School Name
Mathematics 2017

Year 8

Transformations and Congruence

Non Calculator Test

Skills and Knowledge Assessed:

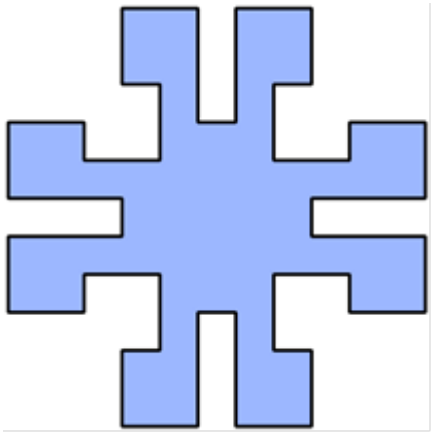
- Describe translations, reflections in an axis, and rotations of multiples of 90° on the Cartesian plane using coordinates. Identify line and rotational symmetries (ACMMG181)
- Define congruence of plane shapes using transformations (ACMMG200)
- Develop the conditions for congruence of triangles (ACMMG201)
- Establish properties of quadrilaterals using congruent triangles and angle properties, and solve related numerical problems using reasoning (ACMMG202)

Name_____

Section 1 Short Answer Section

Write all working and answers in the spaces provided on this test paper.
Geometric Instruments will be needed for this test.

Questions 1 and 2 refer to the diagram below.



1. Draw all the axes of line symmetry on the shape.

2. What order of rotational symmetry does the shape have?

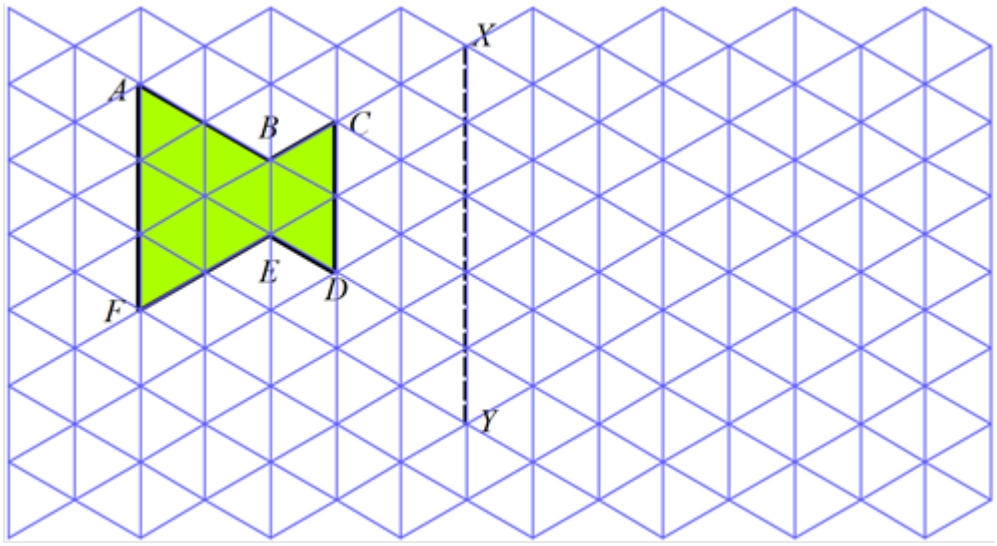
☐ Order 2 ☐ Order 4 ☐ Order 8 ☐ It has none

3. A triangle *ABC* is rotated through 180° about the point *B*.

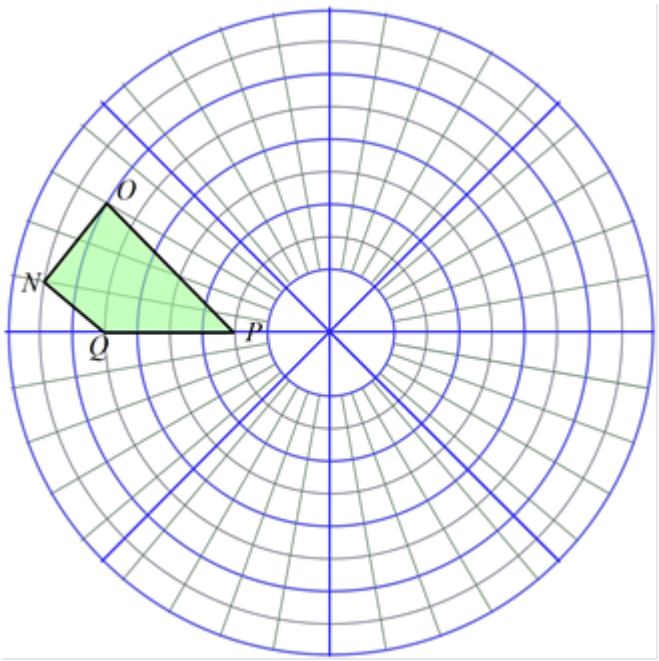
Which point does not change position?

- ☐ Every point changes position.
- ☐ Point *A* does not change position.
- ☐ Point *B* does not change position.
- ☐ Point *C* does not change position.

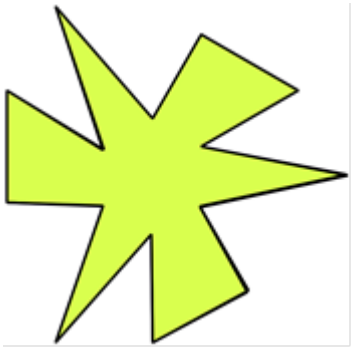
4. Use geometric instruments to draw the image after *ABCDEF* is reflected in the line *XY*.



5. Use geometric instruments to draw the image after *NOPQ* has been rotated through 270° in a clockwise direction.

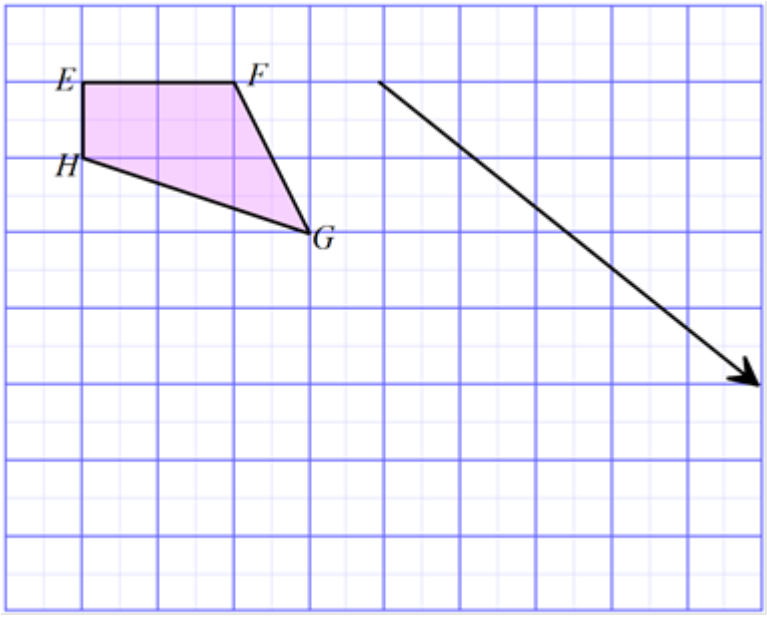


6. What order of rotational symmetry does the shape below have?



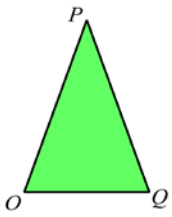
☐ None ☐ 2 ☐ 3 ☐ 6

7. Use geometric instruments to draw the image after *EFGH* is translated in the distance and direction indicated by the arrow.

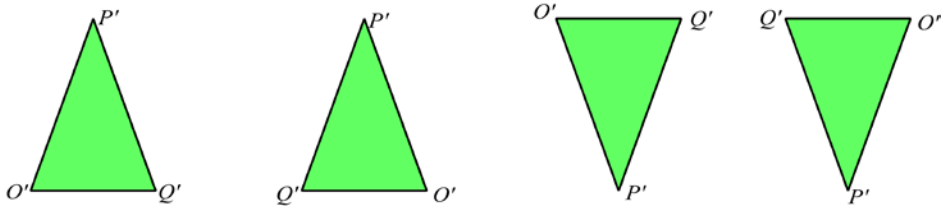


8. The triangle *OPQ* is reflected in the line *OQ*.

Which triangle could be the image?



☐ ☐ ☐ ☐



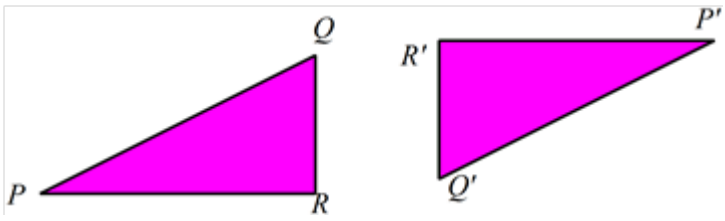
9. The figure *PQR* could be transformed to the figure *P′Q′R′* by:

☐ Rotation through 180°.

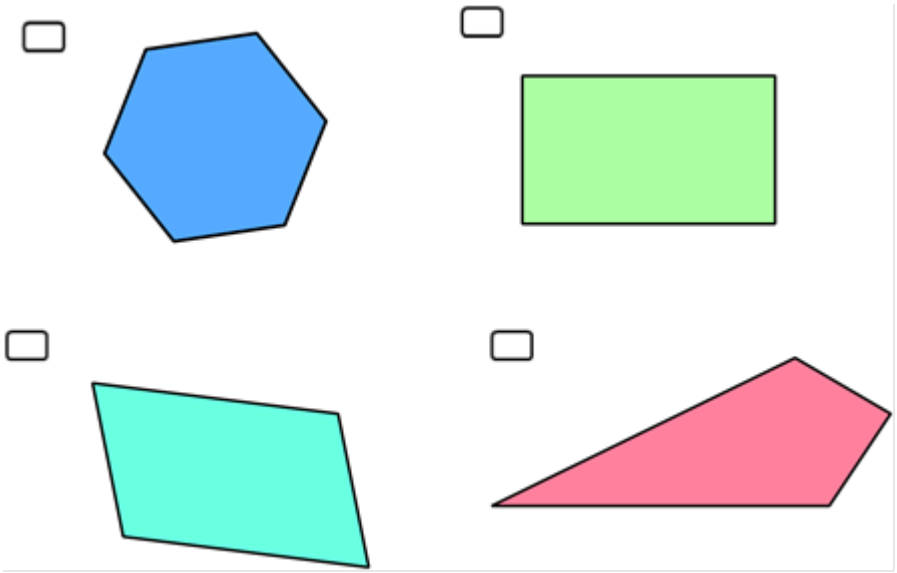
☐ Reflection.

☐ Translation.

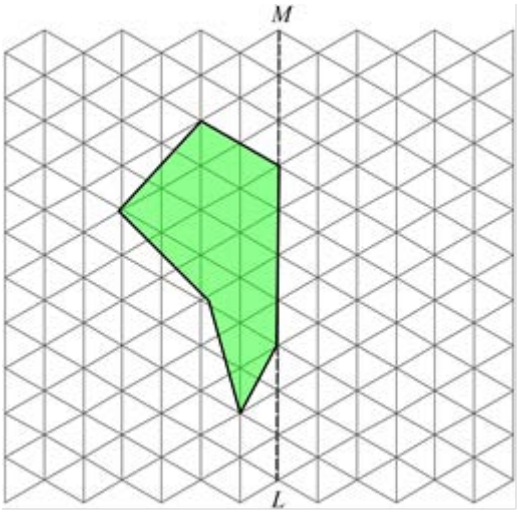
☐ Rotation through 90°.



10. Which polygon has exactly 2 axes of symmetry?



11. Complete the figure given that *LM* is an axis of line symmetry.



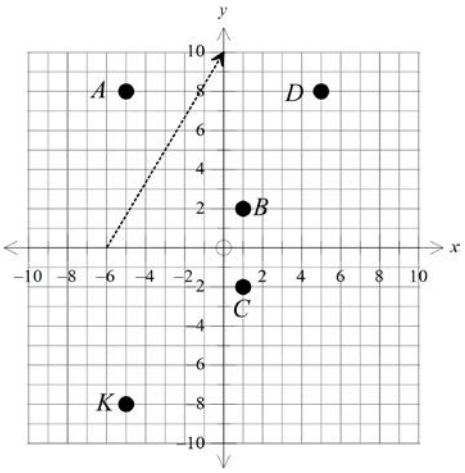
12. A polygon *ABCDE* which has its vertices labelled in a clockwise direction, is transformed to a congruent image which is also labelled in a clockwise direction.

Which of these transformations could have been used?

- ☐ A reflection, a rotation or a translation.
- ☐ Only a reflection and a rotation.
- ☐ Only a reflection and a translation
- ☐ Only a rotation and a translation.

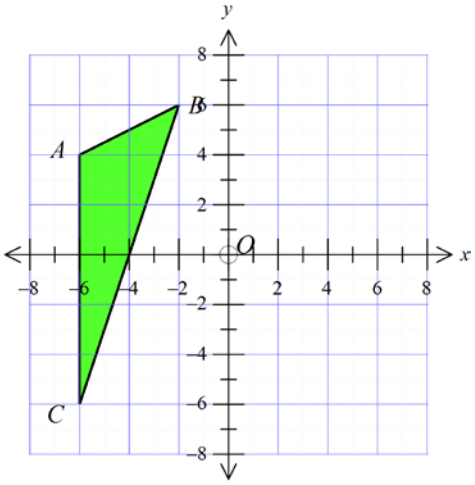
13. The point K (–5, –8) is translated through the distance and direction indicated by the arrow.

Which point is the image after the transformation?



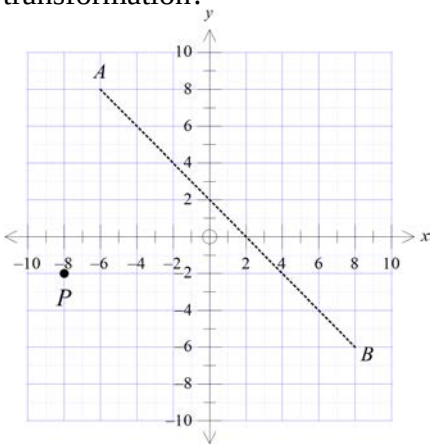
- ☐ A (–5, 8)
- ☐ B (1, 2)
- ☐ C (1, –2)
- ☐ D (5, 8)

14. Draw the image of triangle ABC after a rotation through 180° about the origin O.

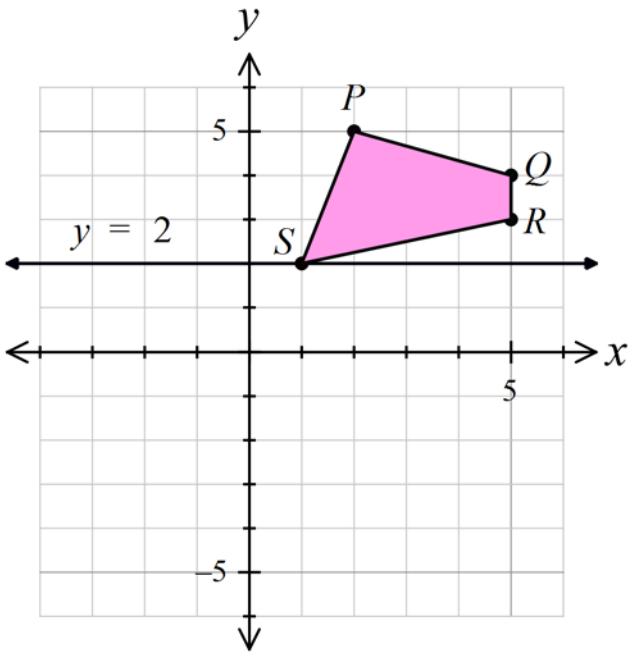


15. The point P (–8, –2) is reflected in the line AB.

Which are the coordinates of the image after the transformation?

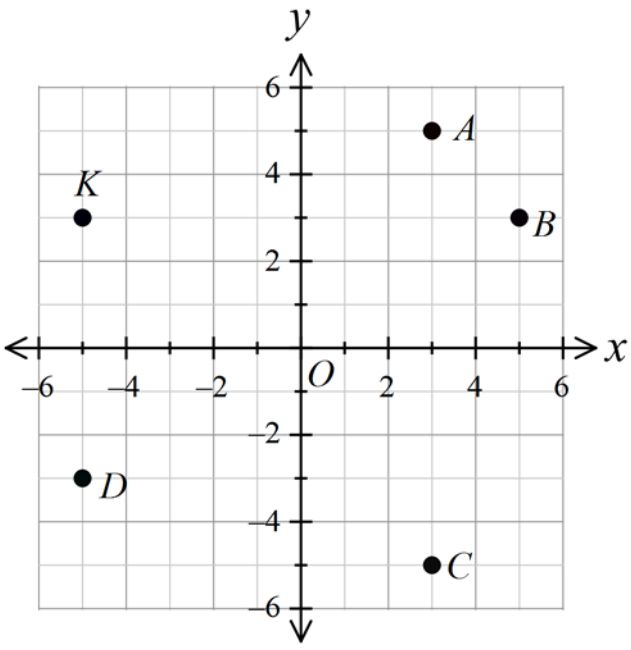


16. Draw the position of the figure *PQRS* after a reflection in the line $y = 2$.



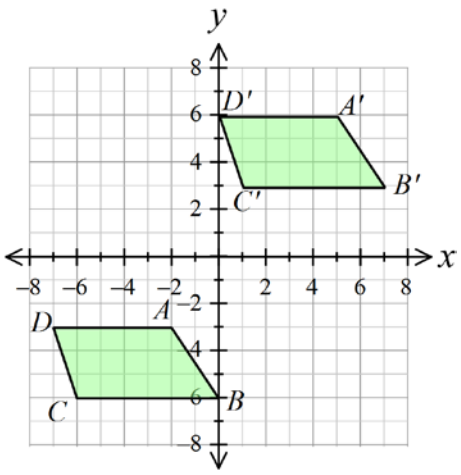
17. The point K (– 5, 3) is rotated through 90° in a clockwise direction about the origin O.
Which point is its image?

- ☐ A (3, 5)
- ☐ B (5, 3)
- ☐ C (3, –5)
- ☐ D (–5, –3)



18. Figure *ABCD* is moved to an image *A'B'C'D'* by a single transformation.

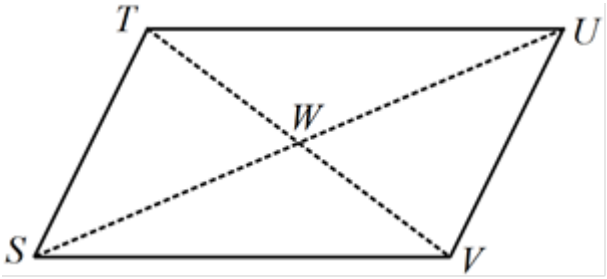
What was the transformation?



- ☐ A reflection in the line $y = x$.
- ☐ A reflection in the line $y = -x$
- ☐ A rotation of 180°.
- ☐ A translation.

19. Quadrilateral *STUV* is a parallelogram.

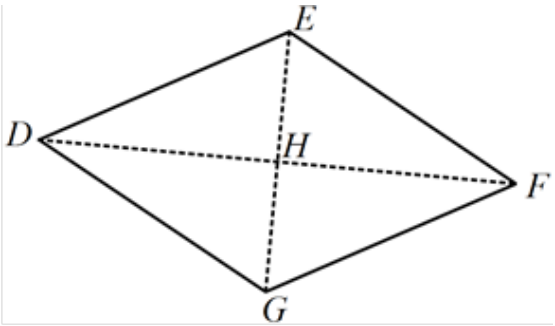
What transformation could move $\Delta\, STW$ to $\Delta\, UVW$?



- ☐ A reflection.
- ☐ A rotation of 90°.
- ☐ A rotation of 180°.
- ☐ A translation.

20. A rhombus *DEFG* has its diagonals drawn, intersecting at H.

Which pair of triangles are not congruent?

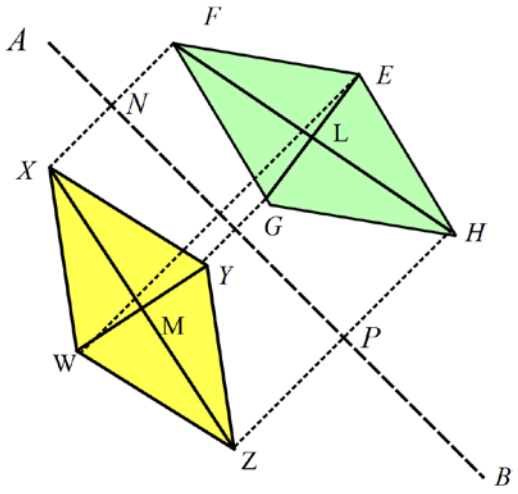


- ☐ $\Delta\, DEF$ and $\Delta\, DGF$
- ☐ $\Delta\, DEF$ and $\Delta\, DEG$
- ☐ $\Delta\, DEG$ and $\Delta\, FEG$
- ☐ $\Delta\, DEH$ and $\Delta\, DGH$

21. The rhombus *WXYZ* is reflected in the line segment *AB*, to give the rhombus *EFGH*.

Which distances are equal?

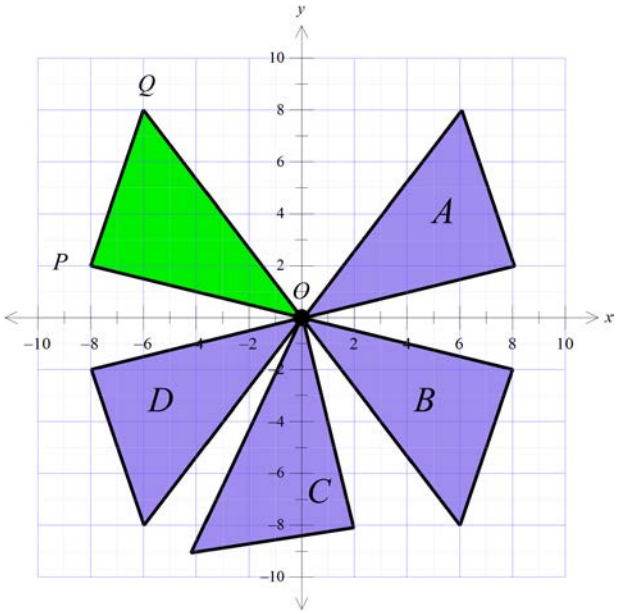
- ☐ *FX* and *HZ*
- ☐ *FN* and *XN*
- ☐ *HE* and *WY*
- ☐ *HF* and *HP*



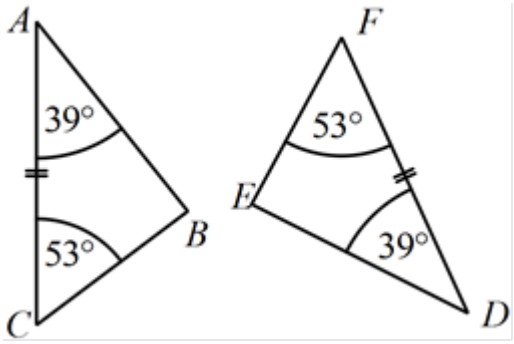
22. *POQ* is rotated through 180° about *O* and then the image is reflected in the *y* axis.

Which figure is its image?

- ☐ Triangle A
- ☐ Triangle B
- ☐ Triangle C
- ☐ Triangle D



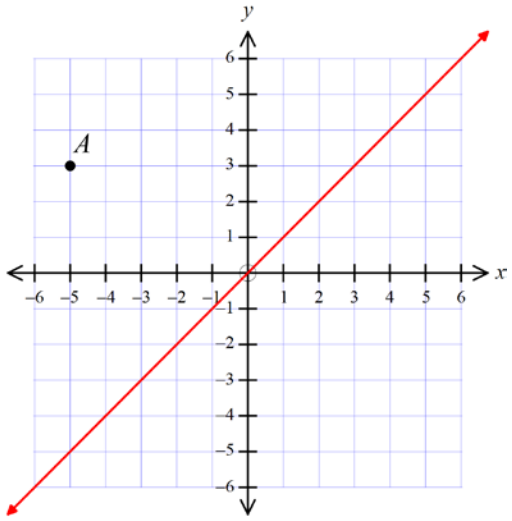
23. Which of the congruence tests could be used to show that $\Delta ABC \equiv \Delta DEF$?



☐ AAS ☐ RHS ☐ SAS ☐ SSS

24. The point A (–5, 3) is reflected in the line $y = x$.
The image is then rotated through 90° in a clockwise direction about the origin.

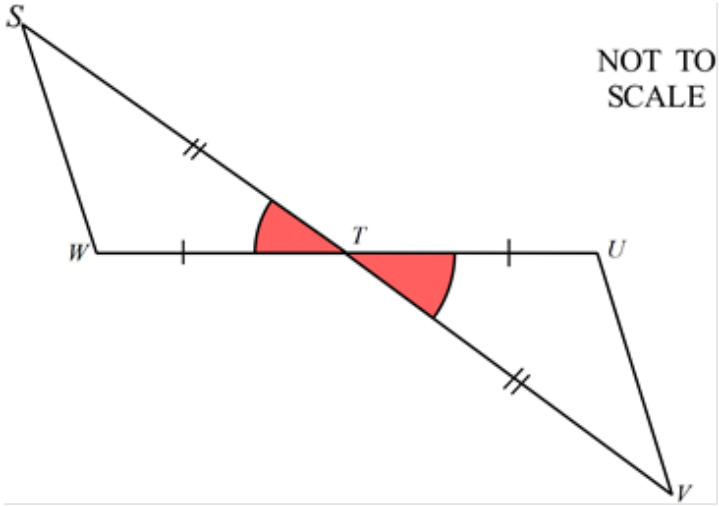
Give the coordinates of the point which is the image after these transformations?



☐ (–5, 3)
☐ (–5, –3)
☐ (–4, –4)
☐ (3, –5)

25. A congruence proof has been started below.

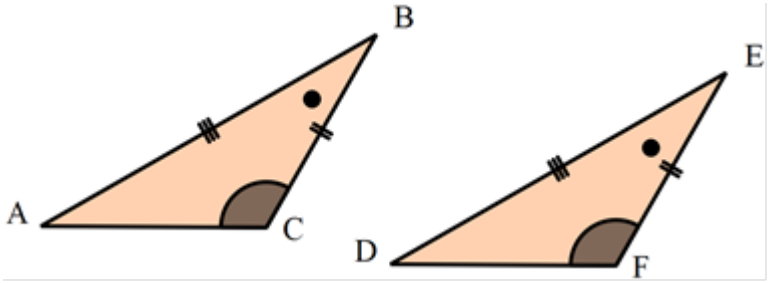
$\angle STW = \angle VTU$ (vert opp angles)
$ST = VT$ (given)
$WT = UT$ (given)
$\therefore \Delta STW \equiv \Delta VTU$ ( )



Which of the congruence tests is used?

☐ AAS
☐ RHS
☐ SAS
☐ SSS

26. In the figure below $AB = DE$, $BC = EF$, $\angle ACB = \angle DFE$ and $\angle ABC = \angle DEF$.

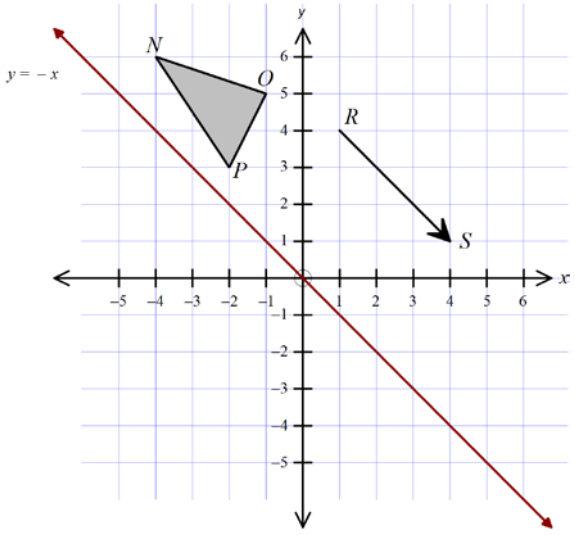


Which two congruence tests could be used to prove $\Delta ABC \equiv \Delta DEF$.

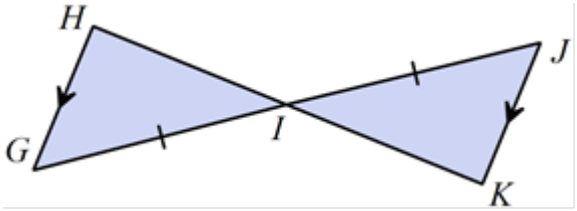
- ☐ AAS and RHS
- ☐ AAS and SAS
- ☐ AAS and SSS
- ☐ SAS and SSS

27. ΔNOP is reflected in the line $y = -x$ and the image is then translated the distance and direction indicated by RS.

Draw the image after the two transformations.



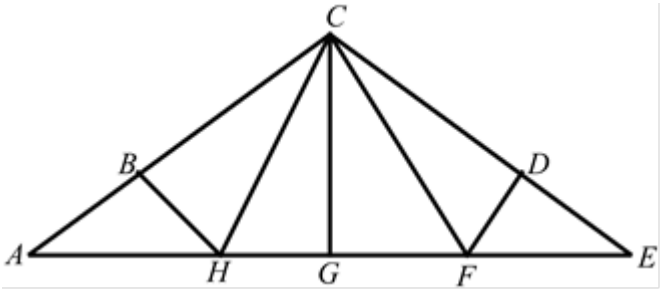
28. Which of the congruence tests could be used to show that $\Delta GHI \equiv \Delta JKI$?



☐ AAS ☐ RHS ☐ SAS ☐ SSS

29. A roof truss for a house is a series of welded steel triangles, as shown below.

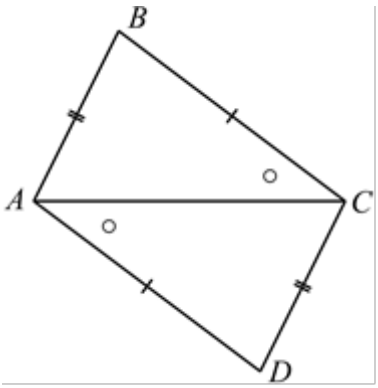
The shape has line symmetry along the line *CG*.



Name two pairs of congruent triangles in the figure.

Δ _____ and Δ _____ Δ _____ and Δ _____

30. In the diagram below, $AB = CD$, $BC = AD$ and $\angle BCA = \angle DAC$.



Name two congruence tests that could be used to prove that $\Delta BCA \equiv \Delta DAC$.

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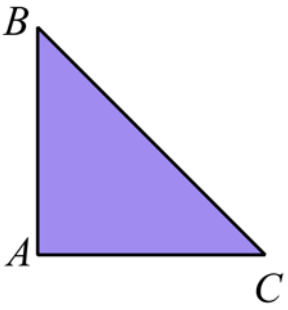
Section 2 Longer Answer Section

Write all working and answers in the spaces provided on this test paper.

Marks

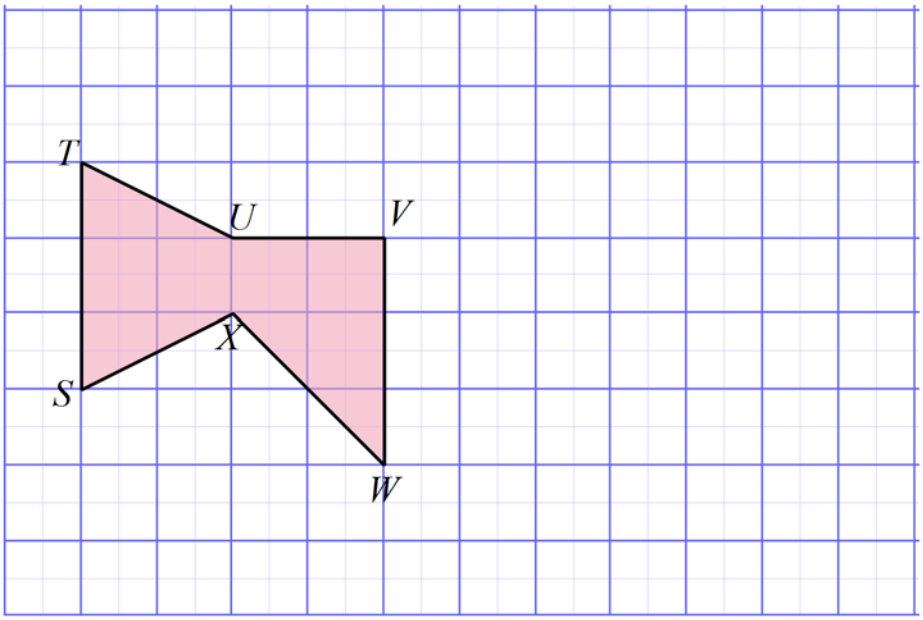
1. (a) Draw the image when the triangle *ABC* is rotated through 90° in a clockwise direction about *C*. **2**

Use geometric instruments.

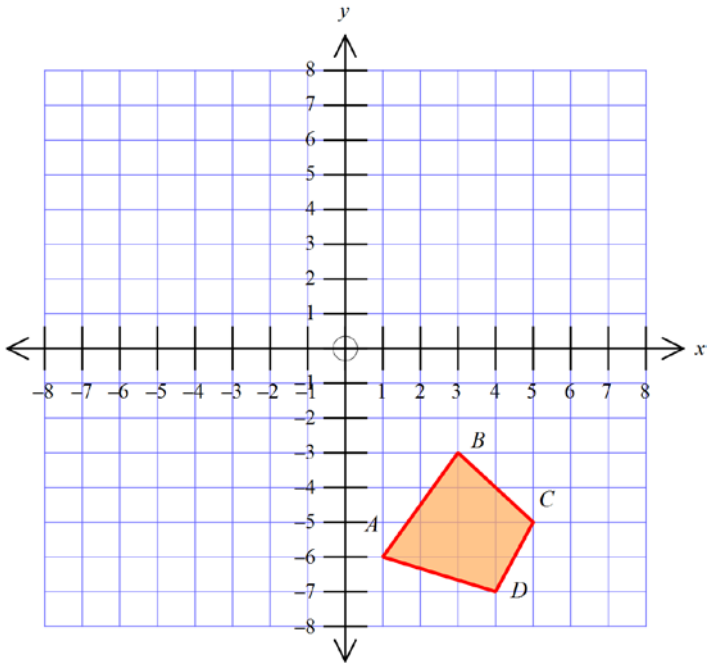


Marks

(b) Translate the figure below so that the side *ST* coincides with *VW*. **2**

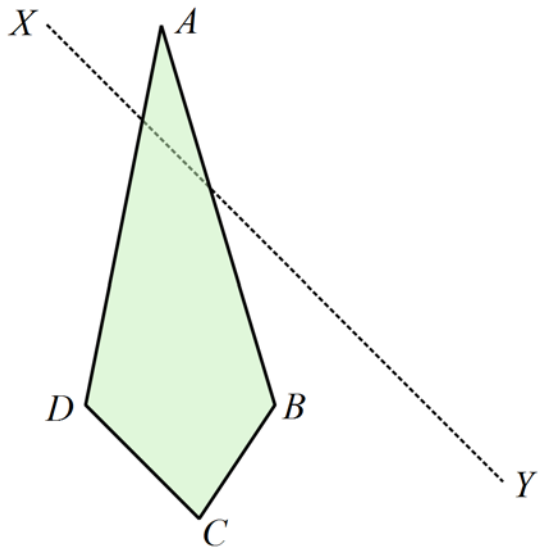


2. (a) Draw a figure congruent to *ABCD*, by rotating through 180° in a clockwise direction. **2**

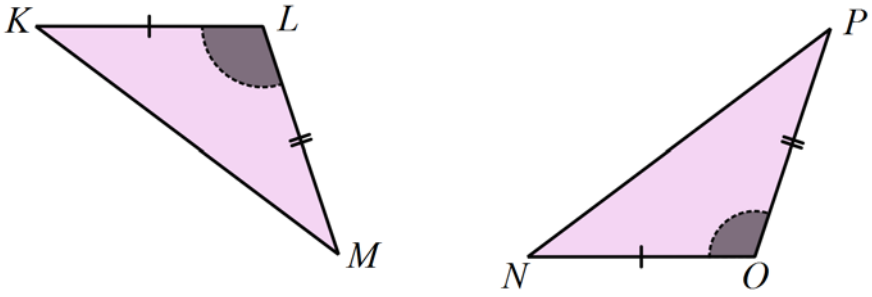


Marks

(b) Draw the image of the quadrilateral *ABCD* after a reflection in the line *XY*. **2**



3. (a) $KL = NO$, $LM = PO$ and $\angle L = \angle O$. **2**
Prove that $\Delta KLM \equiv \Delta NOP$.



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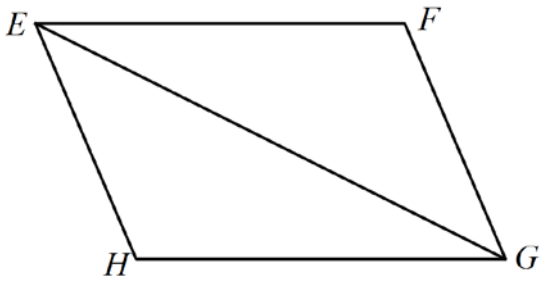
Marks

(b) *EFGH* is a parallelogram with the diagonal EG drawn. **3**
Using **only** the property that *the opposite sides of a parallelogram are parallel*, prove that $\Delta\, EFG \equiv \Delta\, EHG$.



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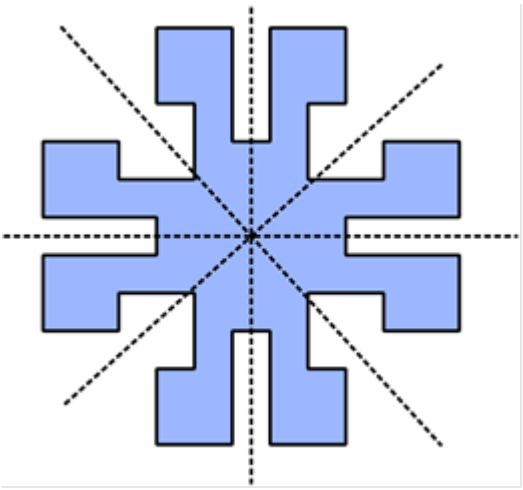
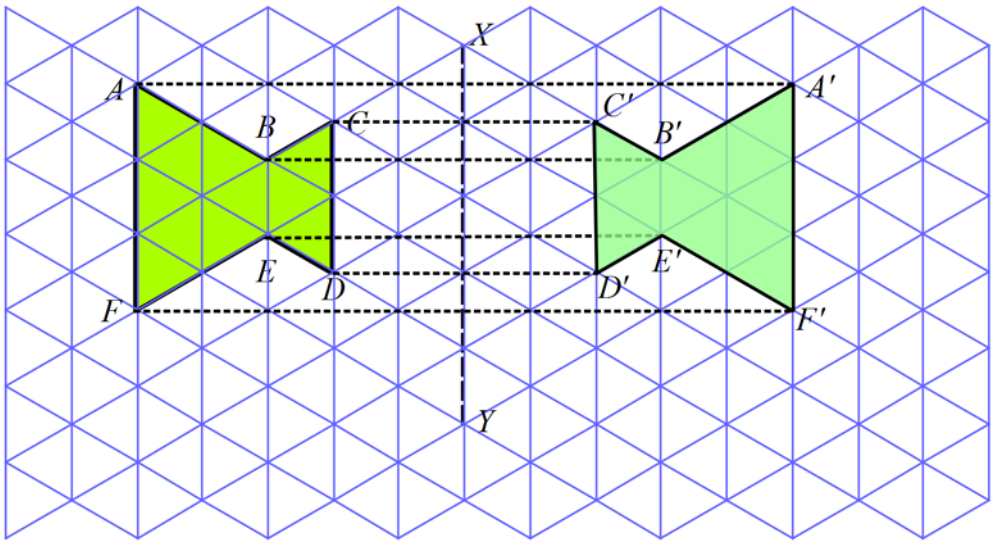
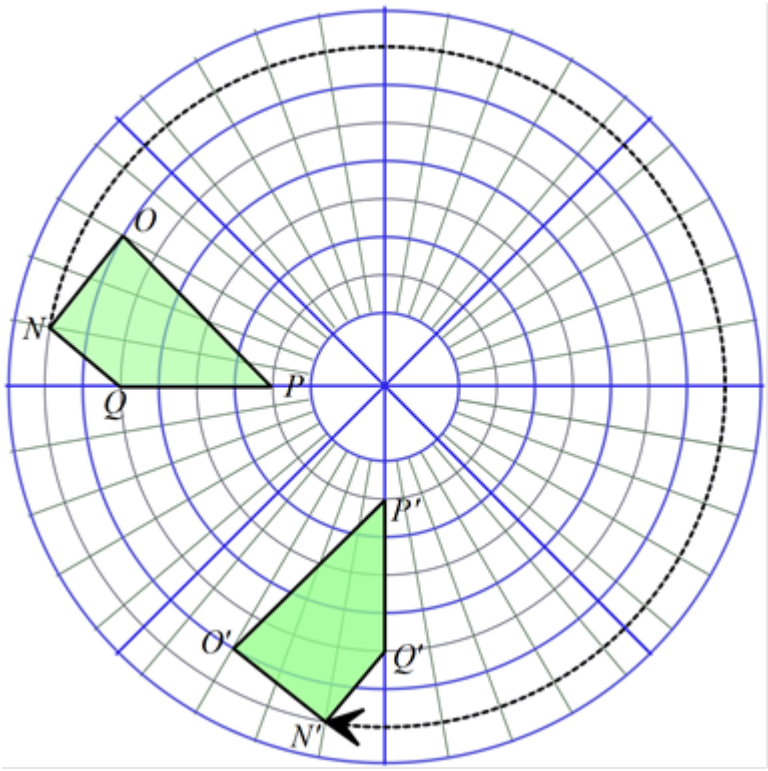
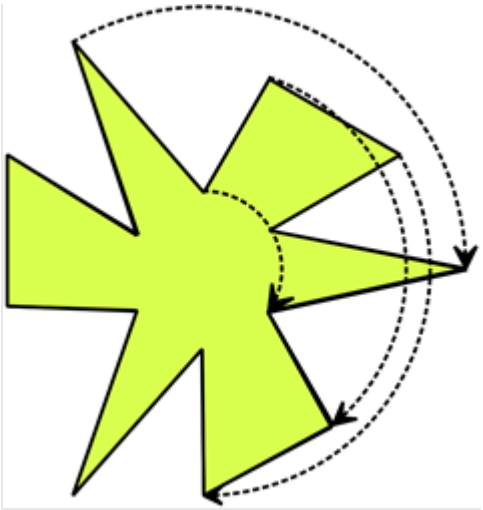
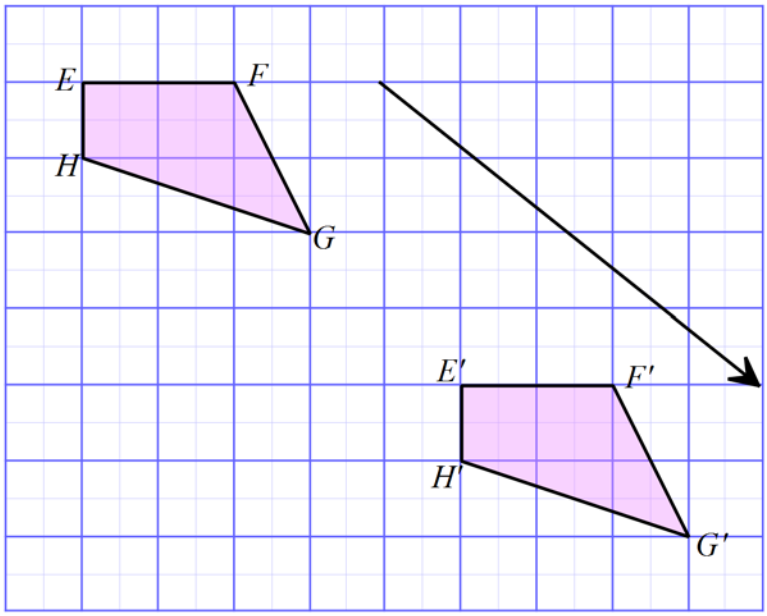
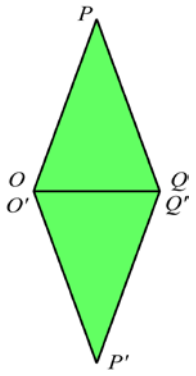
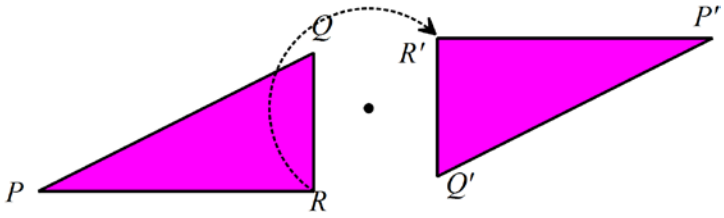
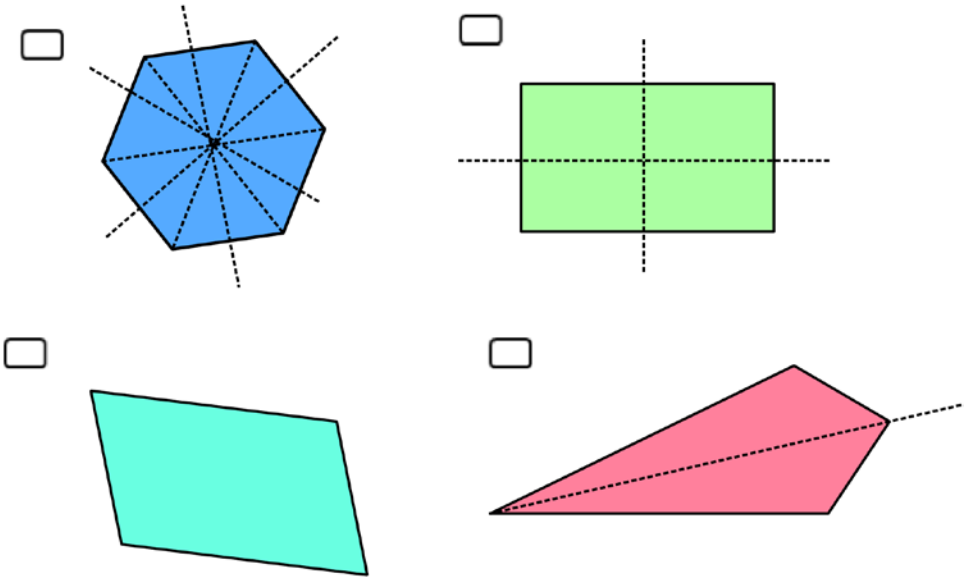
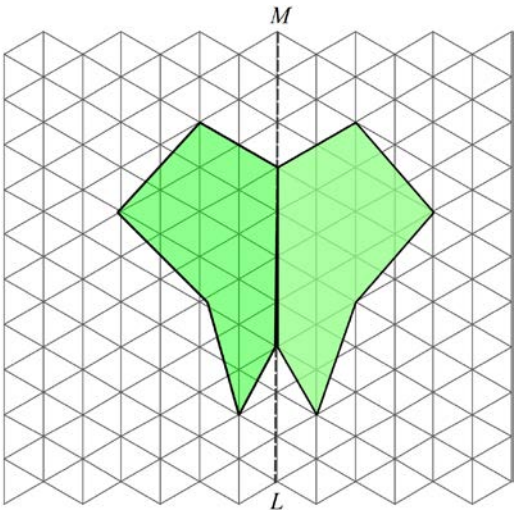
ANSWERS

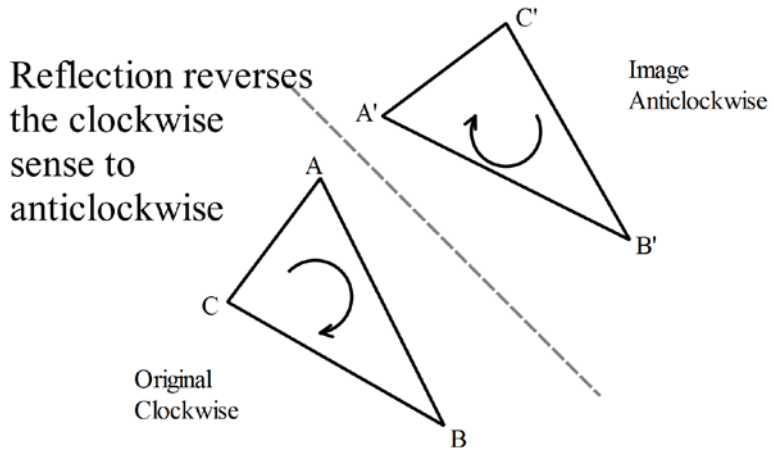
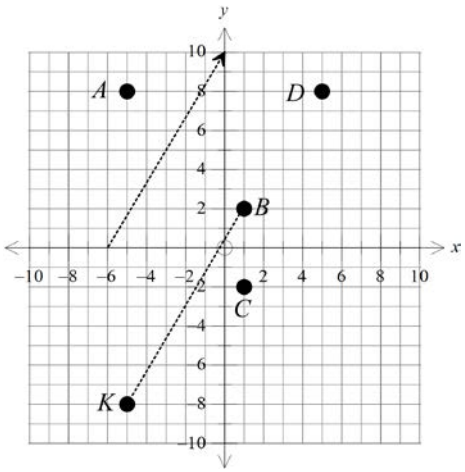
Question	Working and Answer
1.	There are 4 axes as shown 
2.	Order 4 as each point can be rotated to a new position and it still looks the same. **2nd Answer**
3.	Since *B* is the centre of the rotation it's image is in the same position. **3rd Answer**

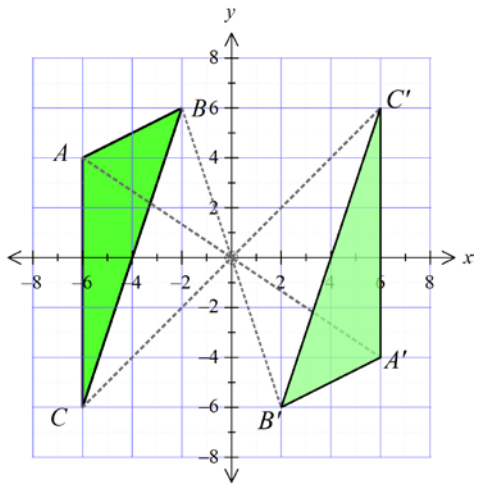
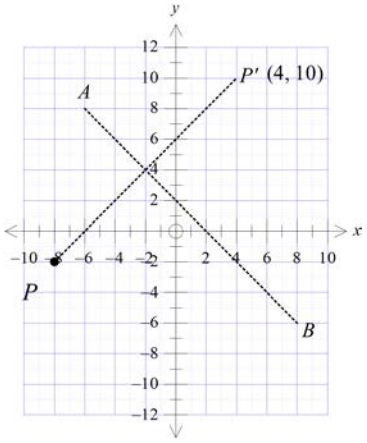
Question	Working and Answer
4.	
5.	

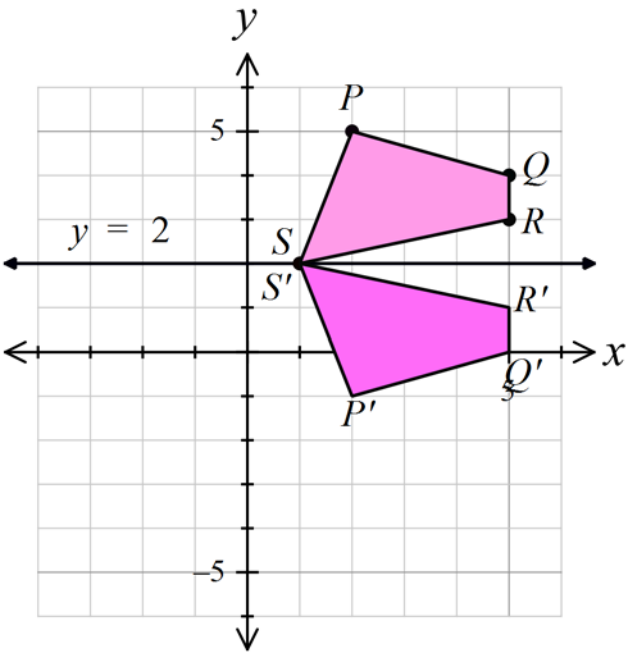
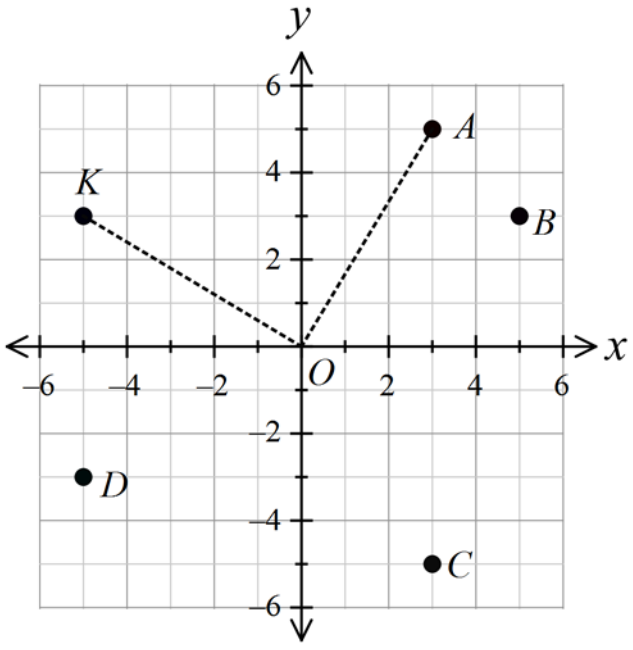
Question	Working and Answer
6.	Order 3 as it can be rotated through 120° twice and appears the same each time. **3rd Answer** 
7.	

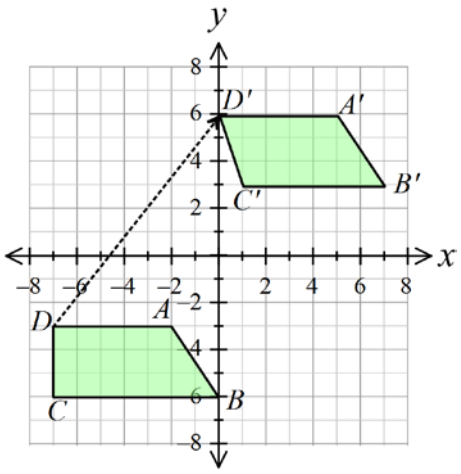
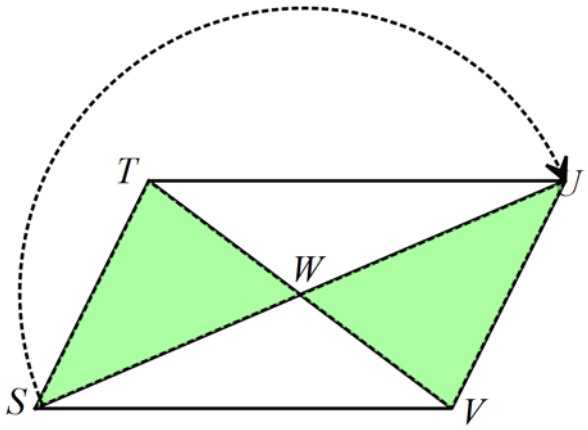
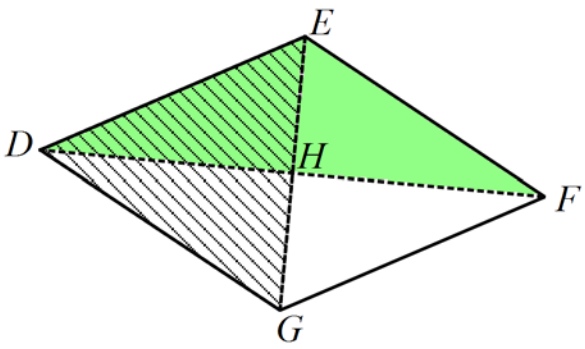
Question	Working and Answer
8.	O and Q have their image in the same position and P is flipped over, to give the third diagram. **3rd Answer** 
9.	It is a rotation through 180° **1st Answer** 

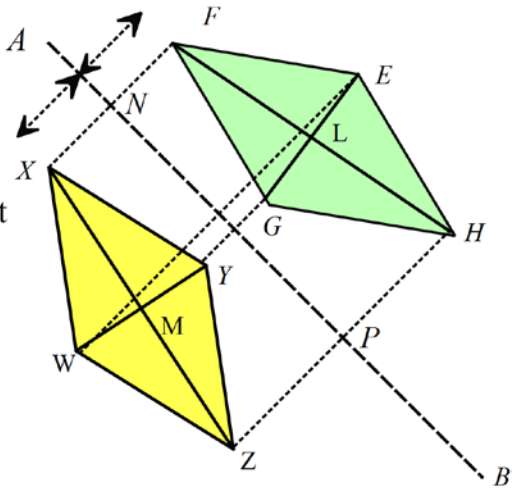
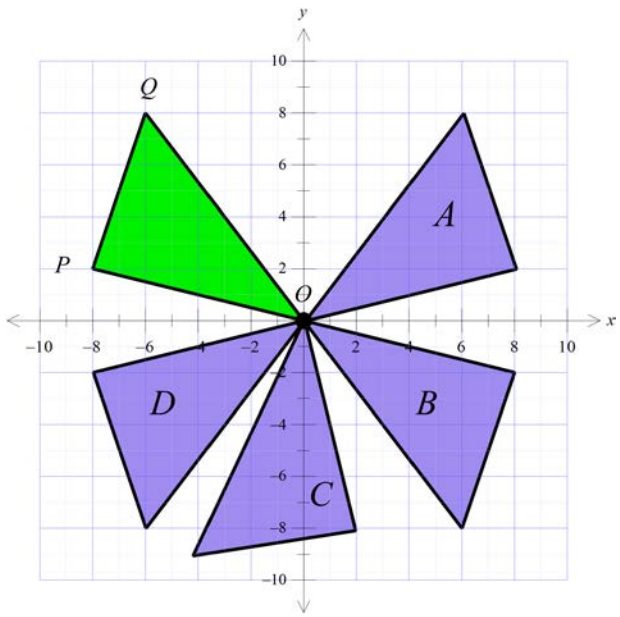
Question	Working and Answer
10.	The rectangle has two axes of symmetry. **2nd Answer** 
11.	

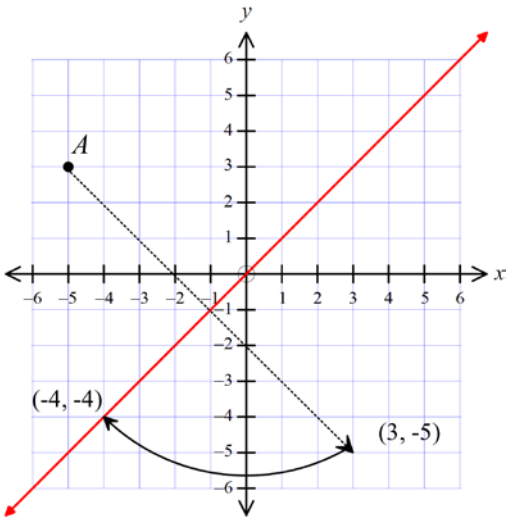
Question	Working and Answer
12.	 A rotation and a translation retain the same directions. **4th Answer**
13.	*K* goes to *B* as shown.  **2nd Answer**

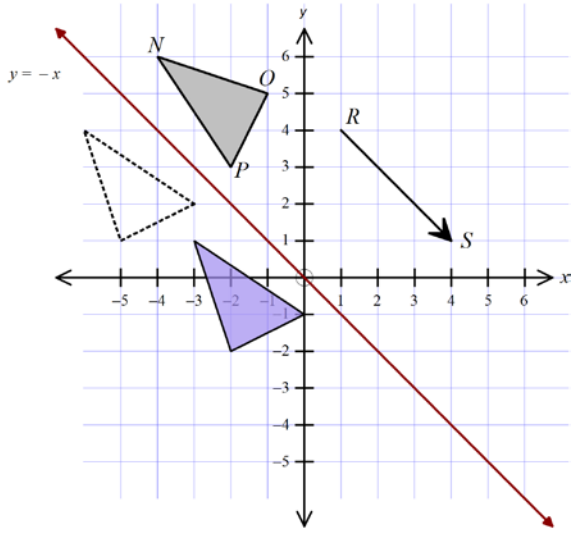
Question	Working and Answer
14.	
15.	**(4, 10)** 

Question	Working and Answer
16.	
17.	 **1st Answer**

Question	Working and Answer
18.	 A translation in the direction of the arrow shown **4th Answer**
19.	 **A rotation of 180º.** **3rd Answer**
20.	Δ *DEF* and Δ *DEG*  **2nd Answer**

Question	Working and Answer
21.	A point and its image are equidistant from the line of reflection. So X and F are equidistant from N  **2nd Answer**
22.	 Rotation through 180° gives triangle B which is then reflected in the y axis to give triangle D. **4th Answer**

Question	Working and Answer
23.	There are two pairs of corresponding angles equal with the included side also equal. ASS **1st Answer**
24.	 **3rd Answer**
25.	Two sides and an included angle (SAS). **3rd Answer**
26.	AAS and SAS **2nd Answer**

Question	Working and Answer
27.	 **Diagram with two triangle drawn.**
28.	There are a pair of equal vertically opposite angles and a pair of equal alternate angles, which together with the given sides being equal allow proof using AAS. **1st Answer**
29.	Any two pairs. Some examples are : $\Delta\, ABH$ and $\Delta\, EDF$. $\Delta\, ACH$ and $\Delta\, ECF$. $\Delta\, BHC$ and $\Delta\, DFC$. $\Delta\, CGH$ and $\Delta\, CGF$.
30.	AC is common, so this allows SSS, since two sides are already given. AC being common, along with $BC = AD$ and the angle given allows SAS.

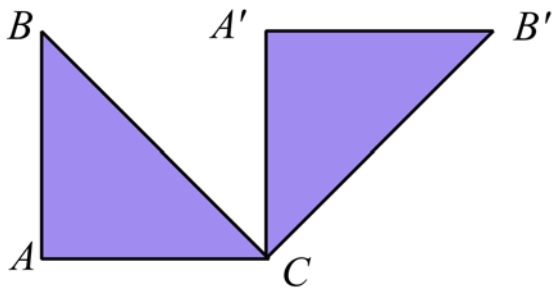
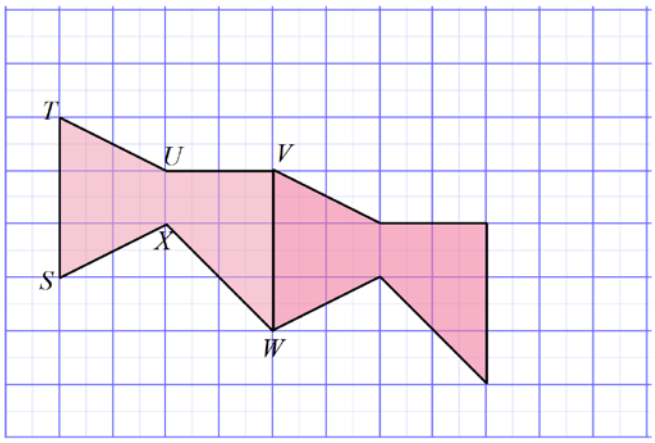
School Name
Mathematics Test 2017

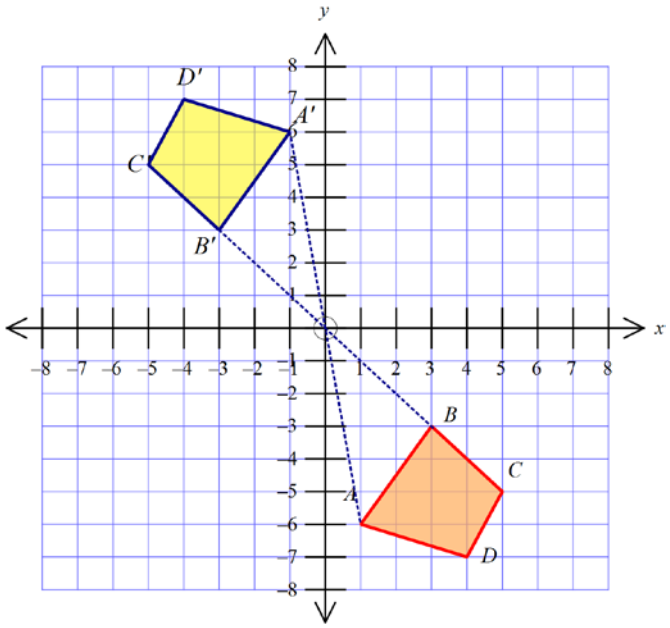
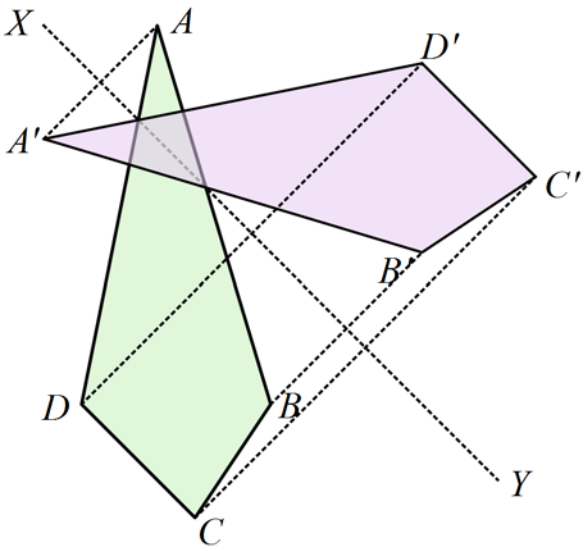
Year 8

Transformations and Congruence

Longer Answer Section

ANSWERS

Question	Answer	Marks
1.	(a)  	2 marks for an accurate drawing. 1 mark if inaccurate or a minor error.
	 	2 marks for an accurate drawing. 1 mark if inaccurate or a minor error.

Question	Answer	Marks
2.	(a) 	2 marks for an accurate and correct drawing of the image. 1 mark for an inaccurate drawing or one with a minor error
	(b) 	2 marks for an accurate and correct drawing of the image. 1 mark for an inaccurate drawing or one with a minor error
3.	(a) In ΔKLM and ΔNOP $KL = NO$ (given) $LM = OP$ (given) $\angle L = \angle O = 90°$ (given) $\therefore \Delta KLM \equiv \Delta NOP$ (SAS)	2 marks for stating the three equal features and stating congruence with SAS. 1 mark for a partial proof or incorrect conclusion

Question	Answer	Marks
	(b) In ΔEFG and ΔEHG $\angle FEG = \angle HGE$ (alt $\angle$ on $\|\|$ lines) $\angle FGE = \angle HEG$ (alt $\angle$ on $\|\|$ lines) EG is common $\therefore \Delta EFG \equiv \Delta EHG$ (AAS)	3 marks for stating the three equal features and including the reasons for the two angles being equal and stating congruence with AAS. 2 marks for a proof without one of the reasons or with another minor error or an incorrect conclusion 1 mark for a proof without reasons or incorrect reasons, or which is only a partial attempt at the proof