# STACK and GeoGebra in Secondary School Mathematics:

# technical and didactic aspects

Guido Pinkernell ◦ STACK Conference Durham ◦ April 2025

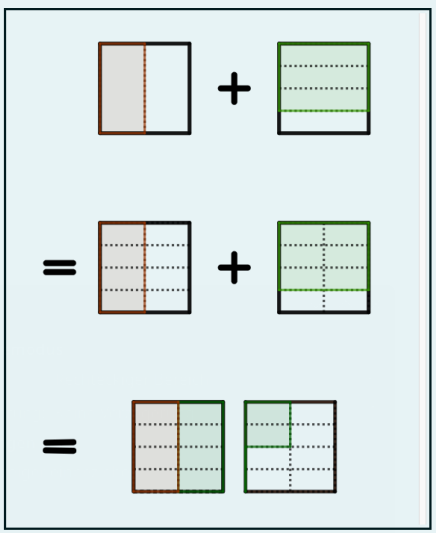
# technical

adding fractions : interpretation of a visualization

STACK question dashboard

This visualization shows
how two fractions are added.

Translate into maths:



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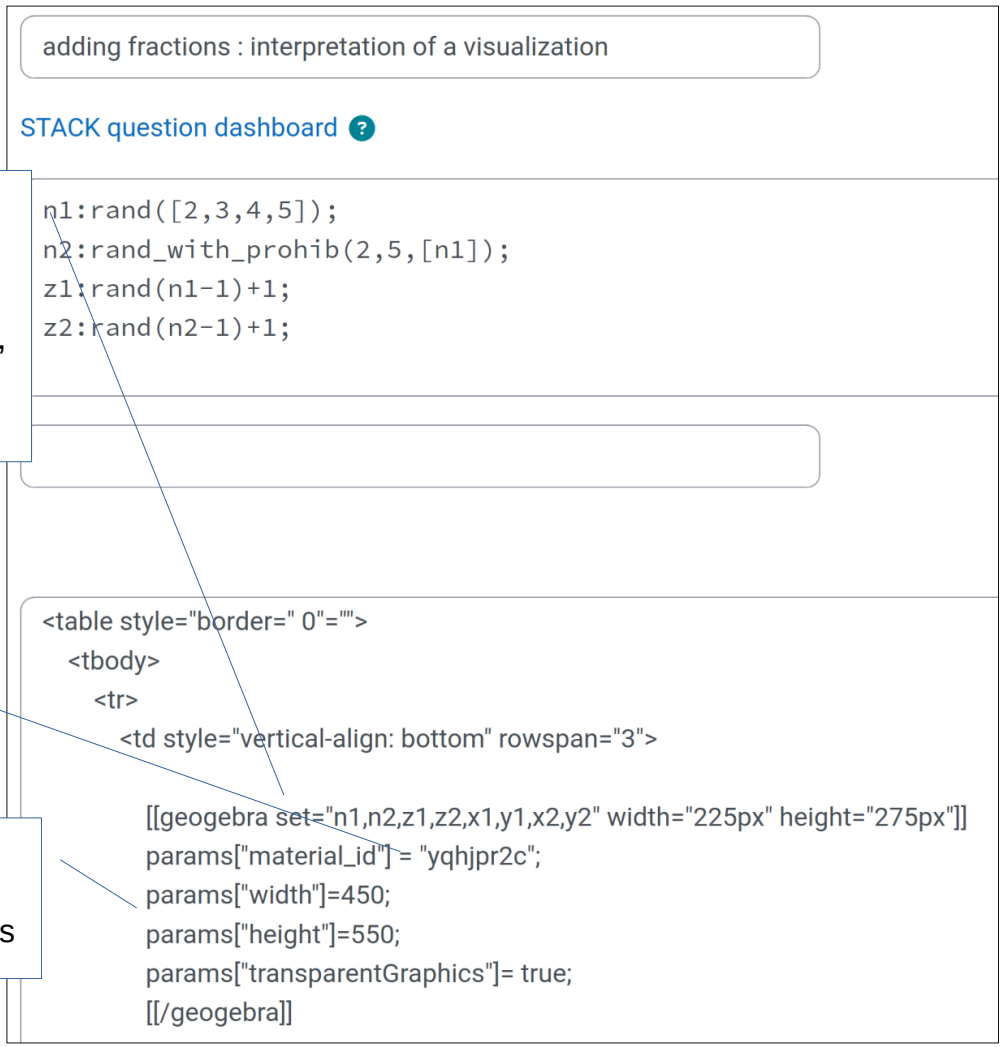
```
n1:rand([2,3,4,5]);
n2:rand_with_prohib(2,5,[n1]);
z1:rand(n1-1)+1;
z2:rand(n2-1)+1;
```

```
<table style="border=" 0"="">
  <tbody>
    <tr>
      <td style="vertical-align: bottom" rowspan="3">

        [[geogebra set="n1,n2,z1,z2,x1,y1,x2,y2" width="225px" height="275px"]]
        params["material_id"] = "yqhjpr2c";
        params["width"]=450;
        params["height"]=550;
        params["transparentGraphics"]= true;
        [[/geogebra]]
```



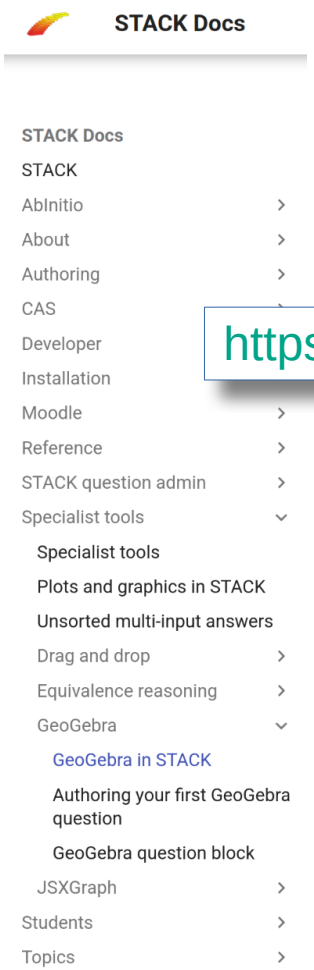

names of variables in applet, with

set: transmit values from STACK to applet
watch: read values from applet into STACK on “Check”
remember: remember values for reloading applet

applet ID on geogebra.org

GeoGebra App Parameters

https://wiki.geogebra.org/en/Reference:GeoGebra_App_Parameters

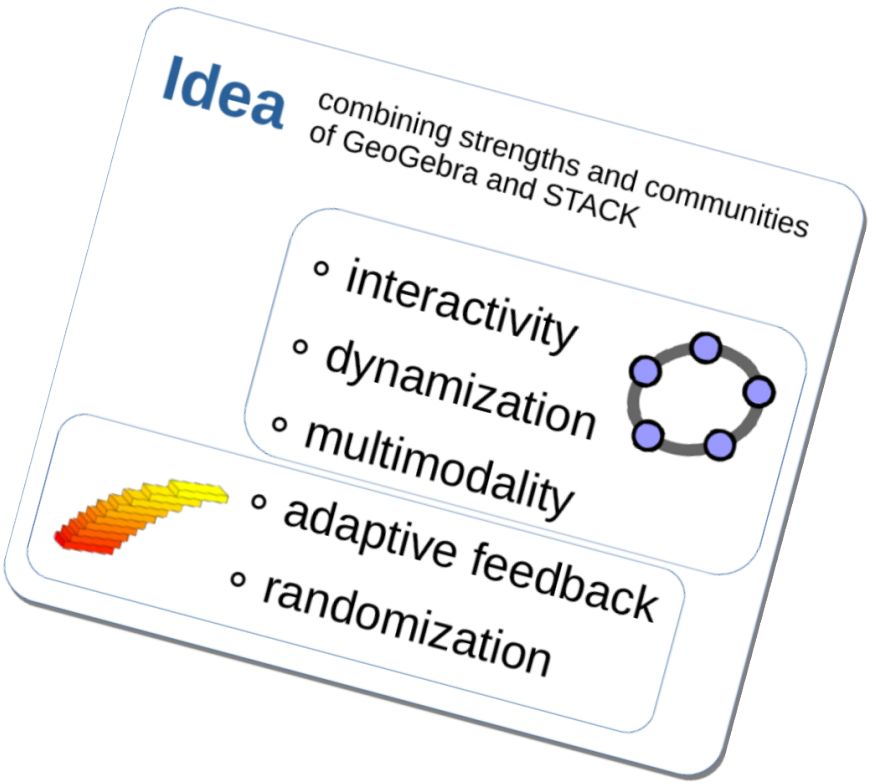



https://docs.stack-assessment.org/en/Specialist_tools/GeoGebra/

didactic

affordances for a transformative digitisation

- in task
- in feedback



affordances for a transformative digitisation

- in task
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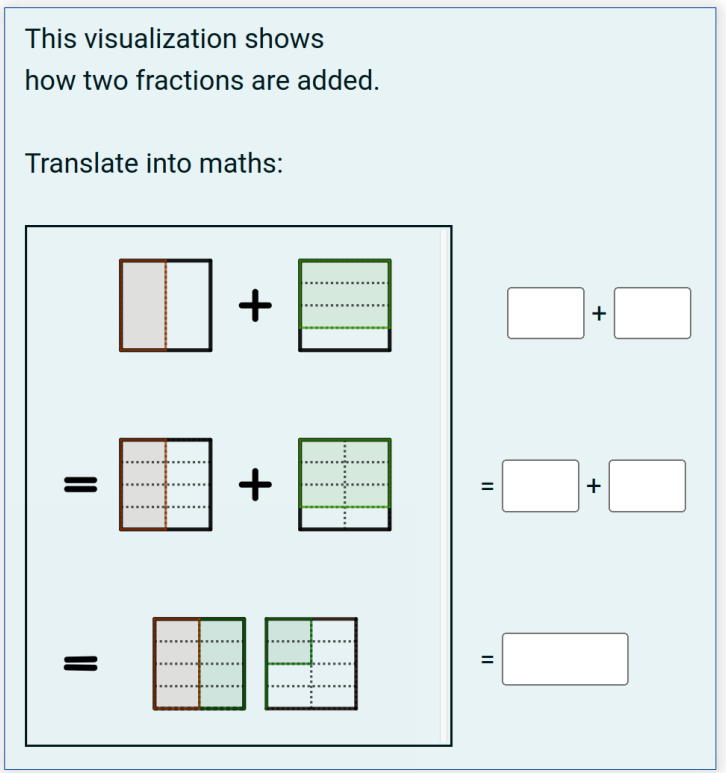
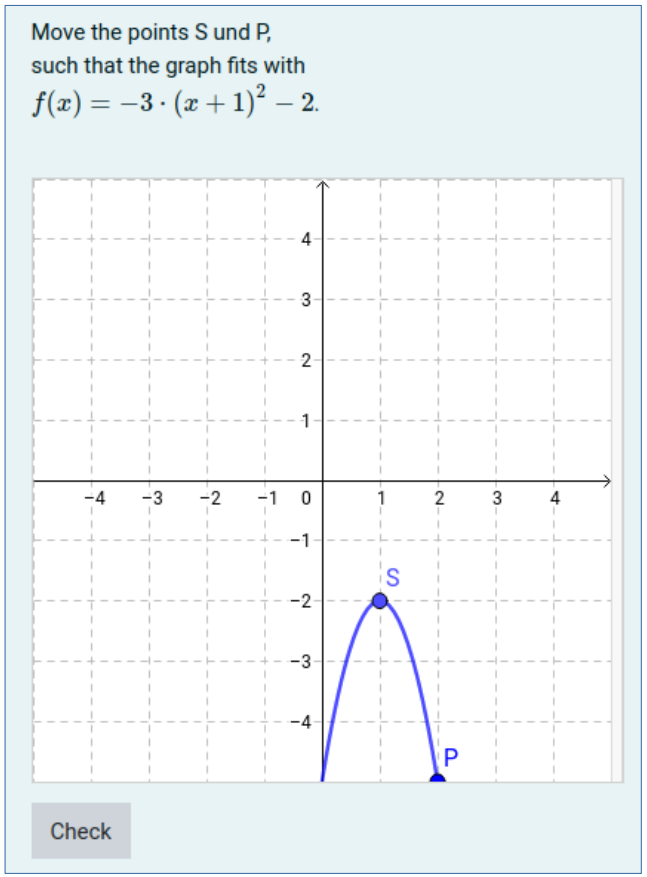


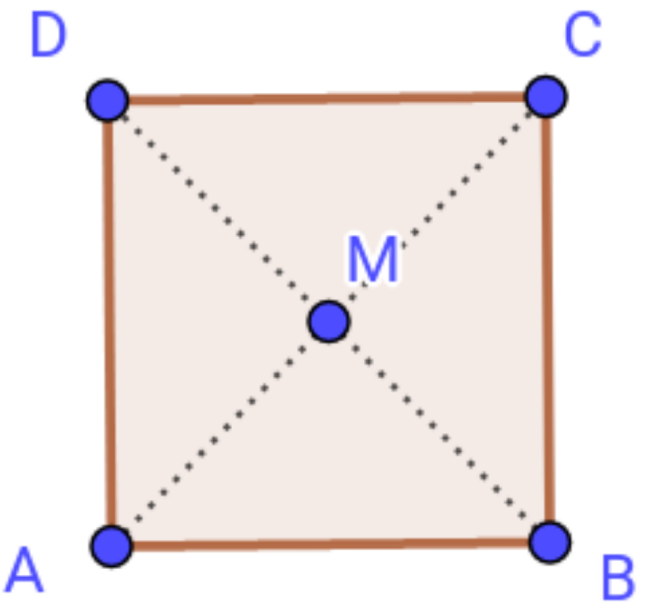
affordances for a transformative digitisation

- in task
- in feedback



affordances for a transformative digitisation

- in task
- in feedback




“This is not a square”
(Pinkernell et al. 2022)

affordances for a transformative digitisation

- in task
- in feedback

Transformations of the plane
are characterised by specific properties.

Do you remember?

A reflection in a line

- [ ] ...preserves distances
- [x] ...has at least one fixed line
- [ ] ...has at least one line of fixed points

Check

**Sorry, part of your answers are not correct.**

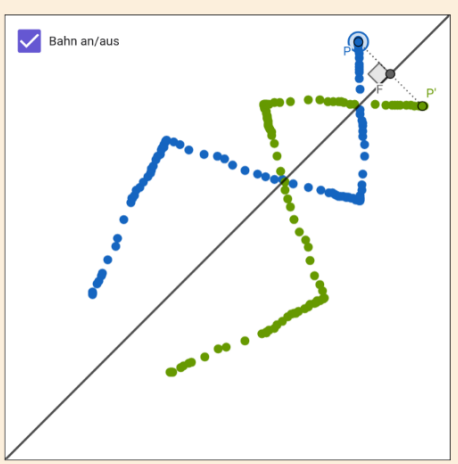
What would be correct then?

**Find out yourself:**

ransformation

- ...preserves distances, if
  a blue segment
  and the corresponding green segment
  are always of the same length,
- ...has at least one fixed line, if
  there is a blue straight line
  which coincides with its corresponding green line,
- ...has at least one line of fixed points, if
  there is a blue straight line
  on which all points coincide with their corresponding green points.

**Check with this reflection in a line:**




**Do you have an idea?**

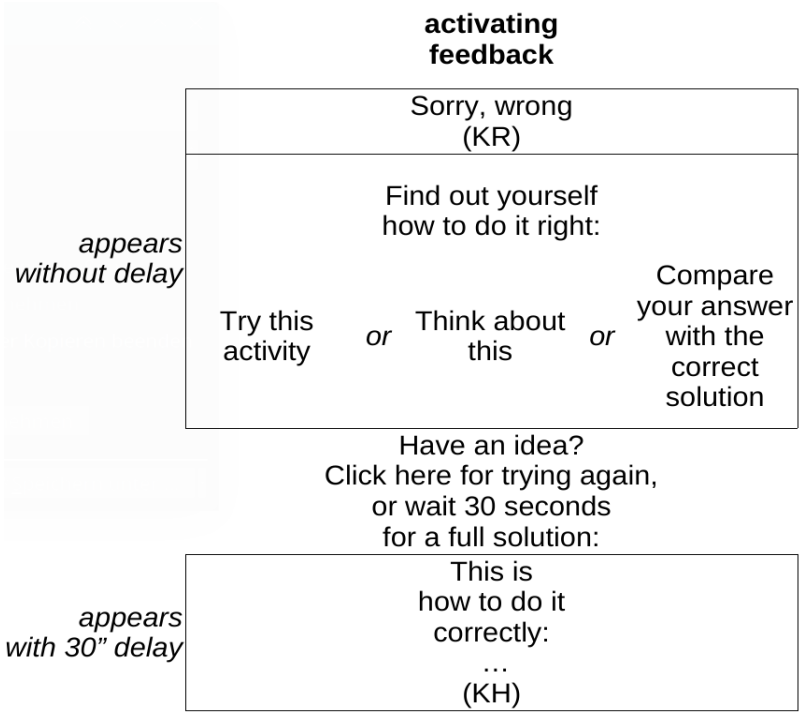
Then try this question again.

**Else wait 30 seconds**
**until a full solution appears here:**

Klicke hier für die Musterlösung

affordances for a transformative digitisation

- in task
- in feedback



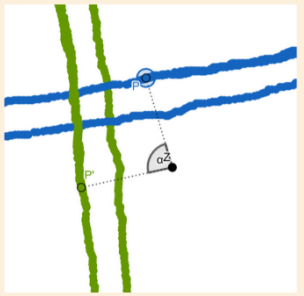
affordances for a transformative digitisation

- in task
- in feedback

**This is what you need to know:**

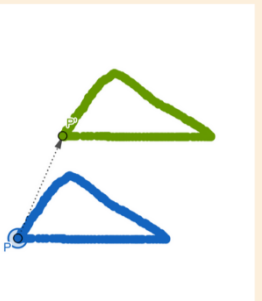
On the right you see two blue straight lines. The corresponding green lines are also straight. Furthermore, parallelism is preserved too.

**The translation hence seems to preserve lines and parallelism!**



On the right you see a blue triangle. The corresponding green triangle seems congruent. To be more precise: The lengths of the triangle sides are preserved, also the size of the angles. And while the blue triangle is drawn round to the left, the green triangle gets drawn round to the left, too.

**The translation hence seems to preserve distances, angles and orientation!**



On the right you see a blue line and its
n line quite exactly on
ue point is at a place
with its corresponding

**Do you have an idea?**

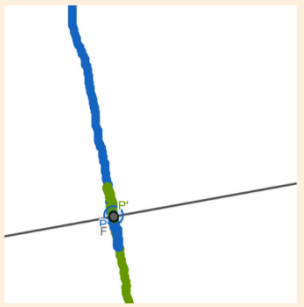
Then try this question again.

**Else wait 30 seconds until a full solution appears here:**

Klicke hier für die Musterlösung

**ms to have fixed lines**

the blue point along the
es that this line consists
of fixed points.



**The translation seems to have a line of fixed points too!**