

Farm in the city



This activity sheet gives information about the construction of the "Farm in the City" unplugged challenge! It is based on dominating sets approach. Networks present many opportunities for the development of algorithms that are practically useful. In this activity, we want to mark some of the junctions, or "nodes," in such a way that all other nodes are at most one step away from one of the marked ones." In parallel to enhancing strategic reasoning and space orientation, this game allows for reflection on best practices in food consumption and on developing local food systems in urban areas to benefit from local agriculture.

Printable resources attached: Maps, badges

Additional material needed: coloured pencils, translucent papers

Territory 2 - The Strong Community



Total duration: 1 hour

Inspired by: CS Unplugged



Learning objectives



Understanding natural systems and technical systems



Acquiring a sense of the rules of living together



Understanding the relationship between objects and space



Sharing rules, taking on roles and responsibilities



Understanding the representations of the world and human activity

Linked SDGs



Game modalities

6 - 12 years old

Work in group

In the classroom

At home

Support of an adult

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Pedagogical interest and topics targeted

Interest of the activity to understand mathematical concepts: Many real-life situations can be abstracted into the form of a network or "graph". Networks present many opportunities for the development of algorithms that are practically useful. In this activity, we want to mark some of the **crossroads, or "nodes"** in such a way that all other nodes **are at most one step away from one of the marked ones**. The question is: **how few marked nodes can we get away with?** This turns out to be a surprisingly difficult problem.

One of the interesting things about this unplugged problem is that **no one knows whether there is an algorithm for finding a minimum set of locations that is significantly faster than the brute-force method!** Through this activity, the pupils are hence approaching several topics, including mapping, relationships, puzzle-solving and iterative goal-seeking, combinatorics and graph theory.

Working on interaction and trust: To strengthen the activity for the most advanced classes, the Unplugged version is introducing several roles in the game dynamics, enabling to **create a higher level of complexity and approaching game theory**. Since the game is repeated, one individual can formulate a strategy that does not follow the regular logical convention of an isolated round and create iterations by adding "transactions" between different players with diverse roles and objectives, creating a high need for **trust and cooperation**. By promoting these discussions, the children can approach **game theory**. By giving the opportunity to the pupils to select their strategy, they can either "**play it collectively**" i.e. cooperate or "**play it against the others**" i.e. compete. However, finding a **win-win strategy** should be promoted, otherwise, none of the players will be able to collect enough winning points. This will enable working on approaching citizenship and living together practices. In this framework, game theory should enable us to learn that the **game defines the players, but in the long run, it's us players who define the game**.

So, do what you can do, to create the conditions necessary to evolve trust. Build relationships. Find win-wins. Communicate clearly.

Open discussion on food consumption and smart city practices: All the activities proposed in the Unplugged quests have been developed to enable the teachers to open discussion on societal questions in the classroom. Within the "**Farm in the City**" game, the objective is to let children learn more about urban farming, local food systems and the importance of smart cities to ease the adoption of more sustainable practices by the citizens supporting urban policies. Additionally to the game implementation, it is also feasible to have a look at the other resources provided in this document to start concrete farming projects with the pupils and illustrate the necessity of these practices with this mathematical activity.





Game rules

Game narrative:

Welcome to our fictive city. After several years of policies toward more urbanisation, citizens are now requesting from the local authorities to better prioritised their well-being, going from the transport system to access to more affordable and better quality food. Thanks to the last election, change in the policy-making of the city has enabled the promotion of new practices and dedicated public funding to urban farming. Answering this new initiative, a group of farmers are trying individually to **find the best strategy within the city to localise their farms, considering both the minimisation of the costs, while ensuring that each citizen is accessing easily their production.** After the reception of the proposals from the farmers, the local authority is willing to open the debate to representatives of the society, especially the tenants of the diverse buildings to ensure that **the project is economically viable.** In addition, with the proposal of the farmers, the transport working group of the municipality is going to evaluate if the transport network is answering the new needs of the citizens to ensure that none of them is in need to take a car for shopping, hence promoting public transportation policies.

Game rules:

After introductory activities during which all your students will successively represent the group of farmers, then either the transport planners or building owners, groups of players will be created, each player endorsing the role of one city representative. Having the children experiment with different positions will enable confronting strategies and building on trust and communication skills. Remind them as often as possible of the different goals they have: either minimising {the farmers, the transport planners}, maximising {the building owner} or optimising {the win-win strategy}.

The role of the teacher:

1. The teacher explains the rules in the three rounds and ensures that all players have understood the game and their roles.
2. Facilitates the process of collaboration in teams.
3. Mediates strategies sharing and the negotiation process in the third round.
4. Opens up a discussion about sustainable cities, including transportation, food production and supply, and principles of living together.





Game rounds

Round 1

The game starts with a presentation of the objectives and the story. At this stage, all the pupils have the same objective i.e. **placing the farms closest to the citizen, in a minimum number of installations**. You will provide the visual of the city, in addition to the **individual translation of the map in a graph as a working document** (best is on translucent paper as it allows to compare the pupils' choices). Your students should **place the first farm on one building**, and then colour all the intersections and streets that are covered by their choices. People living at those intersections and along the streets that come into them are served by this farm. Each student will select **one colour to work on translucent paper**, enabling them to easily compare their work after all. As they find configurations that serve a maximum number of houses, remind them that farms are expensive and the idea is to have a few of them as possible. It is obvious that the conditions can be met if there are enough farms to place at all intersections—the interesting question is how few you can get away with.

Round 2

At this stage, each child will be **given a new role**, either a **building owner** or a **transport planner** with a different objective. The transport planer will use the previous farming map to **place bus stops at critical points of the city**, to ensure that each building with a farm is accessible by public transport. Each child endorsing the building owner role will **search to maximise the number of buildings equipped with farms**. This intermediate step will enable working on **diverse strategies** for developing the communication and trust activity following.

Round 3

The pupils are spread into **groups of 3 persons**. In the group, one pupil should take the role of the **farmer** (using the map from level 1), one will be a **transport planner** and one a **building owner** (using the maps from step 2). By overlapping their work, they will need to **compare the strategy and agree, through discussion, on one final common solution**. The winning team will be identified by the teacher, providing citizen points to the team that provided the best win-win strategy.



Going further



Topic 1 - Game theory, communication & trust

More interesting materials about game theory for children you may find here: https://kids.kiddle.co/Game_theory & <https://kids.frontiersin.org/articles/10.3389/frym.2017.00066>

To practice further team strategy planning and communication you may wish to see other Unplugged activities, e.g. *The Perfect City*, *Pop-up City of the Future*, *Reroute better world*, *Good Ways*, *Brain Twister*



Topic 2 - Urban farming

Take the opportunity of this game to discuss with the classroom regarding urban farming practices. More information on urban farming can be found over the web such as https://en.wikipedia.org/wiki/Urban_agriculture, <https://www.unesco.org/en/articles/unesco-promotes-biodiversity-and-urban-gardening-its-own-premises>, https://en.wikipedia.org/wiki/Urban_beekeeping. More interesting materials about urban farming adapted for children can also be found here: <https://www.petitjourney.com.au/petit-childrens-garden-activities/>, <https://www.littledayout.com/urban-farming-for-kids/>. You can also discuss with children regarding guerilla gardening actions: https://en.wikipedia.org/wiki/Guerilla_gardening, and even create seeds bomb with your pupils: <https://littlebinsforlittlehands.com/make-seed-bombs-earth-day-activity/>. Eventually, to introduce the topic of sustainable and/or urban farming; you can also see other Unplugged activities, e.g. *Cookies and Peace*, *PotLuck March*, *Ecosystem in a Jar*, etc.



Topic 3 - Smart city

Discover with your students what is a smart city: <https://mocomi.com/what-is-a-smart-city/>, <http://howtufunda.com/smart-city-model-school-project-for-science-exhibition/> and think and design your own smart environment, starting with a smart school: <https://circularcomputing.com/news/10-ways-make-school-sustainable/>. Create STEAM activities thanks to other EU-funded projects such as: <https://smartkidsproject.eu/>. To practice further smart city planning you may wish to see other Unplugged activities, e.g. *The Perfect City*, *Pop-up City of the Future*, etc.



Printables



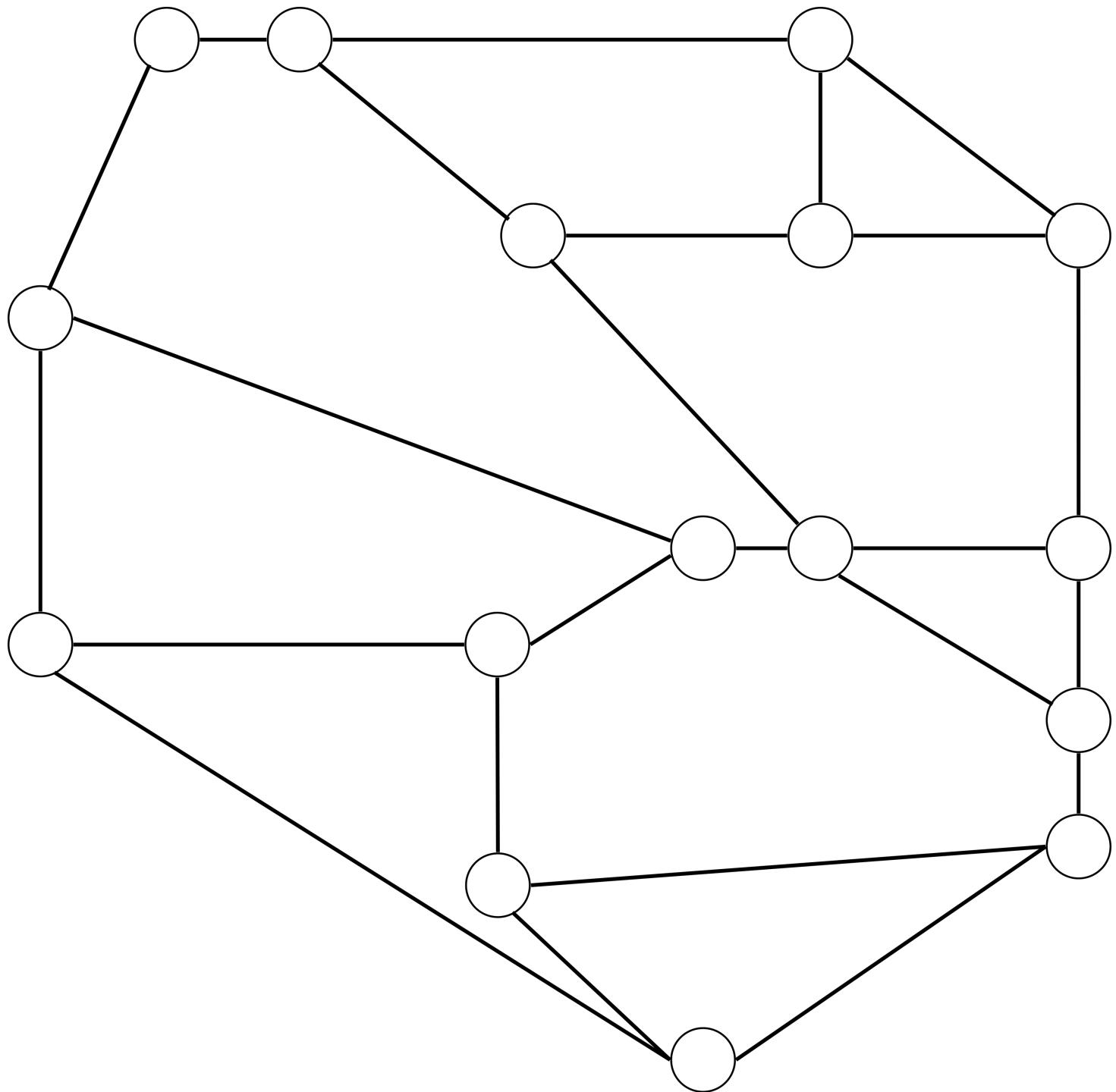
City map - Printable material - 1 for the class - Use it as a background for illustrating the activity and comparing the results of each pupil



Printables



Worksheet & nodes - To be printed on translucent paper. 1 per pupil if work alone mode / 1 per group if work in group mode. Use for performing the activity



Printables



Badges for children in the group round. For illustration their position. Can be used to discuss smart city roles. Children can draw them in the white boxes.

