

## **HISAR HIGH SCHOOL**

### **12<sup>th</sup> Grade Math**

#### **Interdisciplinary Project**

**Departments:** Math, Arts and Computer Science

**Name of the project :** "I Design my own house"

**Goal of the project:** To use math, arts and computer science abilities in a real life application ,

#### **Main Questions:**

- 1) How do you design a house?
- 2) What are the necessary steps?
- 3) How do we draw a plan to scale on a graph paper?
- 4) How can we set up a cost table?
- 5) Can we use a programming language in this project ? For what?
- 6) Which methods should be used ?
- 7) How to finance a project?
- 8) How to use technology whenever needed?

#### **The outcomes of the project:**

- 1) Paper work (3D Cardboard models, origami and perspective drawings (10 pts)
- 2) Drawings (3D view of the house, Plan on a graph paper) (20pts)
- 3) Calculating the cost and preparing the cost table in Excel(20 pts)
- 4) Cost table by using a coding language/ Java-Eclipse (15pts)
- 5) The 2D or 3D software sketches by using a suitable sketch programme /Fusion 360) (15pts)
- 6) A 3D-Print out of the model/ Laser cutter or 3D printer will be used) (10 pts)
- 7) Sharing the project with the school(10 pts)

#### **Description of the project:**

That is a class-project. Each student is supposed to design a 3D house with one living room, one bedroom, a bathroom and a kitchen ( it may be included in the living room). It can be one- or two-flat cottage. All work is supposed to be done at school during the regular class periods.

This project is in the Syllabus and in the teaching plan of the 12<sup>th</sup> Grade Mathematics and will replace the second written exam in the second semester

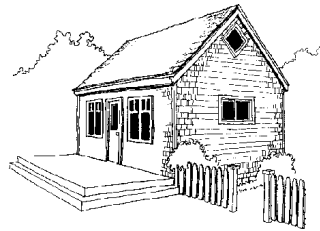
**Steps of the project:**

**(A) Arts work: (supported by the Arts department)**

1. Drawing the nets of some solids on a cardboard and then making that solid.(cube, decorated regular tetrahedron, truncated cube, 20-faced solid)
2. Origami by using the origami paper (open box, cube, ball with 8 vertices)
3. Perspective drawings (with one and two vanishing points)

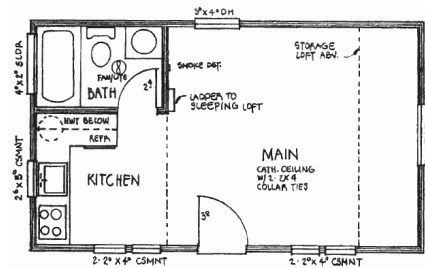
**(B) Designing the cottage: (supported by the Arts department)**

4. Drawing a 3D- Outer view of the cottage and front, back and side views of the cottage,



5. Drawing a 2D plan of the cottage on a graph paper , scale 1:50 .

**(All dimensions must be written on and all the furniture must be drawn in the plan)**



6. Calculating the area and volume of the necessary sections so that cost table can be prepared..

7. Preparing the cost table in Excel . Calculating the total cost for the cottage and making a Credit and repayment table

Details:

Foundation support (concrete or wooden)  
1+1 / Main room+Slipping loft (Bedroom) +  
small Kitchen (may be open-style)/  
Bathroom Flat platform (Floor)+  
Wall frames+Side walls+Rear walls+  
Roof framing+Sheathing the walls and the roof)

A materials list can make cost estimation and materials shopping much easier.

Wood/ Volume /Cost

Outer and inner painting /Amount /Cost

Floor tiling /m<sup>2</sup>/Cost

Door and Window sizes (dimensions) /m<sup>2</sup>/Cost

Glass panels, sliding door, steps to the cottage, plywood for the door

The house wrapped in tarpaper

Roof: Rectangular pyramid or triangular prism

Roof construction+tiling

Heating system (Stove, radiator-system, solar panels)

Water tank in (in the roof or outside the hose) (dimensions, cost, capacity)

Electricity

**Necessary dimensions** Outer dimensions of the cottage ...length:

Inner dimensions of the cottage..... length:

Thickness of the walls.....

Type and dimensions of the roof:

**Inner design**

Furniture, Kitchen, Bathroom Main room , Sleeping loft

Electricity and Heating

**Optional:** Garage, Gardening, Balcony, Patio

**(C) USING TECHNOLOGY FOR COST TABLES and MAKING MODELS**

(Organized and supported by the IT department and by some skilled students)

8. Educating the students on coding ( Java, eclipse) so that they can prepare the cost table in Java.
9. Educating the students on a sketching programme (Fusion 360) so that they can sketch the cottage in their laptops .
10. Getting the 3D print-outs of each cottage by using the Laser Cutter system.
11. Making the models of the cottages by combining the pieces of print-outs from the Laser Cutter.
12. Presenting the arts work , the drawings and the 3D-models on the science day.

**A sample Cost Table:**

	Dimensions	Area	Volume	Material used		Price	Cost
				Type	Amount		
Floor-Main room							
Floor-sleeping loft							
Floor-kitcen							
Floor-bathroom							
Front wall							
Rear wall							
Right wall							
Left wall							
Window I							
Window II							
Door I							
Door II							
Roof							

**Total cost:**

**Credit and repayment table**

- Amount of Credit:
- Rate of interest
- Duration for repayment
- Monthly pay-back