Handheld Geometry

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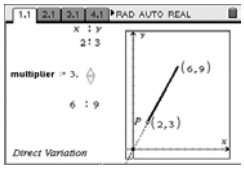
Notes for HG079



"Variation - Direct and Inverse"

General

This is a multiple representation activity for introducing ratio, direct proportion as well as inverse proportion. It has further links with solving simultaneous linear equations graphically.

Student Specific

On the next page are a series of tasks that I set my students from each page. They had to alter point P and the sliders to create an image that reflected the task requirements. Where there are question marks, they had to figure out the appropriate number, or location of Point P. The upper ratio they have to have at the top of the screen, the lower ratio they have to have at the bottom, after whatever multiplication or division has taken place.

Teacher Specific

Pages 1.1 to 4.1 cover Direct Variation, whilst page 5.1 covers Inverse Variation

Open the file at Page 1.1
You can increase or decrease the multiplier by clicking on the slider's arrows.
You can change the starting ratio of x:y by grabbing point P [make sure it says 'Point P' before you try to grab it!]
Point P has been restricted to only moving around integer values.
After the multiplier has been applied to the starting ratio x:y, the resultant, equivalent ratio is stated below and this creates the second point on the axes. As you change the multiplier, look to see how the graph changes.

Page 2.1 is the same, but you control the divider this time.

Page 3.1 is the same, but now you control both multipliers and dividers

Page 4.1 is the same as 3.1, but there is an extra control for 'total'. This represents the total of the numbers that make up the ratio. For example, the ratio 2:3 has a total of 5. So, if you had to split the number 15 into the ratio 2:3, you'd be looking to create an equivalent ratio to 2:3, but whose numbers sum to 15. The answer comes from trebling each number (as 15 divided by 5 is 3). On page 4.1 you can increase the total number to 15 and see what happens to the graph.
Lo and behold, we actually have simultaneous linear equations solved graphically!

Now, you don't need to stress this, but I think it will be a useful piece of imagery for them to relate back to when the topic of linear functions and simultaneous equations are met.

Page 5.1 is the same sort of multipliers, and movable point P, but the relation is inverse proportion. So one slider multiplies the first number in the ratio (and thus divides the second) and the second slider multiplies the second number in the ratio (and thus divides the first).
I'm not yet sure how much this visualisation assists understanding, but it fits well with pages 1.1 to 4.1
I've not yet created any 'tasks' for page 5.1, as I did for the first 4 pages.
If anyone else does this, then I'd love to see them.

Feedback

Do you have any comments on these notes? Please get in Contact via the website and help improve them further. All contributors are acknowledged.

HG079 Variation - Direct and Inverse

Page 1.1

2:5	1:2	? : ?	? : ?
↓ x ?	↓ x ?	↓ x 3	↓ x 5
4:10	4:8	9:6	10:5

Page 2.1

9:12	5:3	3:8	? : ?
↓ ÷ ?	↓ ÷ ?	↓ ÷ ?	↓ ÷ 6
3:4	1:0.6	0.75:2	1.5:1

Page 3.1

4:6	2:5	6:9
↓ ÷ ?	↓ ÷ ?	↓ ÷ ?
↓ x ?	↓ x ?	↓ x ?
6:9	1:2.5	8:12

Page 4.1

Adjust total=12	Adjust total=14	Adjust total=8
2:4	3:9	5:2
↓ ÷ ?	↓ ÷ ?	↓ ÷ ?
↓ x ?	↓ x ?	↓ x ?
? : ?	? : ?	? : ?
Total of these last numbers must equal 12	Total of these last numbers must equal 14	Total of these last numbers must equal 8

Page 5.1

a) What's different here?
b) How can you make the calculated point move leftwards and upwards?
c) How can you make the calculated point move rightwards and downwards?
d) How does this visualisation help you think about inverse proportion, compared to direct proportion?
e) Can you make up some challenges for this page, similar to the ones for pages 1.1 to 4.1, that could be set to other students?