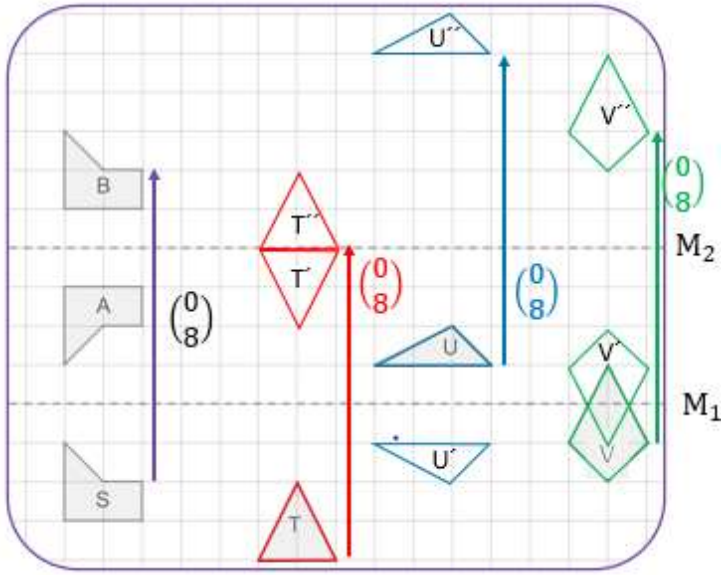
Answers: Week 2 Session 1

Task 1



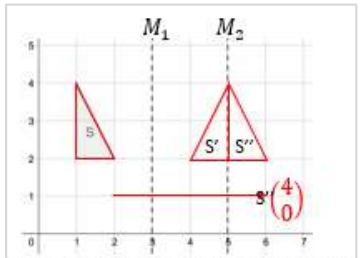
E.g. for T:

T' indicates reflecting T in line M_1

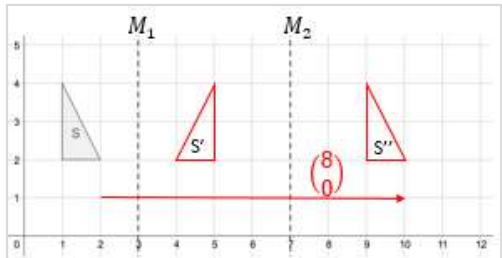
T'' indicates reflecting T' in line M_2

The combined reflections result in a single *translation* of T onto T'' of $\begin{pmatrix}0\\8\end{pmatrix}$, i.e. 0 across and 8 vertically upwards.

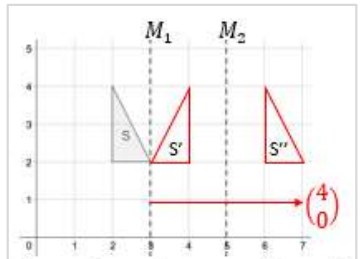
Task 2



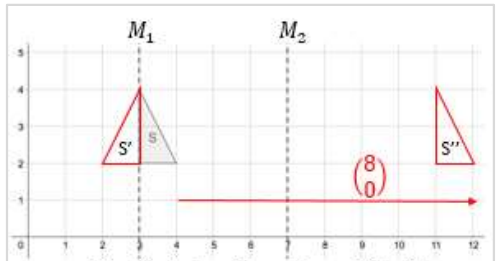
The single transformation of S to S'' is a translation of vector $\begin{pmatrix}4\\0\end{pmatrix}$



The single transformation of S to S'' is a translation of vector $\begin{pmatrix}8\\0\end{pmatrix}$



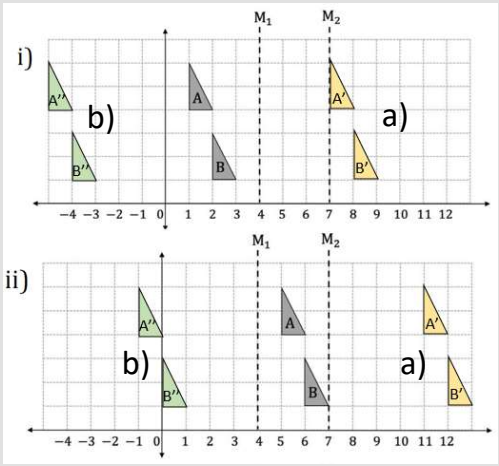
The single transformation of S to S'' is a translation of vector $\begin{pmatrix}4\\0\end{pmatrix}$



The single transformation of S to S'' is a translation of vector $\begin{pmatrix}8\\0\end{pmatrix}$

Exercise

1.



iii) Pattern continues

c) Translations for all i)-iii):

A to A': $\begin{pmatrix}6\\0\end{pmatrix}$

A to A'': $\begin{pmatrix}-6\\0\end{pmatrix}$

B to B': $\begin{pmatrix}6\\0\end{pmatrix}$

B to B'': $\begin{pmatrix}-6\\0\end{pmatrix}$

2.

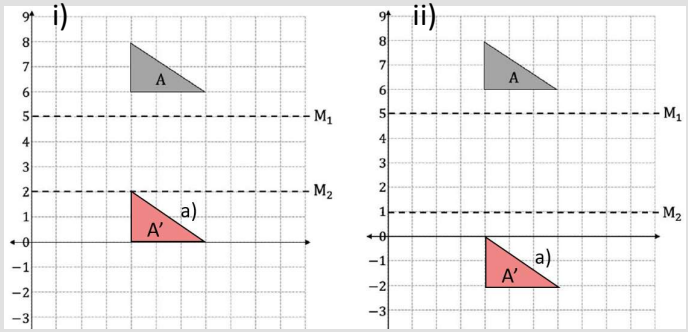
a) A to A': $\begin{pmatrix}7\\0\end{pmatrix}$

b) E.g. $x = 4$ and $x = 7.5$

c) All pairs of mirror lines are parallel to y-axis.

d) All pairs of mirror lines are separated by 3.5 units on the x-axis.

3.



iii) A' at same coordinates as in ii)

b) i) A to A': $\begin{pmatrix}0\\-6\end{pmatrix}$ ii) A to A': $\begin{pmatrix}0\\-8\end{pmatrix}$ ii) A to A': $\begin{pmatrix}0\\-8\end{pmatrix}$

c) The translation is perpendicular to lines M_1 and M_2, and of distance double the gap between them.

4.

When pairs of mirror lines are perpendicular the order of reflection doesn't matter.

When pairs of mirror lines are parallel reversing the order of reflection reverses the equivalent translation (see Q1).

This is always true.

D1.

a) As shown

b) Rotation 90° clockwise about (1,1)

c) Always rotates 90° clockwise about intersection of M_1 and M_2

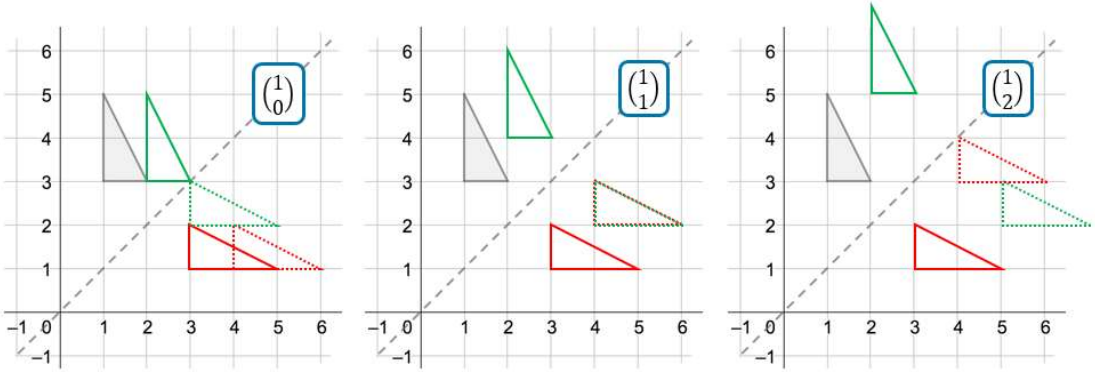
Answers: Week 2 Session 2

Task 1

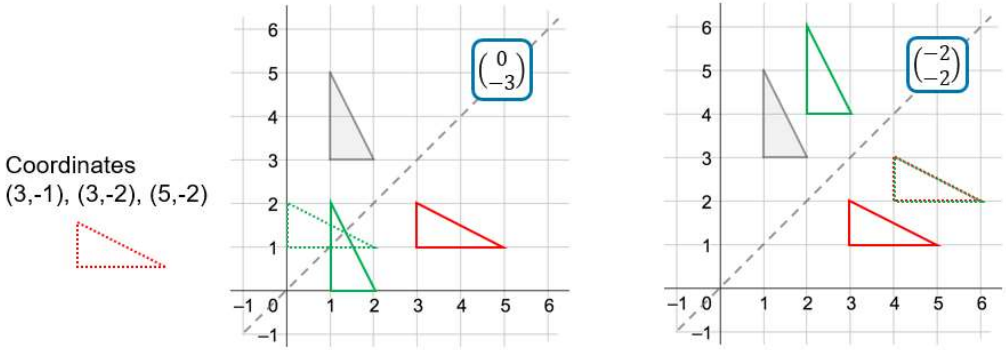
A to B	Reflection in line $x = 4$ followed by translation by $\begin{pmatrix} 0 \\ -3 \end{pmatrix}$ **or** translation by $\begin{pmatrix} 0 \\ -3 \end{pmatrix}$ followed by reflection in line $x = 4$
A to S	Reflection in line $x = 4$
A to T	Translation by $\begin{pmatrix} 0 \\ -3 \end{pmatrix}$
B to A	Reflection in line $x = 4$ followed by translation by $\begin{pmatrix} 0 \\ 3 \end{pmatrix}$ **or** translation by $\begin{pmatrix} 0 \\ 3 \end{pmatrix}$ followed by reflection in the line $x = 4$
B to S	Translation by $\begin{pmatrix} 0 \\ 3 \end{pmatrix}$
B to T	Reflection in line $x = 4$
S to A	Reflection in line $x = 4$
S to B	Translation by $\begin{pmatrix} 0 \\ -3 \end{pmatrix}$
S to T	Reflection in line $x = 4$ followed by translation by $\begin{pmatrix} 0 \\ -3 \end{pmatrix}$ **or** translation by $\begin{pmatrix} 0 \\ -3 \end{pmatrix}$ followed by reflection in the line $x = 4$
T to A	Translation by $\begin{pmatrix} 0 \\ 3 \end{pmatrix}$
T to B	Reflection in line $x = 4$
T to S	Reflection in line $x = 4$ followed by translation by $\begin{pmatrix} 0 \\ 3 \end{pmatrix}$ **or** translation by $\begin{pmatrix} 0 \\ 3 \end{pmatrix}$ followed by reflection in line $x = 4$

Task 2

- Reflecting then translating
- Translating then reflecting



Coordinates
(3,-1), (3,-2), (5,-2)



Exercise

1.

a) (2,4), (3,4) and (2,6)

b)

i) (4,4), (5,4) and (4,6)

ii) (2,1), 3,1) and (2,3)

iii) (3,5), (4,5) and (3,7)

iv) (0,6), (1,6) and (0,8)

2.

a) (7,4), (8,4) and (8,6)

b) (-4,-2), (-6,-2) and (-4,-3)

c) (4,2), (6,2) and (4,3)

d) (2,0), (2,2) and (3,2)

3.

	Final images in **same** location	Final images in **different** locations
a)		●
b)	●	
c)	●	
d)		●

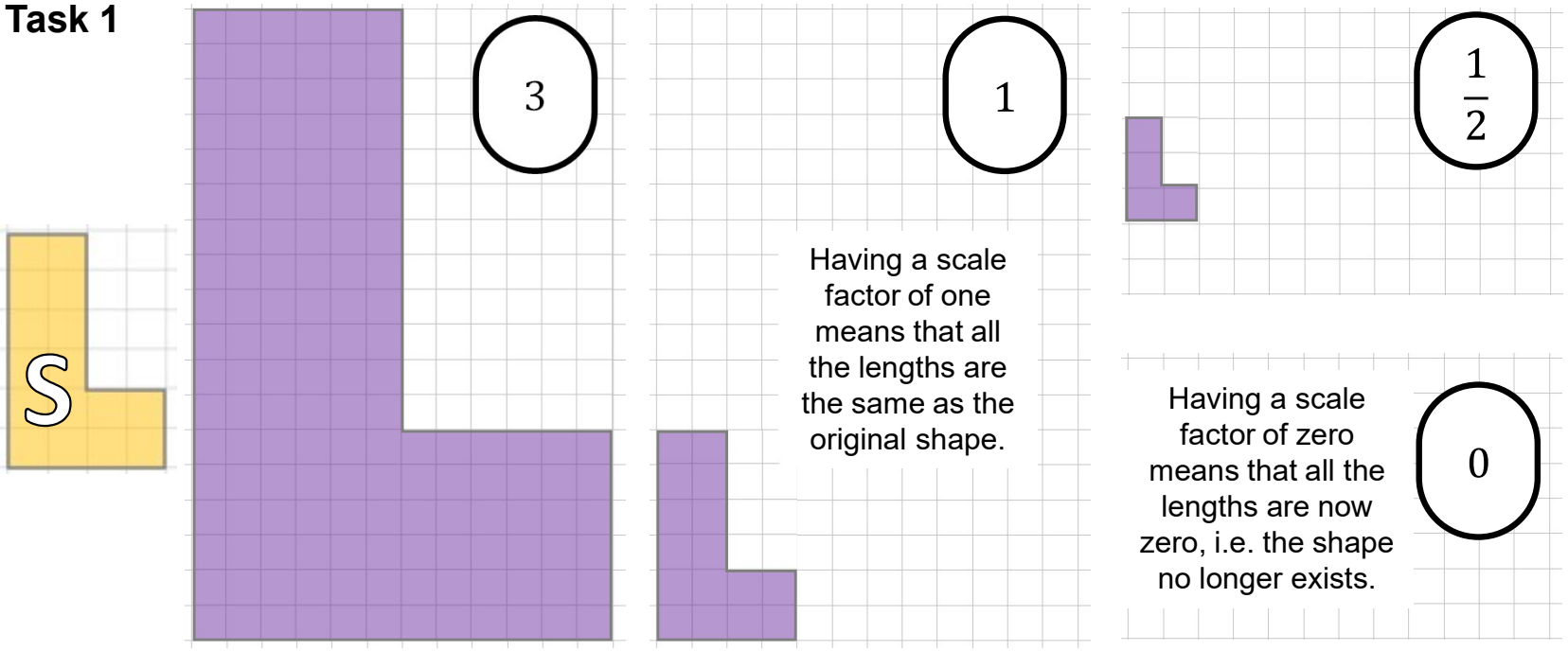
Images will be in the same location if the translation is parallel to the mirror line.

D1.

The distance between corresponding points on the images will double the value of **a** (assume positive distance)

Answers: Week 2 Session 3

Task 1



Task 2

An enlargement multiplies (or scales) all lengths by the same scale factor.

In this case the height is scaled × 2 but the width only × $1\frac{1}{2}$, therefore it is not an enlargement.

For the enlargement to be correct:

- Shape B could be;

$12\text{ cm} \times 8\text{ cm}$ (scale factor 2) or
$9\text{ cm} \times 6\text{ cm}$ (scale factor $1\frac{1}{2}$) or

- Shape A could be;

$6\text{ cm} \times 3\text{ cm}$ (scale factor 2) or
$8\text{ cm} \times 4\text{ cm}$ (scale factor $1\frac{1}{2}$)

Exercise

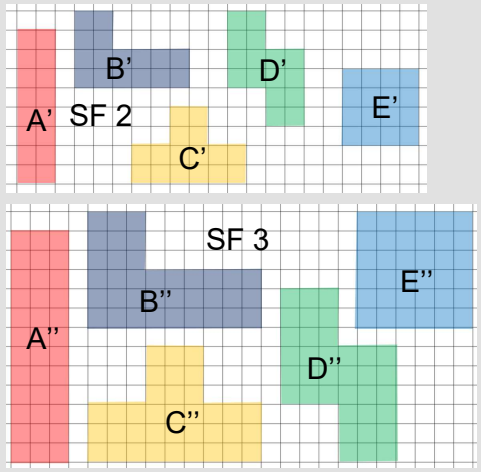
1.

a) i) 4 ii) $\frac{1}{4}$

b) i) 2 ii) $\frac{1}{2}$

c) i) 3 ii) $\frac{1}{3}$

2.



SF 1: Shapes stay the same

3.

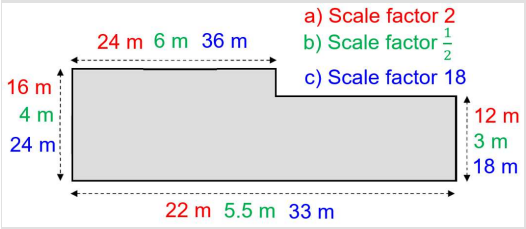
SF 1 perimeters:
A 10; B 10; C 10; D 10; E; 8

SF 2 perimeters:
A' 20; B' 20; C' 20; D' 20; E' 16

SF 3 perimeters:
A'' 30; B'' 30; C'' 30; D'' 30; E'' 24

SF has multiplying effect on perimeter (scaling)

4.



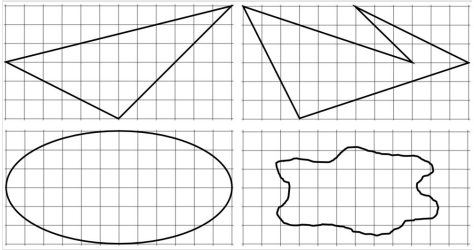
5.

a) Perimeter 76 m
b) Perimeter 19 m
c) Perimeter 114 m

6.

Multiple possible ways of partitioning. Final rectangles must always be 4 × 6

7.



D1.

a)

$a = 4, b = 5;$

$a = 8, b = 10;$

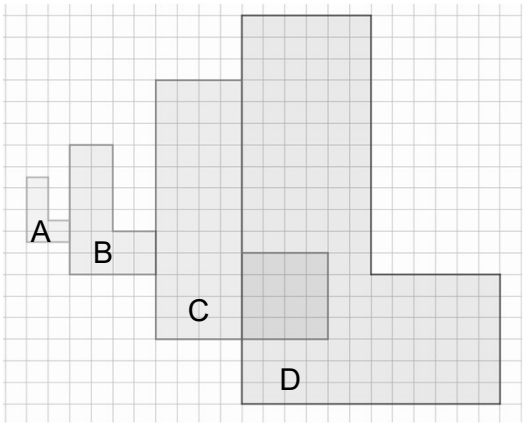
$a = 12, b = 15$

b) E.g.:

$5a = 4b$

Answers: Week 2 Session 4

Task 1



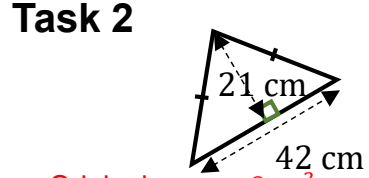
A to B: Scale factor of 2
A to C: Scale factor of 4
A to D: Scale factor of 6

B to A: Scale factor of $\frac{1}{2}$
B to C: Scale factor of 2
B to D: Scale factor of 3

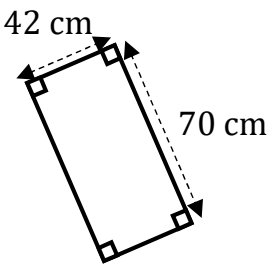
C to A: Scale factor of $\frac{1}{4}$
C to B: Scale factor of $\frac{1}{2}$
C to D: Scale factor of $1\frac{1}{2}$ or $\frac{3}{2}$

D to A: Scale factor of $\frac{1}{6}$
D to B: Scale factor of $\frac{1}{3}$
D to C: Scale factor of $\frac{2}{3}$

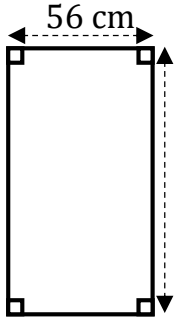
Task 2



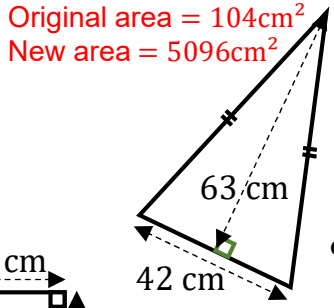
Original area = $9cm^2$
New area = $441cm^2$



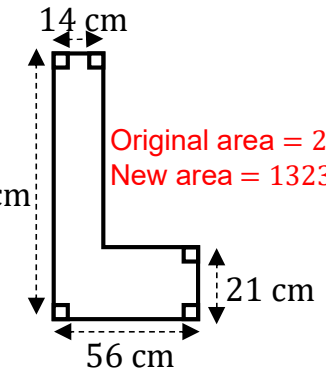
Original area = $60cm^2$
New area = $2940cm^2$



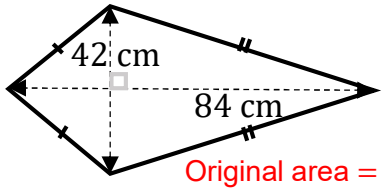
Original area = $72cm^2$
New area = $3528cm^2$



Original area = $104cm^2$
New area = $5096cm^2$



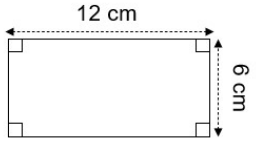
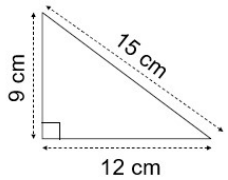
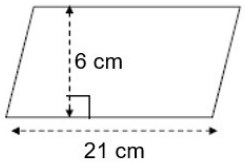
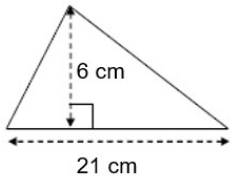
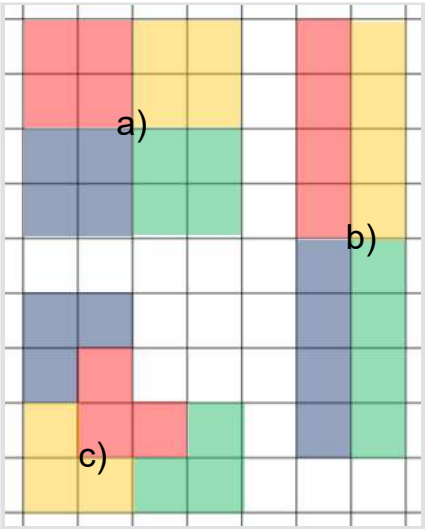
Original area = $27cm^2$
New area = $1323cm^2$



Original area = $44cm^2$
New area = $2156cm^2$

The new areas are 49 × the original area (note that this is also 7^2)

Exercise

1.	2.	3.	4.	5.	D1.
a) 8 cm^2 b) 6 cm^2 c) 14 cm^2 d) 7 cm^2	 Area = 72 cm^2  Area = 54 cm^2  Area = 126 cm^2  Area = 126 cm^2		a) $5 \times 4 \times 5 \times 8 =$ $5 \times 5 \times 4 \times 8 =$ $25 \times 32\ cm^2$ **25 times greater** b) $12 \times 4 \times 12 \times 8 =$ $12 \times 12 \times 4 \times 8 =$ $144 \times 32\ cm^2$ **144 times greater** c) $n \times 4 \times n \times 8 =$ $n \times n \times 4 \times 8 =$ $n^2 \times 32\ cm^2$ **n^2 times greater**	a) Perimeter: Answers in range 350-390 km (or 35-39 million cm) b) Area: Answers in range 5200-5600 km^2 (Note: each square on the grid has length 2 000 000 cm = 20 km)	Areas of the circles compared to smallest in ascending order: 4 times greater (2^2) 36 times greater (6^2) 81 times greater (9^2)