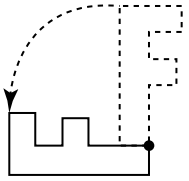
CHAPTER 14

1 Describing Rotations

Goal **Perform and describe the rotation of a shape around a centre that is on the shape.**

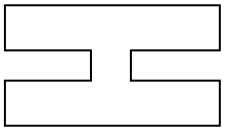
You will need a ruler and a protractor.

1. Describe the rotation of this shape.



Suggested answer: The black dot on the letter "F" is the centre of rotation. The letter was rotated 90° CCW about the centre of rotation.

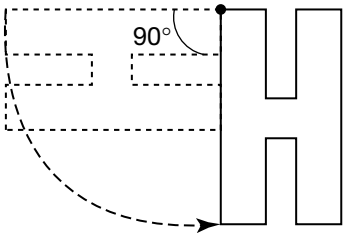
2. **a)** Describe how to rotate the letter so that it ends up in the same position.



Suggested answer: I choose the centre of rotation to be at one vertex. If I do two rotations of 180° about the centre of rotation, it will look the same as it was to start with.

b) Describe a rotation that will change how the letter looks. Sketch the rotation.

Suggested answer: If I choose the same centre of rotation and I rotate the letter 90° CCW about the centre of rotation, the letter will be in a different position.



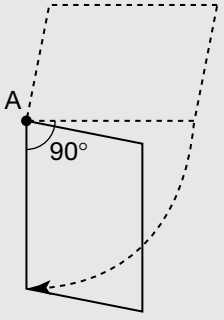
At-Home Help

A **rotation** is a turn of a shape. A rotation is described by the centre of rotation, the angle of rotation, and the direction of the turn.

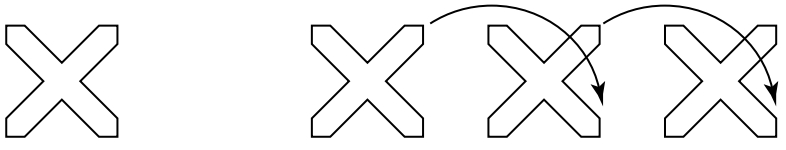
The **centre of rotation** is the point that a shape rotates around. Each point in the shape must stay an equal distance from the centre of rotation.

The **angle of rotation** is how much the shape moved about the centre of rotation. The direction of rotation can be described as clockwise (CW) or counterclockwise (CCW).

For example, the shape below is rotated 90° CW about vertex A.



3. Rotate the letter 90° CW several times. What do you notice about the results?



Suggested answer:
I get the same results as the original letter.

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CHAPTER 14

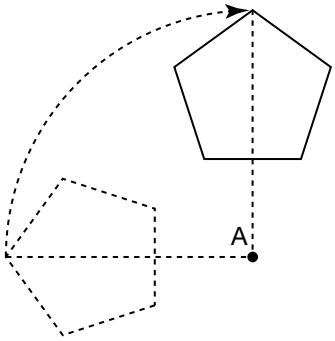
2 Performing and Measuring Rotations

Goal **Perform and describe rotations of shapes about centres not on the shape.**

You will need a ruler, scissors, and a protractor.

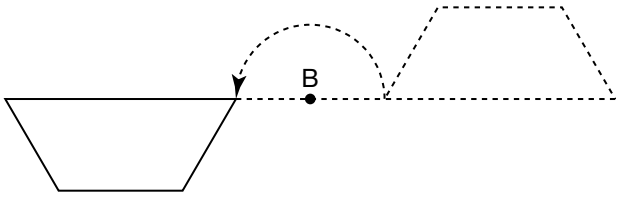
1. Describe each rotation. Include the centre of rotation, angle, and direction.

a)



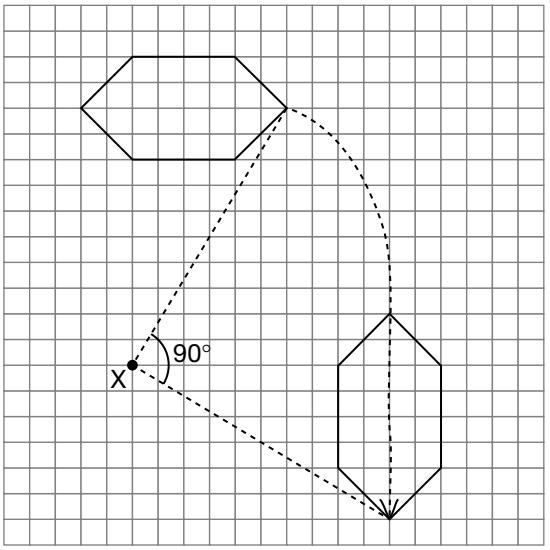
Suggested answer:
The rotation is 90° CW about point A.

b)



Suggested answer:
The rotation is 180° CCW about point B.

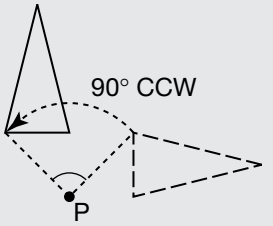
2. Trace the hexagon and cut it out. Rotate the hexagon 90° CW about point X. Sketch the final position.



At-Home Help

Shapes can be rotated about centres that are not on the shape itself.

For example, this triangle is rotated 90° CCW about point P. Point P is the centre of rotation and is outside the triangle.



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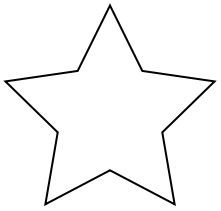
CHAPTER 14

3 Rotational Symmetry

Goal **Determine whether and how a shape can be turned to fit on itself.**

1. a) Predict the order of rotational symmetry for this shape.

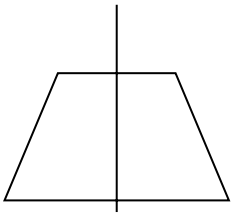


Suggested answer: I predict that when I rotate the star around its centre, I'll get the same shape five different ways.

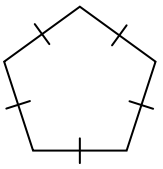
b) Trace and cut out the shape. Determine the order of rotational symmetry.

5

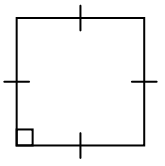
2. Name each shape.
List its order of rotational symmetry.



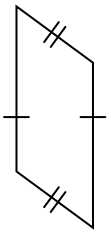
trapezoid: 1



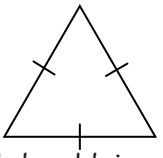
pentagon: 5



square: 4



parallelogram: 1



equilateral triangle: 3

At-Home Help

Rotational symmetry exists when a shape can fit on itself exactly more than once in one complete rotation.

For example, a square can fit on itself four times during one complete rotation.

Order of rotational symmetry is the number of times a shape will fit on itself exactly during one complete rotation.

A shape that can fit on itself only once during one complete rotation has no rotational symmetry, but we say that it has an order of rotational symmetry of 1.

A square has an order of rotational symmetry of 4.

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CHAPTER 14

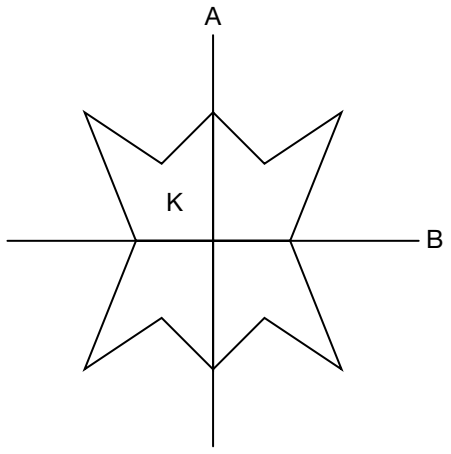
4 Communicate Using Diagrams

Goal **Use clear, labelled diagrams to communicate.**

You will need a ruler and a protractor.

1. a) Melanie said that if you reflect shape K in the line of reflection A, then in the line of reflection B, then in the line of reflection A, then in the line of reflection B, you get the same shape you started with. Draw a diagram to check Melanie's prediction. Use the Communication Checklist.

Suggested answer: My diagram shows that Melanie's prediction is true.



At-Home Help

A clear, labelled diagram can be used to communicate information.

If you are showing a rotation, mark the centre of rotation, the angle of rotation, and the direction of rotation.

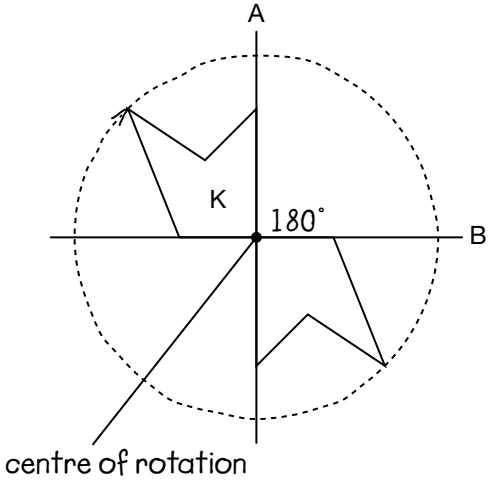
Use the Communication Checklist.

Communication Checklist

- ☑ Is your diagram easy to understand?
- ☑ Did you include measurements for all important sides and angles?
- ☑ Did you use a general enough example or use many examples?
- ☑ Did you give enough information?

b) What other transformations could you perform on shape K to get the same shape you started with? Draw a diagram to show your transformation(s).

Suggested answer: Rotate K 180° CW and again 180° CW.



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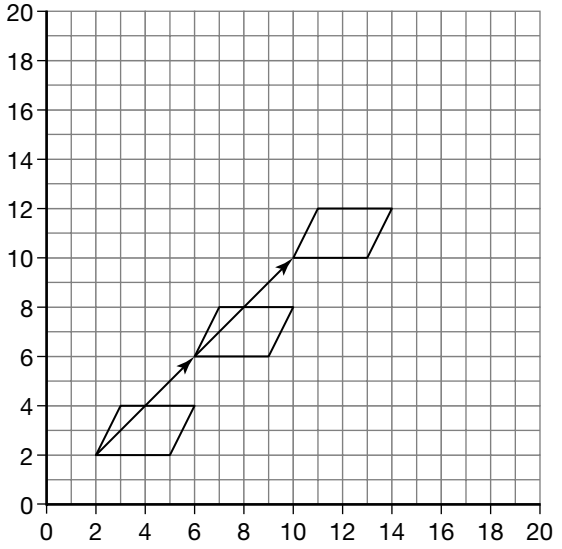
CHAPTER 14

5 Exploring Transformation Patterns with Technology

Goal **Relate number patterns to translation, rotation, and reflection patterns.**

You will need a ruler.



1. a) Describe the pattern for the bottom left vertex if the translations continue the same way.

Suggested answer:
The pattern is (2, 2), (6, 6), (10, 10), ...
The pattern rule is start at (2, 2) and add 4 to each coordinate.

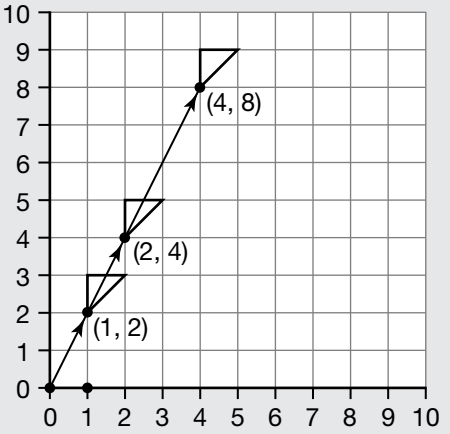
b) What would be the 10th term in the pattern?

Suggested answer:
The first term is 2. The common difference is 4.
10th term = 2 + nine 4s
= 2 + 36
= 38
The 10th shape will have its bottom left vertex at (38, 38).

At-Home Help

Some translations create number patterns.

For example, the coordinate pair of the bottom vertex shows a pattern.



The first and second coordinates are doubled.

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CHAPTER 14

6

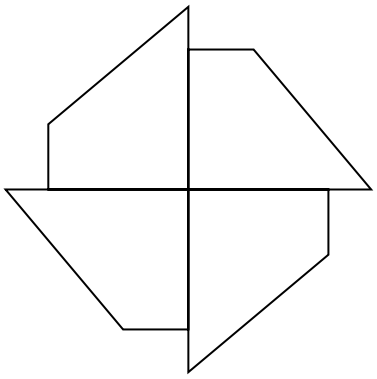
Creating Designs

Goal **Create a design by performing transformations on a basic shape.**

You will need scissors and a protractor.

1. a) Trace this shape and cut it out. Create a design by transforming this shape. Use translations, reflections, or rotations.

Suggested answer:



b) Describe the transformations you used.

Suggested answer:
I rotated the shape four times. Each rotation is 90° CCW. The centre of rotation is the bottom right vertex.

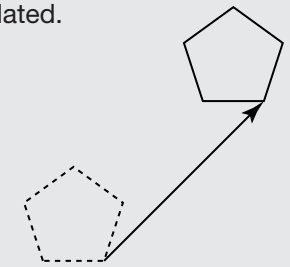
c) Can you get the same design by doing different transformations?

Suggested answer:
Yes. I can reflect the shape along the vertical line and then along the horizontal line. That will make the shape at the lower left. I can rotate both shapes 90° CCW to get the third and fourth shapes.

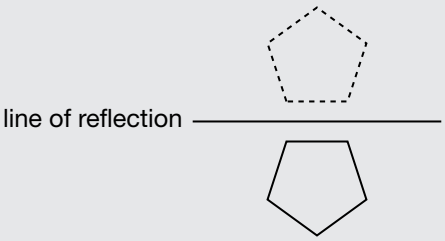
At-Home Help

Designs can be created by transforming a basic shape.

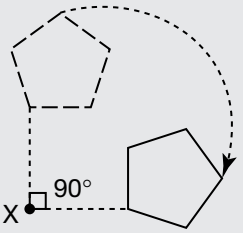
For example, a shape can be translated.



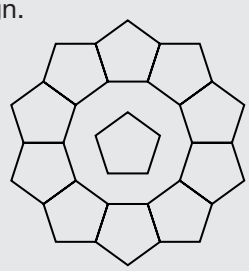
A shape can be reflected.



A shape can be rotated.



By performing a series of transformations, you can create a design.



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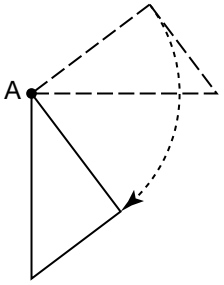
Test Yourself Page 1

Circle the correct answer.

1. What is the best description of this rotation?



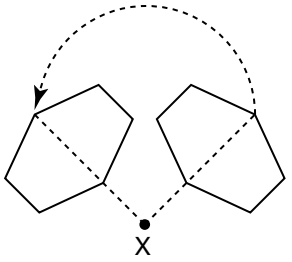
A. The triangle is rotated 90° CW.

B. The centre of rotation is A and the angle of rotation is 90°.

C. The triangle is rotated 90° CW about A.

D. The triangle is rotated 90° CCW about A.

2. What is the best description of this rotation?



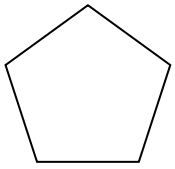
A. The shape is rotated 90° CW.

B. The centre of rotation is X and the angle of rotation is 90°.

C. The shape is rotated 90° CW about X.

D. The shape is rotated 90° CCW about X.

3. What is the order of rotational symmetry of this regular pentagon?



A. 3 **B.** 4 **C.** 5 **D.** 6

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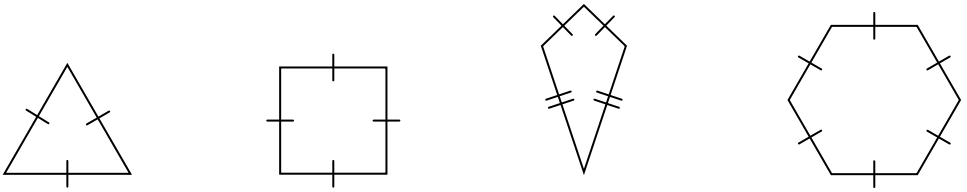
Test Yourself Page 2

4. Which shape has no rotational symmetry?



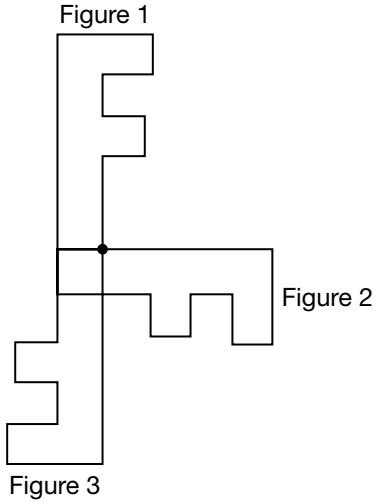
A. equilateral triangle

B. square

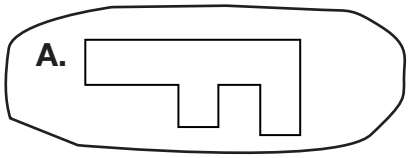
C. kite

D. regular hexagon

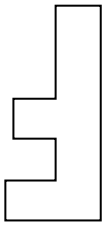
5. What will be the 10th figure in this pattern?



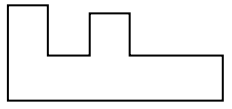
A.



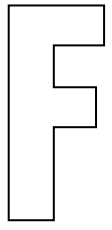
B.



C.



D.



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