

Paper Airplanes

Primary: (ages 7 – 11)

Mathematics

In this exercise, students manufacture and trade paper airplanes. They are able to purchase airplane designs and colouring pens from the teacher to improve the design of the airplane. The activity goes through several rounds of manufacture and trade. Finally, students discuss what strategies are most successful in the game.

Time allocation 2 lesson periods

Subject content Develop essential numeracy skills
Understand money and the concepts of profit, loss, cost, and value

Creative and critical thinking This unit has a **creativity** and **critical thinking** focus:

- Generate several approaches to pose/solve maths problems
- Explain strengths and limitations of different ways to pose/solve a maths problem
- Consider several perspectives and reflect on chosen maths approaches relative to possible alternatives

Other skills Collaboration, Persistence/Perseverance

Key words money; profit; loss; cost; value; buying; selling; market; resources; trade; currency

Products and processes to assess

Mathematics enables students to develop a secure understanding of concepts, principles and processes and to apply them in different contexts allowing them to understand the world around them and their place within it. In this activity students generate, try, and discuss strategies to maximize profit from their manufacture of paper airplanes. At the highest levels of achievement, the students take a specific personal approach to the task, justify their approach with good evidence, and acknowledge the assumptions and limitations on which their approach is based. They are open to the ideas, critiques of feedback of others when relevant and are able to discuss the relative merits of a number of different strategies that might create profit.

Teaching and Learning plan

This plan suggests potential steps for implementing the activity. Teachers can introduce as many modifications as they see fit to adapt the activity to their teaching context.

Step	Duration	Teacher and student roles	Subject content	Creativity and critical thinking
1	Lesson period 1	Everybody gets a sheet of A4 paper and is asked to make a paper airplane and ten counters, each of which is worth one unit of currency. Once they have finished the airplane, they demonstrate it. They then attempt to sell their airplane to someone else if they can find a buyer. A silent auction can be used for this purpose. Each airplane is placed on a sheet of paper and those wishing to purchase it write down what they are willing to pay.		
2		In the second round, everyone gets a second sheet of paper, and a further 10 units of currency. This time however they can buy from the teacher an airplane design (see Resources section) for 2 units of currency and/or colouring pencils/pens, each of which can be bought for 1 unit of currency. They then have to make a new airplane. Again they have to demonstrate their airplane and a silent auction takes place. If they still possess or acquired an airplane in the previous round, they should put these up for sale as well.	Assessing cost; how much to pay and whether to buy	Envision how to solve a meaningful maths problem (e.g. calculate risks and benefits of buying)
3		In the third round, everyone gets a further 10 units of currency. But this time they get no more paper. They can still buy designs and colouring pens from the teacher. However, to make new airplanes they have to dismantle airplanes they already possess and try to improve them so that they can sell them for a better price. Again once they have completed their new designs (or if they have chosen to try to get a better price for an existing design) they demonstrate their airplanes and try to sell them.	Creating strategies to increase money and avoid diminishing resources Assessing what course of action will create more profit, loss, and value	Generate ways to solve a maths problem (e.g. how to increase resources)
4		In the fourth round, no one gets additional currency or paper, but again purchases of designs and colouring pencils from the teacher are possible. Once completed, the planes are demonstrated and sold. Finally, each student adds up the units of currency they have acquired, and the number of airplanes in their possession. Each airplane is worth what they paid for it. The class considers who accumulated the largest amount of currency, and who did not. They discuss what makes someone able to accumulate the greatest amount of currency. What strategies did they try? What were they assuming would happen when they tried that strategy? Was it successful? Would you do anything differently if you did this again? What strategies are most successful?	Experiencing an increase in the complexity of the market Simple maths calculations Identifying and explaining which buying and selling strategies are most successful and why	Explaining the strengths and limitations of different ways of solving maths problem Identifying and questioning their own assumptions about a maths problem Considering different perspectives on approaching a maths problem Reflecting on chosen maths approach relative to possible alternatives

5	Lesson period 2	<p>About a week later, try the activity again. This time after the third round, tell the pupils that they are able to create teams or consortia of whatever size they wish to continue with the manufacture, sale and purchase of airplanes. At the end of several rounds, the worth of each consortium is calculated, but to arrive at a comparative figure, divide the total worth by the number of individuals in the consortium. The teacher may choose to close the unit with a reflective discussion on what students have learned about profit, loss, and managing money</p>	<p>Working co-operatively in a highly competitive market</p>	<p>Considering several perspectives on approaching a maths problem</p>
			<p>Simple mathematical calculations</p>	<p>Generating and playing with alternative approaches to a maths problem</p>
				<p>Reflecting on steps taken to pose and solve maths problems</p>

Resources and examples for inspiration

Web and print

- Not applicable

Other

- A4 sheets of paper, colouring pens, pencils
- Instruction on how to make airplanes downloaded and printed out from <http://www.foldnfly.com/index.html#/1-1-1-1-1-1-1-2> about 25 - 30 different plane designs should be downloaded.

Opportunities to adapt, extend, and enrich

- Additional activities that ask students to manage or use money are available from this series of OECD CERl creative and critical thinking activities. For example, *The great Cookie bake* and *How much will the school trip cost?*

Creativity and critical thinking rubric for mathematics

- Mapping of the different steps of the lesson plan against the OECD rubric to identify the creative and/or critical thinking skills the different parts of the lesson aim to develop

	CREATIVITY Coming up with new ideas and solutions	Steps	CRITICAL THINKING Questioning and evaluating ideas and solutions	Steps
INQUIRING	Make connections to other maths concepts or to ideas from other disciplines		Identify and question assumptions and generally accepted ways to pose or solve a maths problem	4
IMAGINING	Generate and play with several approaches to pose or solve a maths problem	2-5	Consider several perspectives on approaching a maths problem	4,5
DOING	Pose and envision how to solve meaningfully a maths problem in a personally novel way	2-5	Explain both strengths and limitations of different ways of posing or solving a math problem based on logical and possibly other criteria	4
REFLECTING	Reflect on steps taken to pose and solve a maths problem	5	Reflect on the chosen maths approach and solution relative to possible alternatives	4