TEMPLATE for BEST PRACTICE EXAMPLES - SOLVED TASK

1. Name of the task:
   STEAM activities on the Leonardo da Vinci prototype model.
2. Why did you choose this task?
   We aimed to encourage students to take an interest in all areas of STEAM education, to develop a creative approach to the natural and exact sciences and the ability to put them into practice in solving real - world problems.
3. Subjects covered from STEAM areas: history, technologies, mathematics, ICT, physics and geography.
4. Target group (age range and size of the group): 20 students aged 14; 4 students in a group.
5. Duration of the activity: history -1 lesson, technologies-2 lessons, mathematics-1 lesson, ICT-1 lesson, physics -1, geography -1. Total: 7 lessons.
6. Key words: STEAM, Parachutes, renaissance, Leonardo da Vinci.
7. Key sentence describing context of the activity, followed by short description (200 words):

STEAM activities on the Leonardo da Vinci prototype model. The integration of subjects in the implementation of STEAM activities took place in this project. History lessons analyzed the historical part of Leonardo da Vinci's parachute emergence. Technology lessons created a series of parachutes from small to large. Math lessons counted areas. IT lessons applied information skills. Physics lessons experimented if large parachutes fall slower than small ones and how the rate of fall is affected by the weight of the body or the material of the parachute if the parachute is conducted indoors. Temperature differences at different altitudes have been measured during geography lessons, affecting the flight of the parachutes outdoors.

8. Description of the activity environment, including the list of materials and tools needed:

The project was implemented at school. The rate of parachute fall was measured indoors. Air temperature measurements were performed outdoors using an 8-story building near the school.
Tools & Instruments: teaching material, computer for teacher, multimedia, internet access, parachute drawing of Leonardo da Vinci (from the Internet), desks, materials, scissors, glue, threads, rulers, math and physics subjects‘ formulas, Ms Excel programme, notebooks/tablets computers for students' own work, made Leonardo da Vinci‘s parachutes, chronometer, 25g, 50g, 75g weights, device for measuring air temperature and humidity.

9. Step by step, detailed description of the activity, including teaching and learning strategies

1 lesson. Integration into history lessons.
Topics covered: *Discussion of the Renaissance period, Leonardo da Vichy, his work, parachute.*
Activities: After analyzing the personality of Leonardo da Vinci, the students discuss the idea of a Leonardo da Vinci parachute with the teacher. Students work in groups to create a parachute prototype poster on an A4 sheet of paper, trying to draw a parachute diagram. The works are presented. The group presentation is evaluated (Appendix No1).
Lessons 2 and 3. Integration into technology lessons.
Topics covered: *The production of the Leonardo da Vinci parachute during the Renaissance.*
Activity: For the production wooden sticks of different lengths and synthetic material are used. The workflow of the construction of the student parachute is indicated:
* Cut a parachute pattern by cutting along solid lines.
* Fold the material along the dotted lines and carefully cut and fold to create a centered and balanced pattern.
* Carefully glue the synthetic material to the outside of the wooden frame to form a rectangular pyramid. It has one point at the top and four corners at the bottom.

* 8 mm thick string is cut in half to make two hoodlines. The two ends of one string are glued to the two corners of the parachute. Glue the other ends of the string to the other two corners. The cords at all corners are tied in one knot.

Lesson 4. Integration into mathematics lessons

Topics covered: *Status and isosceles triangles and a regular pyramid.*

Activity: Students are acquainted with the formulas for calculating the surface area and volume of a regular pyramid, predict the sequence of mathematical calculations, measure and record the required elements of the four pyramids in groups, calculate the side surface area, volume and volume of used wooden beams, discuss which elements are made of which will need to be calculated. Performs calculations (Appendixes 2, 3).

Lesson 5. Integration into ICT lessons.

Topics covered: *Application of mathematical formulas in Excel.*

Activity: Pupils, familiar with the possibilities of Excel in writing formulas and performing various calculations, discuss the sequence of writing formulas and create an Excel document by working in groups using available mathematical data and entering the simplest mathematical formulas (Appendix No 4).

Lesson 6. Integration into physics lessons.

Topics covered: *Speed, body weight and gravity.*

Activity: Physical experiments with 4 (two bigger and 2 smaller) Leonardo da Vinci prototype models and calculations are performed in the room. At the same time pupils drop parachutes from the same 3 m height, and students watching the fall, decide which landed the first by recording the time of the fall. Then students are asked to add weights to the parachutes. Students take four fall tests indoors and record the fall time. Working in groups, students collect data on how parachutes fall in the air and formulate conclusions (Appendixes No 5, No 6).

Lesson 7. Integration into geography lessons.

Topics covered: *Influence of temperature and humidity on Leonardo da Vichy parachute outdoors.*

Activity:Temperature differences between the parachute launch point and the Earth's surface are measured. The time chosen for the study, when the weather was already warm, was 1 pm, and the location was a high-rise building near the school. The study was conducted on the 8th floor of the house and near the house. The air temperature near the building was 5.5 ° C and the humidity was 30% (Appendix 7, Appendix 8).

10. Learning objectives/competencies:

Aim of the study: to encourage students to be interested in all areas of STEAM education, to develop a creative approach to natural and exact sciences and the ability to apply them in practice, solving real-world problems.

Objectives:

- Encourage students to explore the inventions made during the Renaissance in aspects of STEAM education, revealing the context in which they were created, the ways in which they can be applied, and their significance for human progress in solving real-world problems.
- To develop students' abilities to reveal the concept of the device chosen for realization, principles of construction, operation and use, interfaces with STEAM subjects, to practically produce and present a prototype of a parachute model.
- To analyze the types of pyramids, their properties, to draw regular quadrilateral pyramids and to calculate the volume, area and height.
- Analyze the application possibilities of Excel to perform mathematical calculations.

• Calculate the fall time of large and small parachutes from 3m. height, to record and calculate the rate of fall of different parachutes by changing the weights attached to the parachute 25g., 50g. and 75g.

• Analyze the influence of temperature and humidity on parachute flights in the field.

11. Evaluation/Assessment guidelines:

Teacher assessment, student self-assessment, and group assessment were applied in the lesson cycle (groups of students assessed each other's practical activities). There were applied formative and cumulative assessments. Also, there were assessed posters or PPT presentations and group presentations. Presentations were assessed by groups of students by completing the "Assessment presentation of group work" (Appendix No 1). By agreement with the students, these assessments are added to the cumulative score or recorded in a diary. Pupils' practical activities (parachute production) were assessed using assessment criteria agreed with the pupils.

12. Lessons learned:

Subject knowledge, subject integration was deepened through experiential learning, enhanced information technology, communication and collaboration skills.

13. Additional information/Links: there is no

Contact person:

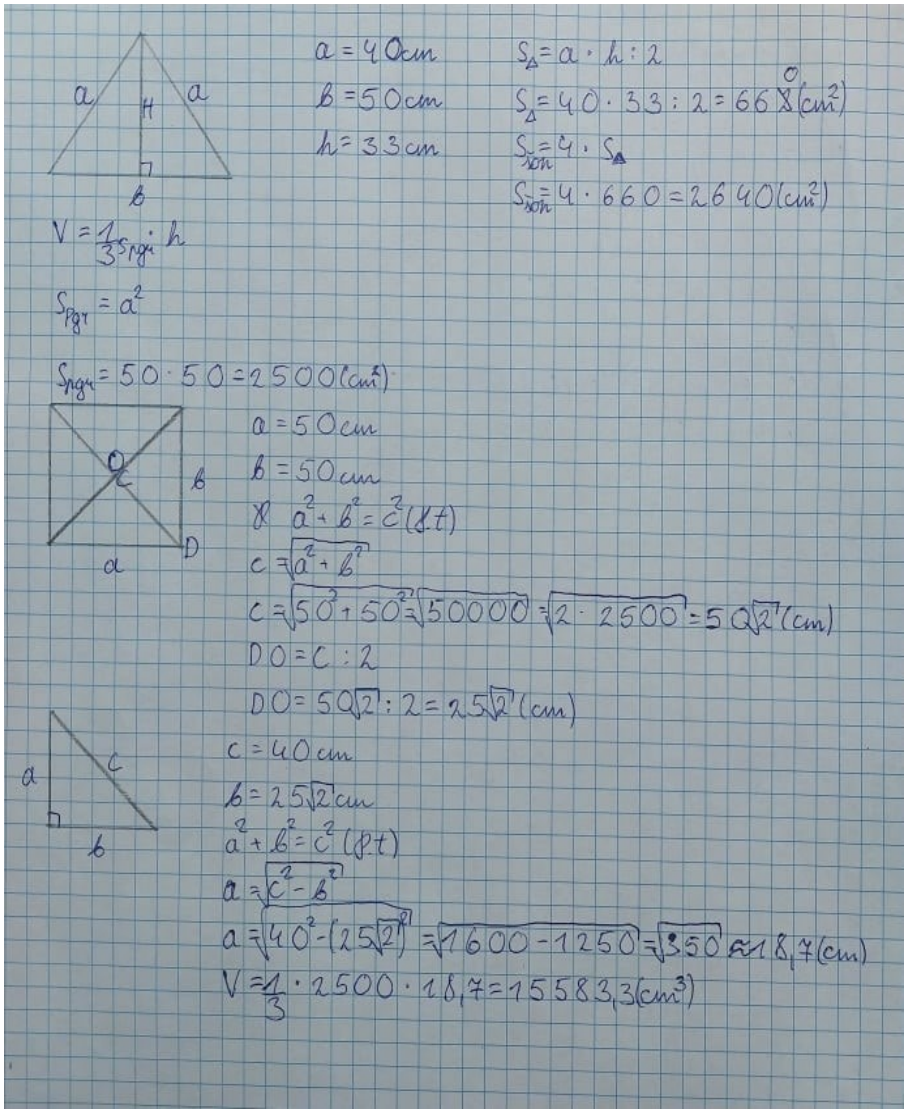
Physics teacher Irma Bartkevičienė e-mail: irma.bartkeviciene@gytariai.lt
History teacher Jūratė Baranauskienė
Technology teacher Jolanas Baršauskas
Math teacher Inga Pokvytienė
ICT teacher Rūta Norūtienė
Geography teacher Dalė Lapatinskaitė
This text was translated by English teacher Asta Jogminienė

Appendix 1

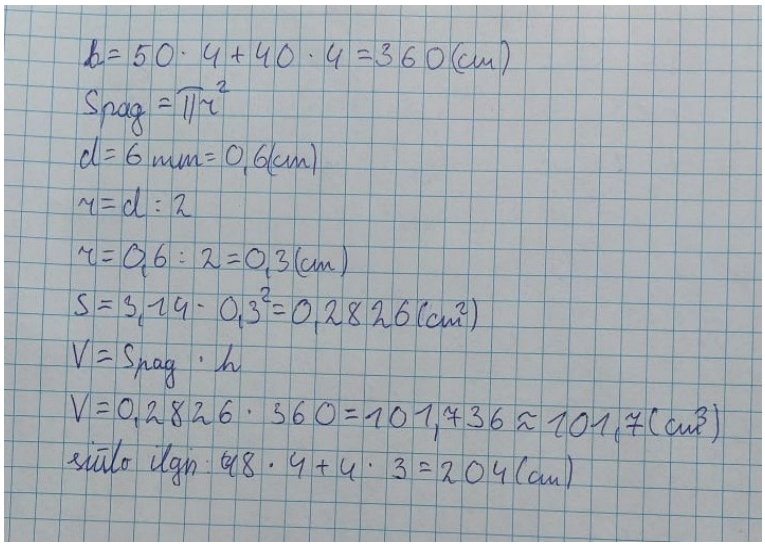
EVALUATION TABLE FOR GROUP PRESENTATION

Criteria and possible points	Points and comments are awarded	1 group	2 group	3 group	4 group
Was the presentation clear to the audience?	How many points?				
	Why so much?				
Was the presentation fun for the listeners?	How many points?				
	Why so much?				
Has the presentation broadened theaudience's horizons?	How many points?				
	Why so much?				
Did the speakers speak correctly?	How many points?				
	Why so much?				
Were visual aids used?	How many points?				
	Why so much?				
In all	How many points?				
	Summary				

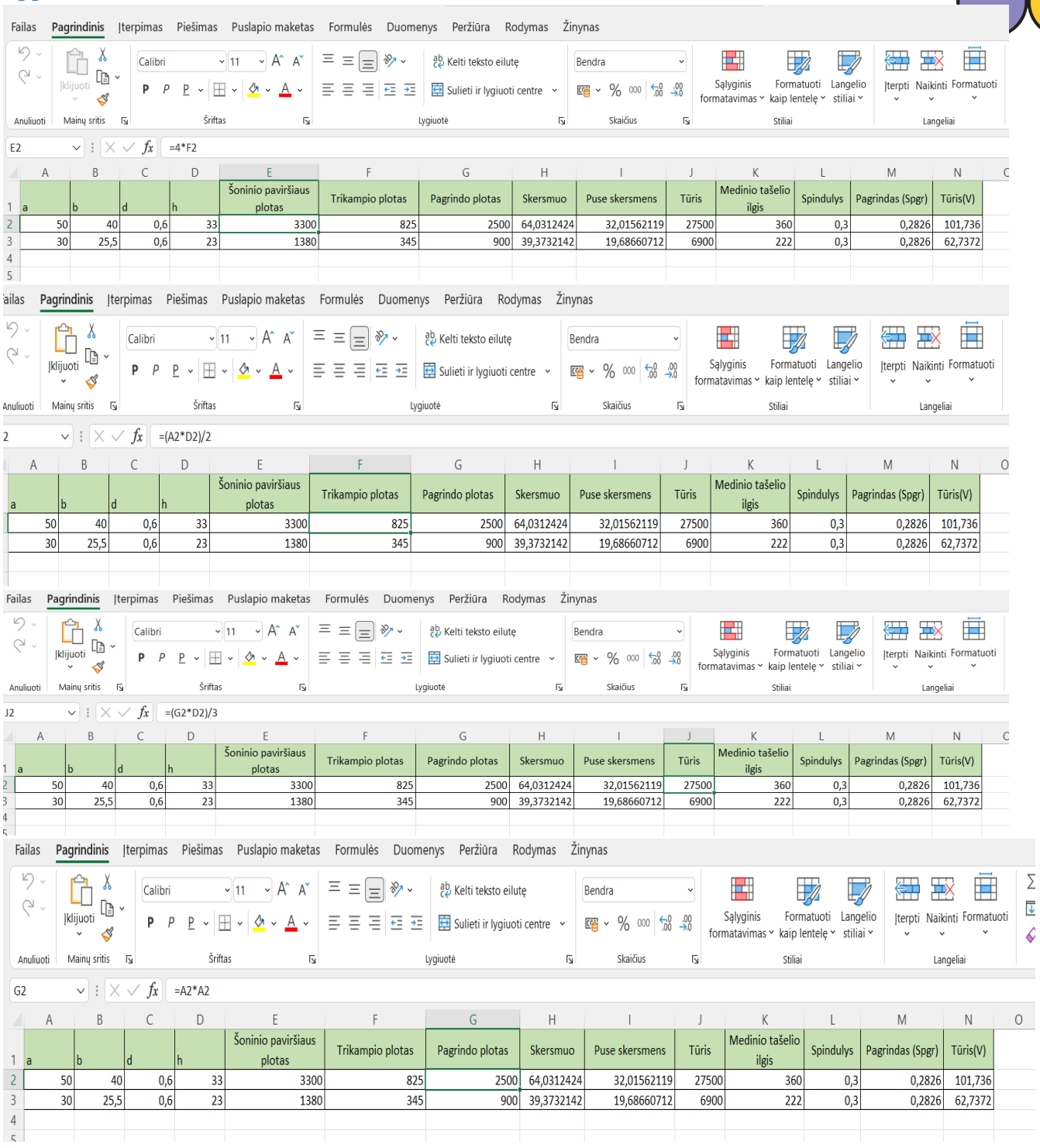
Appendix 2



Appendix 3



Appendix 4



Failas Pagrindinis Įterpimas Piešimas Puslapio maketas Formulės Duomenys Peržiūra Rodymas Žinynas

Anuliuoti | Mainų sritis | Šriftas | Lygiuotė | Skaičius | Stiliai | Langeliai

E2 =4*F2

	A	B	C	D	E	F	G	H	I	J	K	L	M	N
1	a	b	d	h	Šoninio paviršiaus plotas	Trikampio plotas	Pagrindo plotas	Skersmuo	Puse skersmens	Tūris	Medinio tašelio ilgis	Spindulys	Pagrindas (Spgr)	Tūris(V)
2	50	40	0,6	33	3300	825	2500	64,0312424	32,01562119	27500	360	0,3	0,2826	101,736
3	30	25,5	0,6	23	1380	345	900	39,3732142	19,68660712	6900	222	0,3	0,2826	62,7372
4														
5														

Failas Pagrindinis Įterpimas Piešimas Puslapio maketas Formulės Duomenys Peržiūra Rodymas Žinynas

Anuliuoti | Mainų sritis | Šriftas | Lygiuotė | Skaičius | Stiliai | Langeliai

2 =(A2*D2)/2

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
	a	b	d	h	Šoninio paviršiaus plotas	Trikampio plotas	Pagrindo plotas	Skersmuo	Puse skersmens	Tūris	Medinio tašelio ilgis	Spindulys	Pagrindas (Spgr)	Tūris(V)	
	50	40	0,6	33	3300	825	2500	64,0312424	32,01562119	27500	360	0,3	0,2826	101,736	
	30	25,5	0,6	23	1380	345	900	39,3732142	19,68660712	6900	222	0,3	0,2826	62,7372	

Failas Pagrindinis Įterpimas Piešimas Puslapio maketas Formulės Duomenys Peržiūra Rodymas Žinynas

Anuliuoti | Mainų sritis | Šriftas | Lygiuotė | Skaičius | Stiliai | Langeliai

J2 =(G2*D2)/3

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
1	a	b	d	h	Šoninio paviršiaus plotas	Trikampio plotas	Pagrindo plotas	Skersmuo	Puse skersmens	Tūris	Medinio tašelio ilgis	Spindulys	Pagrindas (Spgr)	Tūris(V)	
2	50	40	0,6	33	3300	825	2500	64,0312424	32,01562119	27500	360	0,3	0,2826	101,736	
3	30	25,5	0,6	23	1380	345	900	39,3732142	19,68660712	6900	222	0,3	0,2826	62,7372	
4															
5															

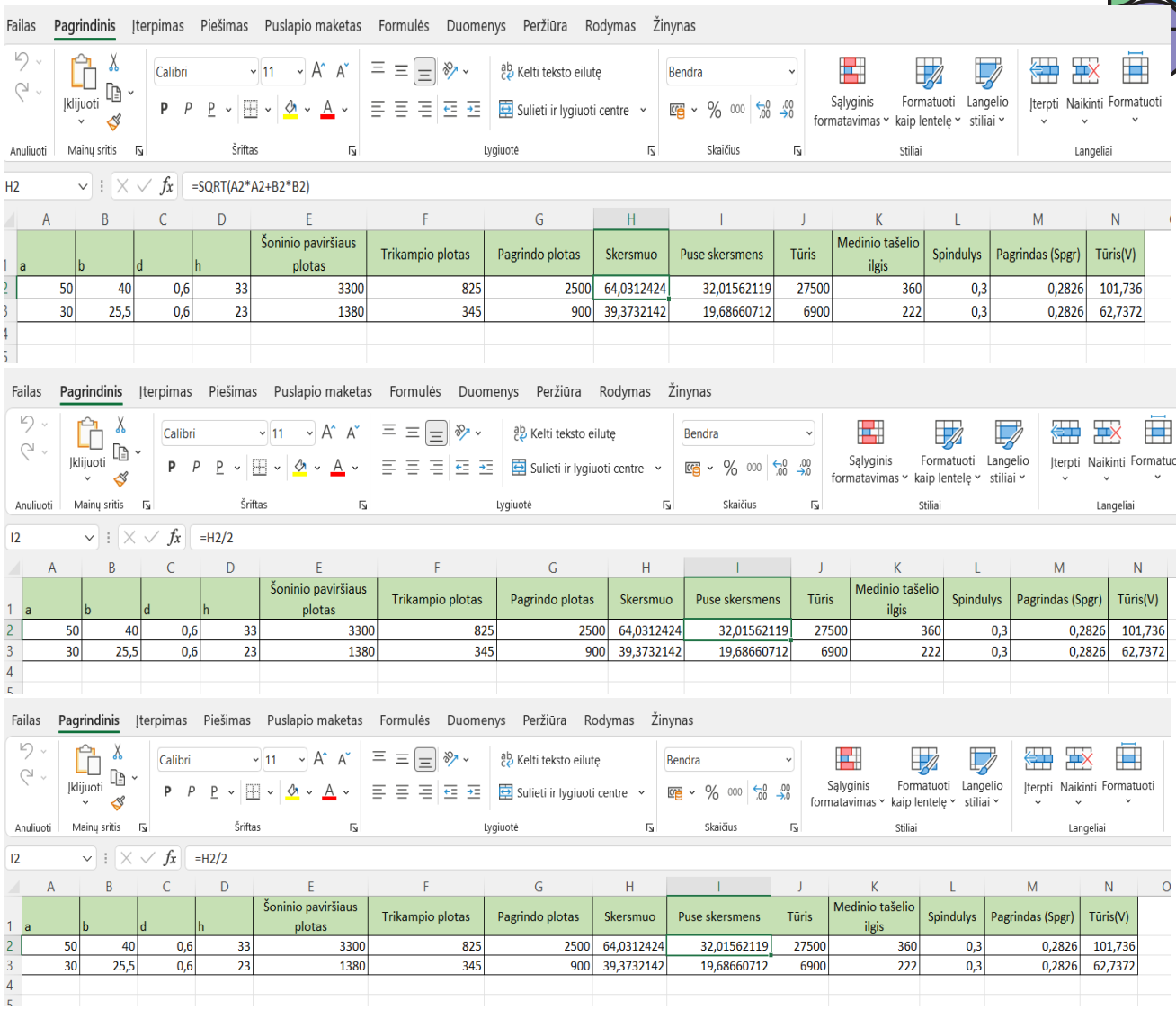
Failas Pagrindinis Įterpimas Piešimas Puslapio maketas Formulės Duomenys Peržiūra Rodymas Žinynas

Anuliuoti | Mainų sritis | Šriftas | Lygiuotė | Skaičius | Stiliai | Langeliai

G2 =A2*A2

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
1	a	b	d	h	Šoninio paviršiaus plotas	Trikampio plotas	Pagrindo plotas	Skersmuo	Puse skersmens	Tūris	Medinio tašelio ilgis	Spindulys	Pagrindas (Spgr)	Tūris(V)	
2	50	40	0,6	33	3300	825	2500	64,0312424	32,01562119	27500	360	0,3	0,2826	101,736	
3	30	25,5	0,6	23	1380	345	900	39,3732142	19,68660712	6900	222	0,3	0,2826	62,7372	
4															
5															

TEMPLATE for BEST PRACTICE EXAMPLES - SOLVED TASK



Failas Pagrindinis Įterpimas Piešimas Puslapio maketas Formulės Duomenys Peržiūra Rodymas Žinynas

Įklijuoti · Calibri · 11 · Kelti teksto eilutę · Sulieti ir lygiuoti centre · Bendra · Sąlyginis formatavimas · Formatuoti kaip lentelę · Langelio stiliai · Įterpti · Naikinti · Formatuoti

Anuliuoti · Mainų sritis · Šriftas · Lygiuotė · Skaičius · Stiliai · Langeliai

H2 =SQRT(A2*A2+B2*B2)

	A	B	C	D	E	F	G	H	I	J	K	L	M	N
1	a	b	d	h	Šoninio paviršiaus plotas	Trikampio plotas	Pagrindo plotas	Skersmuo	Puse skersmens	Tūris	Medinio tašelio ilgis	Spindulys	Pagrindas (Spgr)	Tūris(V)
2	50	40	0,6	33	3300	825	2500	64,0312424	32,01562119	27500	360	0,3	0,2826	101,736
3	30	25,5	0,6	23	1380	345	900	39,3732142	19,68660712	6900	222	0,3	0,2826	62,7372
4														

Failas Pagrindinis Įterpimas Piešimas Puslapio maketas Formulės Duomenys Peržiūra Rodymas Žinynas

Įklijuoti · Calibri · 11 · Kelti teksto eilutę · Sulieti ir lygiuoti centre · Bendra · Sąlyginis formatavimas · Formatuoti kaip lentelę · Langelio stiliai · Įterpti · Naikinti · Formatuoti

Anuliuoti · Mainų sritis · Šriftas · Lygiuotė · Skaičius · Stiliai · Langeliai

I2 =H2/2

	A	B	C	D	E	F	G	H	I	J	K	L	M	N
1	a	b	d	h	Šoninio paviršiaus plotas	Trikampio plotas	Pagrindo plotas	Skersmuo	Puse skersmens	Tūris	Medinio tašelio ilgis	Spindulys	Pagrindas (Spgr)	Tūris(V)
2	50	40	0,6	33	3300	825	2500	64,0312424	32,01562119	27500	360	0,3	0,2826	101,736
3	30	25,5	0,6	23	1380	345	900	39,3732142	19,68660712	6900	222	0,3	0,2826	62,7372
4														

Failas Pagrindinis Įterpimas Piešimas Puslapio maketas Formulės Duomenys Peržiūra Rodymas Žinynas

Įklijuoti · Calibri · 11 · Kelti teksto eilutę · Sulieti ir lygiuoti centre · Bendra · Sąlyginis formatavimas · Formatuoti kaip lentelę · Langelio stiliai · Įterpti · Naikinti · Formatuoti

Anuliuoti · Mainų sritis · Šriftas · Lygiuotė · Skaičius · Stiliai · Langeliai

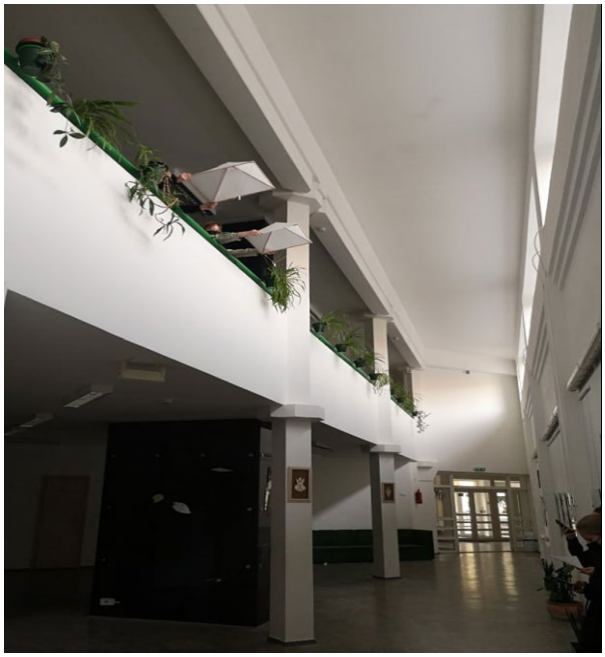
I2 =H2/2

	A	B	C	D	E	F	G	H	I	J	K	L	M	N
1	a	b	d	h	Šoninio paviršiaus plotas	Trikampio plotas	Pagrindo plotas	Skersmuo	Puse skersmens	Tūris	Medinio tašelio ilgis	Spindulys	Pagrindas (Spgr)	Tūris(V)
2	50	40	0,6	33	3300	825	2500	64,0312424	32,01562119	27500	360	0,3	0,2826	101,736
3	30	25,5	0,6	23	1380	345	900	39,3732142	19,68660712	6900	222	0,3	0,2826	62,7372
4														

Appendix 5

Height 3.5 m	Test 1 Parachutes fall without weight	Test 2 Attach 25 grams	Test 3 Attach 50 grams	Test 3 Attach 75 grams
A big parachute	1.96 s	1.86 s	1.78 s	1.73 s
A small parachute	1.47 s	1.45 s	1.33 s	1.23 s
$v = \frac{s}{t}$ Speed calculation large parachute	$v = \frac{3.5}{1.96}$ $= 1.78\ m/s$	$v = \frac{3.5}{1.86}$ $= 1.88\ m/s$	$v = \frac{3.5}{1.78}$ $= 1.96\ m/s$	$v = \frac{3.5}{1.73}$ $= 2.02\ m/s$
$v = \frac{s}{t}$ Speed calculation large parachute	$v = \frac{3.5}{1.47}$ $= 2.38\ m/s$	$v = \frac{3.5}{1.45}$ $= 2.41\ m/s$	$v = \frac{3.5}{1.33}$ $= 2.63\ m/s$	$v = \frac{3.5}{1.23}$ $= 2.84\ m/s$

Appendix 6



Appendix 7

Appendix No 8

Research	Temperature(t°C)	Air humidity%
Land surface near the house	5,5	30
8 th floor approx 26 m)	4,8	36
The difference	0,7	6