High School Mathematics Test 2014

Year 8

Transformations and Congruence

Non Calculator Test

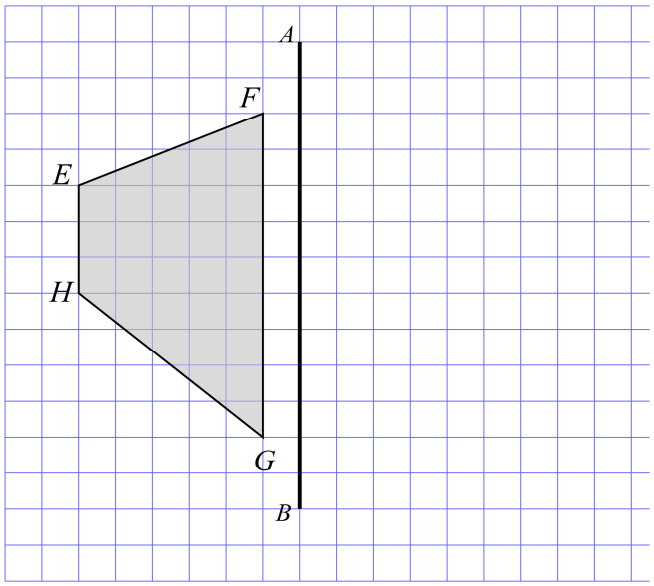
Skills and Knowledge Assessed:

- 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)

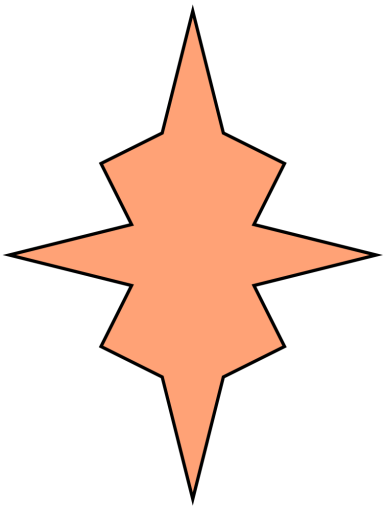
Name_____

Answer all questions in the spaces provided on this test paper by:
Writing the answer in the box 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 for this section.*

1. Use geometric instruments to draw the image after *EFGH* is reflected in the line AB.

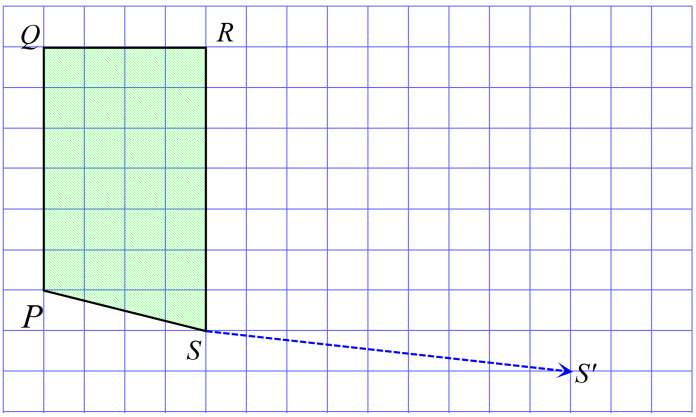


2. How many axes of line symmetry does the shape below have?

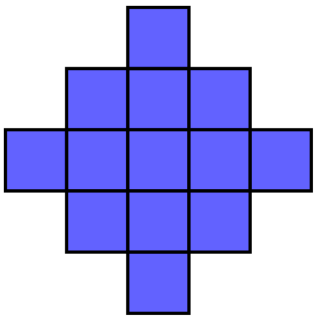


☐ axes

3. Use geometric instruments to draw the image after *PQRS* when it is translated in the distance and direction of the arrow.

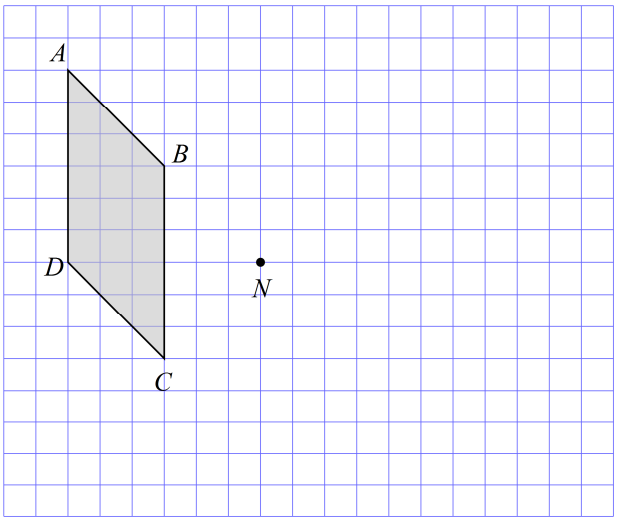


4. What order of rotational symmetry does the shape below have?



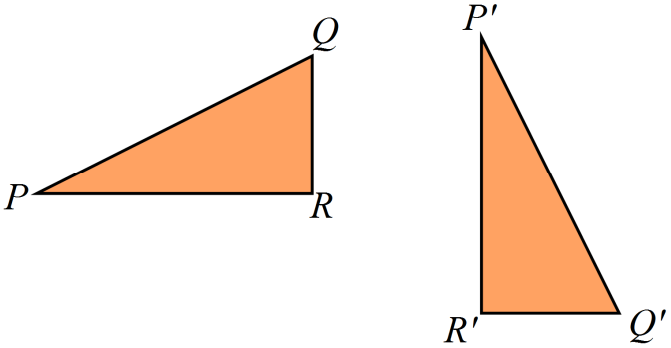
☐ 2 ☐ 4 ☐ 6 ☐ 8

5. Use geometric instruments to draw the image after $ABCD$ is rotated through 180° in a clockwise direction about N.



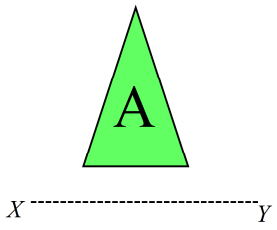
6. The figure PQR could be transformed to the figure $P'Q'R'$ by:

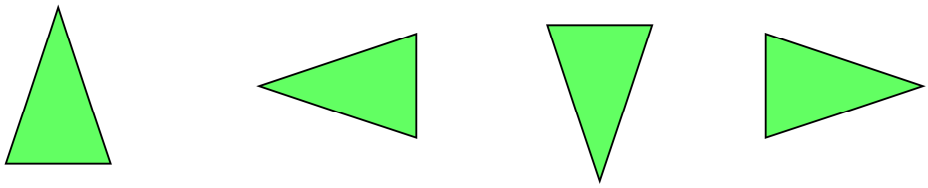
- ☐ Rotation through 180°.
- ☐ Reflection.
- ☐ Translation.
- ☐ Rotation through 90°.



7. The triangle labelled A is reflected in the line XY.

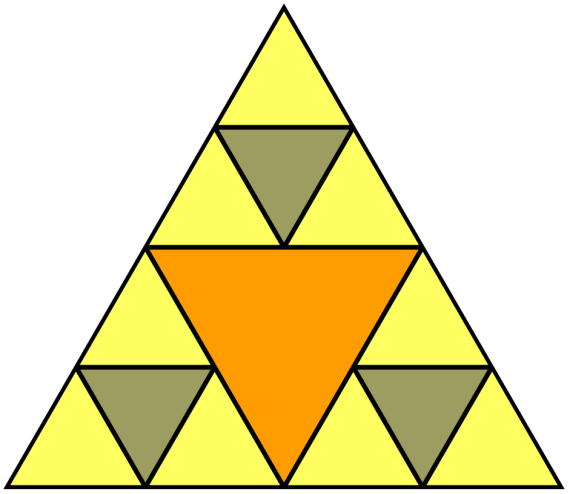
Which triangle could be the image?



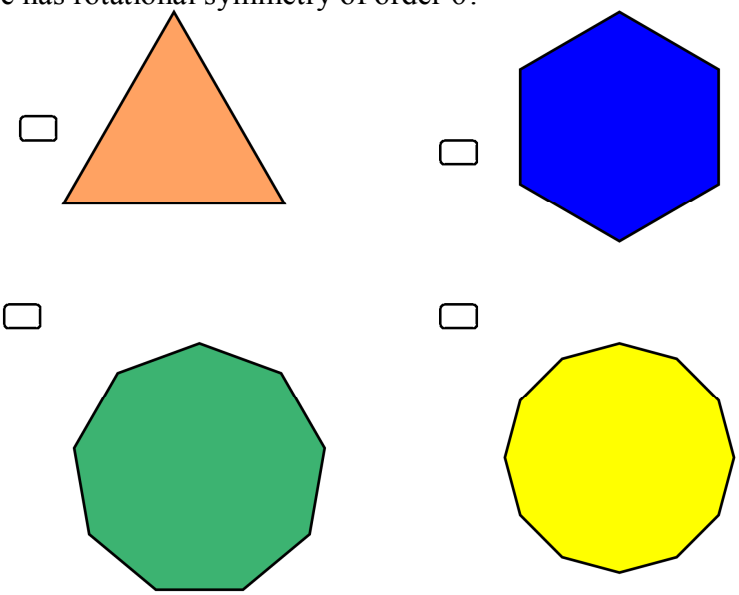


☐ ☐ ☐ ☐

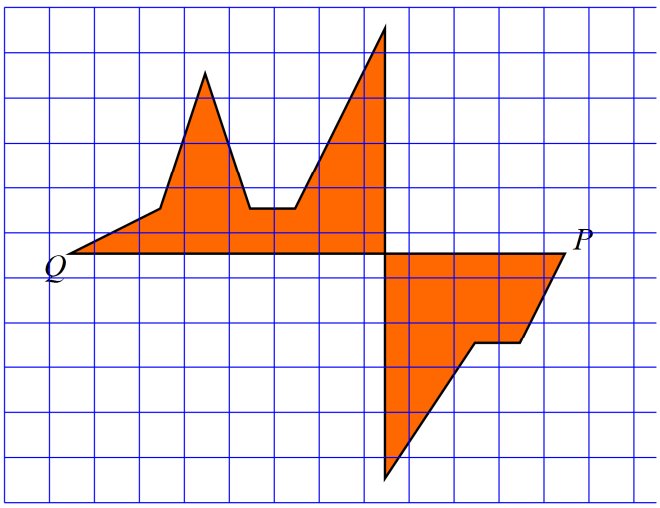
8. Draw all of the axes of line symmetry for the shape shown.



9. Which shape has rotational symmetry of order 6?

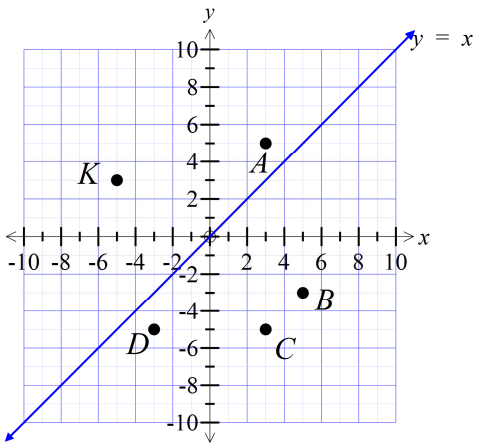


10. Complete the figure given that PQ is an axis of line symmetry.

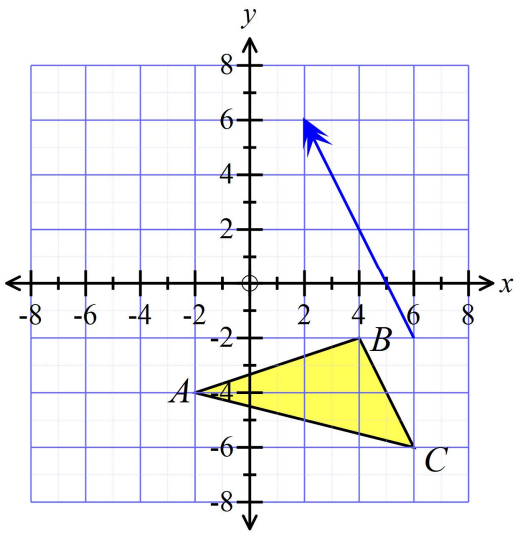


11. The point K (-5, 3) is reflected in the line $y = x$. Which point is the image after the transformation?

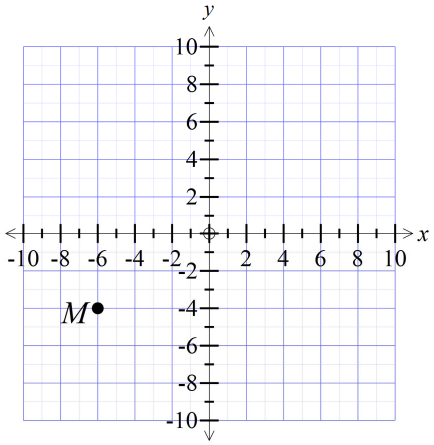
- ☐ A (3, 5)
- ☐ B (5, -3)
- ☐ C (3, -5)
- ☐ D (-3, -5)



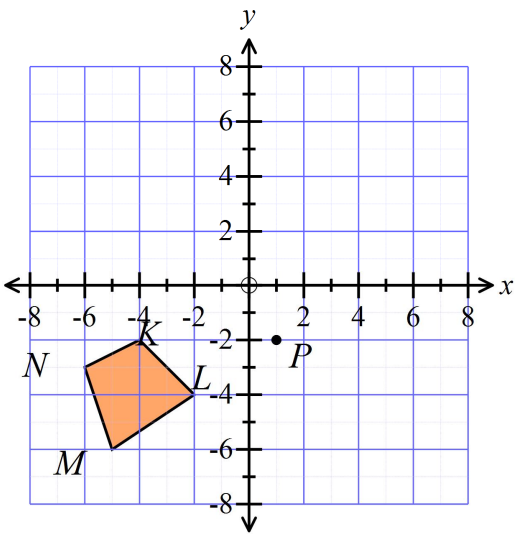
12. Draw the position of the figure ABC after a translation in the direction and distance indicated by the arrow.



13. The point M (-6, -4) is rotated through 90° in an anticlockwise direction about the origin. Which are the coordinates of the image after the transformation?

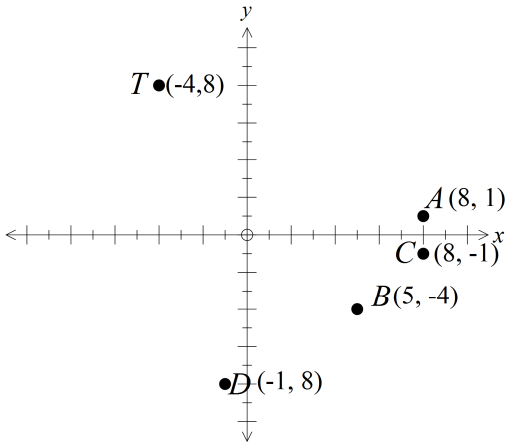


14. Draw the position of the figure *KLMN* after a rotation through 180° in a clockwise direction about the point *P*(1, -2)



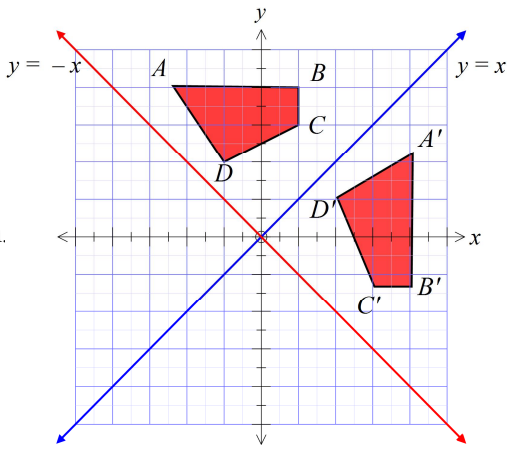
15. The point *T* (-4, 8) is translated nine units to the right and twelve units down.
Which point is the image after the transformation?

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



16. Figure *ABCD* is moved to an image *A'B'C'D'* by a single transformation.
What was the transformation?

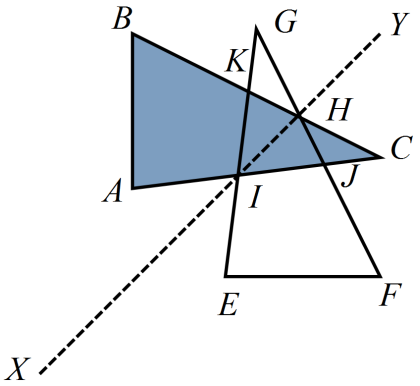
- ☐ A reflection in the line $y = x$.
- ☐ A reflection in the line $y = -x$
- ☐ An anticlockwise rotation of 90° about the origin.
- ☐ A clockwise rotation of 90° about the origin.



17. The triangle ABC is reflected in the line segment XY, to give the triangle EFG.

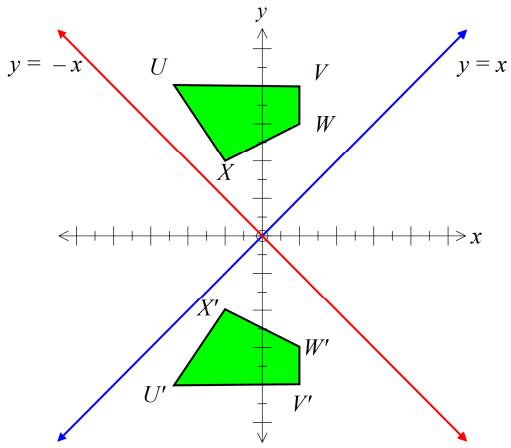
Which is not a pair of congruent triangles?

- ☐ ΔABC and ΔEFG.
- ☐ ΔIJH and ΔIKH.
- ☐ ΔICH and ΔIGH.
- ☐ ΔJHC and ΔIHK.



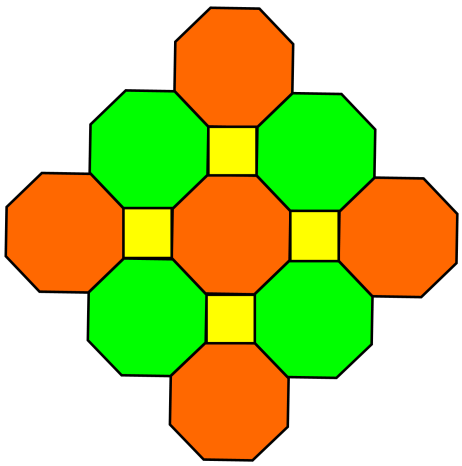
18. Figure $UVWX$ is moved to an image $U'V'W'X'$ by a single transformation.
What was the transformation?

- ☐ 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..



19. This geometric pattern was created by transforming congruent polygons.
Which statement is **not** true?

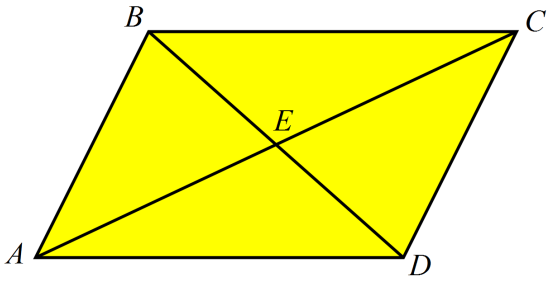
- ☐ All of the polygons in the pattern are congruent.
- ☐ All of the octagons in the pattern are congruent.
- ☐ The pattern has line symmetry.
- ☐ The pattern has rotational symmetry.



20. A parallelogram $ABCD$ has both its diagonals drawn, intersecting at E.

Which statement is true?

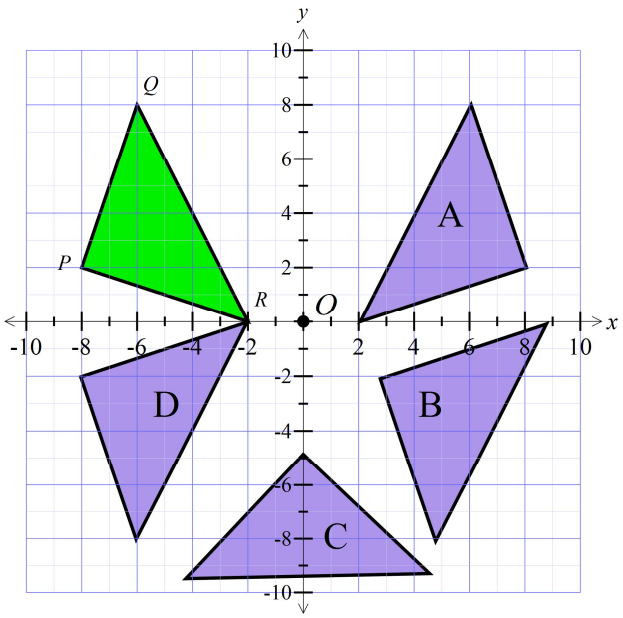
- ☐ $\Delta ABC \equiv \Delta ABD$.
- ☐ $\Delta ABE \equiv \Delta CDE$.
- ☐ $\Delta AED \equiv \Delta CED$.
- ☐ $\Delta ACD \equiv \Delta BCD$.



21. PQR is reflected in the x axis and then translated to the right.

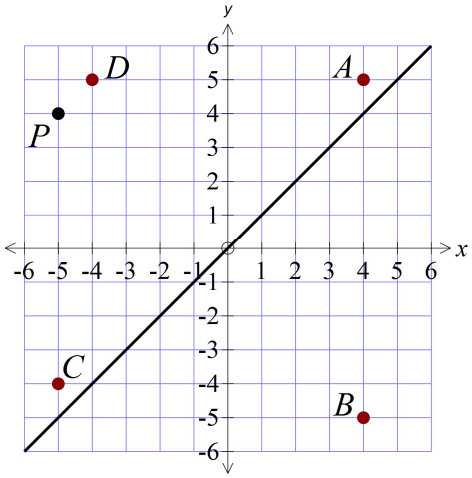
Which figure is its image?

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

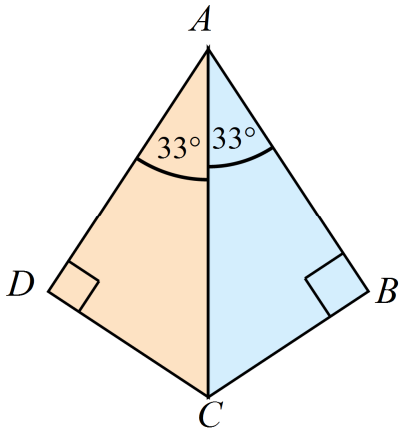


22. The point P (-5, 4) is reflected in the line $y = x$ and then rotated in an anticlockwise direction about the origin.
Which point is the image after these two transformations?

- ☐ A (4, 5).
- ☐ B (4, -5).
- ☐ C (-5, -4).
- ☐ D (-4, 5).



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



☐ AAS ☐ RHS ☐ SAS ☐ SSS

24. The point A (3, 5) is reflected in the line $y = -x$ and then translated 10 units to the right and 6 units upward.
Give the coordinates of the point which is the image after these transformations?

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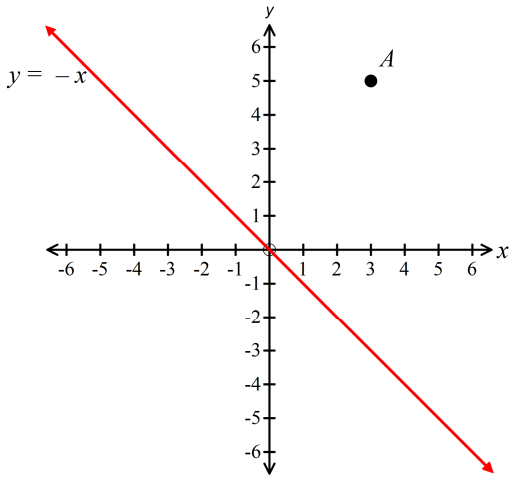
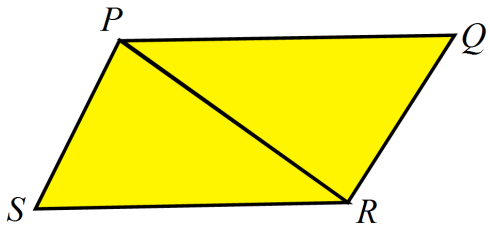


25. In the figure below, $PQ = SR$.
Which single additional piece of information would allow you to show that $\Delta PQR \equiv \Delta PQS$?

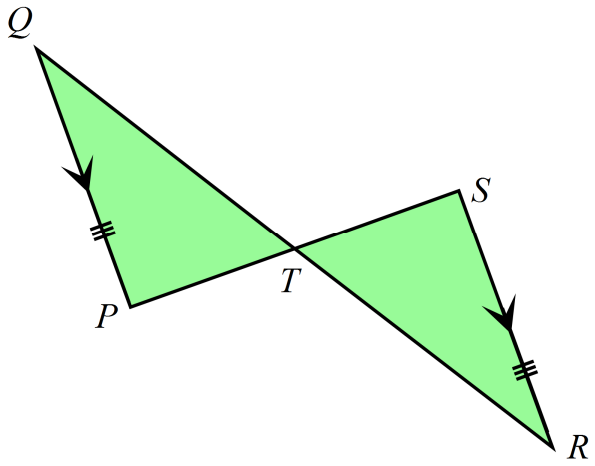


NOT TO SCALE

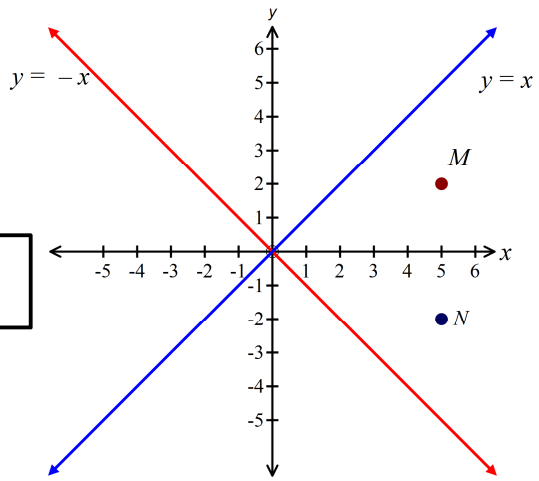
☐ = ☐

26. $QP \parallel SR$ and $QP = SR$.
Which of the congruence tests could be used to show that
$\Delta QTP \equiv \Delta RTS$?

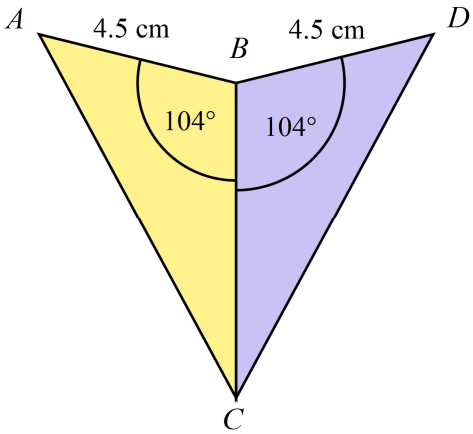
- ☐ AAS
- ☐ RHS
- ☐ SAS
- ☐ SSS



27. The point M (5, 2) is rotated about the origin through 90° in an anticlockwise direction. What single reflection would then move the image to N(5, -2)?

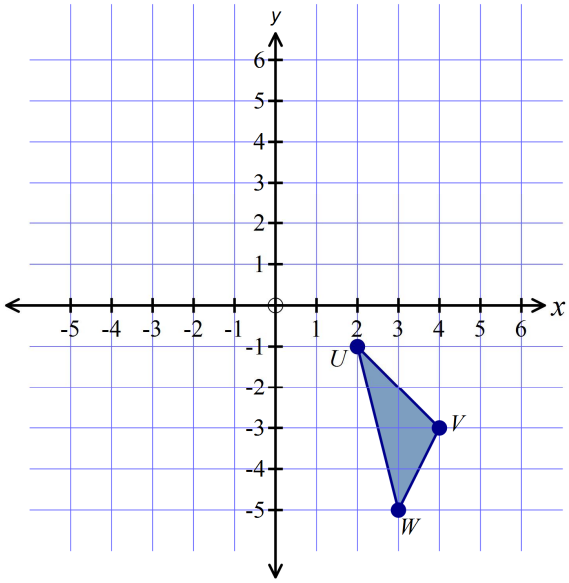


28. Which of the congruence tests could be used to show that $\Delta ABC \equiv \Delta DBC$?

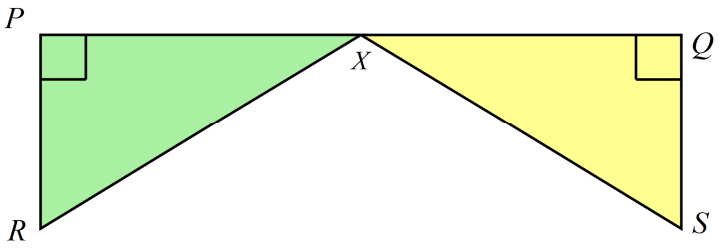


☐ AAS ☐ RHS ☐ SAS ☐ SSS

29. The polygon UVW is rotated about the origin through 180^o in a clockwise direction and then translated 8 units to the right. Draw the image $U'V'W'$ after these two transformations.



30. $RX = SX$, $\angle P = \angle Q = 90^\circ$ and X is the midpoint of PQ.
Which of the congruence tests could be used to show that $\Delta PXR \equiv \Delta QXS$?



☐ AAS ☐ RHS ☐ SAS ☐ SSS

High School Mathematics Test 2014

Year 8

Transformations and Congruence

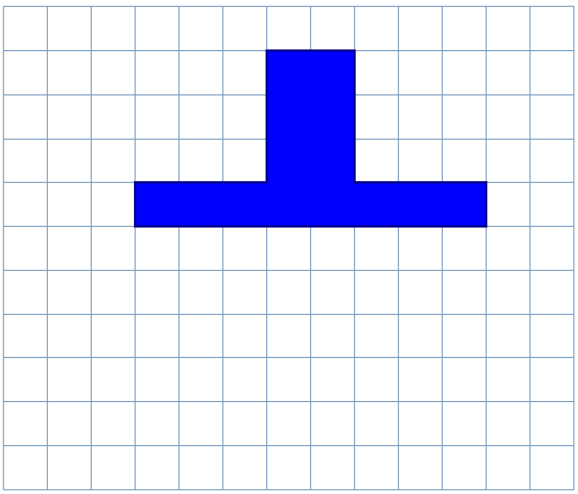
Longer Answer Section

Name_____

Show all working, diagrams and answers in the spaces provided on this test paper.
Answers should be supported by relevant mathematical reasoning and/or calculations.
Marks allocated are shown beside each question.

Marks

1. (a) Complete the diagram below so that the figure has two axes of line symmetry. **2**



(b) Complete the diagram below so that the figure has rotational symmetry of order 3 **2**

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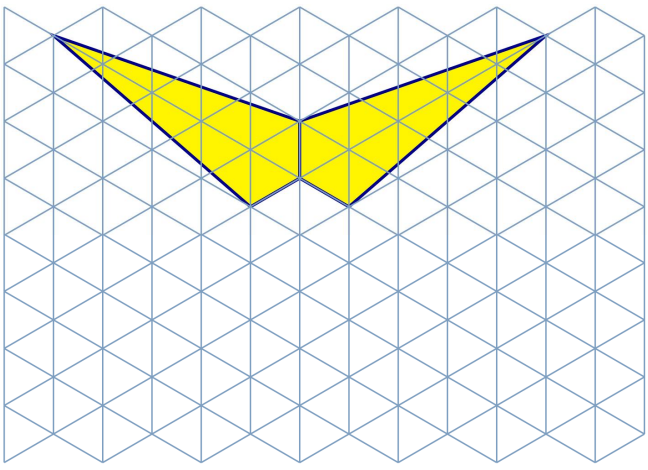
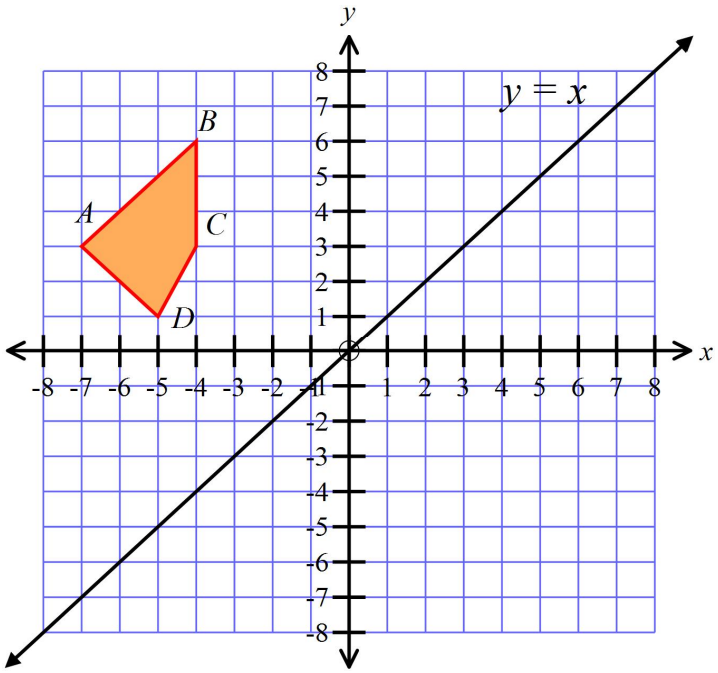
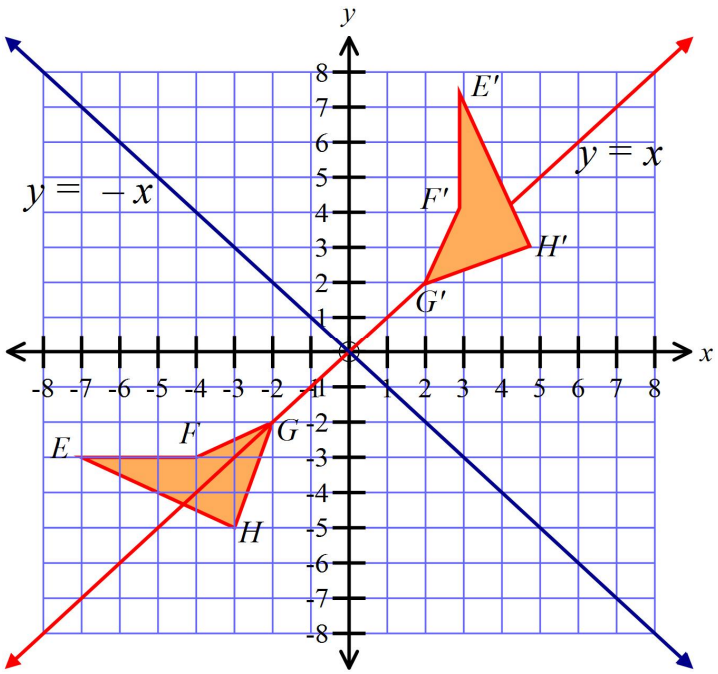


2. (a) Draw a figure congruent to $ABCD$, by reflecting in the line $y = x$. **2**



(b) **1**



Describe a single transformation that could move $EFGH$ to its image $E'F'G'H'$.

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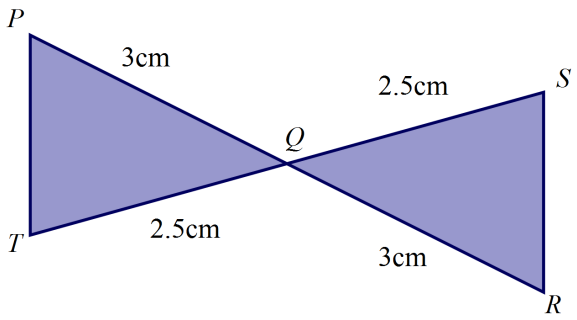
3. (a) Using the information provided on the diagram below, prove that $\Delta PQT \equiv \Delta RQS$. **3**



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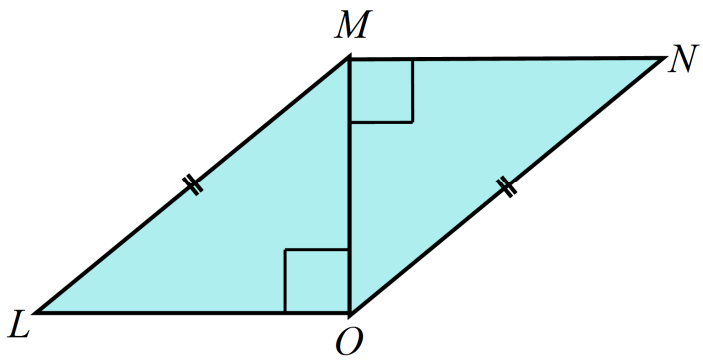
(b) In the figure below, $LM = ON$ and $\angle LOM = \angle NMO = 90°$. **3**
Prove that $\Delta MLO \equiv \Delta ONM$.



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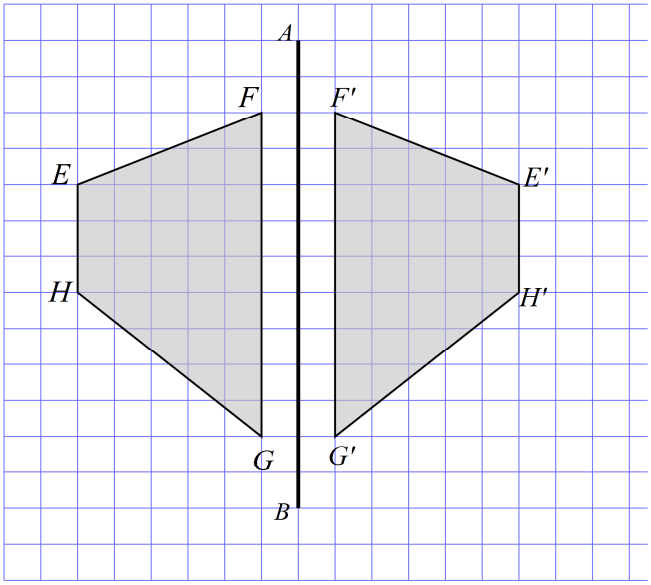
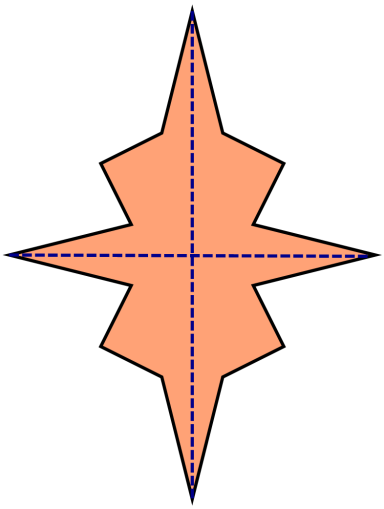
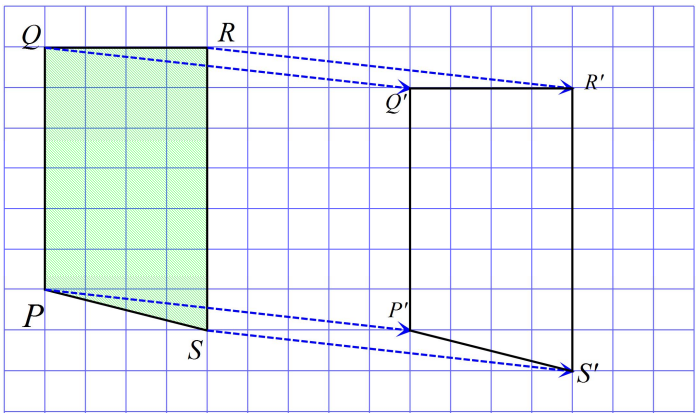
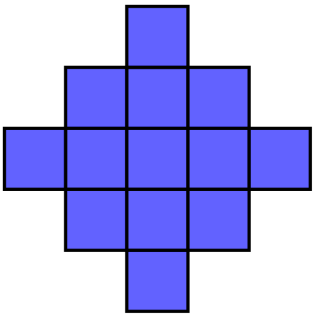
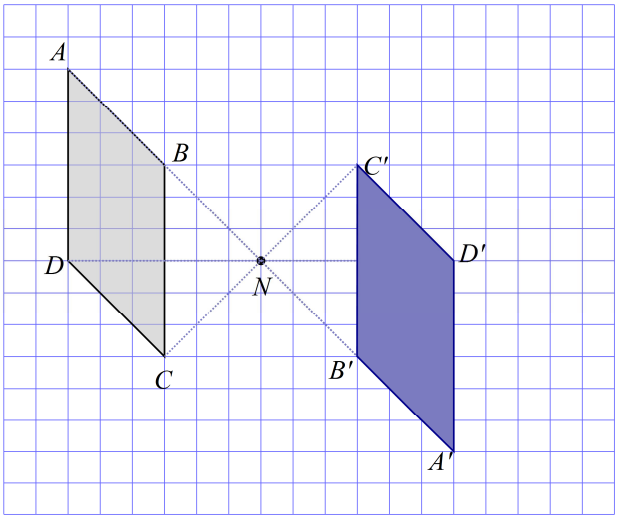
High School
Mathematics Test 2014
Transformations and Congruence
ANSWERS

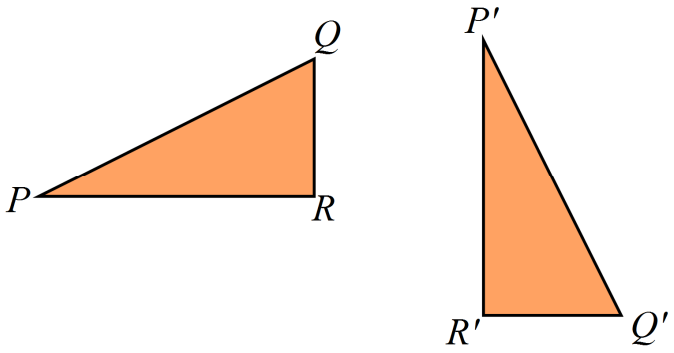
Non Calculator Section (1 mark each)

	Working and Answers
1.	Use geometric instruments to draw the image after *EFGH* is reflected in the line AB. 
2.	How many axes of line symmetry does the shape below have?  2 axes

3.	Use geometric instruments to draw the image after *PQRS* when it is translated in the distance and direction of the arrow. 
4.	What order of rotational symmetry does the shape below have?  ☐ 2 ☐ 4 ☐ 6 ☐ 8
5.	Use geometric instruments to draw the image after *ABCD* is rotated through 180° in a clockwise direction about *N*. 

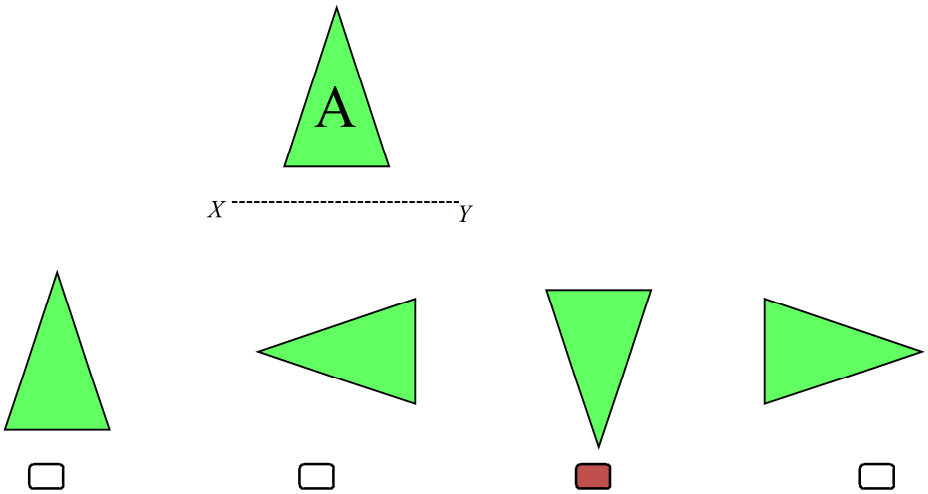
6. The figure PQR could be transformed to the figure $P'Q'R'$ by:

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



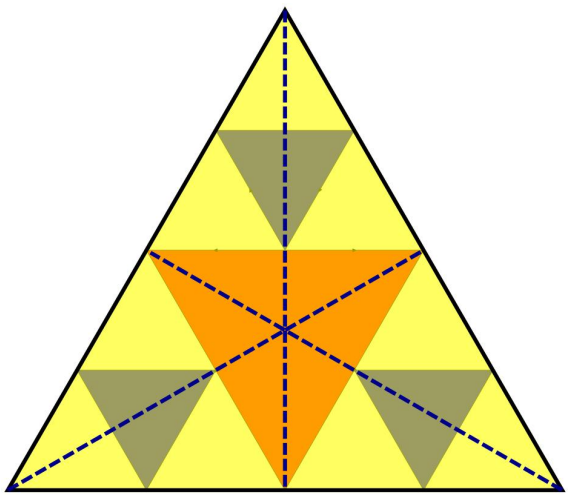
7. The triangle labelled A is reflected in the line XY.

Which triangle could be the image?

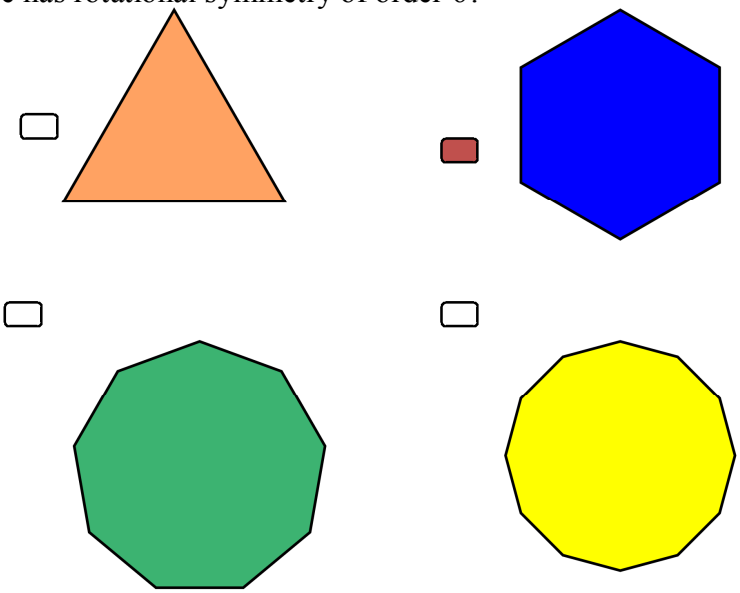


☐ ☐ ☒ ☐

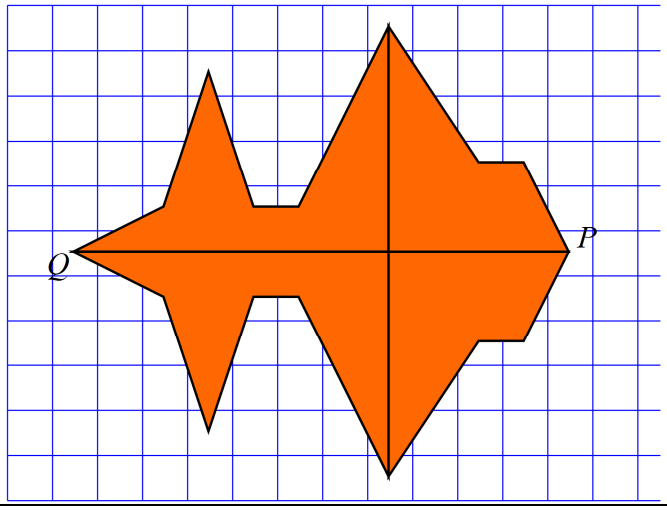
8. Draw any axes of line symmetry for the shape shown.



9. Which shape has rotational symmetry of order 6?

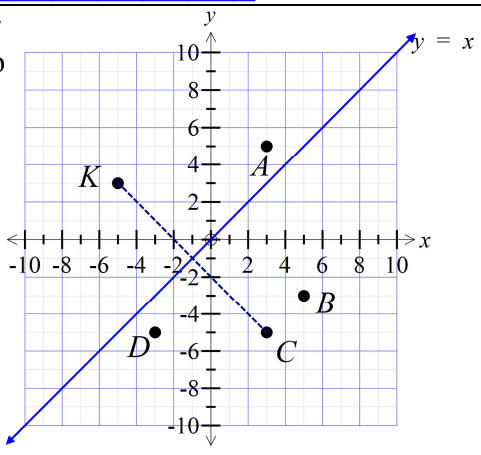


10. Complete the figure given that PQ is an axis of line symmetry.

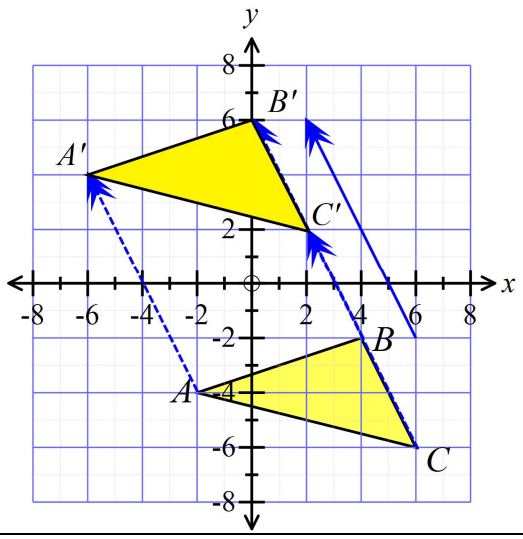


11. The point K (-5, 3) is reflected in the line $y = x$
Which point is the image after the transformatio

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

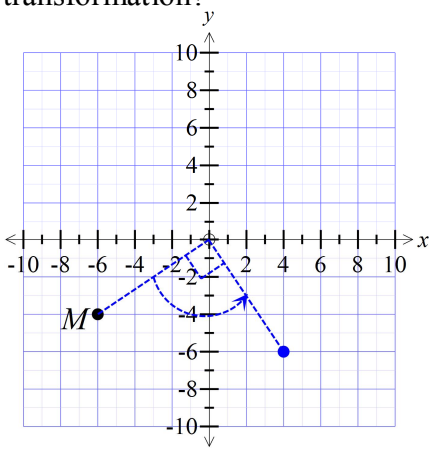


12. Draw the position of the figure *ABC* after a translation in the direction and distance indicated by the arrow.

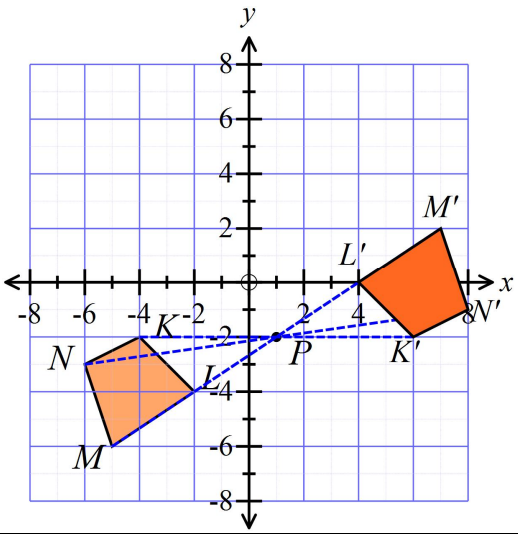


13. The point *M* (-6, -4) is rotated through 90° in an anticlockwise direction about the origin. Which are the coordinates of the image after the transformation?

(4, -6)

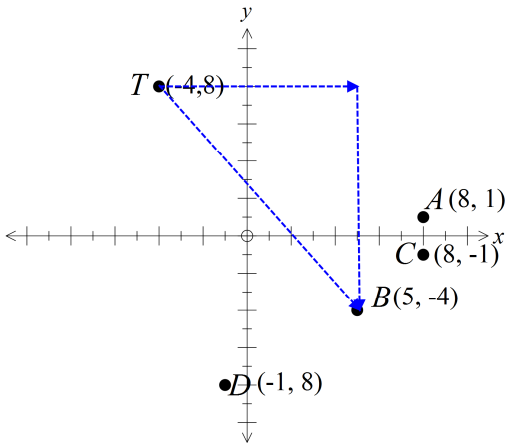


14. Draw the position of the figure *KLMN* after a rotation through 180° in a clockwise direction about the point *P*(1, -2)



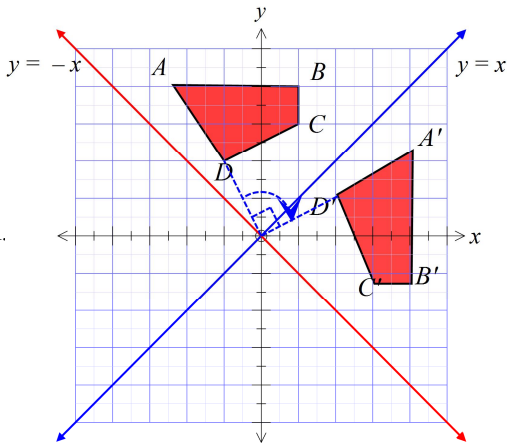
15. The point T (-4, 8) is translated nine units to the right and twelve units down.
Which point is the image after the transformation?

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



16. Figure $ABCD$ is moved to an image $A'B'C'D'$ by a single transformation.
What was the transformation?

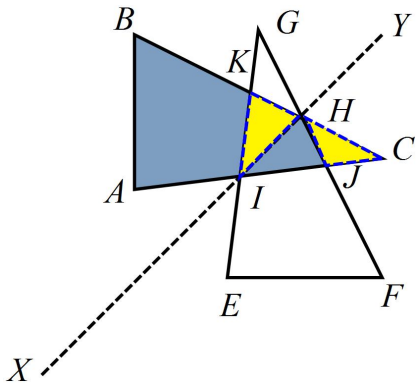
- ☐ A reflection in the line $y = x$.
- ☐ A reflection in the line $y = -x$
- ☐ An anticlockwise rotation of 90° about the origin.
- ☒ A clockwise rotation of 90° about the origin.



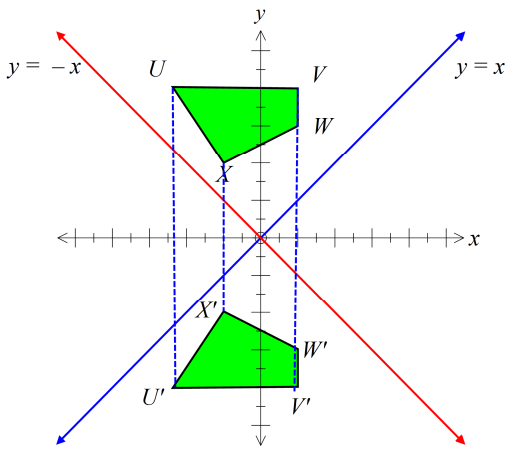
17. The triangle ABC is reflected in the line segment XY, to give the triangle EFG.

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

- ☐ ΔABC and ΔEFG.
- ☐ ΔIJH and ΔIKH.
- ☐ ΔICH and ΔIGH.
- ☒ ΔJHC and ΔIHK.



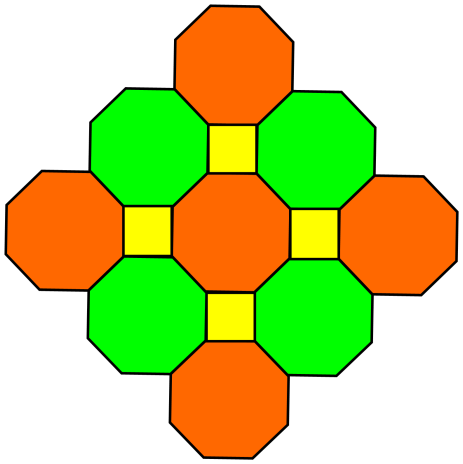
18. Figure *UVWX* is moved to an image *U'V'W'X'* by a single transformation.
What was the transformation?



- [x] 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..

It is flipped over, hence a reflection.

19. This geometric pattern was created by transforming congruent polygons.
Which statement is **not** true?

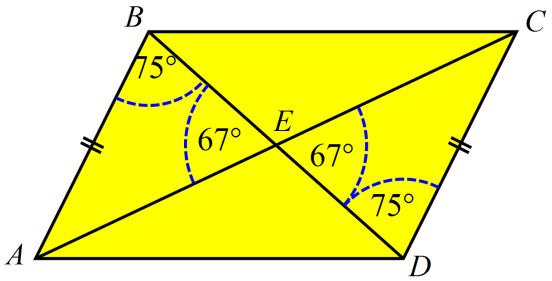


- [x] All of the polygons in the pattern are congruent.
- [ ] All of the octagons in the pattern are congruent.
- [ ] The pattern has line symmetry.
- [ ] The pattern has rotational symmetry.

(Since there are squares and octagons,
not all are congruent)

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

Which statement is true?



- [ ] $\Delta ABC \equiv \Delta ABD$.
- [x] $\Delta ABE \equiv \Delta CDE$.
- [ ] $\Delta AED \equiv \Delta CEB$.
- [ ] $\Delta ACD \equiv \Delta BCD$.

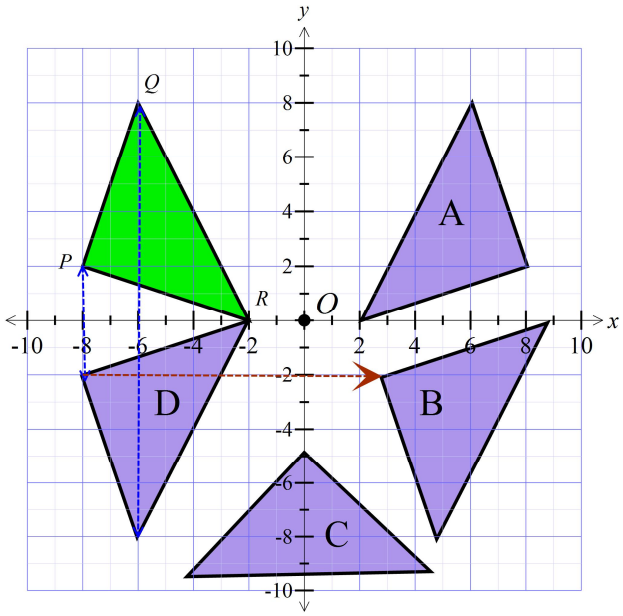
Can use AAS to show congruence.

21. *PQR* is reflected in the *x* axis and then translated to the right.

Which figure is its image?

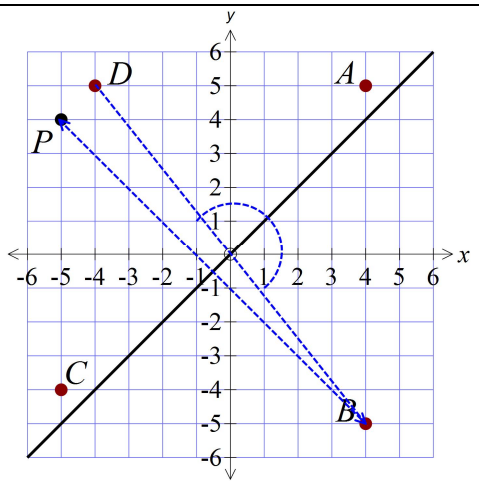
- ☐ Triangle A
- ☐ Triangle B
- ☐ Triangle C
- ☐ Triangle D

Reflection gives D then translation gives B.



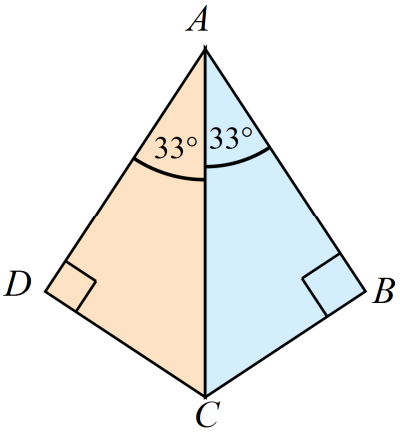
22. The point P (-5, 4) is reflected in the line $y = x$ and then rotated 180° in an anticlockwise direction about the origin. Which point is the image after these two transformations?

- ☐ A (4, 5).
- ☐ B (4, -5).
- ☐ C (-5, -4).
- ☐ D (-4, 5).



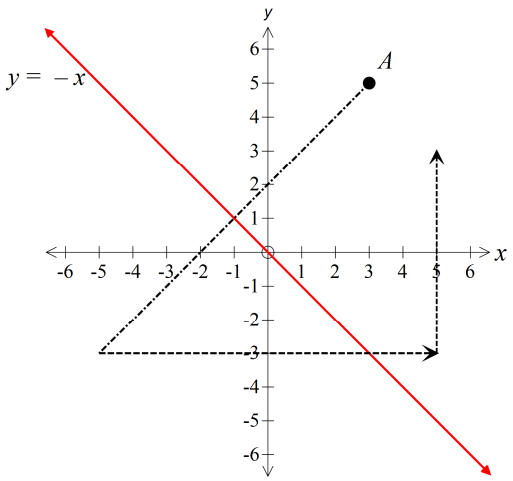
23. Which of the congruence tests could be used to show that $\Delta ADC \equiv \Delta ABC$?

Use the right angle the 33° angle and the common side for AAS.



- ☐ AAS
- ☐ RHS
- ☐ SAS
- ☐ SSS

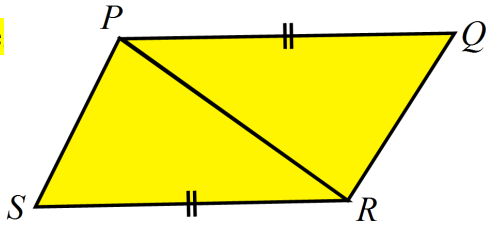
24. The point A (3, 5) is reflected in the line $y = -x$ and then translated 10 units to the right and 6 units upward. Give the coordinates of the point which is the image after these transformations?



(5 , 3)

25. In the figure below, $PQ = SR$.
Which single additional piece of information would allow you to show that $\Delta PQR \equiv \Delta PQS$?

PR is a common side



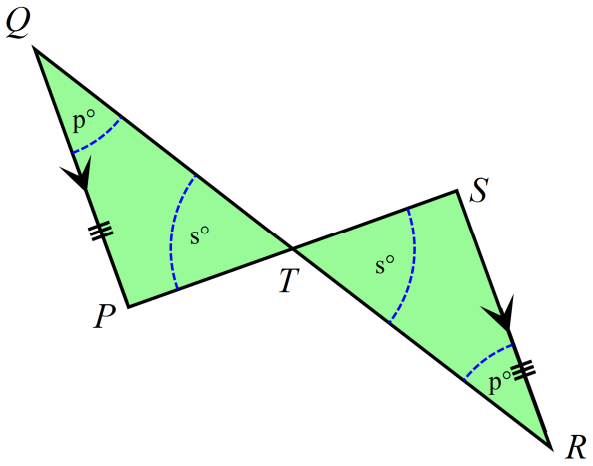
NOT TO SCALE

PS = QR would give SSS.

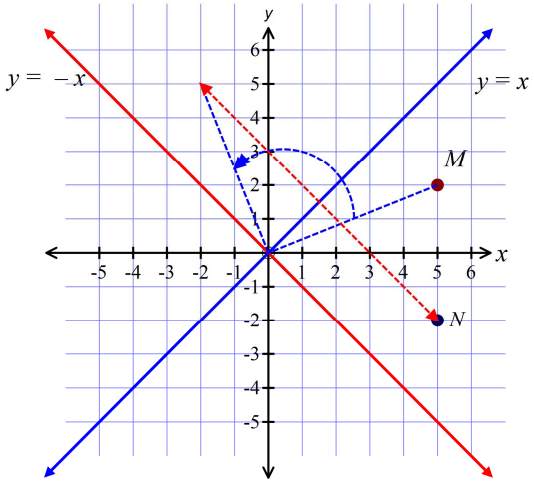
$\angle PRS = \angle QPR$ would give SAS.

26. $QP \parallel SR$ and $QP = SR$.
Which of the congruence tests could be used to show that $\Delta QTP \equiv \Delta RTS$?

- [x] AAS
- [ ] RHS
- [ ] SAS
- [ ] SSS

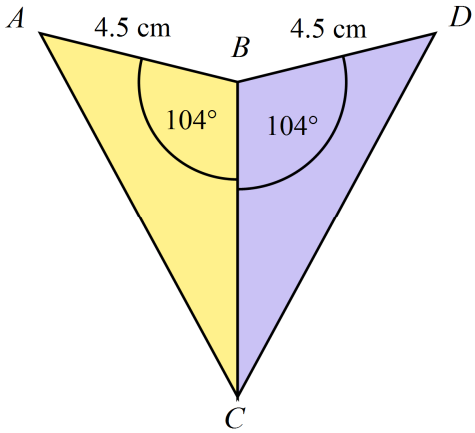


27. The point M (5, 2) is rotated about the origin through 90° in an anticlockwise direction. What single reflection would then move the image to N(5, -2)?



A reflection in the line $y = x$.

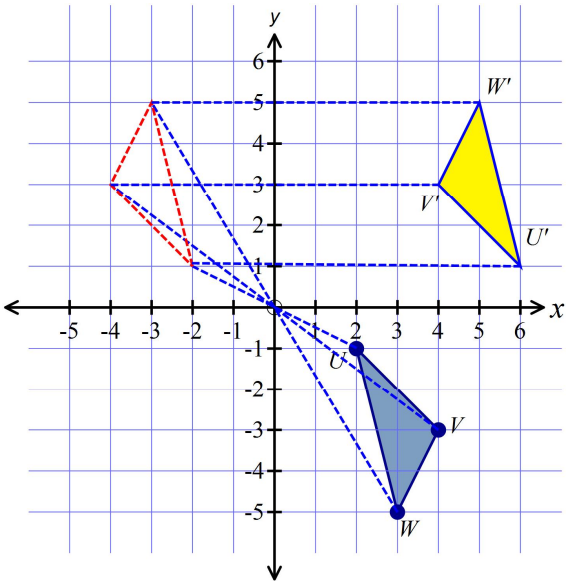
28. Which of the congruence tests could be used to show that $\Delta ABC \equiv \Delta DBC$?



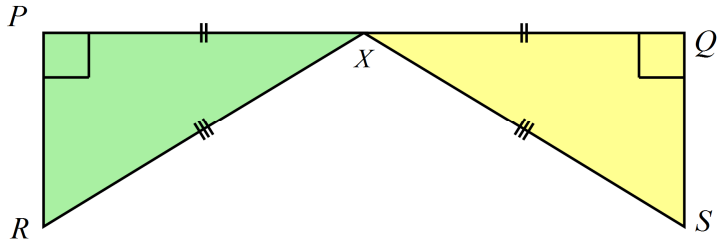
Using the common side BC.

☐ AAS ☐ RHS ■ SAS ☐ SSS

29. The polygon UVW is rotated about the origin through 180° in a clockwise direction and then translated 8 units to the right. Draw the image $U'V'W'$ after these two transformations.



30. $RX = SX$, $\angle P = \angle Q = 90^\circ$ and X is the midpoint of PQ.
Which of the congruence tests could be used to show that $\Delta PXR \equiv \Delta QXS$?

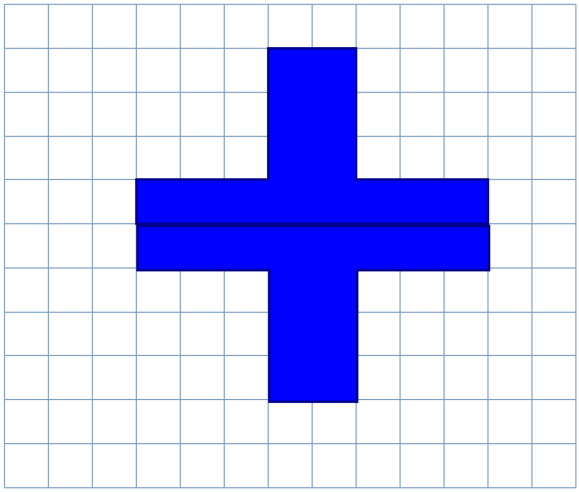


☐ AAS ■ RHS ☐ SAS ☐ SSS

High School
Mathematics Test 2014

Longer Answer Section

1. (a) Complete the diagram below so that the figure has two axes of line symmetry. **2**



Others are possible.

(b) Complete the diagram below so that the figure has rotational symmetry of order 3 **2**

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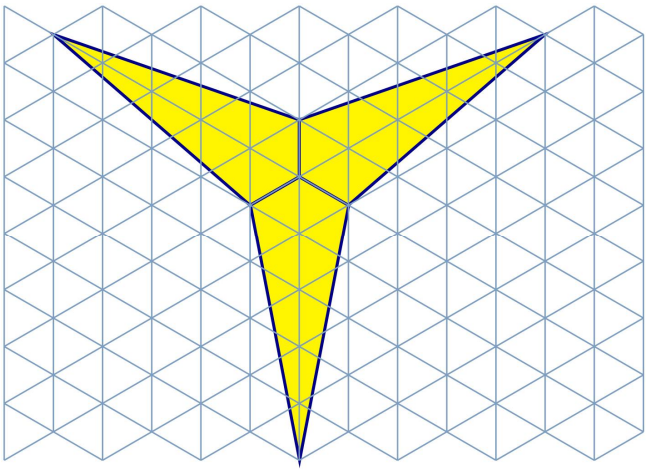
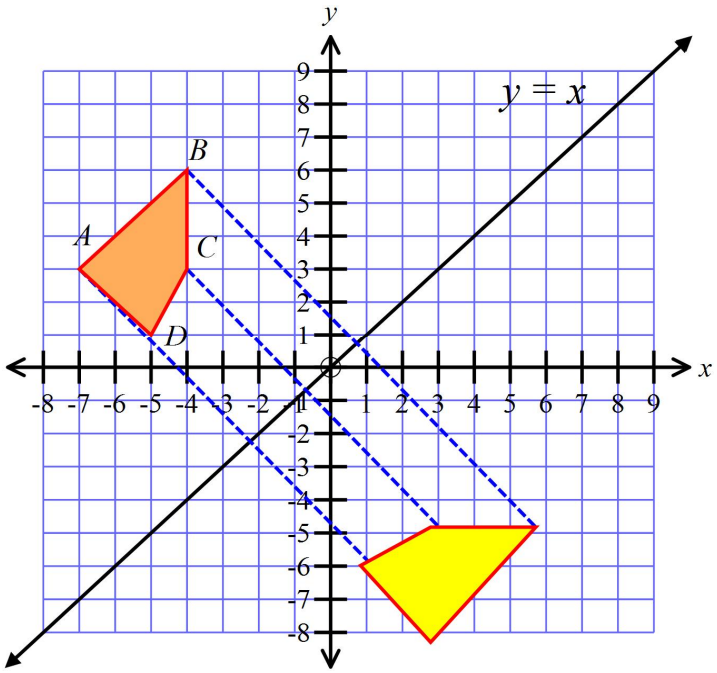
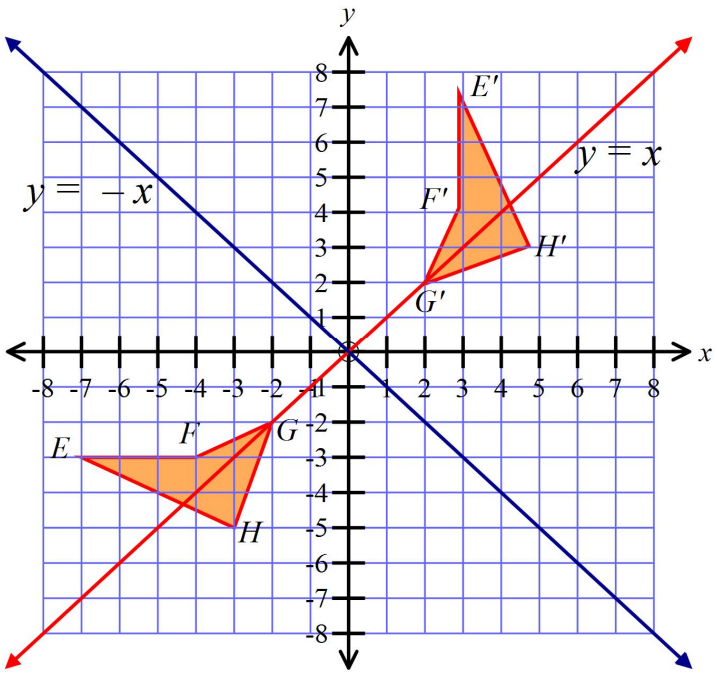


2. (a) Draw a figure congruent to *ABCD*, by reflecting in the line $y = x$. **2**



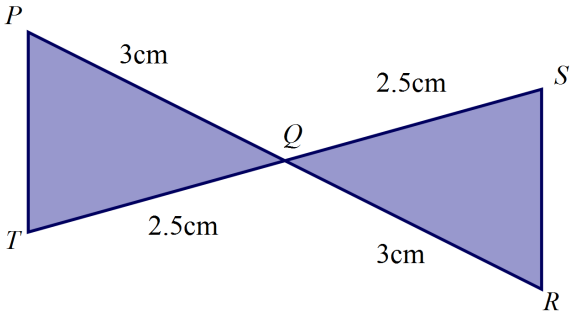
(b) **1**



Describe a single transformation that could move *EFGH* to its image *E'F'G'H'*.

A reflection in the line $y = -x$.

3. (a) Using the information provided on the diagram below, prove that $\Delta PQT \equiv \Delta RQS$. **3**



In ΔPQT and ΔRQS

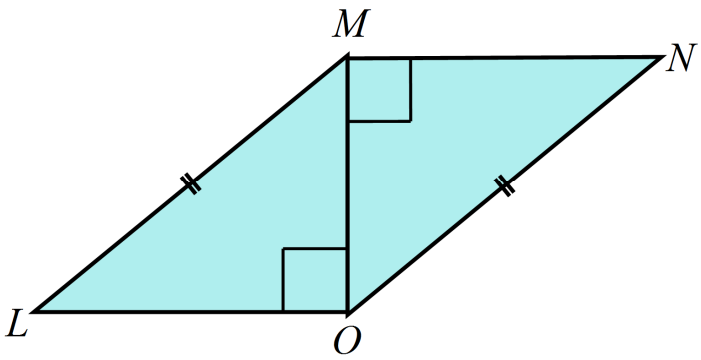
$PQ = RQ = 3$ cm (given)

$TQ = SQ = 2.5$ cm (given)

$\angle PQT = \angle RQS$ (vertically opposite angles)

$\Delta PQT \equiv \Delta RQS$ (SAS)

(b) In the figure below, $LM = ON$ and $\angle LOM = \angle NMO = 90^\circ$. **3**
Prove that $\Delta MLO \equiv \Delta ONM$.



In ΔMLO and ΔONM

$LM = ON$ (given)

MO is common.

$\angle MOL = \angle NMO = 90^\circ$ (vertically opposite angles)

$\Delta MLO \equiv \Delta ONM$ (RHS)