Unit 1

Lesson 5

Dilations

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Part 1

As Alice goes through her adventure, she encounters the following potions and cakes:
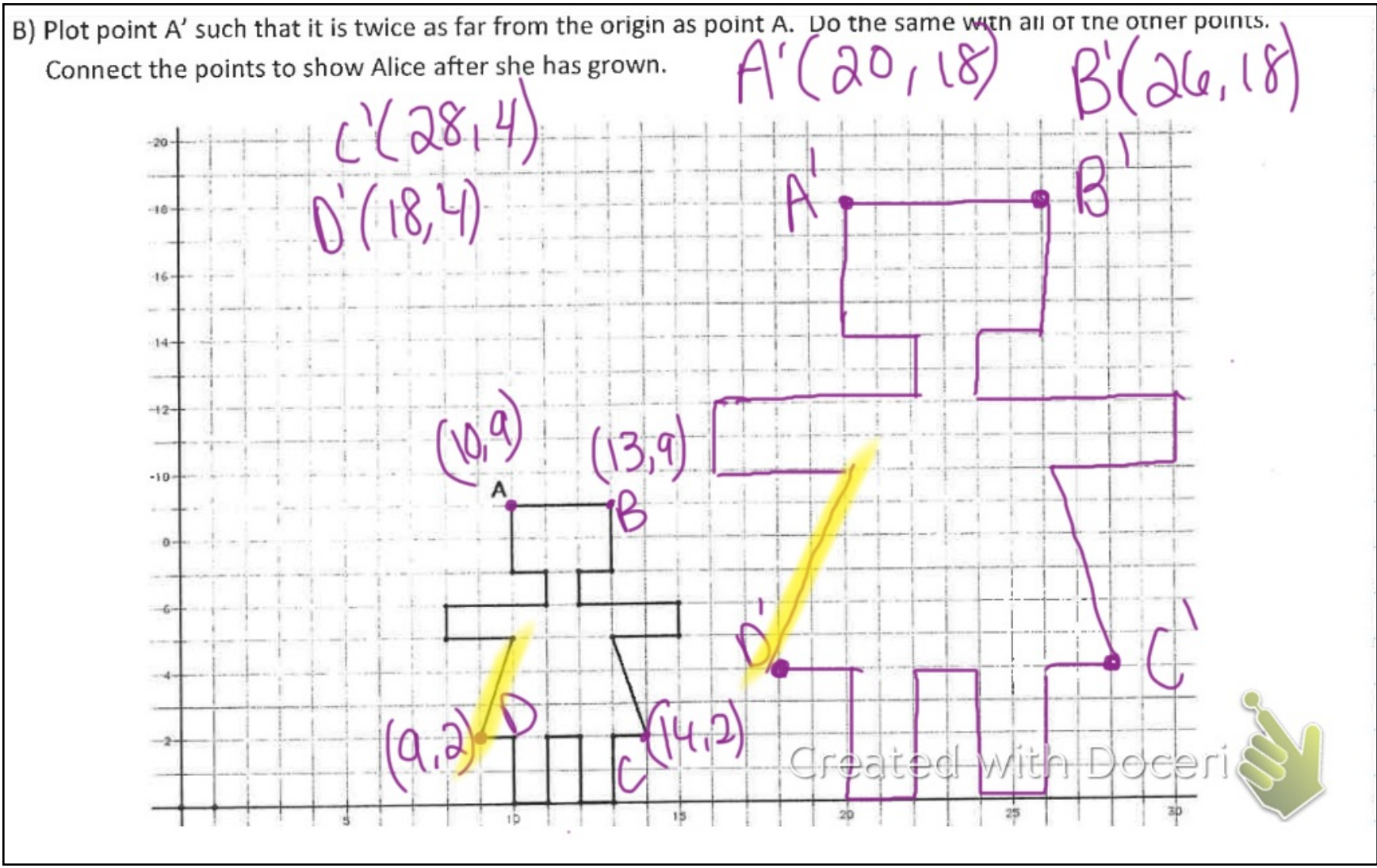
Red potion – shrink by $\frac{1}{9}$

Blue potion – shrink by $\frac{1}{36}$

Green potion – shrink by $\frac{1}{15}$

Yellow potion – shrink by $\frac{1}{4}$

Chocolate cake – grow by 12 times

Red velvet cake – grow by 18 times

Carrot cake – grow by 9 times

Lemon cake – grow by 10 times

Find Alice's height after she drinks each potion or eats each bite of cake. **If everything goes correctly, Al** **return to her normal height by the end.**

Starting Height	Alice Eats or Drinks	Scale factor from above	New Height
54 inches	Red potion	$\frac{1}{9}$	6 inches
6 inches	Chocolate cake	6×12	72 in
72	Yellow potion	72×¼	18 in
18	Carrot cake	18×9	162
162	Blue potion	162×1/36	4.5 or 9/2
4.5	Lemon cake	4.5×10	45
45	Green potion	45×115	3
3	Red velvet cake	×18	54 inches

B) Plot point A' such that it is twice as far from the origin as point A. Do the same with all of the other points. Connect the points to show Alice after she has grown.

A'(20, 18)   B'(26, 18)

C'(28, 4)

D'(18, 4)

(10, 9)   (13, 9)
   A   B

(9, 2) D   (14, 2)
             C

C) Answer the following questions:

1. How many times larger is the new Alice? ___$2x$___

2. How much farther away from the origin is the new Alice? ___twice as far___

3. What are the coordinates for point A? ___(10,9)___ Point A'? ___(20,18)___

4. What arithmetic operation do you think happened to the coordinates of A? $(2x, 2y)$

5. Write your conclusion as an Algebraic Rule $(x, y) \rightarrow ($, $)$

6. What arithmetic operation on the coordinates do you think would shrink Alice in half? $\times \frac{1}{2}$

7. Write your conclusion as an algebraic rule. $(\frac{1}{2}x, \frac{1}{2}y)$

8. If Alice shrinks in half, how far away from the origin will her image be from her preimage? $\frac{1}{2}$ as far

9. Sketch Alice after she shrinks. $A''(5, 4.5)$ $B''(6.5, 4.5)$ $C''(7, 1)$ $D''(4.5, 1)$

10. Choose a diagonal segment on Alice's dress. Calculate the slope of this segment on all three dresses. What do you notice about all three of the slopes? ___equal___

What is the name given to this geometric relationship? ___Parallel___

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➢   A **DILATION** stretches or shrinks the original figure.

- The **description** of a dilation should include the __Scale factor__, the __center__ of the dilation, and whether the dilation is an __enlargement__ or a __reduction__.

- The amount by which the image grows or shrinks is called the "__Scale__ __Factor__."

- The __center__ of dilation is a fixed point in the plane about which all points are expanded or contracted.

- A dilation is an enlargement of the pre-image if the __Scale factor__ is __> 1__.

- A dilation is a reduction of the pre-image if the __Scale factor__ is __$0 < x < 1$__.

- If the scale factor is 1, then the pre-image and image are __$\cong$__.
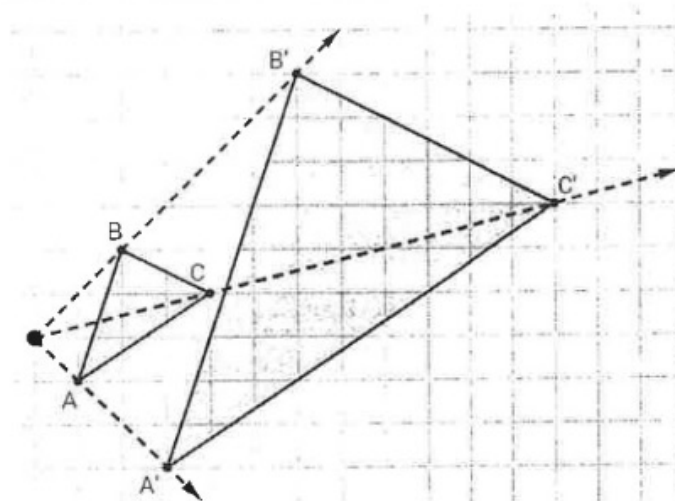
between 0 and 1

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❖ **Algebraic Rule:** $(x, y) \rightarrow (ax, ay)$

If $a > 1$ then the dilation is *an enlargement*

If $0 < a < 1$ then the dilation is *a reduction*

The distance between the center of a dilation and any point on the pre-image is equal to the *scale factor* multiplied by the distance between the dilation center and the corresponding point on the image.
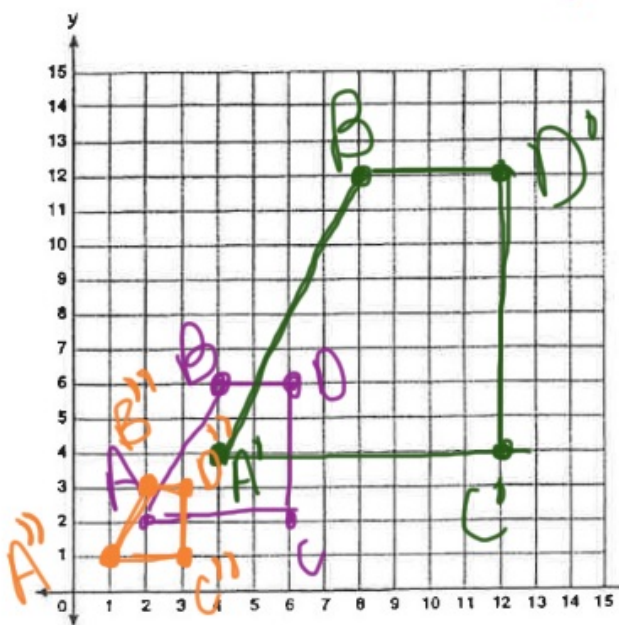
❖ A dilation is (SOMETIMES) / ALWAYS / NEVER   an 'Isometry'.

1. Graph and connect these points: A (2, 2) B (4, 6) C (6, 2) D (6, 6).

2. Graph the image on the same coordinate plane by applying a scale factor of 2. C.O.D. @ origin

Write the rule: $(2x, 2y)$

3. Graph the image on the same coordinate plane by applying a scale factor of $\frac{1}{2}$.

$(\frac{1}{2}x, \frac{1}{2}y)$

Write the rule: _____

4. Choose a diagonal segment on the trapezoid. Calculate the slope of this segment on all three figures.

What do you notice about all three of the slopes? _____

What is the name given to this geometric relationship?

Parallel

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