High School Mathematics Test 2015

Year 8

Transformations and Congruence

Non Calculator Section

Name_____

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)

Answer all questions in the spaces provided on this test paper by:

Writing the answer in the box provided.

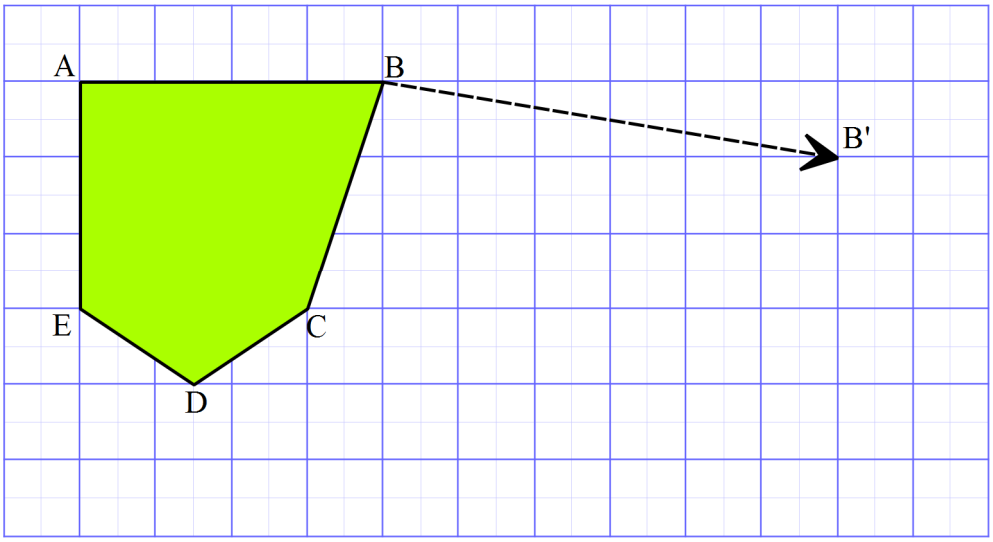
Completing a drawing in the space provided.

or

Shading in the bubble for the correct answer from the four choices provided.

Show any working out on the test paper. Calculators are **not** allowed.

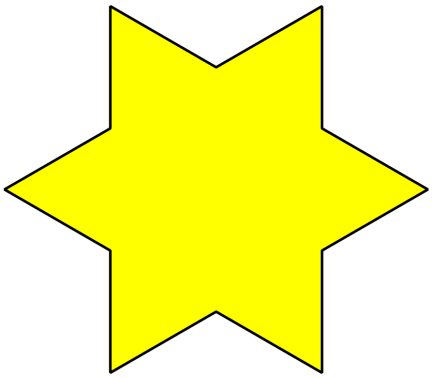
1. Use geometric instruments to draw the image after *ABCDE* is translated in the direction and distance of the arrow.



2. Which is **not** always true of two congruent triangles.

- ☐ The corresponding angles are equal in size.
- ☐ The corresponding sides are equal in length.
- ☐ Their areas are equal.
- ☐ They are both right angled.

Questions 3 and 4 refer to the diagram below.

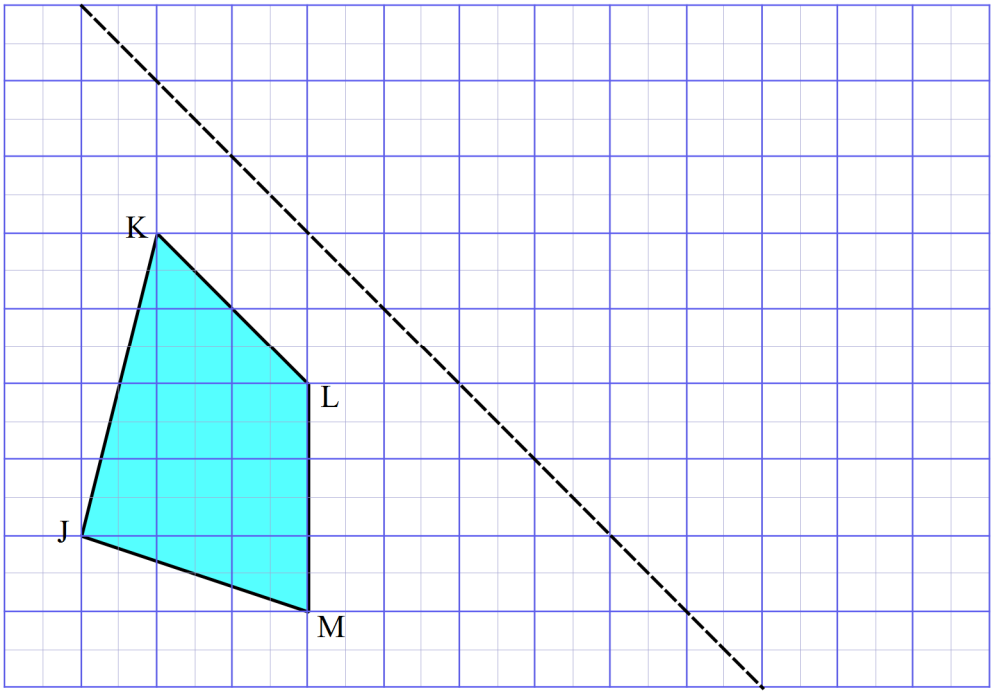


3. Draw all the axes of line symmetry on the shape.

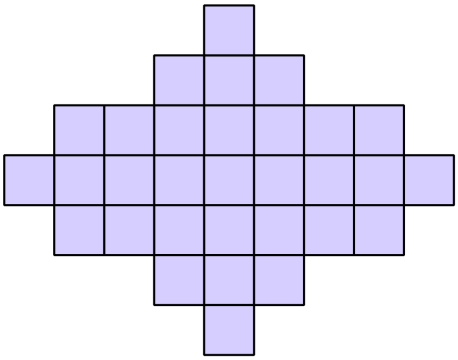
4. What order of rotational symmetry does the shape have?

☐ Order 2 ☐ Order 3 ☐ Order 6 ☐ Order 12

5. Use geometric instruments to draw the image after *JKLM* has been reflected in the dotted line.

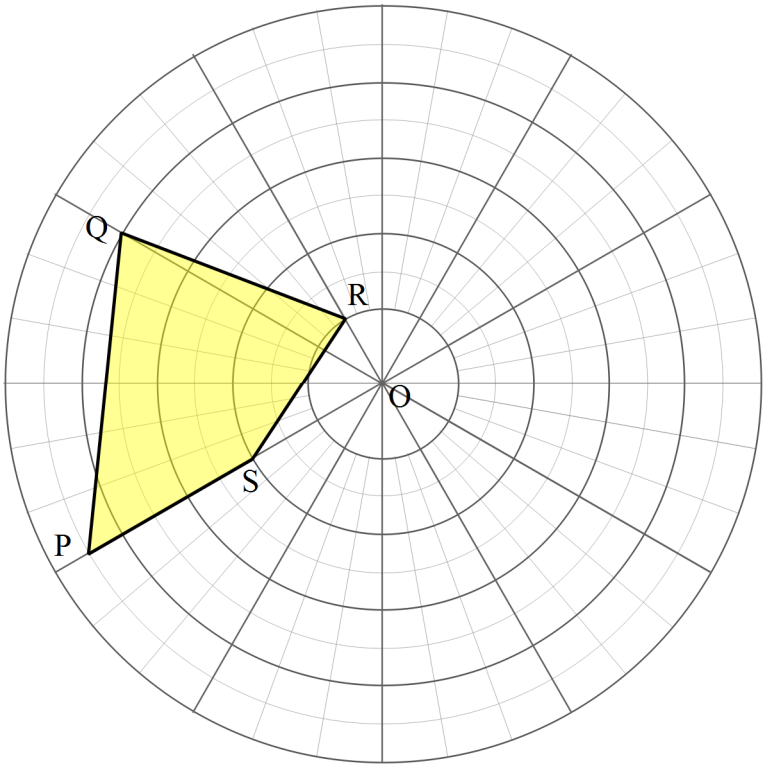


6. What order of rotational symmetry does the shape below have?



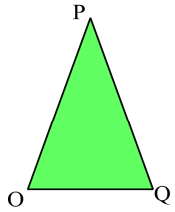
☐ 2 ☐ 4 ☐ 6 ☐ 8

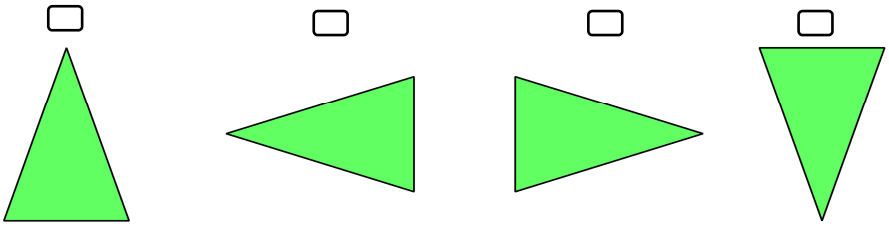
7. Use geometric instruments to draw the image after *PQRS* is rotated through 120° in a clockwise direction about *O*.



8. The triangle OPQ is rotated through 90° in an anticlockwise direction about O.

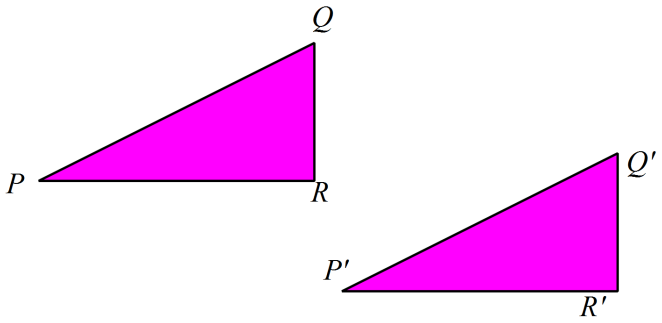
Which triangle could be the image?



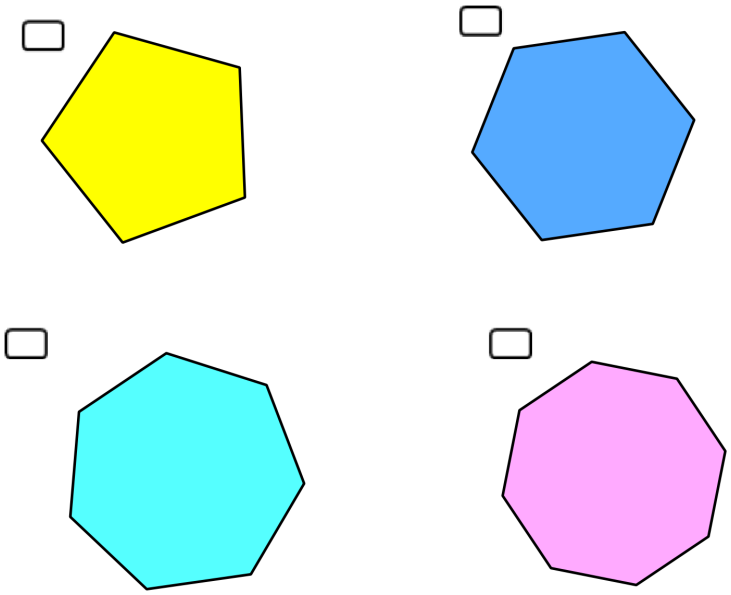


9. The figure PQR could be transformed to the figure $P'Q'R'$ by:

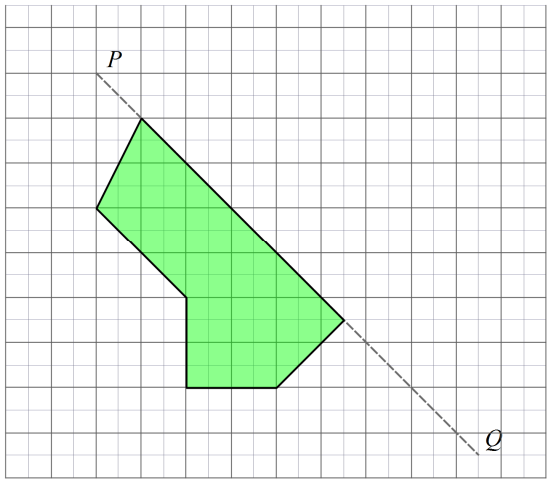
- ☐ Rotation through 180°.
- ☐ Reflection.
- ☐ Translation.
- ☐ Rotation through 90°.



10. Which polygon has rotational symmetry of order 7?



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

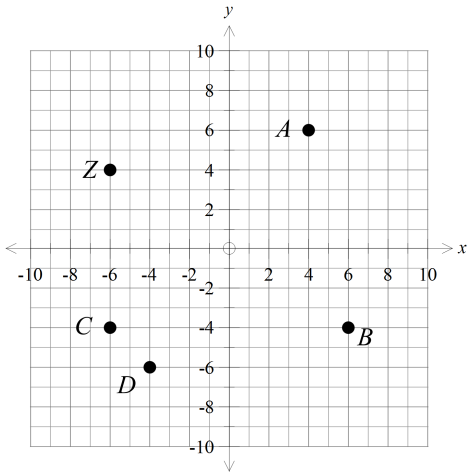


12. Which transformation creates an image which is congruent to the original, but which has the order of the vertices reversed? (e.g. they are labelled clockwise in the original and anticlockwise in the image.)

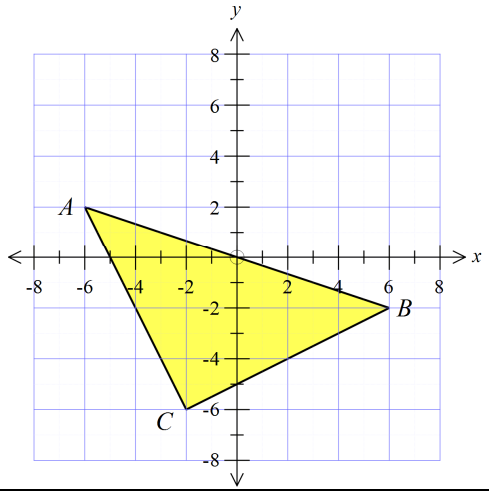
- ☐ A reflection.
- ☐ A rotation
- ☐ A translation
- ☐ An enlargement

13. The point Z (-6, 4) is rotated about the origin through 90° anticlockwise. Which point is the image after the transformation?

- ☐ A (4, 6)
- ☐ B (6, -4)
- ☐ C (-6, -4)
- ☐ D (-4, -6)

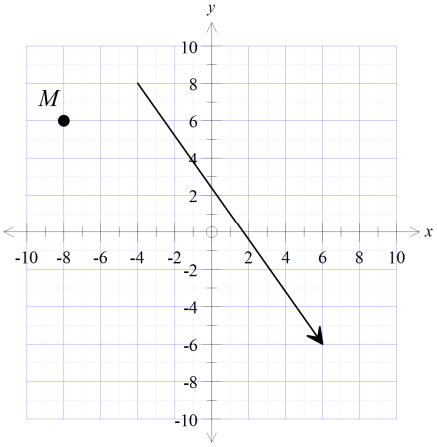


14. Draw the image of triangle ABC after a reflection in the x axis.

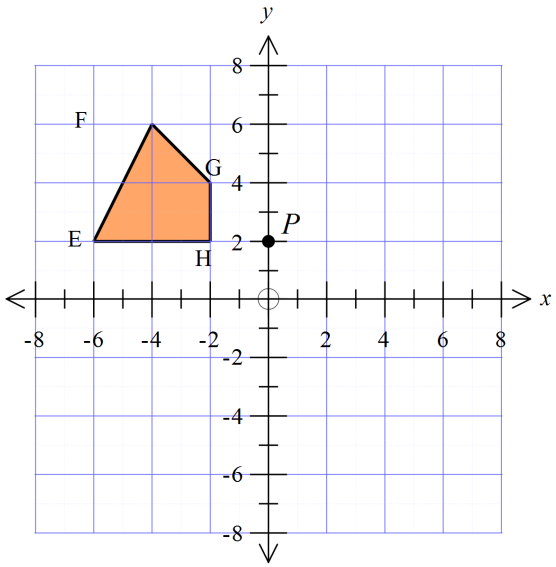


15. The point M (-8, 6) is translated in the direction and distance indicated by the arrow.

Which are the coordinates of the image after the transformation?



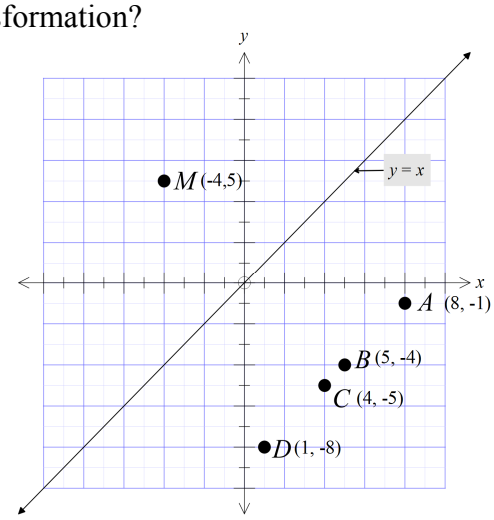
16. Draw the position of the figure $EFGH$ after a rotation through 90° in a clockwise direction about the point P(0, 2)



17. The point M (-4, 5) is reflected in the line $y = x$.

Which point is the image after the transformation?

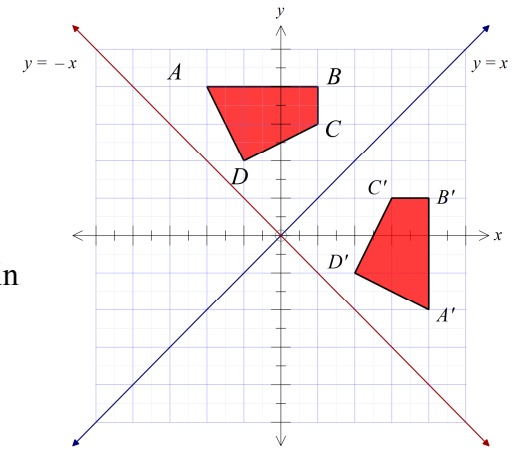
- ☐ A (8, -1)
- ☐ B (5, -4)
- ☐ C (4, -5)
- ☐ D (1, -8)



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

What was the transformation?

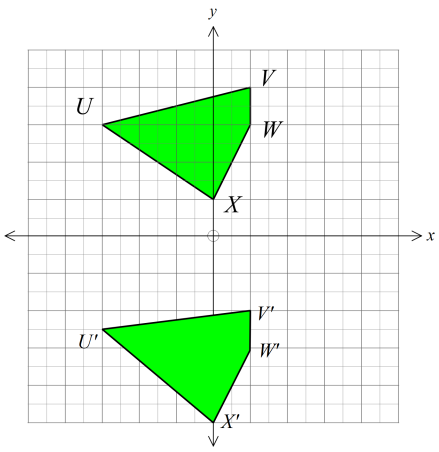
- ☐ A reflection in the line $y = x$.
- ☐ A reflection in the line $y = -x$
- ☐ An anticlockwise rotation of 90° about the origin
- ☐ A clockwise rotation of 90° about the origin.



19. Figure $UVWX$ is moved to an image $U'V'W'X'$ by a single transformation.

What was the transformation?

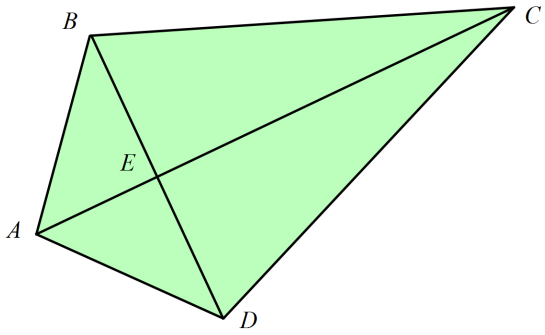
- ☐ A reflection in the x axis
- ☐ A reflection in the y axis.
- ☐ A rotation of 180° about the origin.
- ☐ A translation downward along the y axis.



20. A kite *ABCD* has both its diagonals drawn, intersecting at *E*.

Which statement is true?

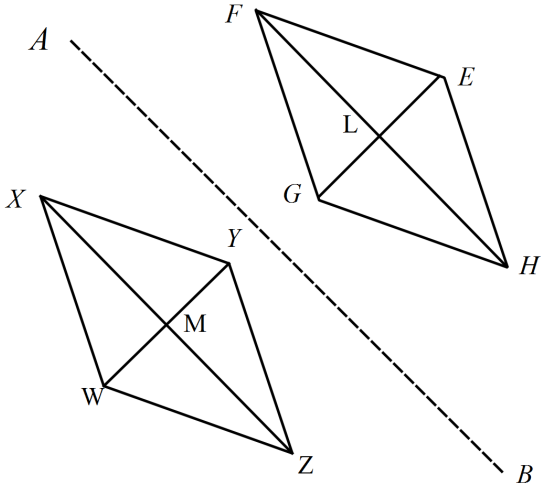
- ☐ Δ ABE ≡ Δ BEC
- ☐ Δ ABE ≡ Δ CED
- ☐ Δ ABE ≡ Δ ADE
- ☐ Δ ABE ≡ Δ ABC



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

Which is **not** a pair of congruent triangles?

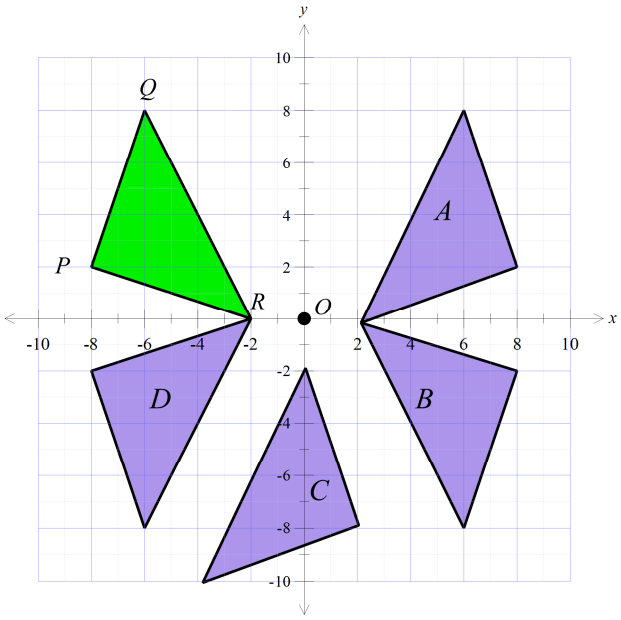
- ☐ Δ *EFH* and Δ *WXZ*
- ☐ Δ *FGH* and Δ *XYZ*
- ☐ Δ *LEF* and Δ *MWX*
- ☐ Δ *WXZ* and Δ *GEH*



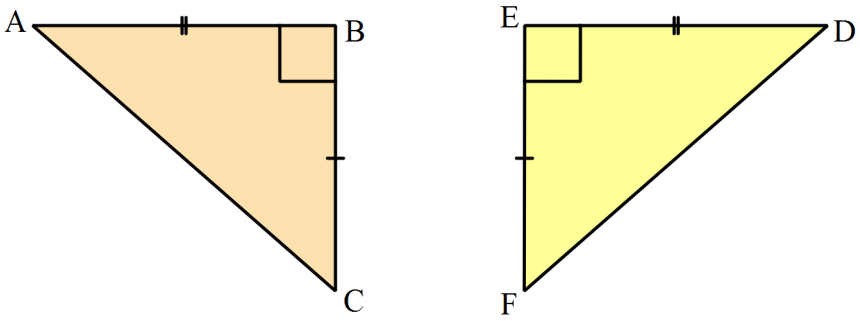
22. *PQR* is reflected in the *y* axis and then the image is reflected in the x axis.

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 $\Delta ABC \equiv \Delta DEF$?

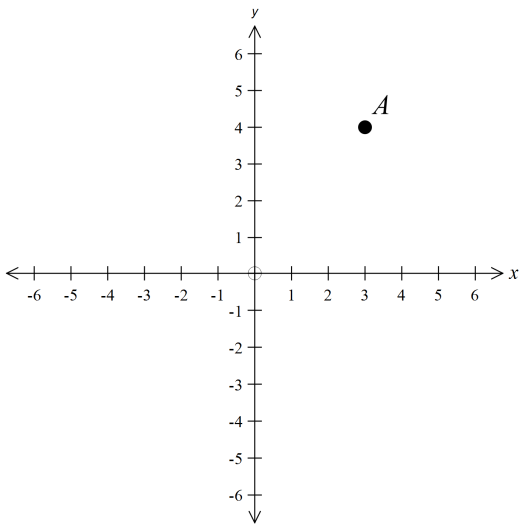


☐ AAS ☐ RHS ☐ SAS ☐ SSS

24. The point A (3, 4) is rotated through 90° in a clockwise direction about the origin and then translated 8 units to the left and 7 units upward.

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

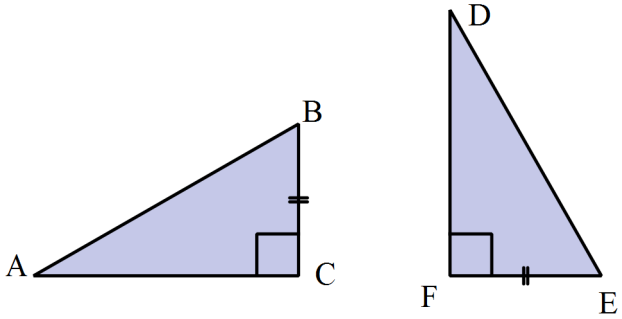
(,)



25. In the figure below, $BC = EF$.

$\angle ACB = \angle DFE = 90°$. .

Which single additional piece of information would allow you to show that $\Delta ACB \equiv \Delta DFE$ using SAS.



☐ = ☐

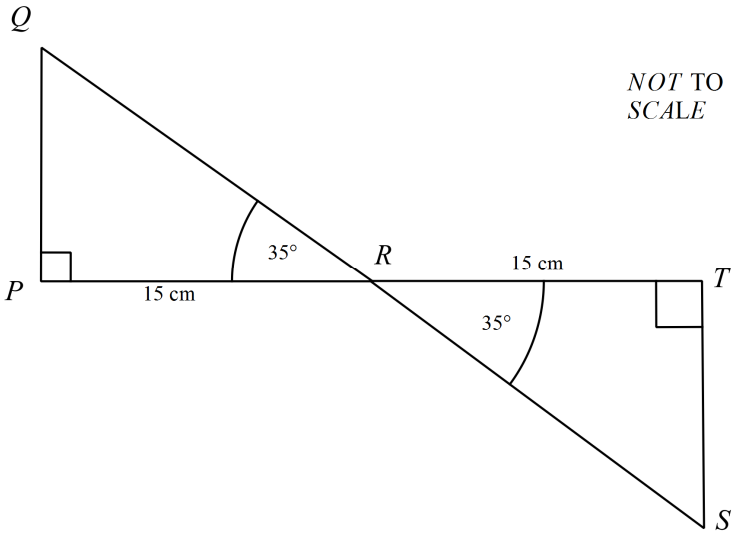
26. $\angle QRP = \angle SRT = 35°$.

$\angle QPR = \angle STR = 90°$.

$PR = TR = 15$ cm

Which of the congruence tests could be used to show that

$\Delta QRP = \Delta SRT$?



☐ AAS

☐ RHS

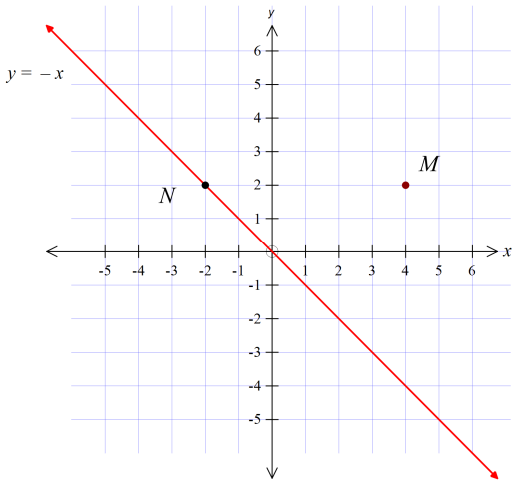
☐ SAS

☐ SSS

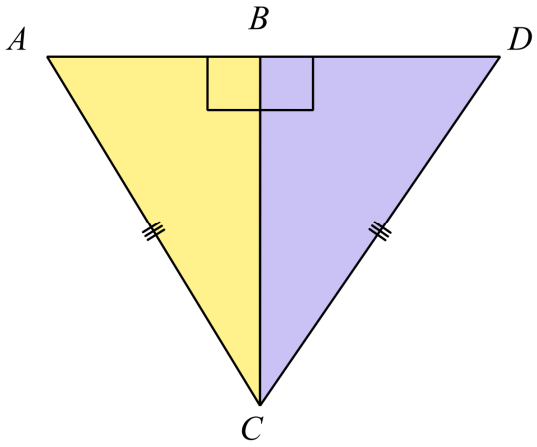
27. The point M (4, 2) is reflected in the line $y = -x$.

Describe the single translation which would then move the image to

N(-2, 2)?

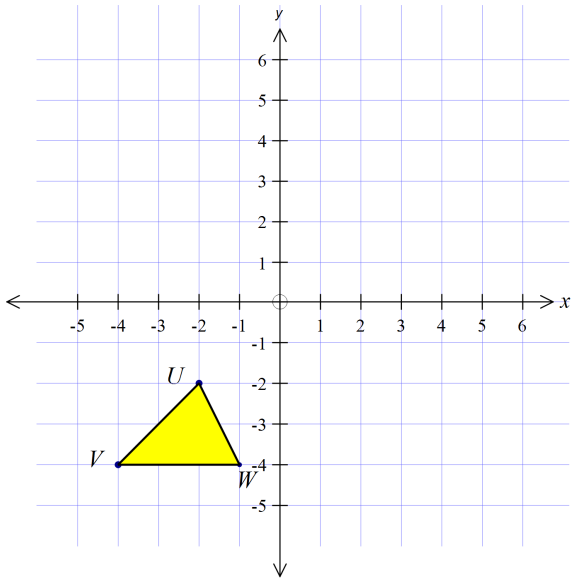


28. Which of the congruence tests could be used to show that $\Delta ABC \equiv \Delta DBC$?



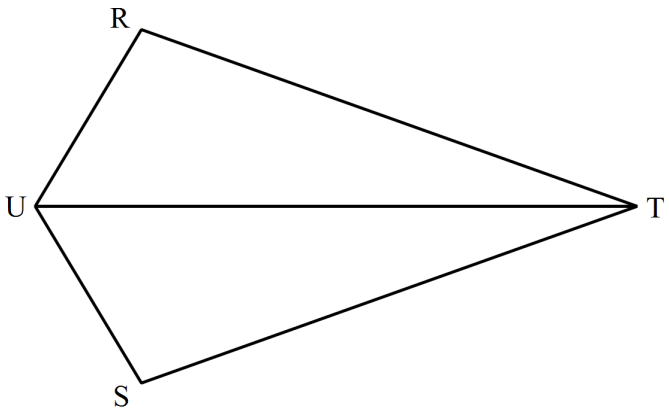
☐ AAS ☐ RHS ☐ SAS ☐ SSS

29. The polygon UVW is rotated about the origin through 180° in a clockwise direction and then translated 5 units to the left. Draw the image $U'V'W'$ after these two transformations.



30. $RU = SU$ and $\angle RUT = \angle SUT$.

Which of the congruence tests could be used to show that $\Delta RUT \equiv \Delta SUT$?



☐ AAS ☐ RHS ☐ SAS ☐ SSS

High School Mathematics Test 2015

Year 8

Transformations and Congruence

Calculator Allowed
Longer Answer Section

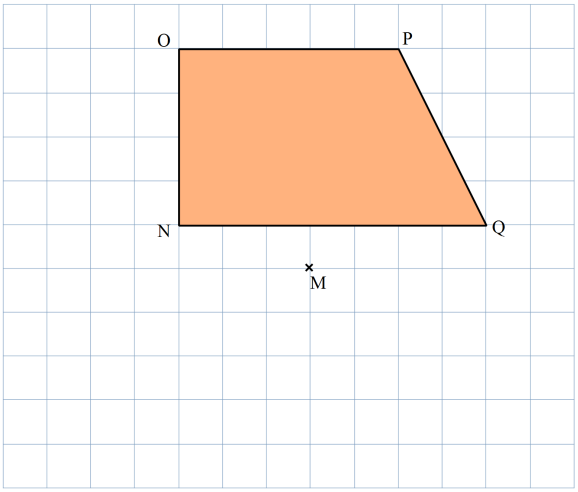
Name_____

Write all working and answers in the spaces provided on this test paper.
Marks may not be awarded if working out and/or answers are not clear.
Marks allocated are shown beside each question.
Calculators are allowed.

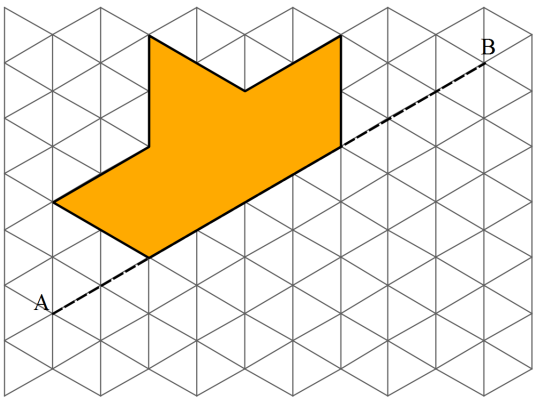
Marks

1. (a) Draw the image of the trapezium *NOPQ* after a rotation through 180° about *M*. **2**

Use geometric instruments.



(b) (i) Part of a shape is shown. Complete the shape so that AB is an axis of line symmetry **2**



(ii) What order of rotational symmetry does the resulting shape have? **1**

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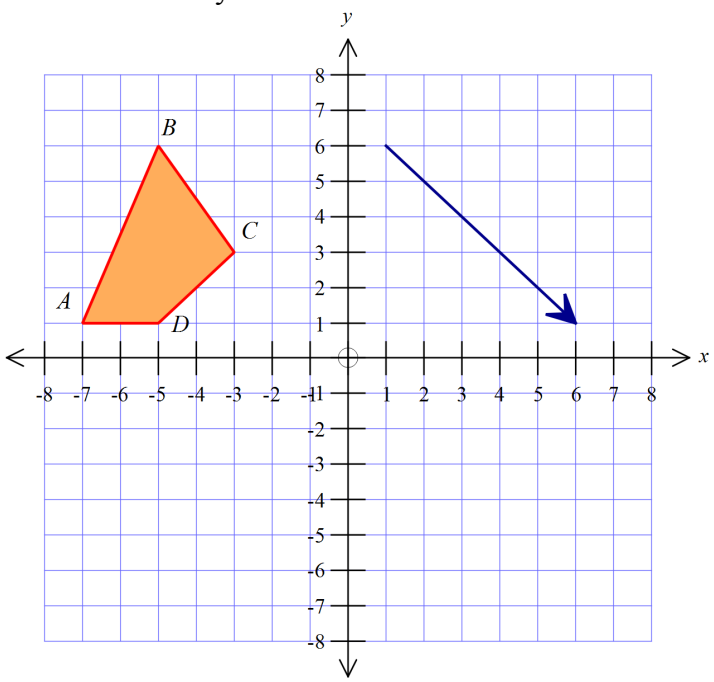
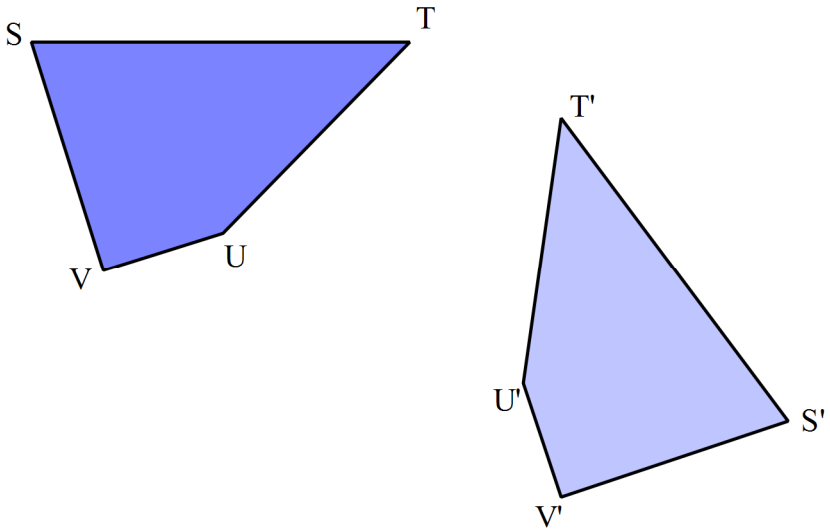
Marks

2. (a) Draw a figure congruent to *ABCD*, by translating in the direction and distance indicated by the arrow. **2**



(b) **2**



Describe a single transformation that could move *STUV* to its image *S'T'U'V'*.
Add any additional lines or points to the diagram to illustrate your answer.

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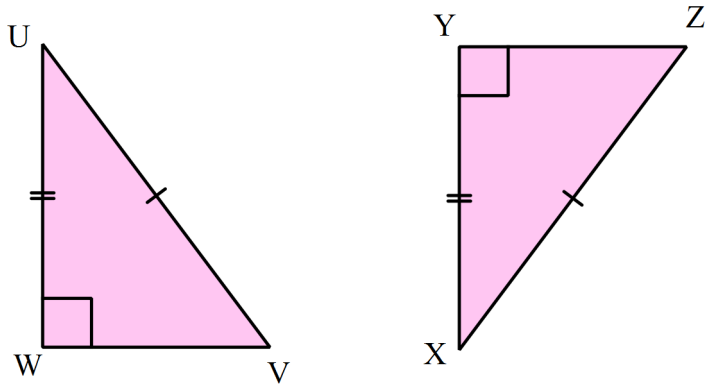
Marks

3. (a) UW = XY, UV = XZ and $\angle W = \angle Y = 90°$. . **2**
Prove that $\Delta UVW \equiv \Delta XYZ$.



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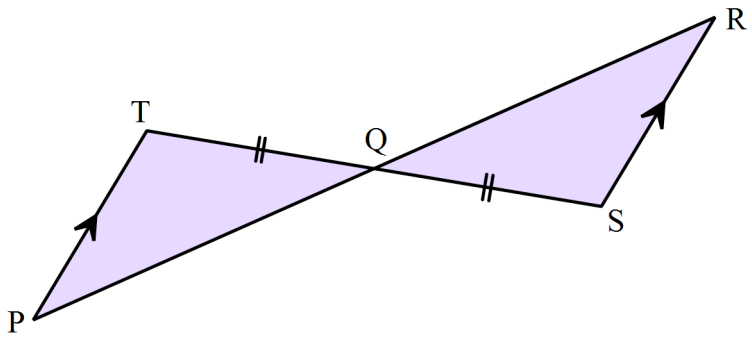
(b) TS is a straight line segment, PT || SR and TQ = QS. **3**
Prove that $\Delta PQT \equiv \Delta RQS$.



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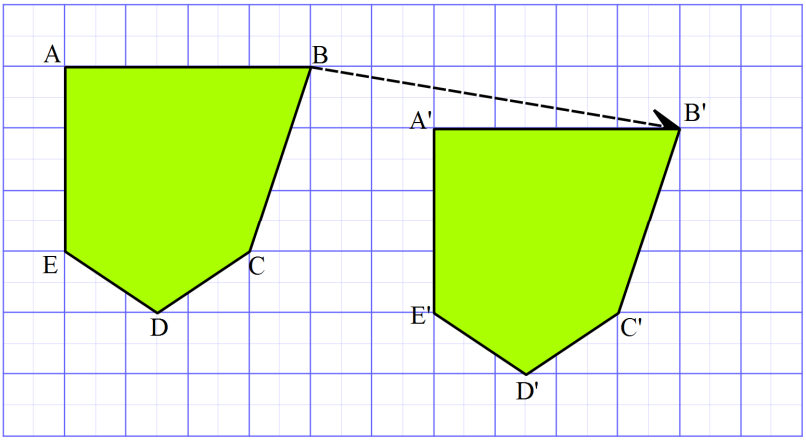
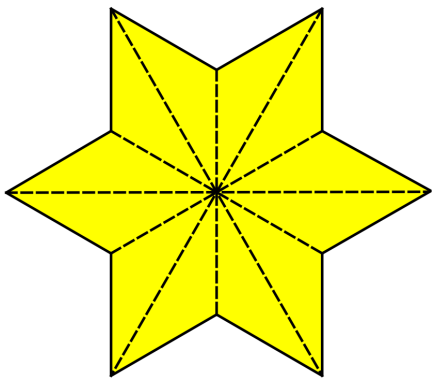
High School Mathematics Test 2015

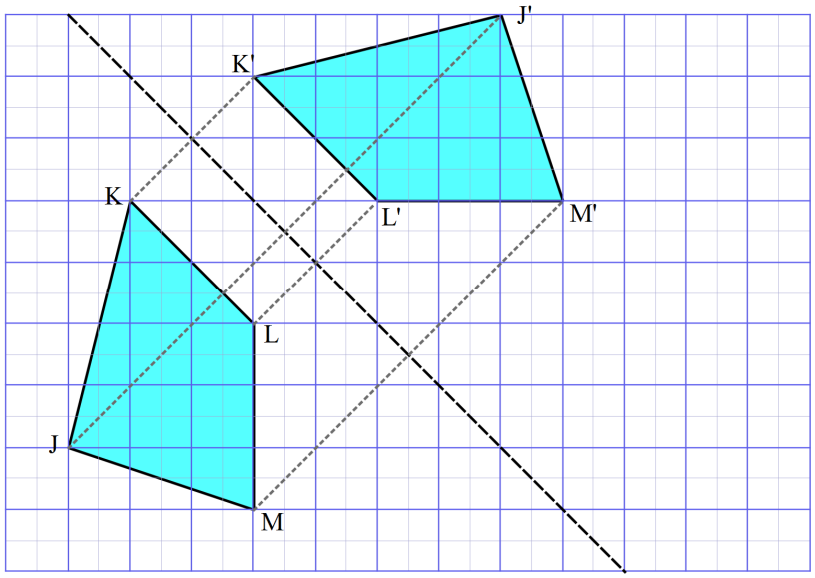
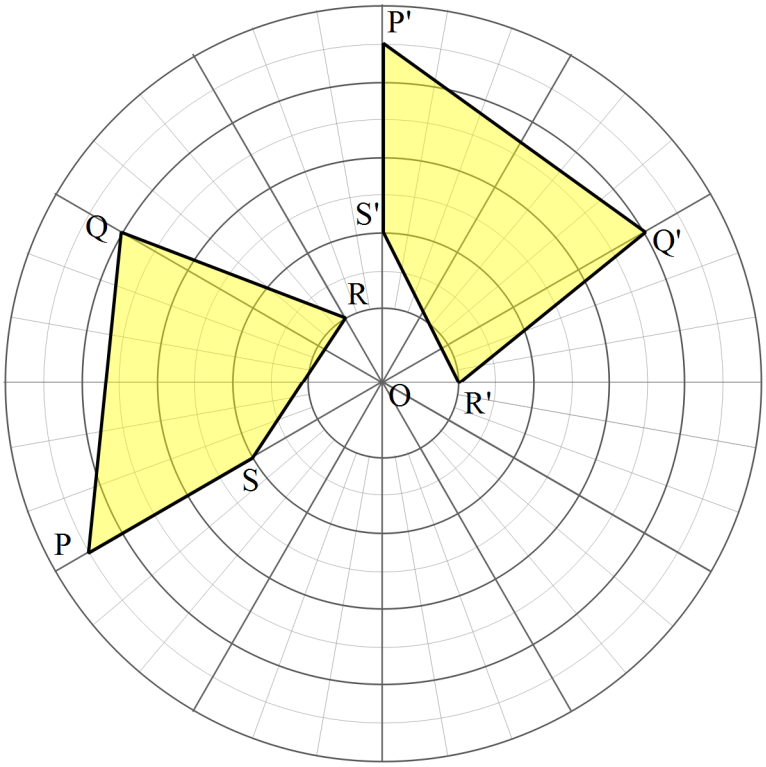
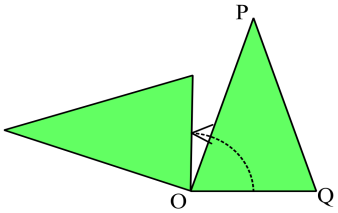
Year 8

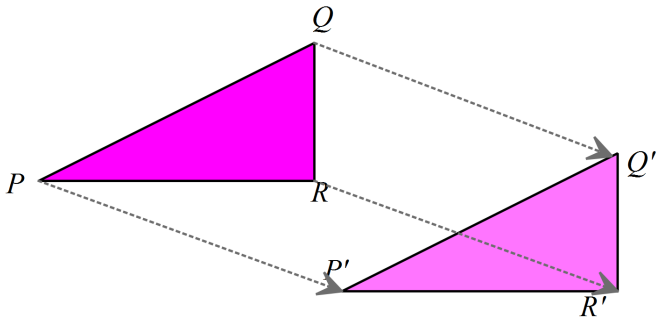
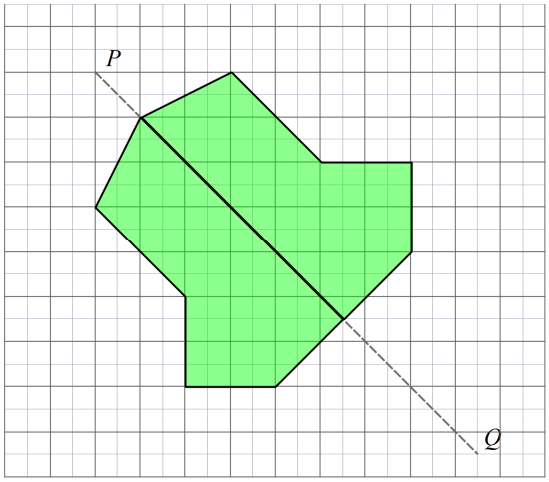
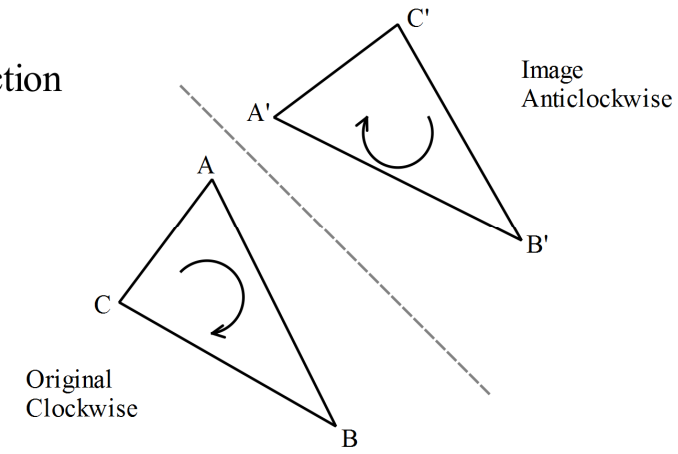
Transformations and Congruence

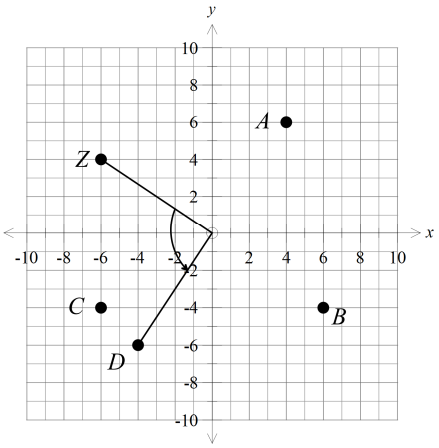
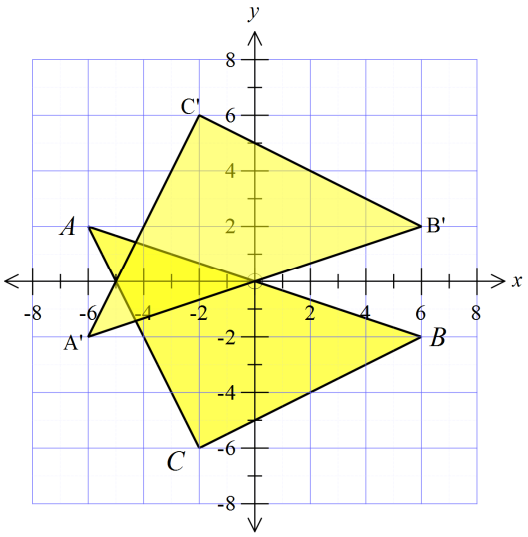
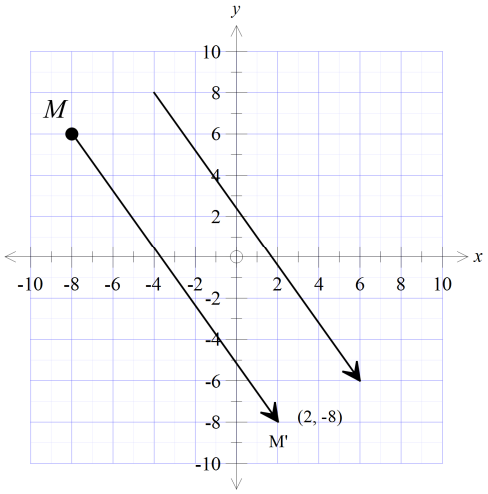
Non Calculator Section

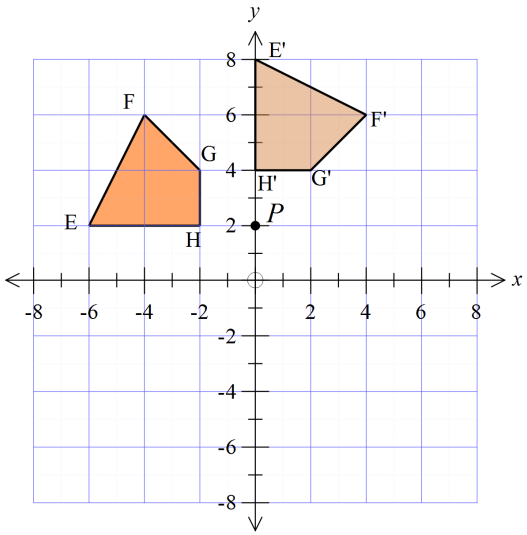
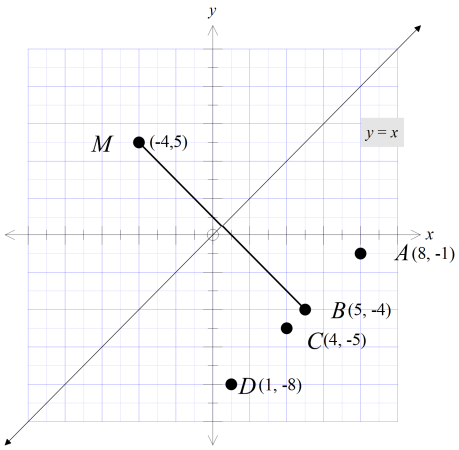
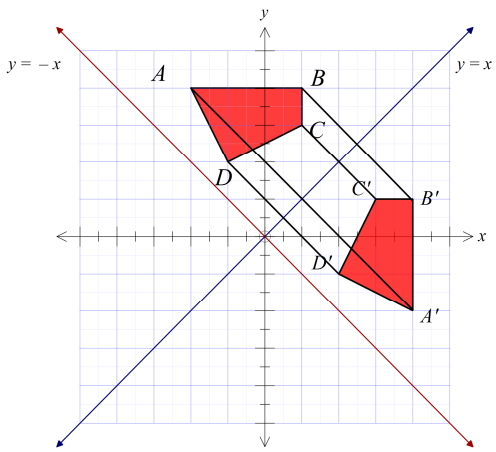
ANSWERS

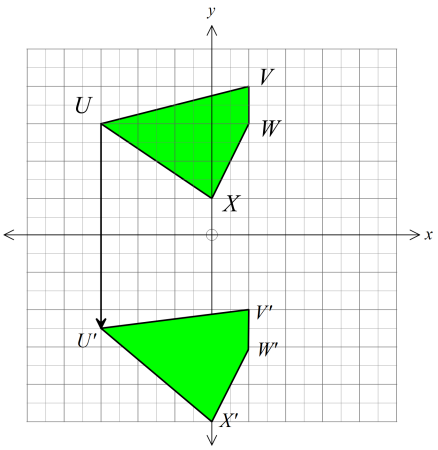
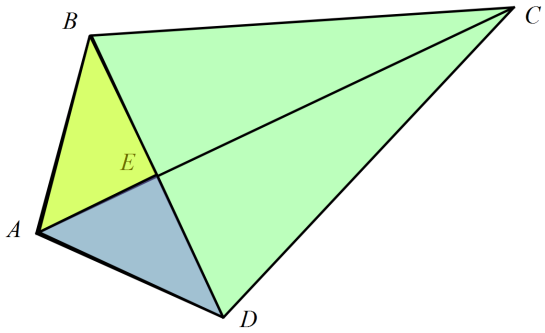
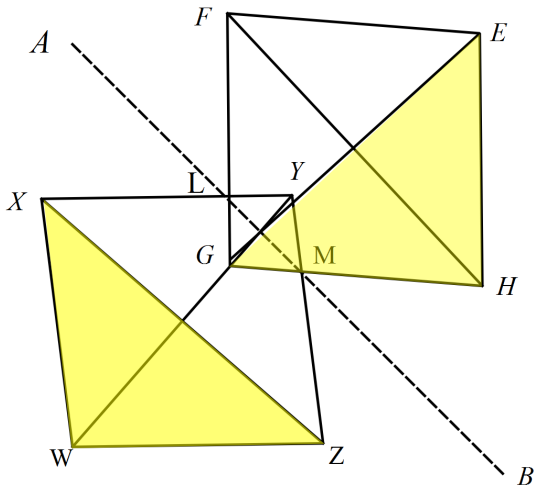
No.	WORKING	ANSWER
1.		See Diagram
2.	They may both be right angled, but it is not always the case.	4th Answer
3.	There are 6 axes as shown 	6
4.	Order 6 as each point can be rotated to a new position and it still looks the same.	3rd Answer

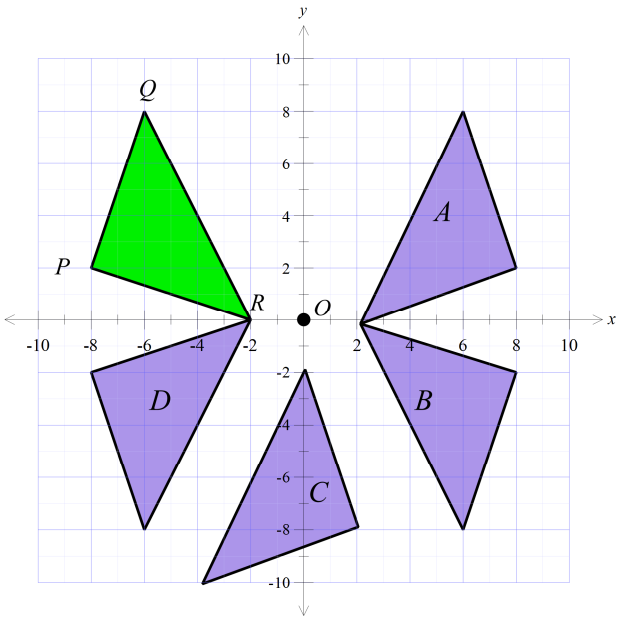
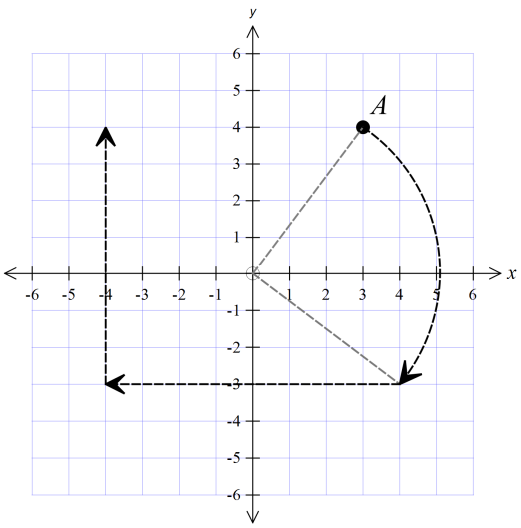
5.		See diagram
6.	Order 2 as it can be rotated through 180^{o} and still appears the same.	1st Answer
7.	- 	See Diagram
8.		2nd Answer

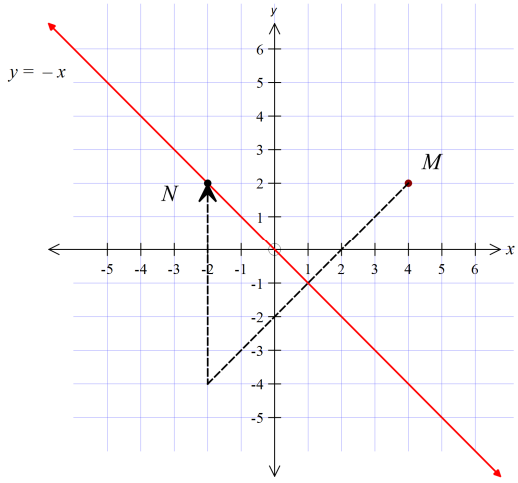
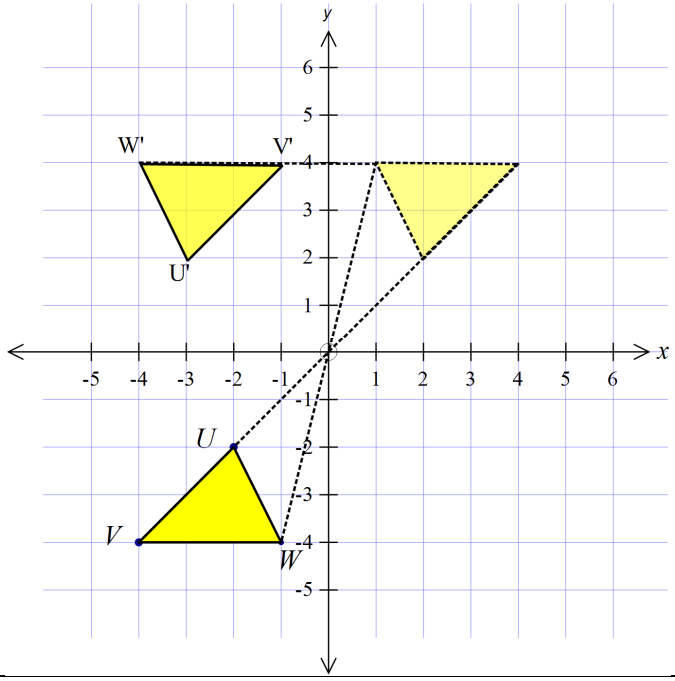
9.	It is a translation 	3rd answer
10.	The heptagon with 7 sides has rotational symmetry of order 7.	3rd answer
11.		See diagram
12.	Reflection 	1st answer

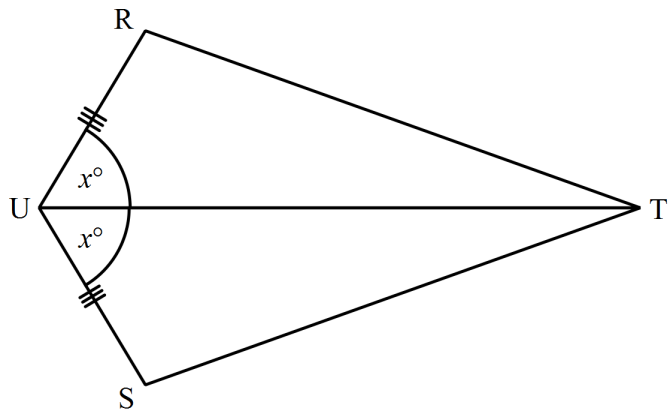
13.		4th answer
14.		See diagram
15.		(2, -8)

16.		See diagram
17.		2nd Answer
18.	 Reflection in the line $y = x$.	1st answer

19.	 A translation in the direction of the y axis.	4th answer
20.	 Δ ABE ≡ Δ ADE	3rd answer
21.	 The shaded pair are not congruent	4th answer

22.	 Reflection in the *y* axis gives triangle A which is then reflected in the *x* axis to give triangle B.	2nd answer
23.	There are two pairs of corresponding sides equal with the included angle also equal. SAS	3rd answer
24.		(-4, 4)
25.	AC = DF (allows for SAS)	AC = DF
26.	Two angles and a corresponding side (AAS).	1st answer

27.	 Translation is 6 units directly upward (direction of the positive y axis)	
28.	Right angle, hypotenuse and a side in each triangle (RHS)	2nd answer
29.		See diagram

30.	 UT is common The information gives SAS	3rd answer

High School Mathematics Test 2015

Year 8

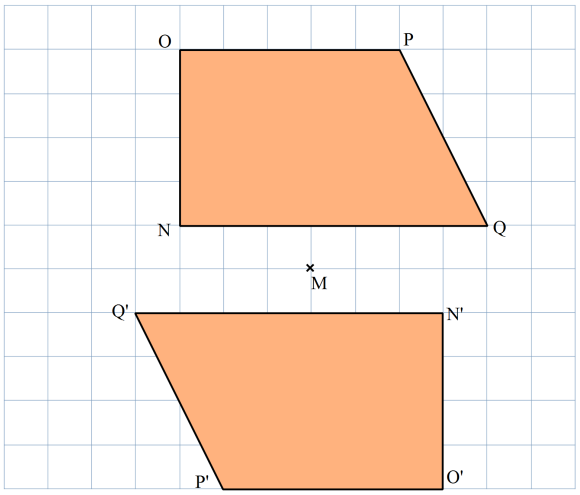
Transformations and Congruence

Calculator Allowed
Longer Answer Section

ANSWERS

Marks

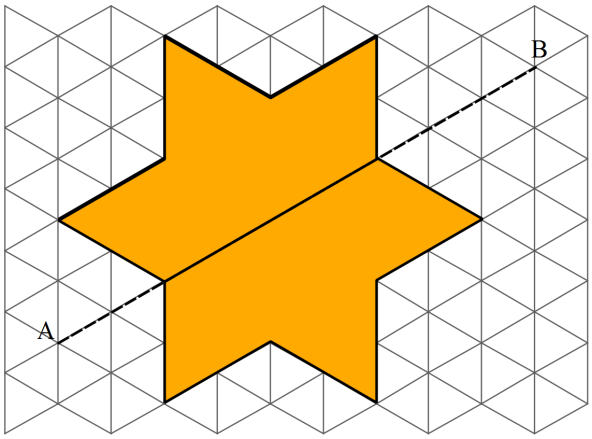
1. (a)



2 marks for an accurate drawing.

1 mark if inaccurate or a minor error.

(b) (i) See diagram.



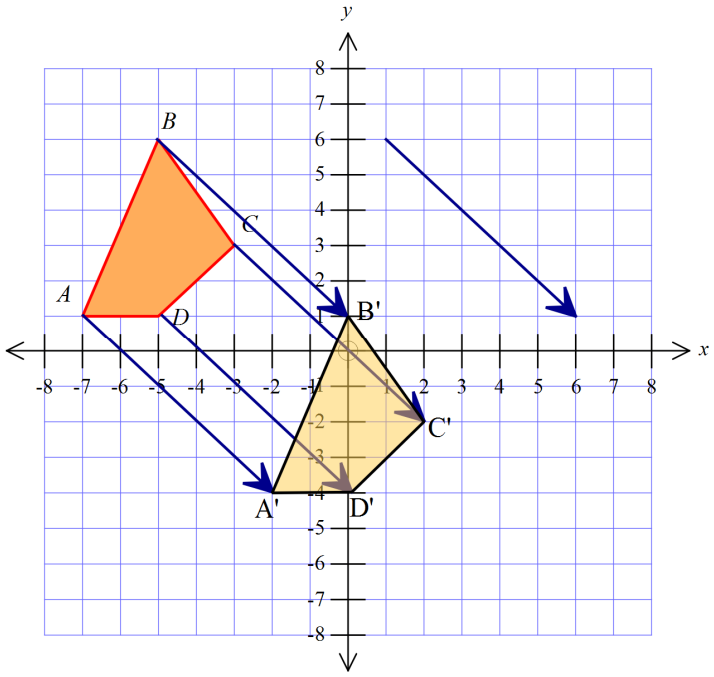
(i) 2 marks for an accurate drawing.

1 mark if inaccurate or a minor error.

(ii) The figure has rotational symmetry of order 6.

1 mark for answer

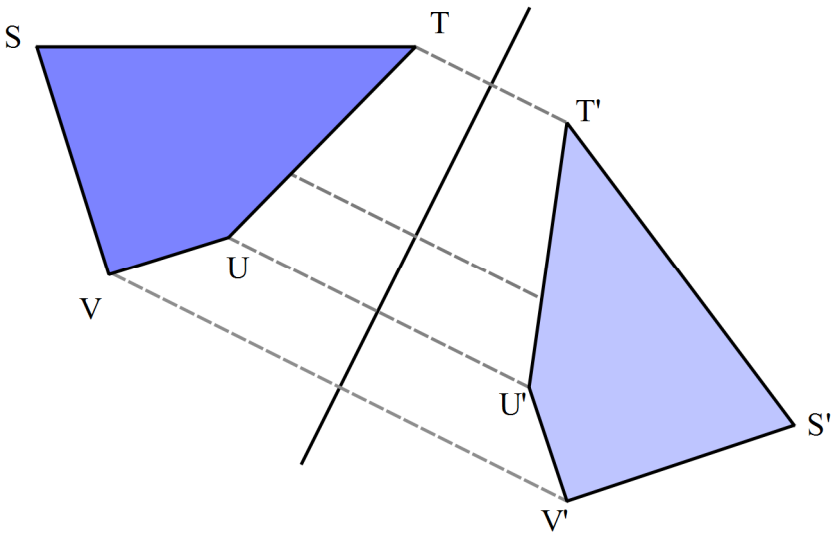
2. (a) Draw a figure congruent to *ABCD*, by translating in the direction and distance indicated by the arrow.



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 stating it is a reflection and drawing in the line, in an approximate position or describing accurately its position.

1 mark for doing only one of the above.

A reflection in the line AB shown.

3. (a) In Δ UVW and Δ XYZ

$UW = XY$ (given)

$UV = XZ$ (given)

$\angle W = \angle Y = 90°$ (given)

$\therefore$ Δ UVW ≡ Δ XYZ (*RHS*)

2 marks for stating the three equal features and stating congruence with RHS.

1 mark for a partial proof or incorrect conclusion

(b) In Δ PTQ and Δ RSQ

$TQ = SQ$ (given)

∠ PTQ = ∠ RSQ (alt ∠ on ∥ lines)

∠ TQP = ∠ SQR (vert opposite ∠)

∴ Δ PTQ ≡ Δ RSQ (*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