own answer.

Activity 1(8 minutes):

Pupils complete the activity illustrated in Appendix 2. They carefully observe the data presented in the table and answer the questions. Then, they communicate their answers and exchange opinions with their peers.

Activity 2(9 minutes):

The teacher asks pupils to play a game in groups (see Appendix 3). Each group has to complete the missing numbers so that the mean of every diagonal will be equal to a given number. During a whole-class discussion, pupils will share and compare their reasoning.

Activity 3 (10 minutes):

This activity is presented in Appendix 4. Once they solve the problem individually, pupils will exchange their solutions with their partner. They will correct their partners' answers. Then, pupils will engage in a whole-class discussion, in which they will talk about their solutions.

Concluding activity - Reflection (8 minutes):

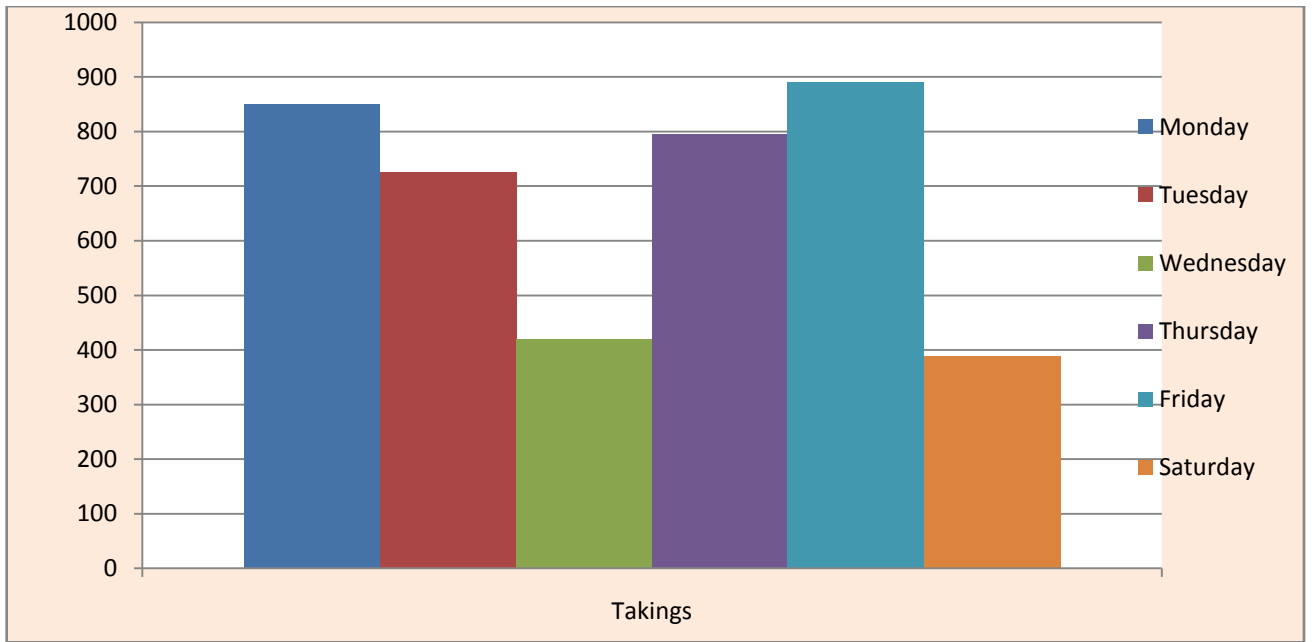
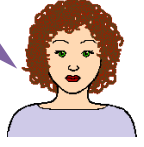
At the end, pupils are given two mathematical situations and need to pose two questions for them. After that, they should solve the two problems individually and compare their solutions with those of their classmates.

Appendix 1:

The average takings of each day are €700.



The average takings of each day are €678.



Appendix 2:

The table below shows the sales of a bakery during the last week. Answer the following questions:

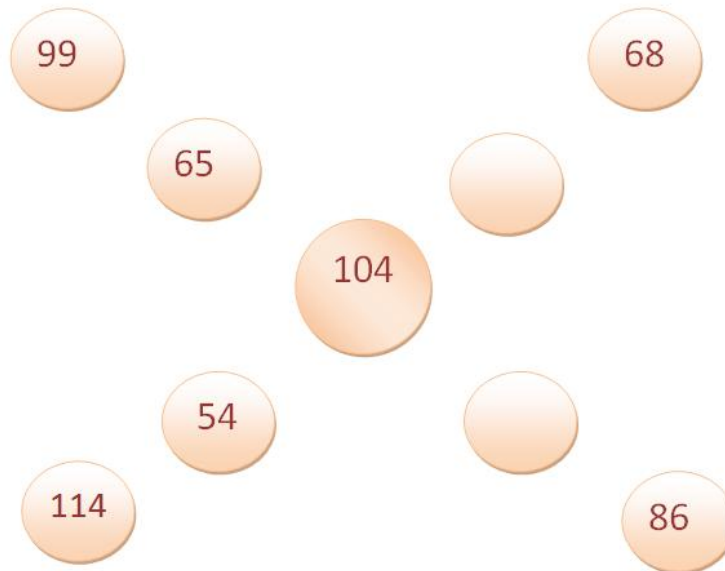
DAY	BAKERY'S SALES
Monday	112
Tuesday	87
Wednesday	121
Thursday	70
Friday	150
Saturday	198

- (a) Calculate the average sales of the bakery.
- (b) Find the bakery's sales of Sunday, given that the average sales during the whole week was €115.

Appendix 3:

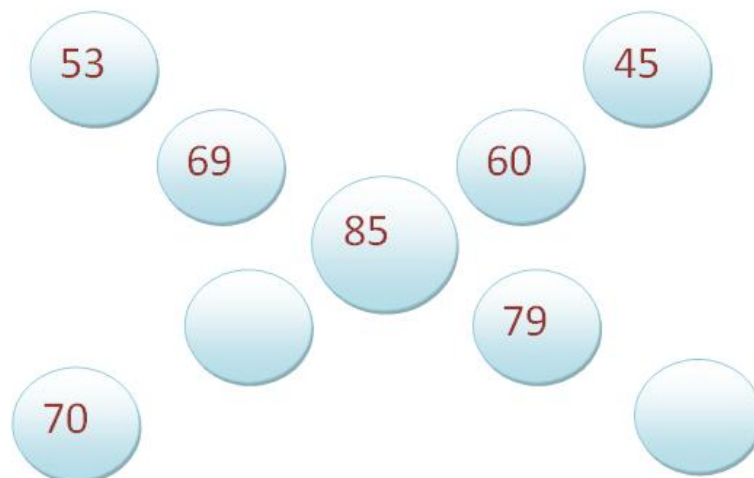
Team 1: Travellers

Complete the missing numbers so that the mean of every diagonal will be equal to 93.



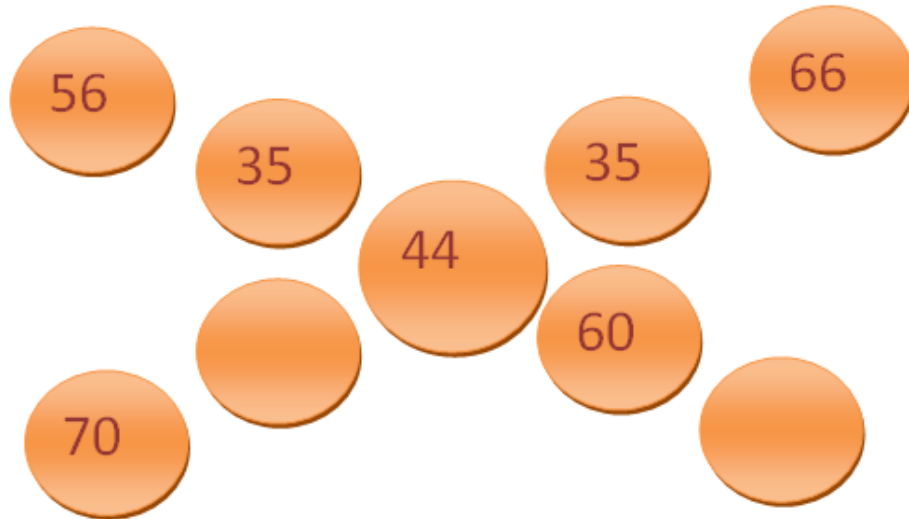
Team 2: Explorers

Complete the missing numbers so that the mean of every diagonal will be equal to 75.



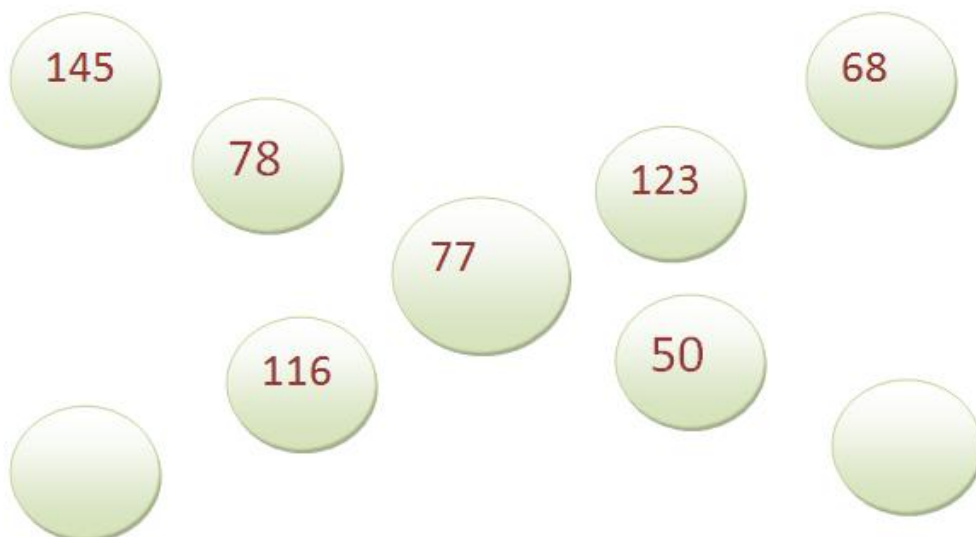
Team 3: Mathematicians

Complete the missing numbers so that the mean of every diagonal will be equal to 50.



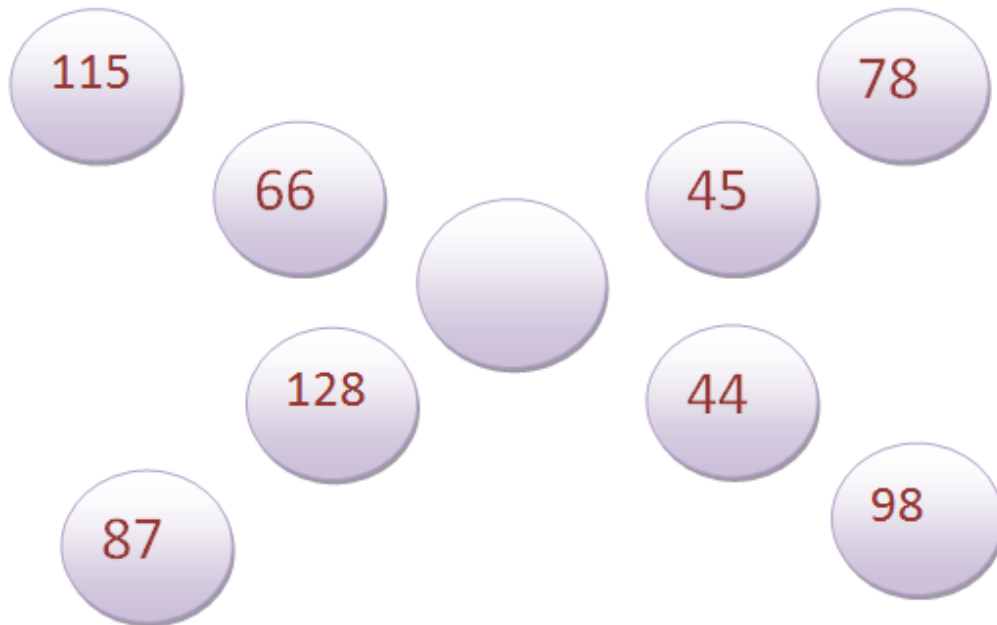
Team 4: Young Scientists

Complete the missing numbers so that the mean of every diagonal will be equal to 91.



Team 5: Ecologists

Complete the missing numbers so that the mean of every diagonal will be equal to 67.





Appendix 4:

Solve the problem:

Sophia and her classmates had a test in Science last Monday. The mean score of the test was 72. However, today they realized that Christina's score was 73 instead of 38. Can you help them find the correct mean score of the class?

Appendix 5:

1) Michael and George participated in 5 games of their school's basketball tournament. The following table presents the points they gained in each game.

	1 st game	2 nd game	3 rd game	4 th game	5 th game
Michael 	28	26	31	22	21
George 	27	35	21	26	29

☞ Write two questions related to the above situation and answer them.

Question 1:

.....

Question 2:

.....

2) Christina's sister is an 8th grade pupil. She has already completed five maths tests. Her grades in the four tests are as follows: 87, 89, 94 and 96. Grade A can be achieved only if a pupil's mean score is greater than 90.

☞ Write two questions related to the above situation and answer them.

Question 1:

.....

Question 2:

.....