Co-funded by the
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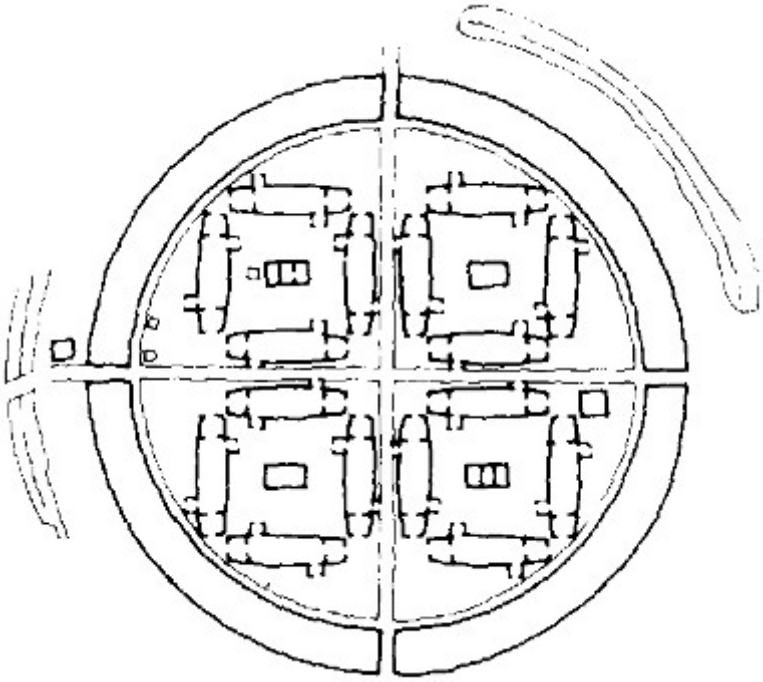
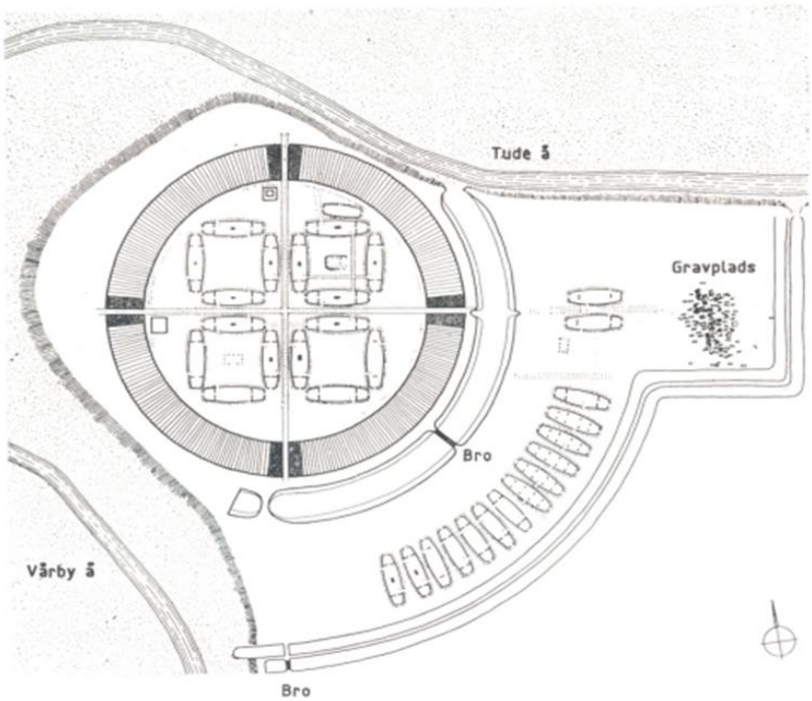
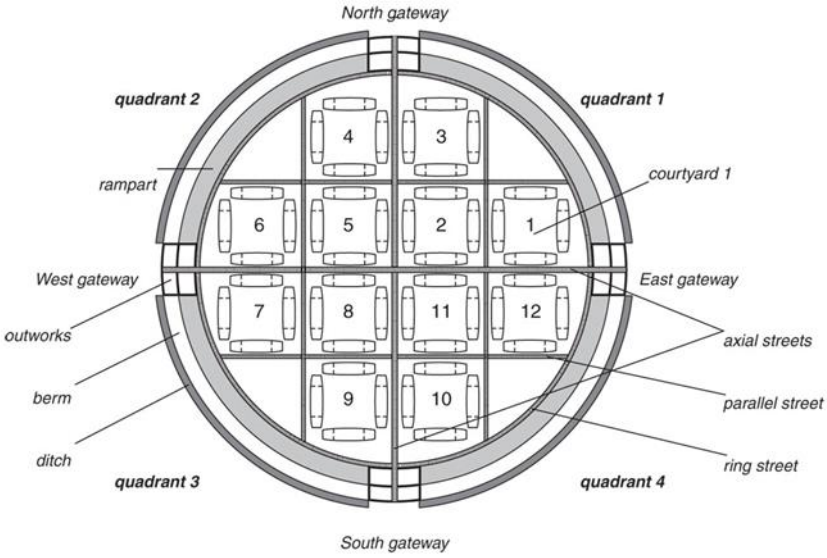
The architect of King Harald Bluetooth

Name of the object	The Viking fortress "Fyrkat" 
Map of the history of Viking's ring forts	The Vikings' 5 ring fortresses are attributed to Harald Bluetooth, who ruled Denmark in the period c. 958 for the showdown with his son, Svend D.1 Tveskaeg, which led to the Kings death in 987. The five ringfortresses manifest Harald the Bluetooth as the king who gathered all of Denmark and they lie a day's ride from either a major fortified city or a ringfortres The fortresses are thus a mark of royal power: "Here I am a powerful king" Notice: In Danish they are called "Trelleborge" which is an old name for a fortification made of logs!
Recommended ages (from...)	From 12 years. It is a little difficult to build.
Thematic areas combined (STEAM)	T: Print of Viking houses E: Creating a copy of the fortress A: Age of the Vikings M: Geometry: Diameter, radius, π, aspect ratio, area, circumference and problem calculation

Materials needed	1 Thick cardboard of 20x20 cm, corrugated cardboard about 20 x 50 cm, small pieces of cardboard, glue gun, pencil and In this work description, 1 1litre yoghurt cup has been used to shape the rampart around. Tools: Pencil, felt pen, glue gun, sharp knife, compass and scissors Possibly.3D-print of Viking houses.
Instructions step by step	**Step 1:** Assemble materials **Step 2**: Size **Step 3**: Find the centre **Step 4:** Draw the inner and outer radii of the rampart **Step 5**: Mark the stepway **Step 6**: The rampart **Step 7**: The floor plans of the houses **Step 8:** Mounting the ramparts, pavements, and houses **Step 9**: Interesting theories.
Here you can find more	•App: Apple store and Google Play: Aggersborg •Runge, Mads and Gamble Barry (editors): Viking Age Ring Fortresses, A Danish nomination to UNESCO World Heritage List, January 2021 •Roesdahl, Else and others: Aggersbor in the Viking Age, Jutland Archaeological Society 2014. •https://natmus.dk/museer-ogcastles/trelleborg/trelleborgs-history/exhibitions/trelleborgs/
Interesting information	Some measures from the fortresses *See the step 2.* The Fortress called "Trelleborg"



The Fortress called "Aggersborg"



The Trelleborg House - the type of house from the Ring Fortress

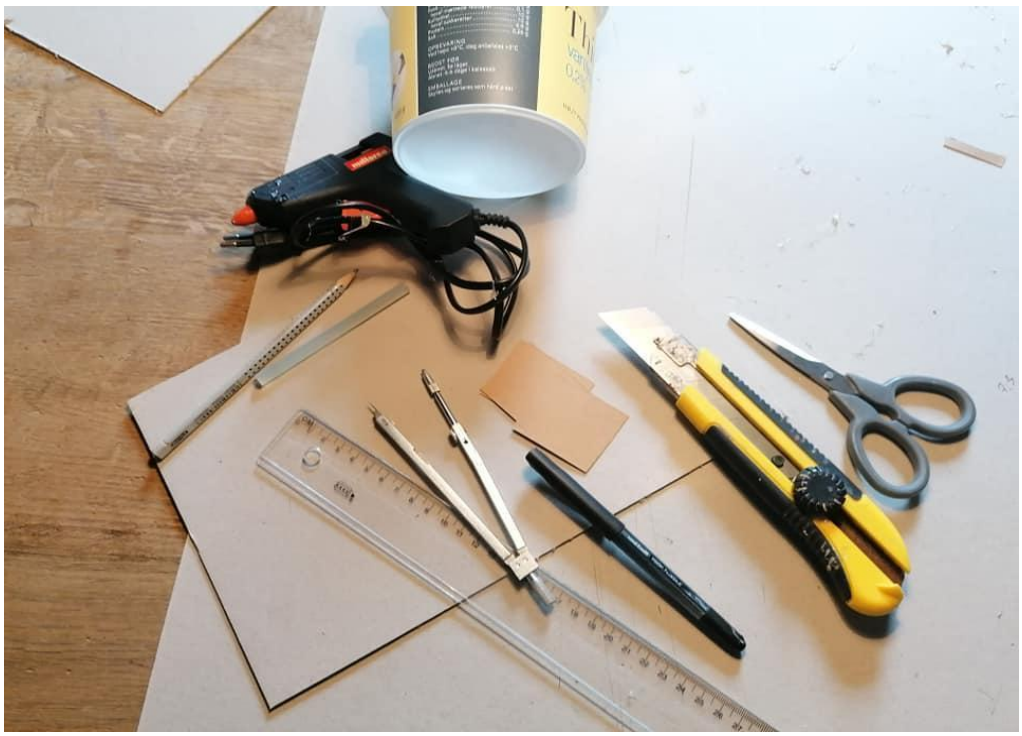
The Bluetooth logo is composed of a rune-H and a rune-B, which stands for Harald Bluetooth/Harold Bluetooth.

Step by step: How to build the Viking fortress “Fyrkat”

Step 1

Time needed: 10min

Assemble the materials



Step 2: The size of the fortress

Time needed: 10 min.

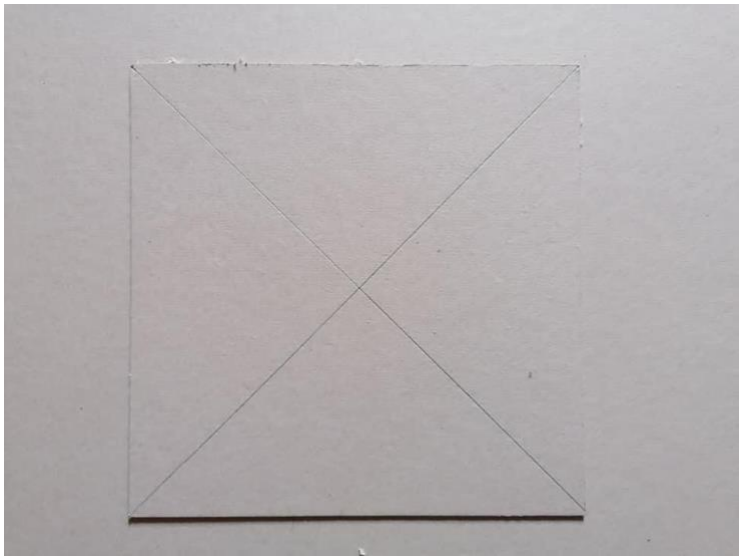
It is very important to decide which size fits you. In this version 1 mm = 1m. The model of Fyrkat is the simplest to start with. Note: It is not recommended to make a copy in smaller scale than shown, as it can be very difficult to control for the students. The measures you need are in blue colour see template below:

Component party	External diameter	Berm width	Rampart width	Internal diameter	Long houses length	House width a narrowest party and the widest
1.Aggersborg	260	8	10	240	48/32	
2.Fyrkat	140 (14 cm)	10	10.5 (1.5 cm)	120 (12 cm)	16/28.5 (2.8 cm)	5/7.5m (5 mm/ 7.5mm)
3.Nun Tray	150	8.5	14.5	120	16	
4.Trelleborg	170	5-6	17.5	136	16/29.4	
5.Borgring	144.5	No berm	10.6	123.5	Not detected	

Step 3: Find the centre

Time needed: 2 min.

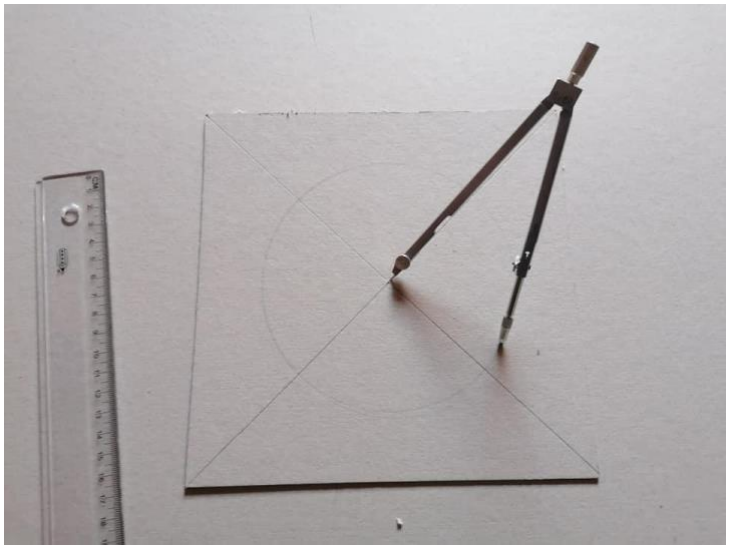
You will find the centre by drawing a line from a corner to the opposite corner. This line is called a diagonal.

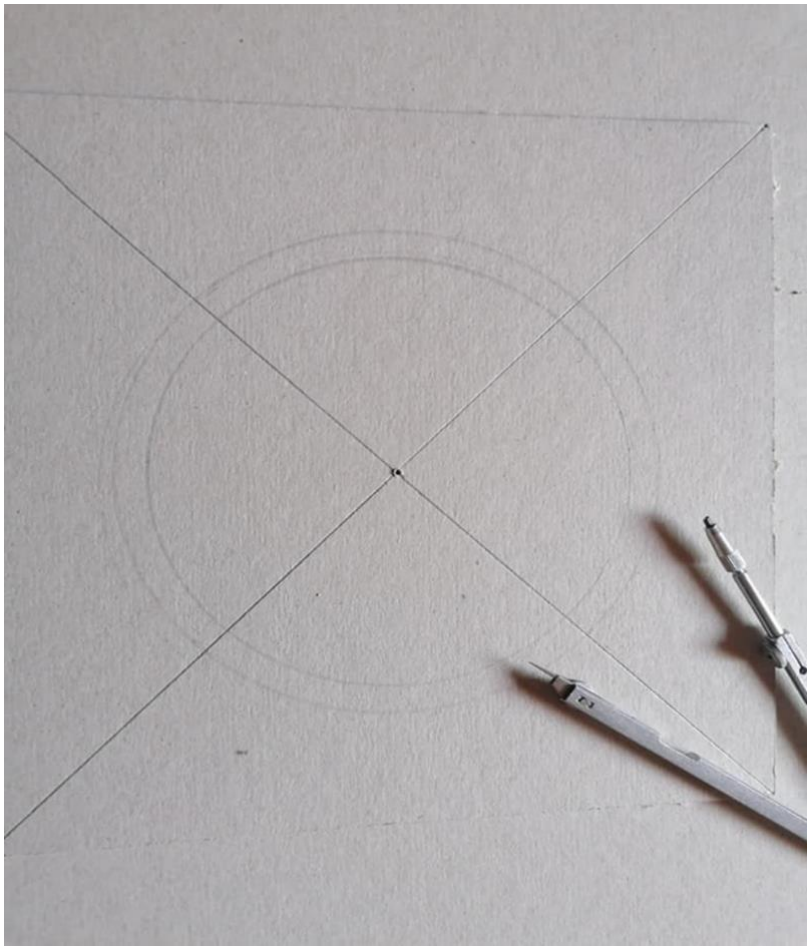


Step 4: Marking the outer and inner circles of the rampart

Time needed: 5 min.

1. Set the compass for a radius of about 6.1 cm to the inner diameter and set a circle.
2. Set the compass to a radius of 7.2 cm to the outer diameter and set a circle.

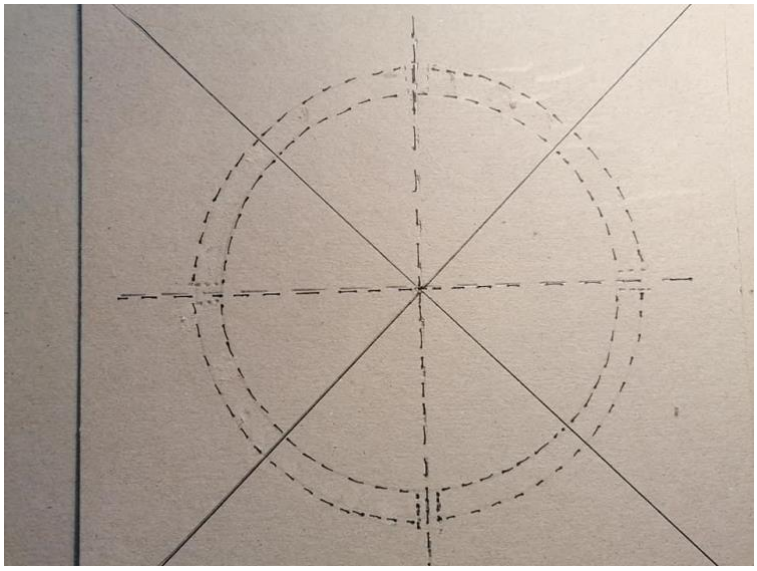




Step 5: The stepway

Time needed: 2 min

On the ring fortifications there is a sidewalk through the castle, which looks like spokes on a wheel. Put 5 mm on the embankment to the opposite side.



Pic 1 Draw a dotted line through the castle: from top to bottom and from right to left. If you want gate openings in the wall, draw them in so that they are 5 mm wide in the width of the wall. See the picture: at the bottom of the rampart.

Step 6: The rampart

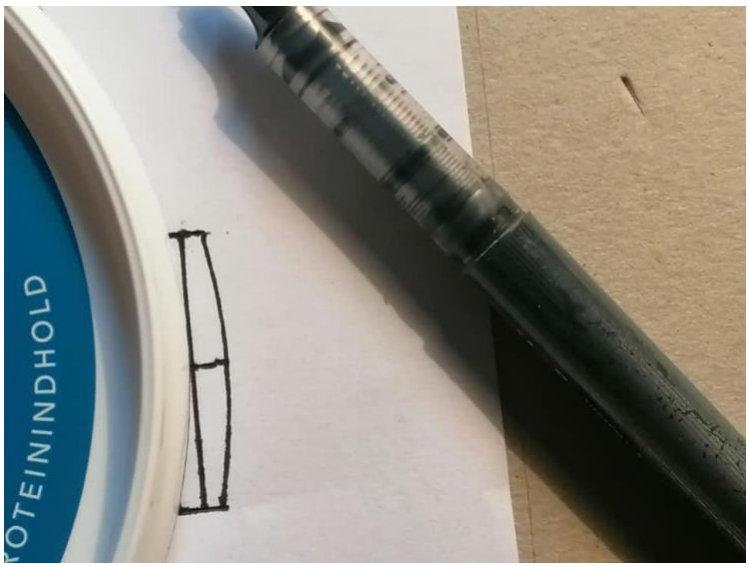
Time needed: 10 min**.**

1. Cut 3 pieces of corrugated cardboard 5 mm wide and 50 cm in length.
2. Find a suitable shape that has a diameter of about 12 cm. For our creation, we used a yogurt cup.
3. Glue one end of a strip of corrugated cardboard onto the yogurt cup and roll it up tightly. Glue in appropriate range and increase with the next strip until the ramparts are about 1 cm thick. That's about four laps.
4. Take it off carefully. Remember it's glued! Cut it free when glue is dried.

Step 7: The floor plans of the houses

Time needed: 15min

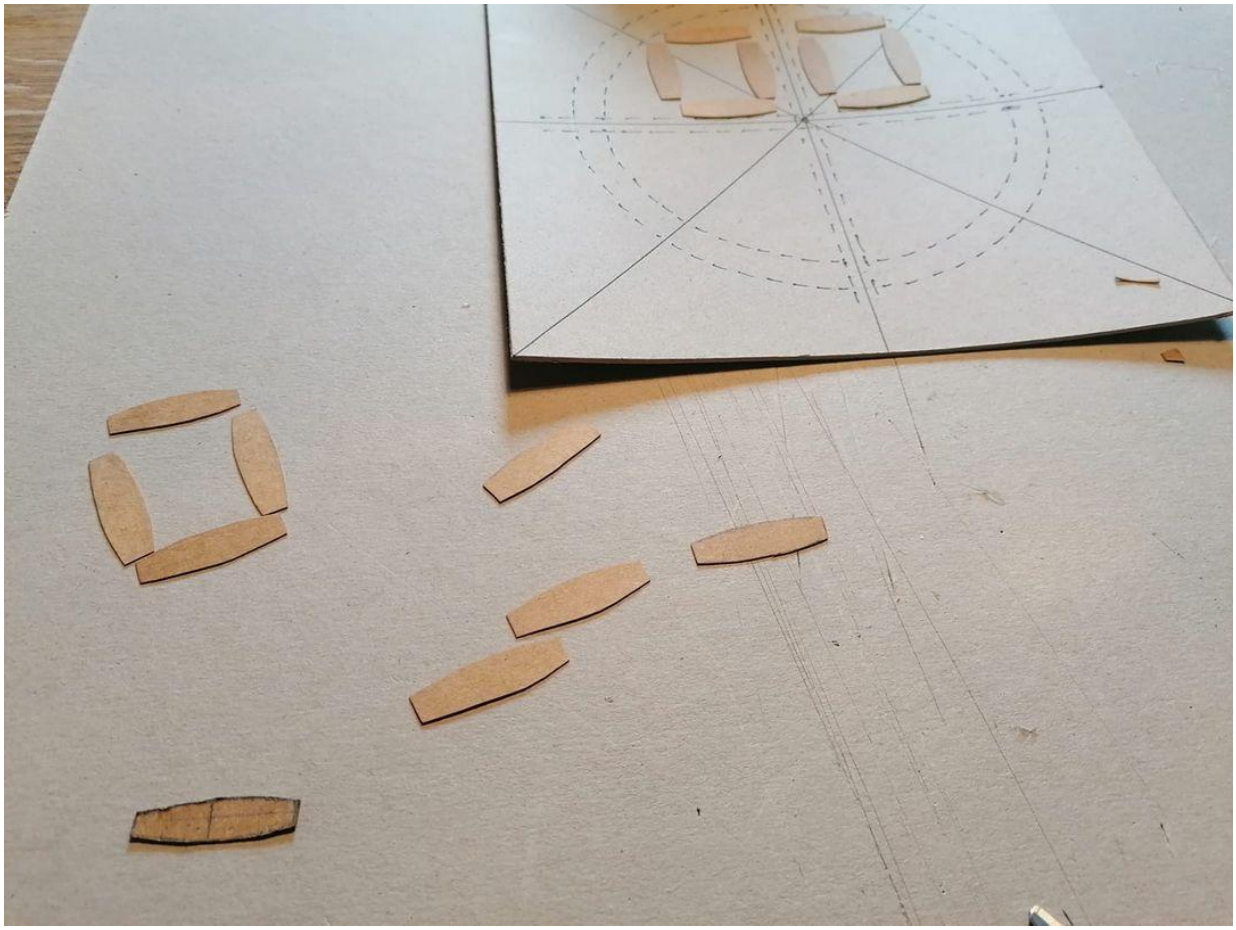
You need to make 16 identical floor plans of the houses:



- Draw a line of 2.8 cm (It is the length of the house)
- For both ends, draw a 5 mm line perpendicular to the longitudinal line of the house. (These are the gables of the house)
- Draw a line 7.5 mm long angled in the middle of the longitudinal line. (it makes the housing wider in the middle)

- If necessary, use the lid from the yogurt cups to connect the gables. See picture below.
- Cut out the house and use it to copy the 15 other houses.

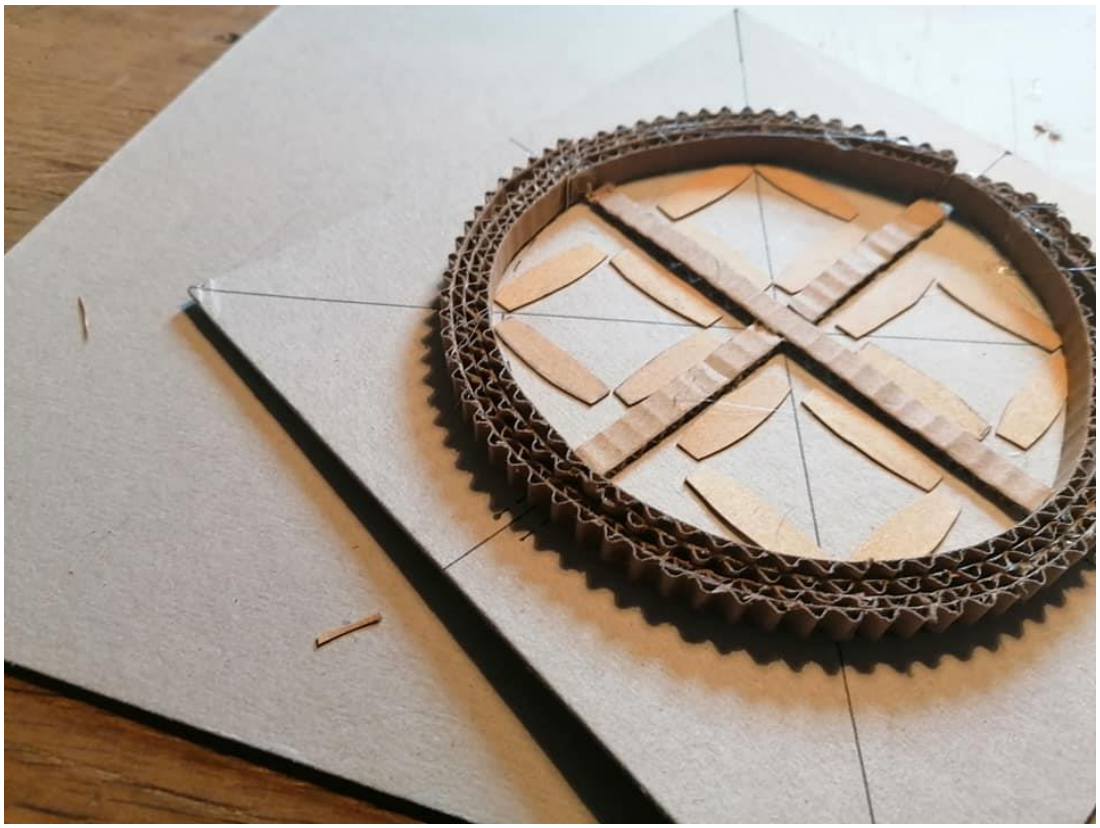

OGHURT 10% · MED GRÆS



Step 8: Fitting the houses, the ramparts and the pavement

Time needed: 15 min

1. Glue the rampart onto cardboard.
2. Make 2 pieces of corrugated cardboard in about mm. width and glue them firmly.
3. Glue the houses. Note they should form a square when sitting gable corner against gable corner.
4. You may want to cut a hole for port openings. Note: be careful that the rampart is glued!
5. Now that you are finished, and you can show King Harald Bluetooth your plans!



Step 9: Interesting theories

You may have noticed that there are some things that are the same from ring fortress to ring fortress? There are many theories as to why they looked the way they do. Below is a picture of a theory that even talk about a sacred geometry this is a theory put forward in a group on Facebook called: "The Northern European Trelleborgs."

"One of the fascinating things about Trelleborg near Slagelse is that the castle seems to have been built according to the principles of sacred geometry. For the builder, it was important that the layout reflected the union between heaven and earth. According to sacred geometry, the circle symbolised the spiritual, heavenly world, and the square the earthly, material world. In the initial construction phase, the ring wall was therefore intended to reflect a fusion between the two spheres: the circle and the square with the same perimeter. On the plan shown, this is defined as the circle tangent to points N and M and coinciding with the outer front of the rampart, and the square C,C1,C2,C3, which frames the circle marking the inner front of the rampart. In other words, the dimensions of the rampart were defined with respect for a divine geometric master plan as a visible expression of the fusion between heaven and earth.

Was it Harald Bluetooth who instructed his architects to respect the principles of the sacred geometry when building the castle? Or must we look for the preconditions for this practice earlier in the Viking Age? Read more about sacred geometry in connection with Trelleborg here: https://www.academia.edu/.../DEN_STORE_KONGES_BORG_P%C3...

Literature: Robert Lowlor, sacred geometry. London 1982.
John Michell: City of Relevation. New York 1972.
John Michell: The Dimensions of Paradise. London 1988