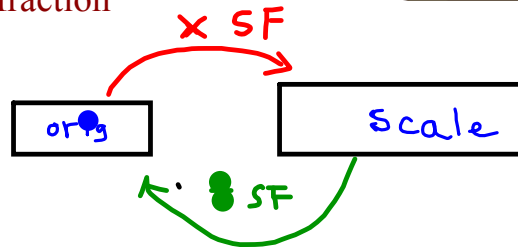# Overview

To Find **Scale Factor** = $\dfrac{\text{Scale Length}}{\text{Original Length}}$

Given scale factor As a decimal or fraction

Find the scale dimensions
original x scale factor

× SF

orig   scale

÷ SF

Find the original dimensions
scale ÷ scale factor

Scale Diagrams

For an enlargement or reduction, the scale factor is: $\dfrac{\text{Length on scale diagram}}{\text{Length on original diagram}}$

An enlargement has a scale factor > 1. A reduction has a scale factor < 1.

Similar Triangles

Similarity Statements
ΔPQR ~ ΔSTU

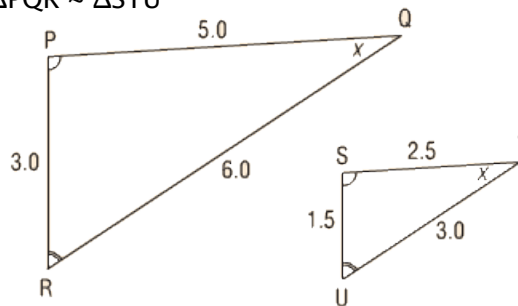When we check whether two triangles are similar:
▶ their corresponding angles must be equal:
$\angle P = \angle S$ and $\angle Q = \angle T$ and $\angle R = \angle U$
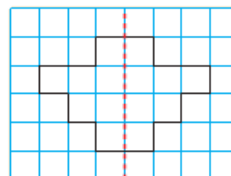*or*
▶ their corresponding sides must be proportional:
$\dfrac{PQ}{ST} = \dfrac{QR}{TU} = \dfrac{PR}{SU}$
Any of the ratios $\dfrac{PQ}{ST}, \dfrac{QR}{TU}$, and $\dfrac{PR}{SU}$ is the scale factor.

Line Symmetry

A shape has line symmetry when a line
divides the shape into two congruent parts
so that one part is the image of the other part
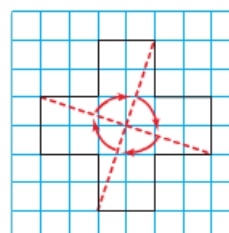after a reflection in the line of symmetry.

HORIZONTAL _____ y =

VERTICAL | x=

Rotational Symmetry

A shape has rotational symmetry when it coincides with
itself after a rotation of less than 360° about its centre.
The number of times the shape coincides with itself
is the order of rotation.
The angle of rotation symmetry = $\dfrac{360°}{\text{the order of rotation}}$

Counterclockwise
Clockwise
Point of Rotation
Degree

1

Lesson 7.1 Scale Diagrams and Enlargements

1. The actual length of a needle is 6 cm. The length of the needle on a scale diagram is 9 cm. What is the scale factor of the diagram?

2) Determine the unknown

	Diameter of original circle	Scale factor	Diameter of scale diagram
a)	8 cm	6	
b)	40 mm		150 mm
c)	3.5 cm	5.8	
d)		20.5	369 m

3. Calculate the dimensions enlargement of an equilateral triangle with side length 3 cm.
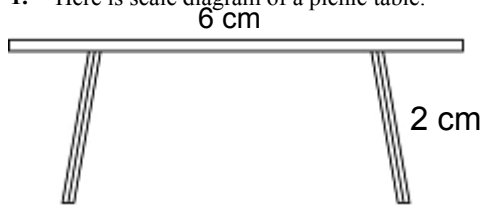Use a scale factor of **5**

3 cm
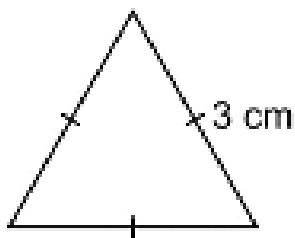
4.) The dimensions of a photo of a mountain bike are 15 cm by 12 cm. An enlargement is to be made for a poster with dimensions 4.0 m by 3.2 m. What is the scale factor of the poster to the nearest tenth?

Lesson 7.2 Scale Diagrams and Reductions

1. Here is scale diagram of a picnic table.

6 cm

2 cm

The actual length of the picnic table is 180 cm with legs 60 cm.
What is the scale factor for this diagram?

2. A rectangular playground has dimensions 24 m by 16 m.
Calculate the dimensions of the scale diagram of this playground with a scale factor of   1/200

3) A reduction of each object is to be drawn with the given scale factor. Determine the
corresponding length in centimeters on the scale diagram.

a) Fishing rod length 280 cm, scale factor 1/50

b) Boogie board length 1.5 m, scale factor 0.05

c) Jogging route 10 km, scale factor 0.000 02

4. The scale diagram below has a scale factor of 0.25.
What are the dimensions of the actual rectangle?

8 cm

Orig   scale   2 cm

Lesson 7.4 Similar Triangles

1. Identify the similar triangles in the following diagrams. Equal angles are marked on the diagrams. Write the ratios of the sides

a)

b)

c)
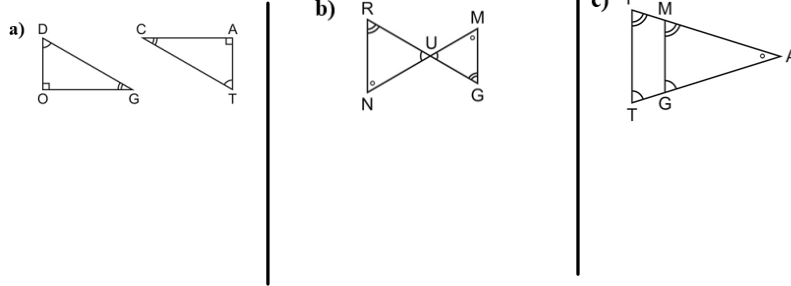
2) A person who is 1.9 m tall has a shadow that is 1.5 m long. At the same time, a flagpole has a shadow that is 8 m long. Determine the height of the flagpole to the nearest tenth of a meter. Draw a diagram.

3) A surveyor wants to determine the width of a river. She measures distances and angles on land, and sketches this diagram. What is the width of the river, PQ?
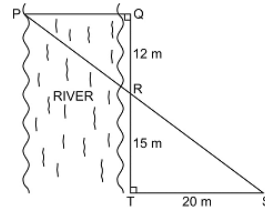
3. A surveyor wants to determine the width of a river. She measures distances and angles on land, and sketches this diagram. What is the width of the river, PQ?

4. Determine the length of XY in each pair of similar triangles
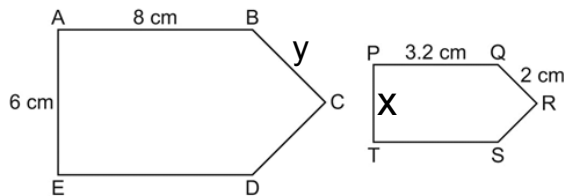Remember you get points for setting up the ratio of sides

a)

6 cm   9 cm

8 cm
4 cm

b)

4.5 cm
5.0 cm
2.5 cm

4
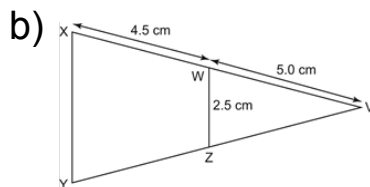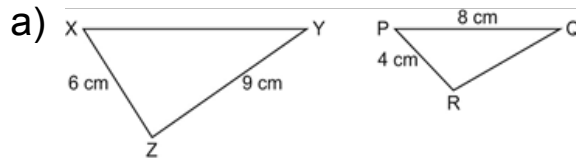
Lesson 7.3 Similar Polygons

1. Which rectangles are similar? Give reasons for your answer.

Remember you get points for setting up ratio of sides

4.5 cm   2.7 cm   1.5 cm

C   0.9 cm

B   1.8 cm

2.7 cm   A
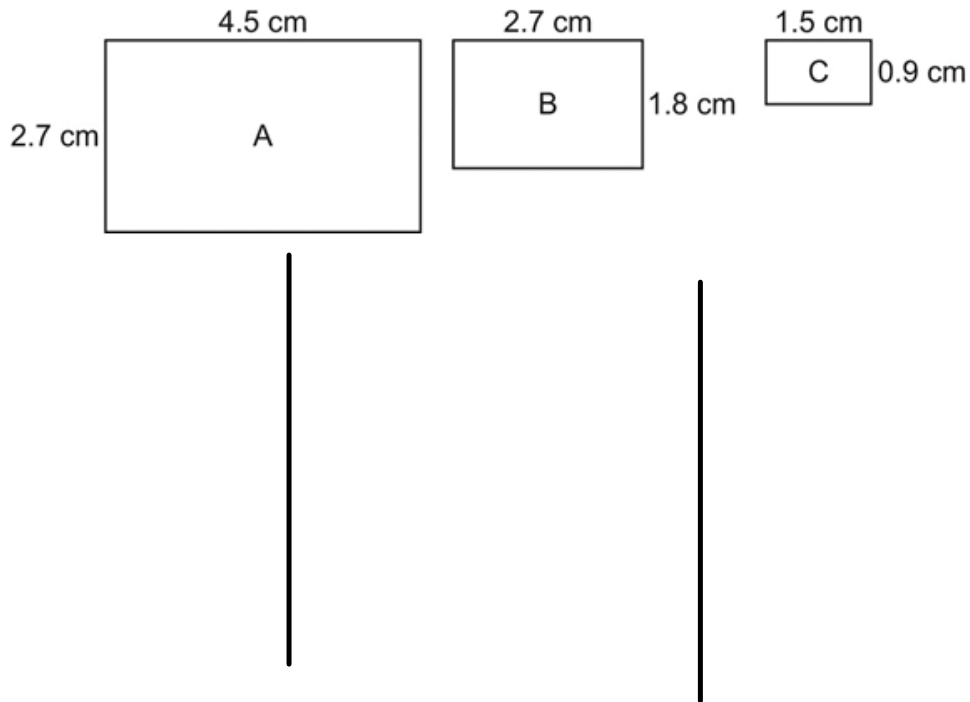
2) These polygons are similar. Determine each length.

a) PT   (*x*)   **b)** BC   (*y*)

A   8 cm   B

y   P   3.2 cm   Q

2 cm

6 cm   C   X   R

T   S

E   D

3) Which statements are true? Justify your answers.

   a) All regular octagons are similar.

   b) All quadrilaterals are similar.

   c) All circles are similar.

   d) All pentagons are similar.

Lesson 7.5 Reflections and Line Symmetry

1. Draw in the lines of symmetry in each design.

a)

b)
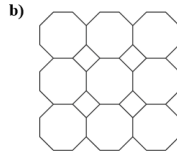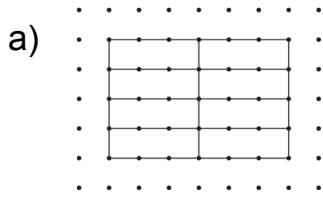
2. Draw the image of ΔPAM after each reflection below.
Write the coordinates of the larger shape formed by ΔPAM
and its reflection images.
Draw the lines of symmetry of the larger shape.

P (   )

A (   )

M (   )
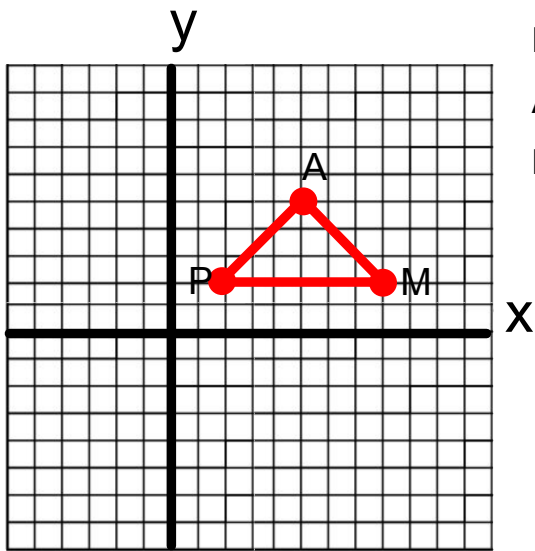
a) Reflect ΔPAM in the horizontal line passing through 2 on the *y*-axis. (Blue)

    P' (   )

    A' (   )

    M' (   )

b) Reflect ΔPAM in the vertical line passing through 5 on the *x*-axis. (Red)

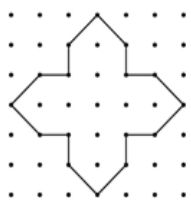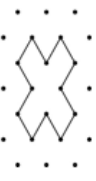   P' (   )

    A' (   )

    M' (   )
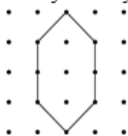
c) Reflect ΔPAM in the oblique line passing through the points (2, 2) and (5, 5). (Yellow)

    P' (   )

    A' (   )

    M' (   )

3. Identify the shapes that are related to the shape X by a line of reflection. Describe the line of symmetry in each case.
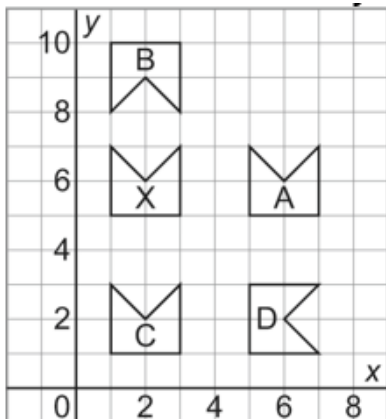
Lesson 7.6 Reflections and Line Symmetry

1. Which polygons have rotational symmetry? State the order of rotation and the angle of rotation symmetry for each.

a)

order of rotation=

Angle of rotation=

b)

order of rotation=

Angle of rotation=

c)

order of rotation=

Angle of rotation=

d)

order of rotation=

Angle of rotation=

2) Draw the rotation image for each rotation of quadrilateral ABCD.
Rotate quadrilateral ABCD clockwise about vertex D by:
a) 90°   **b)** 180°   **c)**   270°
       Blue   Red   Yellow
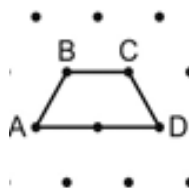
3) What is the order of rotation and the angle of rotation symmetry, if any, for:
  a)   an equilateral triangle   **b)**   a regular polygon with 9 sides

  c) a kite that is not a rhombus   **d)**   the plus sign +

4) Plot the kite FISH on a coordinate grid.   The vertices of FISH are F(3, 4), I(5, 2), S(3, 1), H(1, 2).
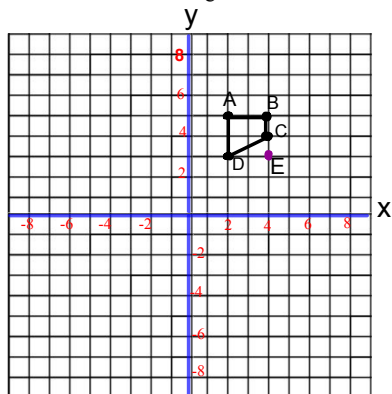Rotate the kite FISH:
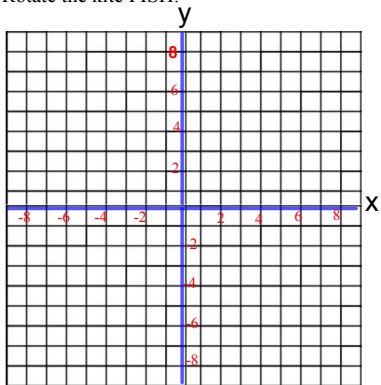
  a)   90° clockwise about vertex F (Blue)

  b)   180° about vertex F (Red)

  c)   270° clockwise about vertex F (yellow)

  Look at the shape formed by the kite and its rotation images.

  Write the coordinates of this shape.
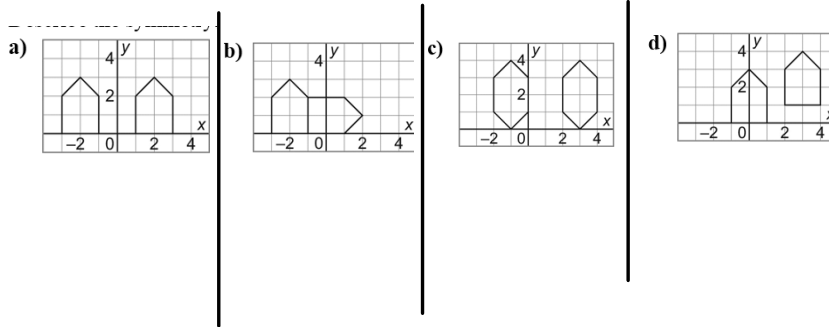
  Describe any rotational symmetry in this shape.

5.   Draw the rotation image for each transformation of quadrilateral ABCD

  a)   180° about vertex B (Blue)

  b)   90° clockwise about vertex A (Red)

  c)   90° counterclockwise about point E (Yellow)

Lesson 7.7 Identifying Types of Symmetry on the Cartesian Plane

1. For each pair of shapes, determine whether they are related by line symmetry, by rotational symmetry, by both line and rotational symmetry, or by neither. Describe the symmetry, if any.
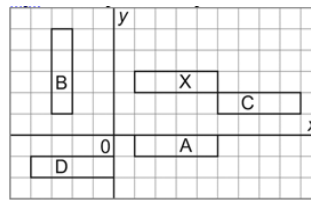
a)

b)

c)

d)

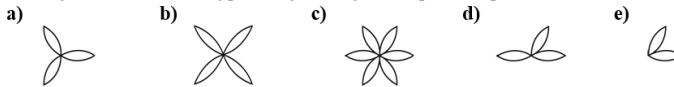**2.** Which of the rectangles A, B, C, D is related to rectangle X:

a) by rotational symmetry about the origin?

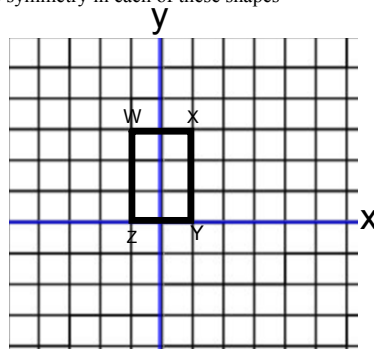**b)** by rotational symmetry about one of the vertices of rectangle X?

c) by line symmetry?

3. Identify and describe the types of symmetry in the petal shapes.

a)   b)   c)   d)   e)

4) Draw the image of quadrilateral WXYZ after each transformation. Write the coordinates of each shape formed by quadrilateral WXYZ and its image. Describe the symmetry in each of these shapes

W ( )
X ( )
Y ( )
Z ( )

a) reflection in the *x*-axis (Blue)   W' ( )
X' ( )
Y' ( )
Z' ( )

b) rotation 90° clockwise about the origin

W' ( )
X' ( )
Y' ( )
Z' ( )

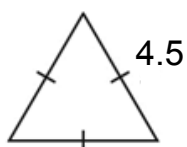**c)** rotation 90° clockwise about the point (1, 0)

W' ( )
X' ( )
Y' ( )
Z' ( )

d) translation 1 square right and 1 square down

W' ( )
X' ( )
Y' ( )
Z' ( )

8

Lesson 7.1
1. 1.5

2. **a)** 48 cm   **b)** 3.75
    c) 20.3 cm   **d)** 18 m

3.

4.5

4. About 26.7

Lesson 7.2
1. $\dfrac{1}{30}$

2.

12 cm

8 cm
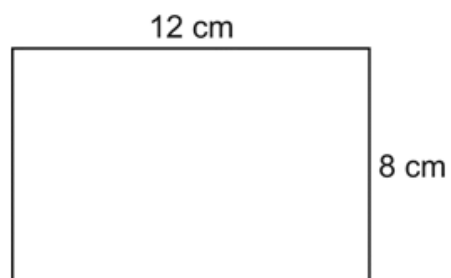
3. **a)** 5.6 cm   **b)** 7.5 cm
    c) 20 cm

4. 32 cm by 8 cm

Lesson 7.4

1. a) ΔDOG ~ ΔTAC
    b) ΔRUN ~ ΔGUM
    c) ΔPAT ~ ΔMAG

2. 10.1 m

3. 16 m

4. a) 12 cm   b) 4.75 cm

x

1.9 m

1.5 m   8 m
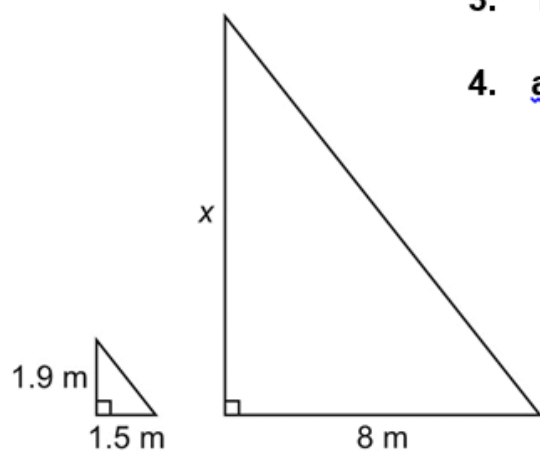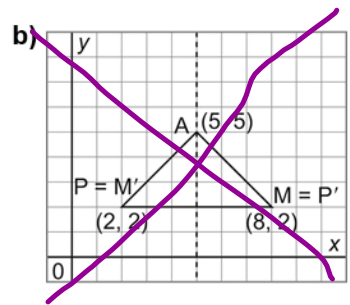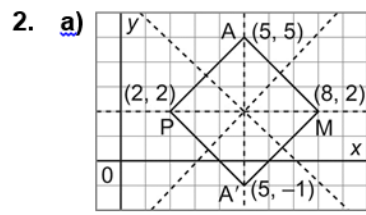
Lesson 7.3

1. A and C because $\dfrac{4.5}{1.5} = \dfrac{2.7}{0.9}$

2. a) 2.4 cm   b) 5 cm

3. a and c

Lesson 7.5

1. **a)**

   b)

2. **a)**

   b)

   c)
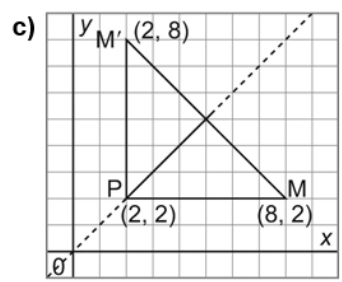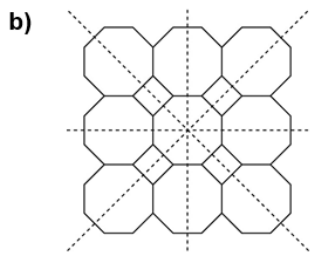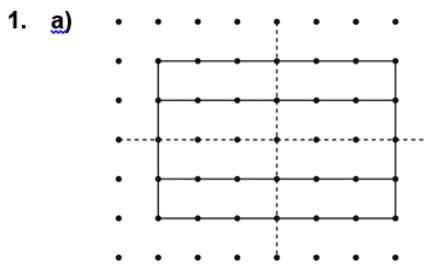
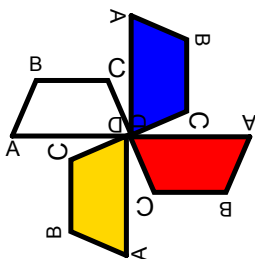

3. A: reflected in vertical line passing through 4 on the x-axis

   B: reflected in horizontal line passing through 7.5 on the y-axis

   C: not related to X by line symmetry

   D: reflected in oblique line passing through (0, 0) and (8, 8)

Lesson 7.6

1. **a)** 2, 180°   **b)** 4, 90°
   c) no rotational symmetry   **d)** 2, 180°

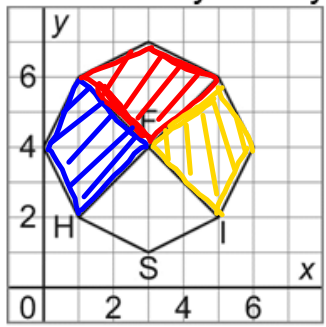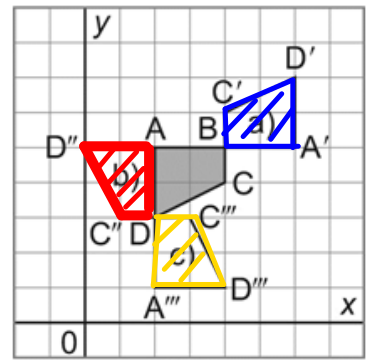2)

3. **a)** 3, 120°   **b)** 9, 40°
   c) no rotational symmetry   **d)** 4, 90°

4. (1, 2), (0, 4), (1, 6), (3, 7), (5, 6), (6, 4), (5, 2), (3, 1)
   Rotational symmetry of order 4 about F


5.

Lesson 7.7

1. **a)** The *y*-axis is a line of symmetry.
    b) Rotational symmetry about the point
        (−1, 0) with a 90° clockwise rotation
    c) The vertical line passing through 1 on the
        x-axis is a line of symmetry; rotational
        symmetry about the point (1, 2) with a
        180° rotation.
    d) No symmetry

2. **a)** B   **b)** C   **c)** A

3. **a)** 3 lines of symmetry, rotational symmetry
        of order 3
    b) 4 lines of symmetry, rotational symmetry
        of order 4
    c) 6 lines of symmetry, rotational symmetry
        of order 6
    d) No symmetry
    e) 1 line of symmetry, no rotational
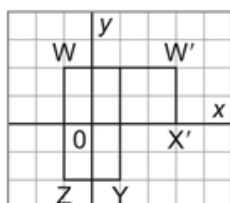   symmetry

4. **a)**
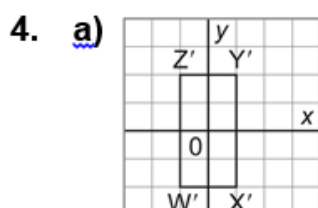
W'(−1, −2), X'(1, −2), Y'(1, 2), Z'(−1, 2)
The *x*- and *y*-axes are lines of symmetry;
rotational symmetry of order 2 about the
origin.

b)
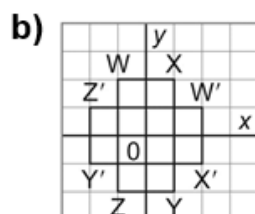
W(−1, 2), X(1, 2), W'(2, 1), X'(2, −1),
Y(1, −2), Z(−1, −2), Y'(−2, −1), Z'(−2, 1)
The *x*- and *y*-axes are lines of symmetry;
the line through (1, 1) and (−1, −1) is a
line of symmetry; the line through (−1, 1)
and (1, −1) is a line of symmetry;
rotational symmetry of order 4 about the
origin.

c)

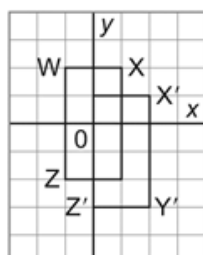

W(−1, 2), W′(3, 2), X′(3, 0), (1, 0),
Y(1, −2), Z(−1, −2)
The line through (1, 0) and (−1, 2) is a
line of symmetry, no rotational symmetry.

d)

W(−1, 2), X(1, 2), X′(2, 1), Y′(2, −3),
Z′(0, −3), Z(−1, −2)
Rotational symmetry of order 2 about the
point (0.5, −0.5); no lines of symmetry