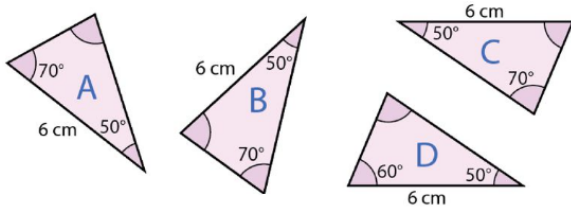
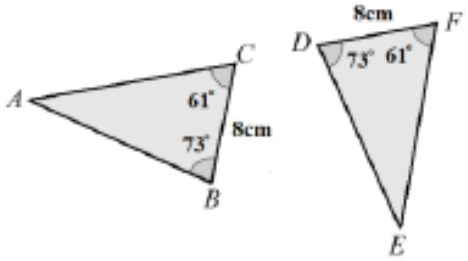
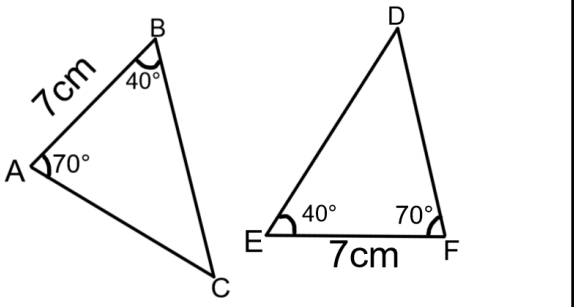
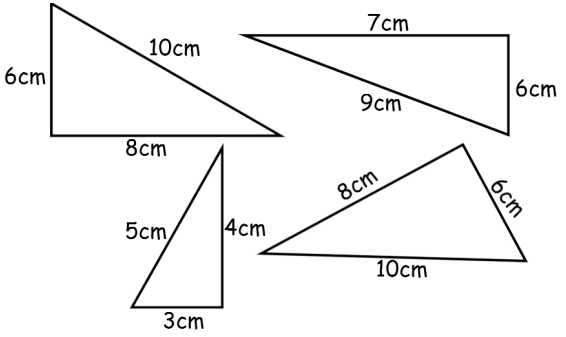
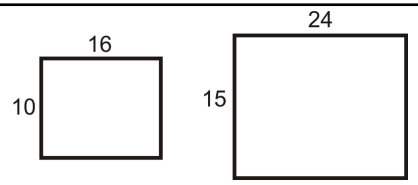
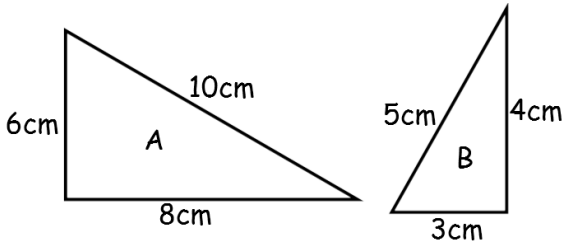
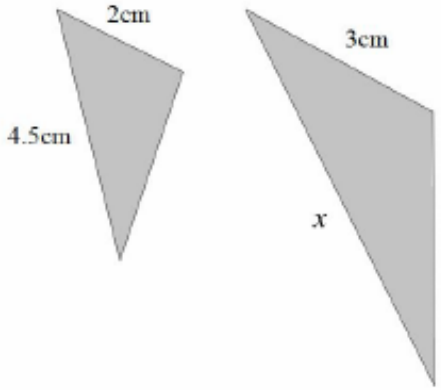
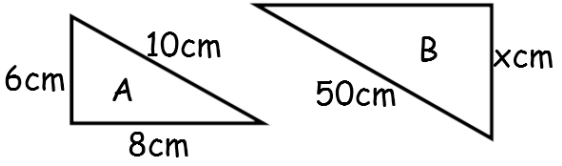
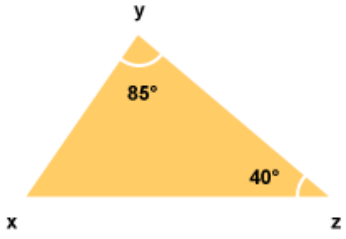
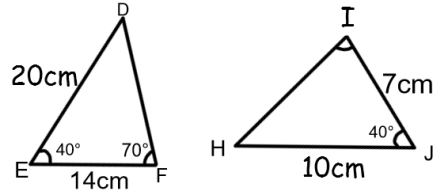
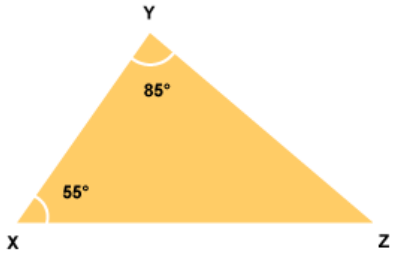
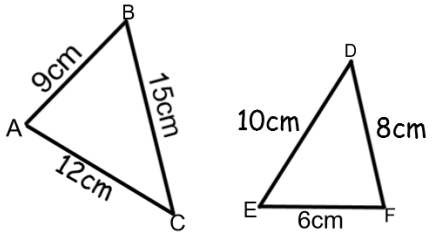
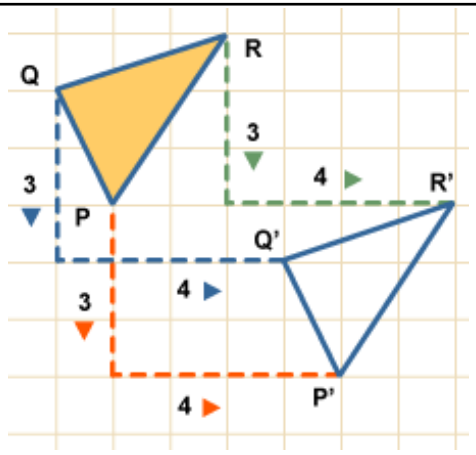
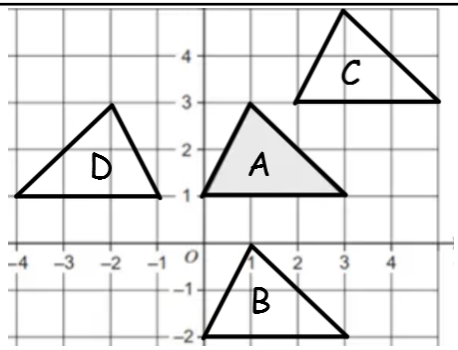
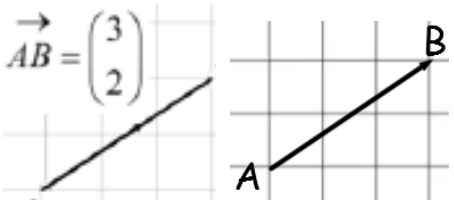
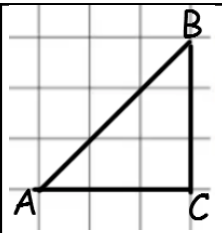
GCSE Mathematics – Unit 19: Congruence, Similarity and Vectors **Name:…….**

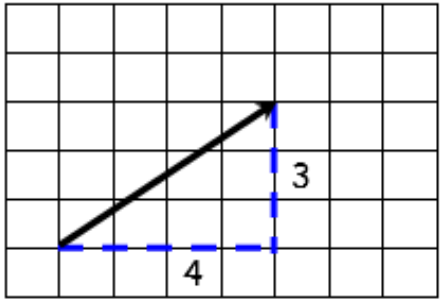
Topic/Skill	Definition/Tips	Example	Your Turn
Congruent Shapes	Shapes are congruent if they are **identical** - **same shape** and **same size**. Shapes can be rotated or reflected but still be congruent.		Spot the odd one out 
Congruent Triangles	4 ways of proving that two triangles are congruent: 1. **SSS** (Side, Side, Side) 2. **RHS** (Right angle, Hypotenuse, Side) 3. **SAS** (Side, Angle, Side) 4. **ASA** (Angle, Side, Angle) or **AAS** <u>ASS does not prove congruency.</u>	 $BC = DF$ $\angle ABC = \angle EDF$ $\angle ACB = \angle EFD$ $\therefore$ The two triangles are congruent by AAS.	
Similar Shapes	Shapes are similar if they are the **same shape but different sizes**. The proportion of the matching sides must be the same, meaning the ratios of corresponding sides are all equal.		

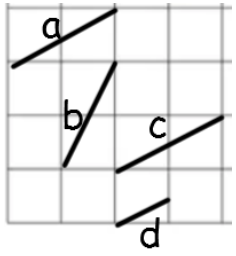
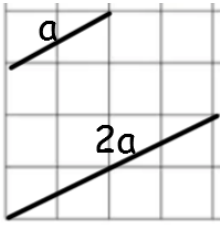
			Which one is **not** similar?
Scale Factor	The **ratio of corresponding sides** of two similar shapes. To find a scale factor, **divide a length** on one shape **by the corresponding length** on a similar shape.	 Scale Factor = $15 \div 10 = 1.5$	 What is the scale factor **from A to B?**
Finding missing lengths in similar shapes	1. Find the **scale factor**. 2. **Multiply or divide** the corresponding side to find a missing length. If you are finding a missing length on the larger shape you will need to multiply by the scale factor. If you are finding a missing length on the smaller shape you will need to divide by the scale factor.	 Scale Factor = $3 \div 2 = 1.5$ $x = 4.5 \times 1.5 = 6.75cm$	 **A and B are similar** Find x
Similar Triangles	To show that two triangles are similar, show that: 1. The three sides are in the same proportion 2. Two sides are in the same proportion, and their included angle is the same 3. The three angles are equal		 You can show these two triangles are similar by…

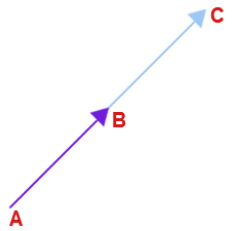
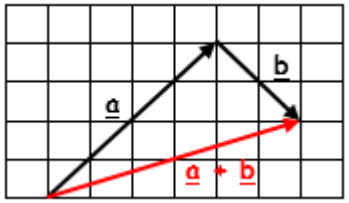
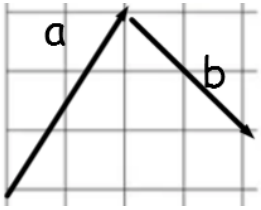
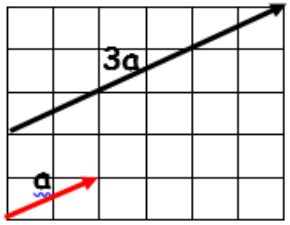
		 You can show these two triangles are similar by working out the missing angles and showing that they are the same.	 You can show these two triangles are similar by…
Translation	**Translate** means to **move a shape**. The shape does not change **size** or **orientation**.		 Which of the following is not a translation of Shape A?
Vector Notation	A vector can be written in 3 ways:	**a** or $\vec{AB}$ or $\begin{pmatrix}1\\3\end{pmatrix}$	
Column Vector	In a column vector, the **top** number moves **left (-) or right (+)** and the **bottom** number moves **up (+) or down (-)**	$\begin{pmatrix}2\\3\end{pmatrix}$ means '2 right, 3 up' $\begin{pmatrix}-1\\-5\end{pmatrix}$ means '1 left, 5 down'	$\begin{pmatrix}4\\-2\end{pmatrix}$ = ↑4←2 True / False $\begin{pmatrix}-1\\0\end{pmatrix}$ = ←1↕0 True / False $\begin{pmatrix}-5\\-2\end{pmatrix}$ =↓5←2 True / False

<table>
<tr>
<td>Vector</td>
<td>A vector is a quantity represented by an arrow with both direction and magnitude.

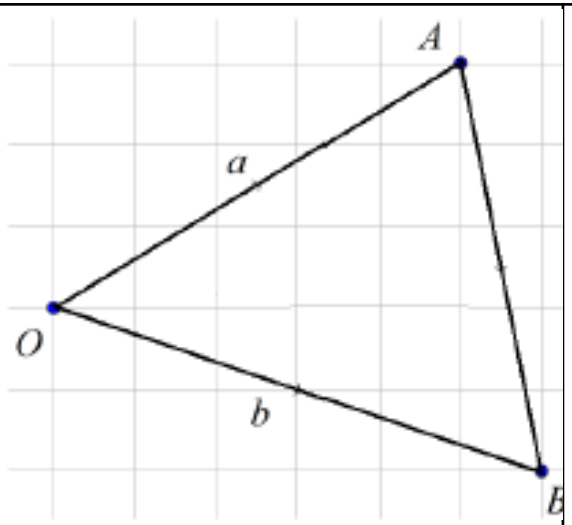
$\vec{AB} = -\vec{BA}$
Negative means opposite.</td>
<td> 
</td>
<td> 

Give the vectors:
$\vec{AB}=$
$\vec{BA}=$
$\vec{AC}=$
$\vec{CB}=$</td>
</tr>
<tr>
<td>Magnitude</td>
<td colspan="2">Magnitude is defined as the length of a vector.
 

Magnitude (length) can be calculated using Pythagoras Theorem:
$3^2 + 4^2 = 25$
$\sqrt{25} = 5$</td>
<td>Find the magnitude of $\vec{AB}$</td>
</tr>
<tr>
<td>Equal Vectors</td>
<td>If two vectors have the same magnitude and direction, they are equal.</td>
<td> </td>
<td> 
</td>
</tr>
<tr>
<td>Parallel Vectors</td>
<td>Parallel vectors are multiples of each other.
a and 2a are parallel.
2a+b and 4a+2b are parallel as they are multiple of each other.
2x(2a+b)=4a+2b</td>
<td> 
</td>
<td>Which pairs of vectors would not be parallel?
$a + b \; and \; 2a + b$
$a + b \; and \; 3a + 3b$
$2a + 2b \; and \; 3a + 3b$</td>
</tr>
</table>

Collinear Vectors	**Collinear** vectors are vectors that are on the **same line**. To show that two vectors are **collinear**, show that one vector is a **multiple** of the other (parallel) **AND** that both vectors **share a point**.		How would you show $\vec{AB}$ and $\vec{BC}$ are collinear?
Resultant Vector	The **resultant** vector is the vector that results from **adding** two or more vectors together. The resultant can also be shown by **lining up** the **head** of one vector with the **tail** of the other.	if **a** = $\begin{pmatrix}4\\4\end{pmatrix}$ and **b** = $\begin{pmatrix}2\\-2\end{pmatrix}$ then **a** + **b** = $\begin{pmatrix}4\\4\end{pmatrix} + \begin{pmatrix}2\\-2\end{pmatrix} = \begin{pmatrix}6\\2\end{pmatrix}$ 	 What is the vector of a+b?
Scalar of a Vector	A **scalar** is the **number** we **multiply** a vector by:  Here the scalar is 3		

Vector Geometry

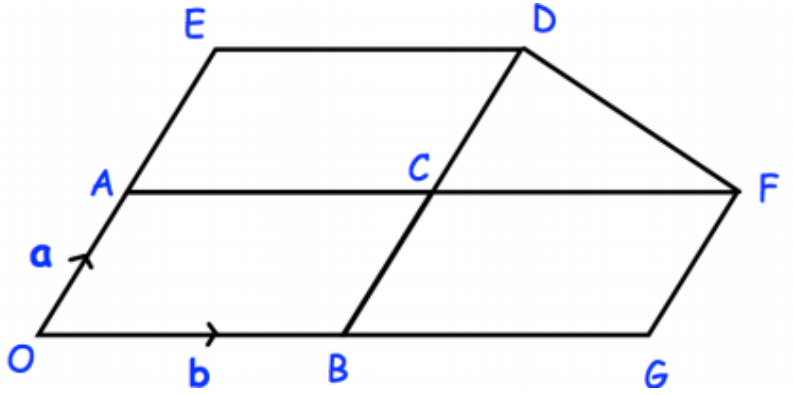


$\overrightarrow{OA} = a \qquad \overrightarrow{AO} = -a$

$\overrightarrow{OB} = b \qquad \overrightarrow{BO} = -b$

$\overrightarrow{AB} = \overrightarrow{AO} + \overrightarrow{OB} = -a + b = b - a$

$\overrightarrow{BA} = \overrightarrow{BO} + \overrightarrow{OA} = -b + a = a - b$



		(a) Express, in terms of **a** and **b**, the following vectors. Give your answers in their simplest form. (i) $\overrightarrow{OC}$ (ii) $\overrightarrow{BA}$ (iii) $\overrightarrow{DF}$ (b) Show $\overrightarrow{EG}$ and $\overrightarrow{DF}$ are parallel.