

# Cutting and enlarging art

Primary: (ages 7 – 11)

Mathematics

Students examine an art image and reproduce it by twice its size. This requires students to engage in critical thinking and observation as well as measuring, enlarging and being able to calculate proportionately. Additionally, the activity has a focus on working and consulting together, since each pupil reproduces a specific part of the artwork to connect with the parts being made by other pupils

**Time allocation** 2 lesson periods

**Subject content** Measuring and multiplying; thinking proportionately  
Enlarging an image by twice its size with the help of a ruler  
Helping one another to make the artwork correct

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

- Question first impressions and assumptions about what you see and consider multiple perspectives
- Generate, explore, and appraise ideas for how to approach a maths task
- Reflect on steps taken and the chosen maths approach relative to possible alternatives

**Other skills** Communication, Persistence/Perseverance

**Key words** measuring; multiplication; proportion; ratios; art; grids; reproduction; geometry

## Products and processes to assess

Students work collaboratively to produce a reproduction of a painting. At the highest levels of achievement not only are their observations, measurements and calculations correct enabling them to produce a close copy of the original, they consider several ways of formulating and completing the task. Their work process shows a clear understanding of the strengths and limitations of chosen and alternative approaches. They are open to the ideas, critiques, and feedback of others and are starting to acknowledge the assumptions they and others are making in their reasoning.

## 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	<p>The teacher explains that later the students are going to do some work with using mathematics to change the size of paintings. In order to make sure that they don't alter anything else about the painting, students will need to observe the painting really carefully. As an illustration, teacher and students together look at, for example, the painting <i>Coquelicots</i> (Poppies) by Monet (Fig. 2). Here one sees a couple of figures in a field with poppies. The field makes one think of grass and green. But if you look carefully, you see that large parts of the field aren't green at all; there are also a variety of other colours to be seen. To observe well requires that you sometimes have to 'put your brain on hold' as it were, so as to really see what is there, and to not perceive what you already believe to know about something. This is something pupils need to learn.</p> <p>It's not a problem if pupils initially say that the field is green. In this case ask them to look more precisely at specific parts of the field. It's precisely the experience of realising that something else can become apparent than initially thought, which is a good learning experience. From this one learns to look better and to look differently. To observe openly is the basis of critical thinking and even of science.</p> <p>The teacher explains this further with an example: the difference between <i>thinking</i> like Winnie the Pooh or like Rabbit (see power-point).</p> <p>The teacher explains the assignment to the pupils. Students will work in groups and receive an image that they will need to enlarge to twice its original size. Teacher reminds students that they will need to look really closely and carefully at the image to achieve this, as well as using measurement, multiplication, and other mathematics.</p> <p>Questions can be about which colours are seen where, what continuation can be found in lines and forms, what the painting is about, and what students would need to discuss if they were working in a group with each individual enlarging just one part of the painting</p> <p>The children reflect on how they can calculate the overall size of the new painting. Each child has a ruler and is encouraged to measure in centimetres and millimetres and multiply by two, for both length and width.</p>	<p>Measuring in centimetres and millimetres</p> <p>Multiplying by two</p> <p>Length and width</p>	<p>Observing and describing relevant information</p> <p>Questioning their first impressions and assumptions about what they see</p> <p>Generating and exploring ideas for how to approach a maths task</p>

2	Lesson period 2	<p>The students (in groups of four or five) receive a representation with the image of a painting, and receive the same image cut into strips. The students divide the strips amongst themselves. They have to observe precisely, in order to make a good reproduction of the image in enlarged size, and also need to discuss things together in order to come up with a pleasing visual transition between the various parts of the image.</p> <p>The students all have a strip of the image and sit in groups of 4 (those having the same image sit together). They observe the image, measure and enlarge it, so as to be able to subsequently draw their own strip 2 x enlarged. They discuss together to make agreements, for example about use of colour.</p> <p>The new images must be twice as large as the original, with correct proportions. This means that everything in the length and width has to become twice as long (and that the surface area has been enlarged by four times). The students have to think for themselves about how to go about this. They may use a ruler to measure things on the image and to transfer proportionate measurements according to the enlargement needed for their own drawing. Another method is to draw a grid on the image and to draw a grid on their own drawing, whereby the blocks are twice as large. In this way you can observe and draw per block.</p>	<p>Simple propositions</p> <p>Measurement of strips</p> <p>Length and width</p> <p>Multiplication</p> <p>Surface area</p> <p>Measurement of individual objects/grids/part of image</p>	<p>Considering multiple perspectives on a maths problem</p> <p>Generating, exploring, and appraising ideas for how to approach a maths task</p> <p>Envisioning how to meaningfully solve a maths problem</p>
3	Lesson period 3	<p>The students fill in an evaluation form on which they indicate how their learning process went and what they thought of their end result (see Appendix 1). The end results and the lesson goals are discussed together in the class. Students explain how they worked on the assignment. Where/how did you make use of A/C/P thinking? Where has the image really been enlarged by twice its size and what worked out well? Where are differences? Why is this?</p> <p>Discussion at this point can encourage the students to think together about tips for other students undertaking this assignment. Can the students explain themselves what they have learnt?</p>	<p>Reflecting on the use of mathematics for everyday tasks</p>	<p>Evaluating and explaining the strengths and limitations of proposed solutions and output</p> <p>Reflecting on steps taken and chosen maths approach relative to possible alternatives</p>

## Resources and examples for inspiration

### Web and print

- For this lesson one needs images of one or more paintings. The image is cut into strips and it must be clear how these strips fit together. Take this into account when choosing the paintings. A large image is needed for display on the (digital) blackboard, to be used as an example and for the discussion with pupils.
- Each group of pupils needs to have an image of a painting, and the same image is to be cut into strips (insert image).
- Each group has 2 images of a painting, of which 1 is cut into four strips.
- Drawing paper
- Evaluation form

### Other

- Colouring pencils/crayons
- Pencil
- Ruler
- Tape

**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

	<b>CREATIVITY</b> Coming up with new ideas and solutions	Steps	<b>CRITICAL THINKING</b> Questioning and evaluating ideas and solutions	Steps
<b>INQUIRING</b>	Make connections to other maths concepts or to ideas from other disciplines	1,2	Identify and question assumptions and generally accepted ways to pose or solve a maths problem	1
<b>IMAGINING</b>	Generate and play with several approaches to pose or solve a maths problem	1,2	Consider several perspectives on approaching a maths problem	2
<b>DOING</b>	Pose and envision how to solve meaningfully a maths problem in a personally novel way	2	Explain both strengths and limitations of different ways of posing or solving a math problem based on logical and possibly other criteria	3
<b>REFLECTING</b>	Reflect on steps taken to pose and solve a maths problem	4	Reflect on the chosen maths approach and solution relative to possible alternatives	4

Date.....

Name.....

I've worked together with.....

Circle the correct answers if you see an \*

1. In this assignment, we worked together on drawing a painting. Each student worked on a strip of the image, and tried to make a good reproduction of the image, enlarged by twice its size.

We chose the painting made by:

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The title is:

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This is what stood out for me (colour, form, atmosphere):

2. My strip was adjacent to the strip of: .....

and of

.....

We agreed upon:

Colour:.....

....

Atmosphere:.....

....

Other:.....

....

The best transition with other strips

was:.....

Because:.....

...

3 Results

I am/I am not happy with the results, because:.....  
.....  
.....

4 Next time, I want to make these improvements:.....  
.....  
.....

5. Collaboration:

We finished in time\*:            yes/no

The result was good\*:            yes/no

Everybody cooperated\*:        yes/no

We divided the work equally\*:    yes/no

I knew what I had to do\*:        yes/no

My best contribution to the group was:

.....  
.....  
.....

6. Transfer

This is what I've

learned:.....  
.....  
.....  
.....

This week, I'll use it

for:.....  
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.....  
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I want *this* to go better next time:

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.....  
.....

And I'll make sure that happened, by:

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