

25. [Exploring Geometry]

Skill 25.1 Following directions and using compass bearings to describe location on a map.

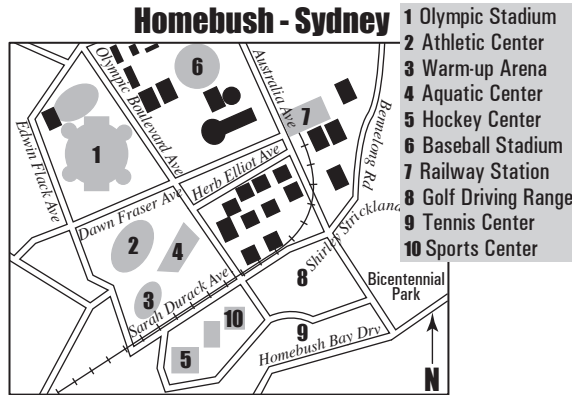
MMBlue 1 1 2 2 3 3 4 4
MMGreen 1 1 2 2 3 3 4 4

- Follow the directions one at a time.

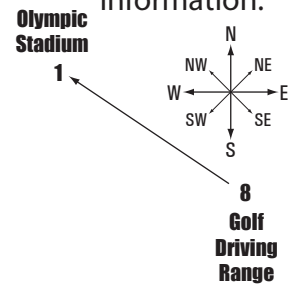
Hints: A compass showing North will allow you to find your bearings.

Clockwise from North, "Never Eat Sea Weed" is one way to remember the 4-point compass.

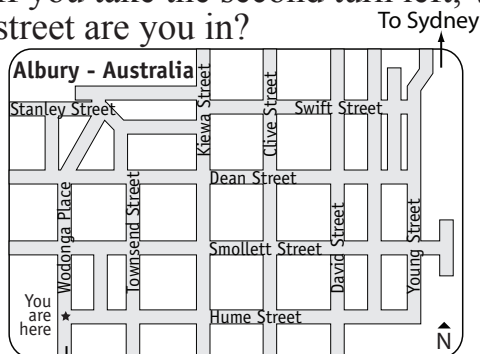
Q. At Homebush, in which direction is the Olympic Stadium from the Golf Driving Range?



A. NW Focus on the relevant information.

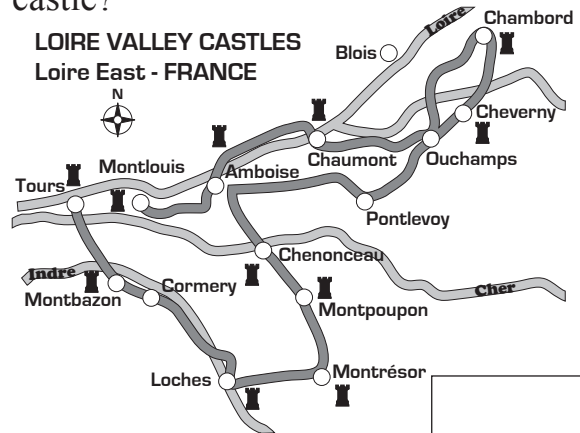


a) From where you are, travel east until you reach David Street. Then walk north. If you take the second turn left, what street are you in?

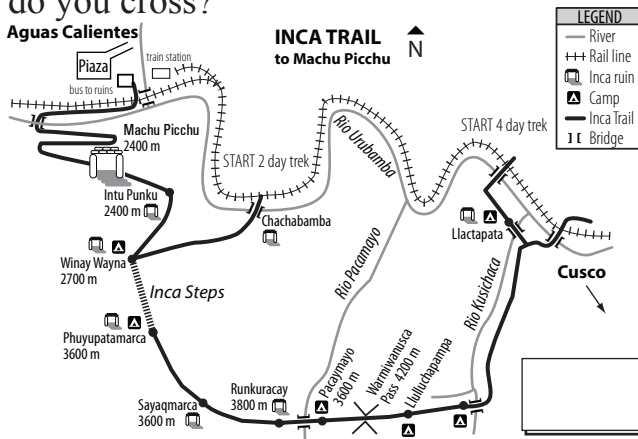


To Melbourne

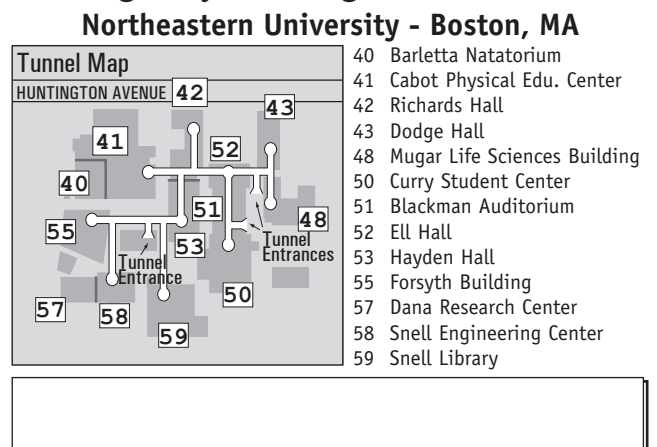
b) From Montrésor castle, which direction do you have to drive to reach Loches castle?



c) From the northern most bridge over Rio Kusichaca you travel south east on the Inca Trail until the T intersection. Then you turn right and follow the Inca Trail to the Inca Steps. How many more bridges do you cross?



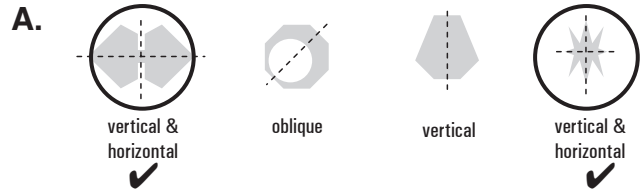
d) Using the closest tunnel entrance to building 58, take the first turn right, then turn left. Turn right and walk to the end of the tunnel. If you turn left again, which building are you facing?



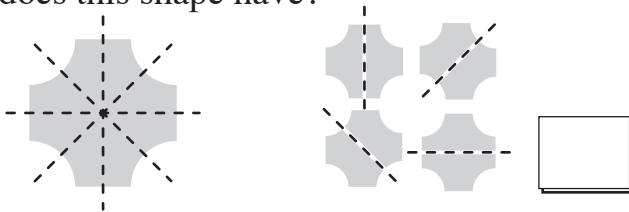
Skill 25.2 Identifying and classifying symmetry in two-dimensional shapes.

- Imagine a line along which the shape can be folded to have one part fit exactly over the other part.

Q. Draw the axes of symmetry for these shapes. Circle the shapes that are both horizontally and vertically symmetrical.



a) Draw all the axes of symmetry for this shape. How many axes of symmetry does this shape have?



b) Draw all the axes of symmetry for this shape. How many axes of symmetry does this shape have?



c) Draw all the axes of symmetry for this shape. How many axes of symmetry does this shape have?



d) Draw all the axes of symmetry for this shape. How many axes of symmetry does this shape have?



e) Draw the axes of symmetry for these shapes. Circle the shapes that have horizontal symmetry.



f) Draw the axes of symmetry for these shapes. Circle the shapes that are both horizontally and vertically symmetrical.



g) Draw the axes of symmetry for these shapes. Circle the shapes that have vertical symmetry.



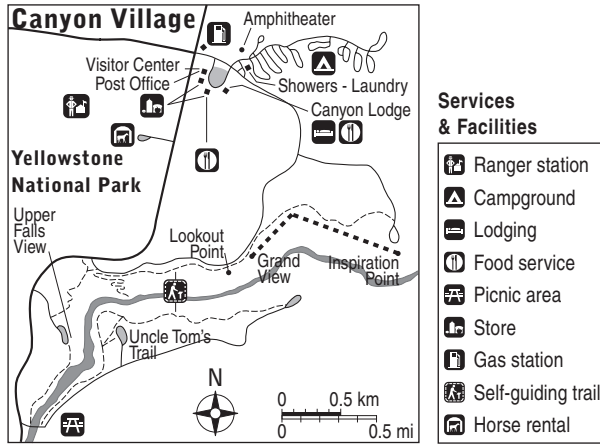
h) Draw the axes of symmetry for these shapes. Circle the shapes that are both horizontally and vertically symmetrical.



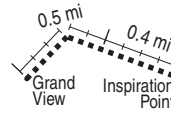
Skill 25.3 Using a scale to calculate distance on a map.

- Place a piece of paper against the scale matching the starting points.
- Slide the paper across the line to be measured, marking the start and end points as you go.
- Add together the scale lengths covered.

Q. You walk from the Inspiration Point to Grand View, along the marked path. What distance did you travel in miles?



A. $0.5 + 0.4 = 0.9 \text{ mi}$



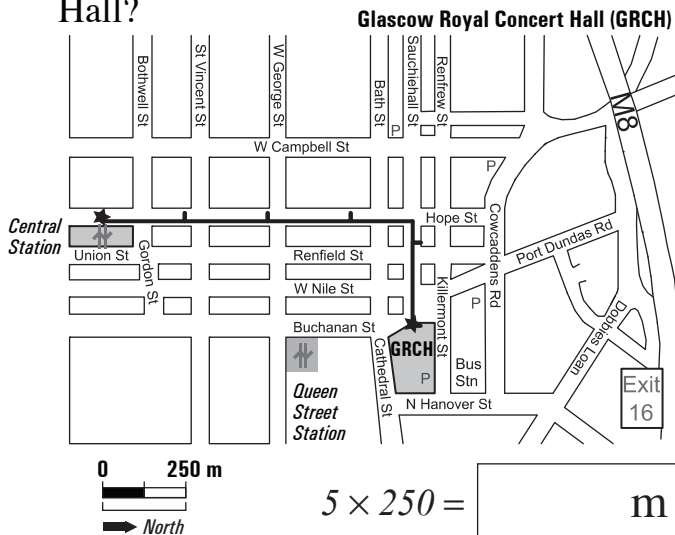
There are 2 distances to be measured.

Mark the start of the first distance and the turning point on paper. Rotate the paper to match the second distance and then mark the end.

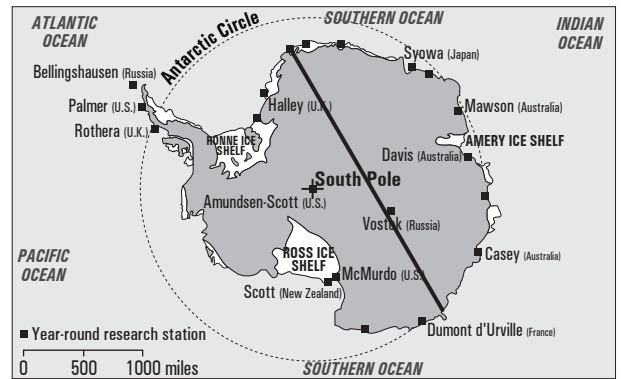
Check the paper against the scale.

Slide the paper along the scale as necessary.

a) How far is it from Central Station, along Hope St. to the Glasgow Royal Concert Hall?



b) Using the scale, what is the marked distance on this map of Antarctica?

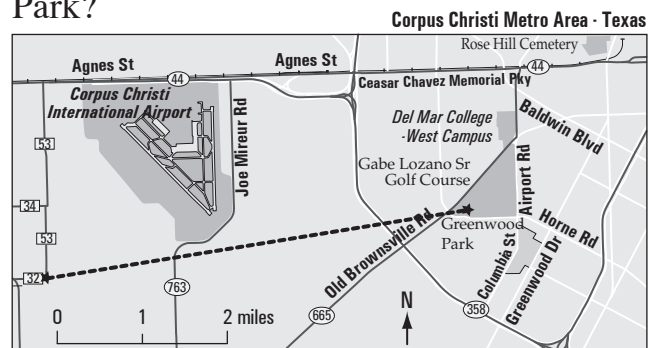


mi

c) A plane flies from Bergen to Copenhagen and then to Stockholm. Using the scale, how far did the plane travel?

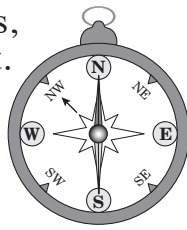


d) Using the scale, what is the marked distance from route 32 to Greenwood Park?

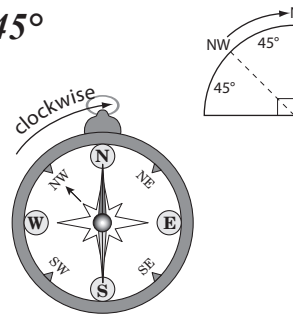


mi

Q. According to the compass, you are facing north-west. How many degrees clockwise must you turn to walk north?



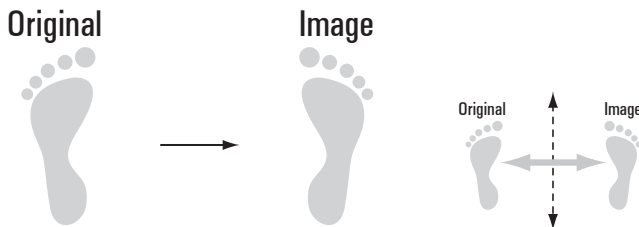
A. 45°



Find the North direction.

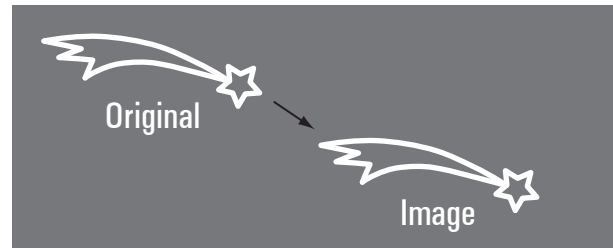
Calculate the number of degrees by picturing a circle.

a) Which transformation (translation, rotation, reflection) has moved this shape to its new position?

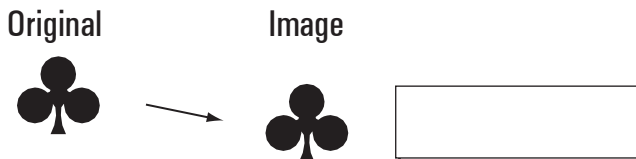


reflection

b) Which transformation (translation, rotation, reflection) has moved this comet to its new position?



c) Which transformation (translation, rotation, reflection) has moved the original shape to its new position?



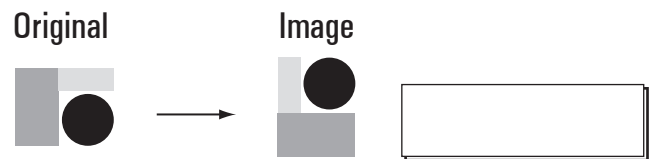
d) Which transformation (translation, rotation, reflection) has moved the original shape to its new position?



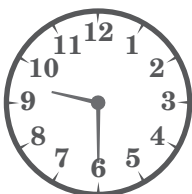
e) Which transformation (translation, rotation, reflection) has moved this shape to its new position?



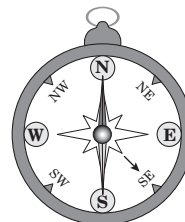
f) Which transformation (translation, rotation, reflection) has moved this shape to its new position?



g) How many degrees must the big hand of this clock turn to show exactly 9:45?



h) According to the compass, you are facing south-east. How many degrees clockwise must you turn to walk west?



Skill 25.5 Drawing translations, reflections and rotations of objects on a grid (1).

Translation (slide)

- Move the shape up (positive, vertically), down (negative, vertically), left (negative, horizontally) or right (positive, horizontally) on the grid, without flipping, turning or changing its size.

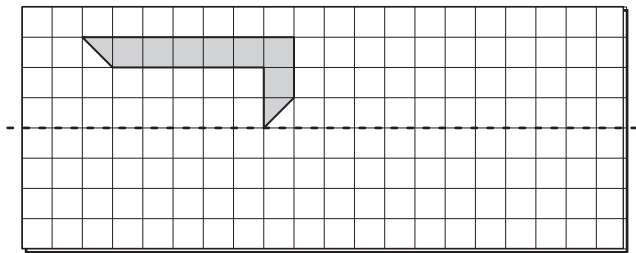
Reflection (like in a mirror)

- Draw a perpendicular line to the mirror line from each vertex of the shape.
- Extend the perpendicular line beyond the mirror line by the same distance.
- Graph and join the reflected points.

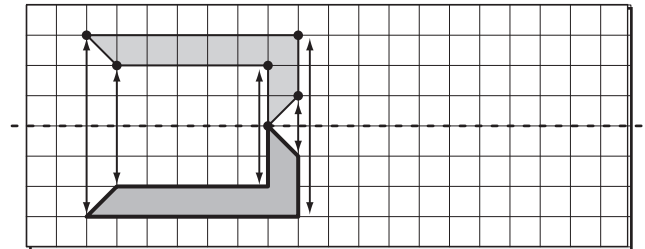
Rotation (turning about a point or center of rotation)

- Rotate each vertex by the given angle, in the given direction.
- Graph and join the rotated points.

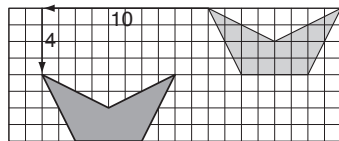
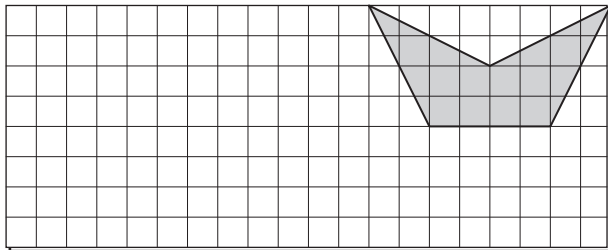
Q. Redraw this shape reflected in the horizontal line.



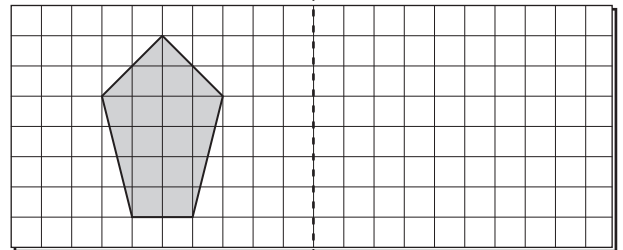
A.



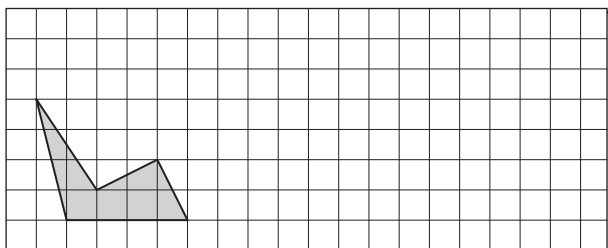
a) Translate this shape 8 units left and 4 units down.



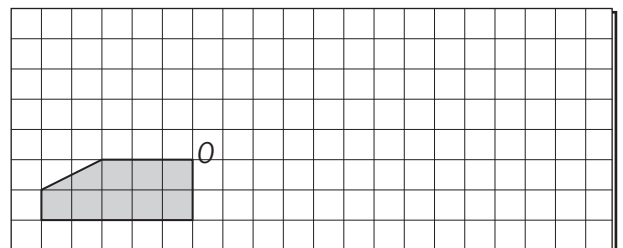
b) Redraw this shape reflected in the vertical line.



c) Translate this shape 3 units up and 10 units right.



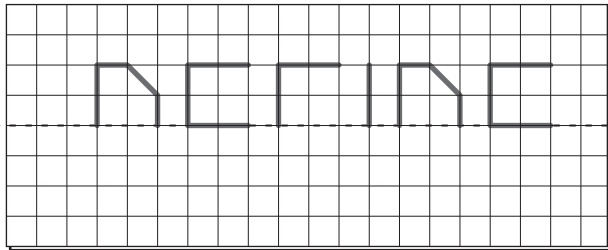
d) Redraw this shape rotated 180° about the point *O*.



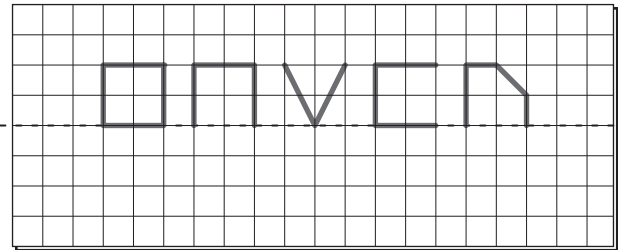
Skill 25.5 Drawing translations, reflections and rotations of objects on a grid (2).

MMBlue 1 1 2 2 3 3 4 4
MMGreen 1 1 2 2 3 3 4 4

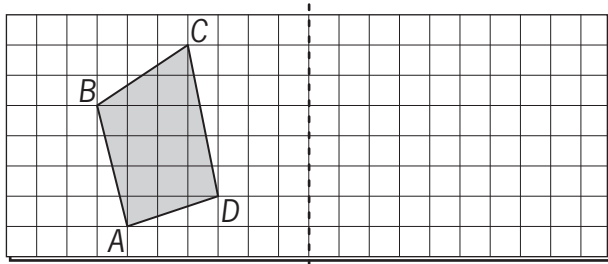
- e) Redraw this diagram reflected in the horizontal line.



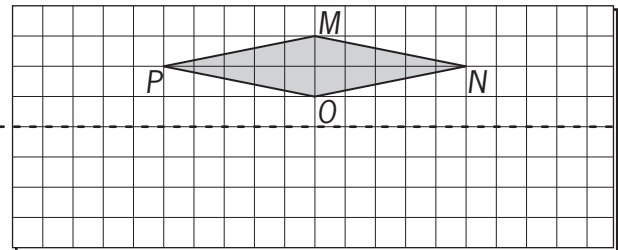
- f) Redraw this diagram reflected in the horizontal line.



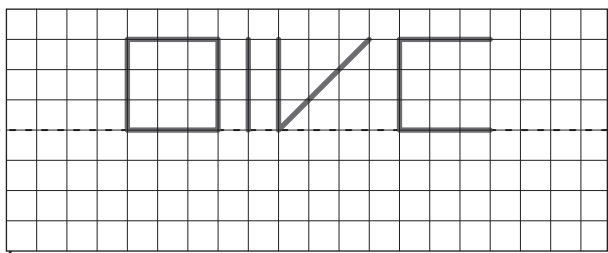
- g) Draw and label the reflection of the quadrilateral $ABCD$ in the vertical line.



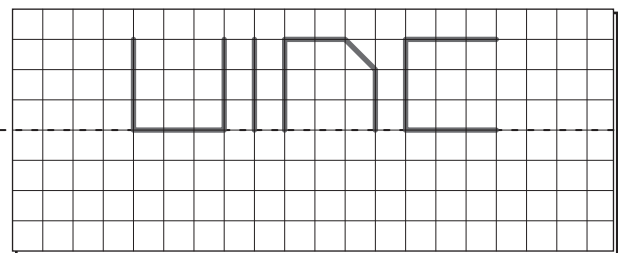
- h) Draw and label the reflection of the rhombus $MNOP$ in the horizontal line.



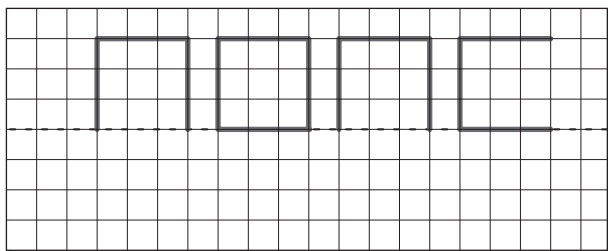
- i) Redraw this diagram reflected in the horizontal line.



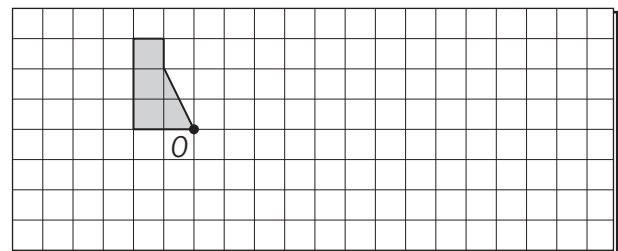
- j) Redraw this diagram reflected in the horizontal line.



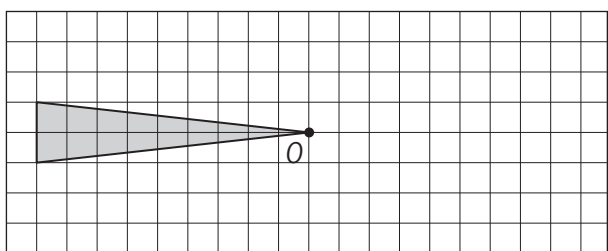
- k) Redraw this diagram reflected in the horizontal line.



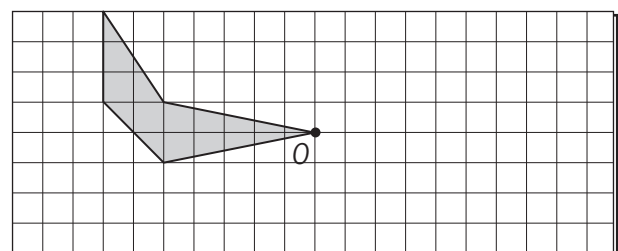
- l) Redraw this shape rotated 180° about the point O .



- m) Redraw this shape rotated 180° about the point O .



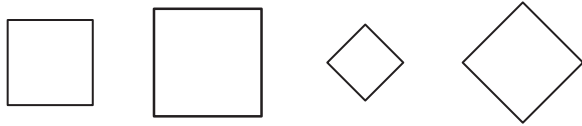
- n) Redraw this shape rotated 180° about the point O .



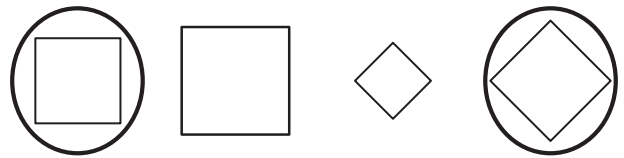
Skill 25.6 Recognizing congruence of two-dimensional shapes.

- Check which shapes are the same shape.
- Check which shapes are the same size.

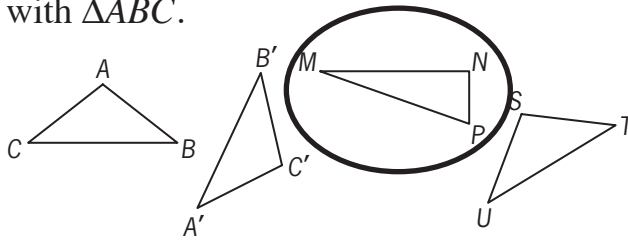
Q. Circle the pair of congruent shapes.



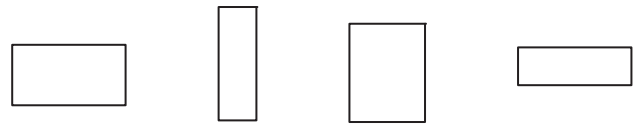
A.



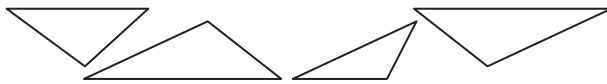
a) Circle the triangle that is **not** congruent with $\triangle ABC$.



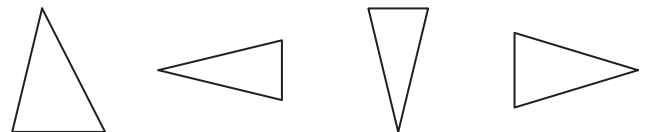
b) Circle the pair of congruent shapes.



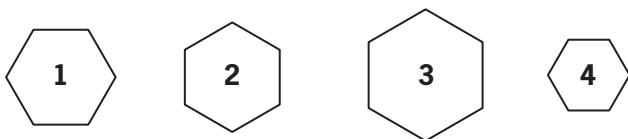
c) Circle the pair of congruent triangles.



d) Circle the pair of congruent triangles.

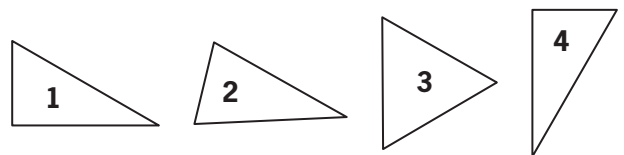


e) Find the pair of congruent hexagons.



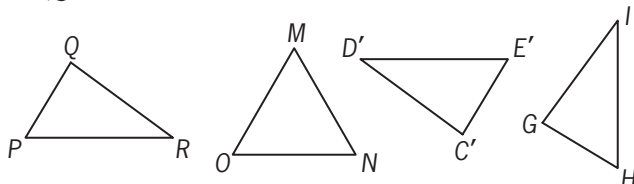
and

f) Find the pair of congruent triangles.

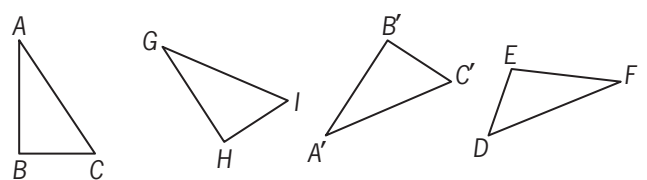


and

g) Which triangle is **not** congruent with $\triangle PQR$?



h) Which triangle is **not** congruent with $\triangle ABC$?

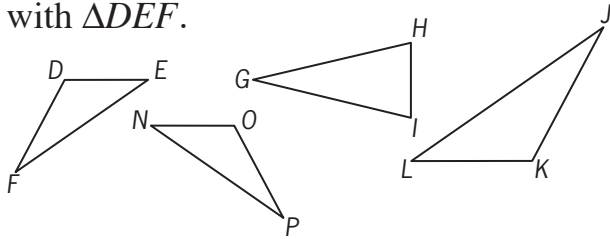


Skill 25.7 Recognizing similarity of two-dimensional shapes.

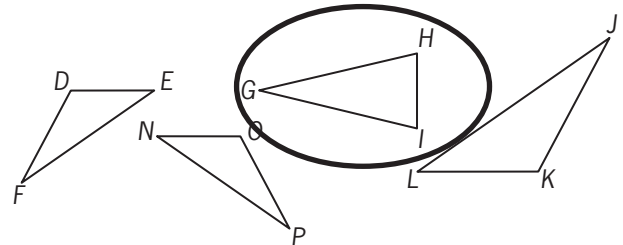
- Check which shapes are the same shape.

Hint: The shapes can be a different size.

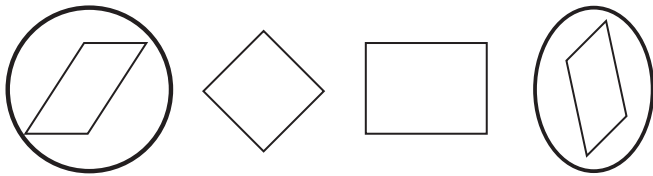
Q. Circle the triangle that is **not** similar with $\triangle DEF$.



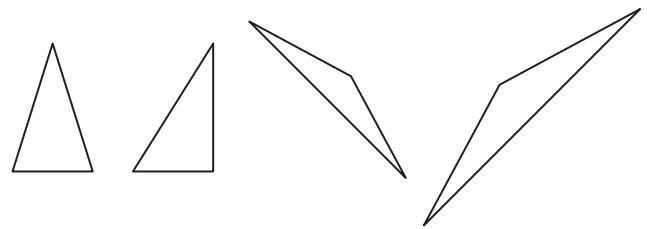
A. $\triangle GHI$ All triangles can be rotated, reflected or enlarged to exactly cover $\triangle DEF$ except for $\triangle GHI$. $\triangle GHI$ looks like an isosceles triangle. $\triangle DEF$ looks like a scalene triangle.



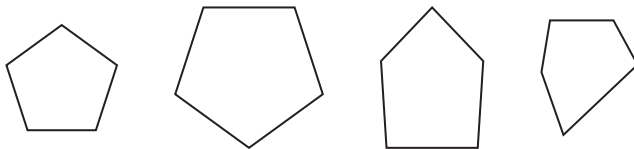
a) Circle the pair of similar shapes.



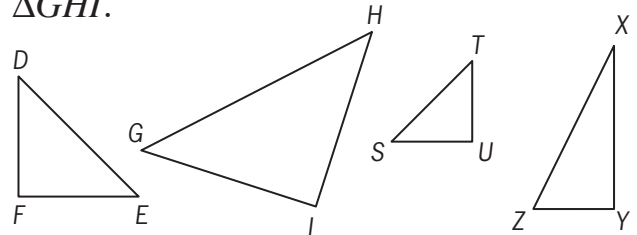
b) Circle the pair of similar triangles.



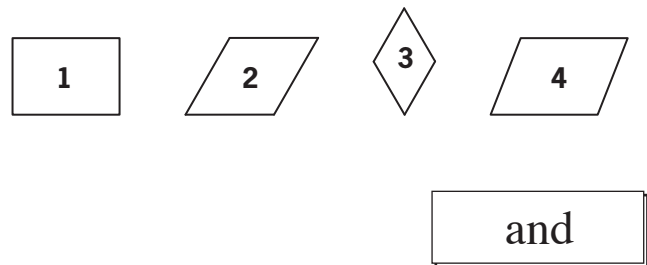
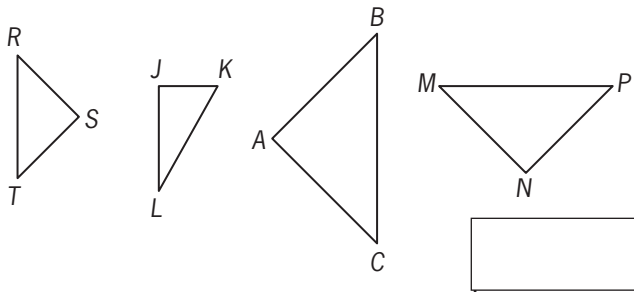
c) Circle the pair of similar shapes.



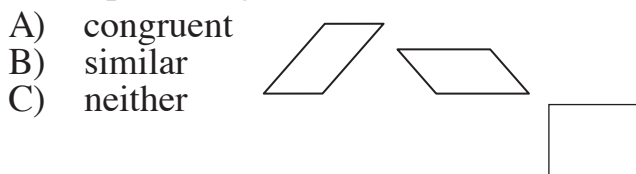
d) Circle the triangle that is **not** similar with $\triangle GHI$.



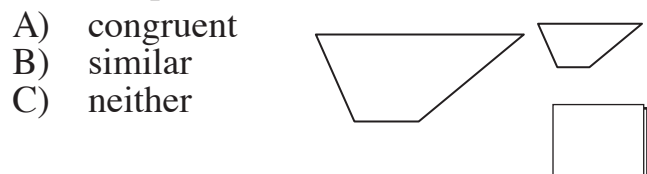
e) Which triangle is **not** similar with $\triangle MNP$? **f)** Find the pair of similar shapes.



g) These parallelograms are:

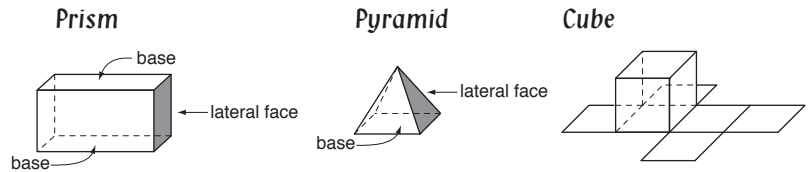


h) These trapezoids are:

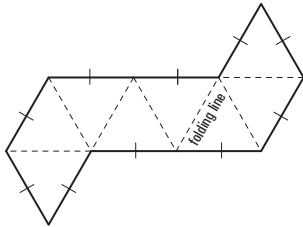


Skill 25.8 Recognizing nets of three-dimensional shapes.

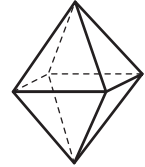
- Identify the shapes in the net.
- Imagine the shape folded. OR Make a model by tracing, cutting out and folding the net.



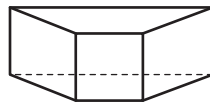
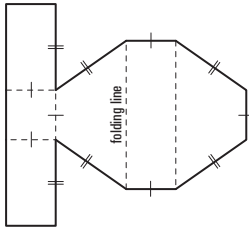
Q. What 3-dimensional shape can this net be used to make?



A. *regular octahedron*

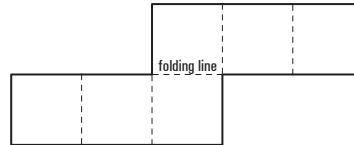


a) What 3-dimensional shape can this net be used to make?

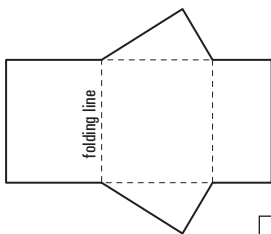


trapezoidal prism

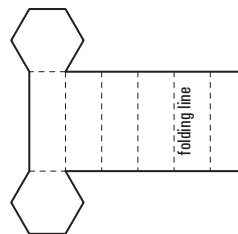
b) What 3-dimensional shape can this net be used to make?



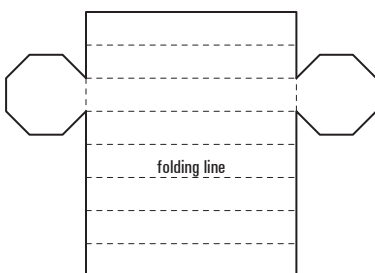
c) What 3-dimensional shape can this net be used to make?



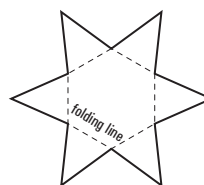
d) What 3-dimensional shape can this net be used to make?



e) What 3-dimensional shape can this net be used to make?



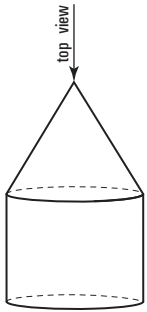
f) What 3-dimensional shape can this net be used to make?



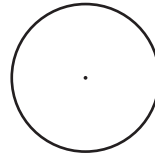
Skill 25.9 Drawing top, side and front views of three-dimensional shapes.

- Imagine what you would see from the stated direction OR
- Make a model and observe the view.

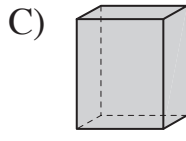
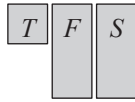
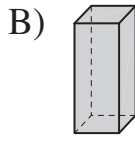
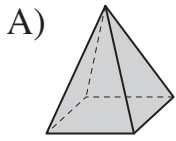
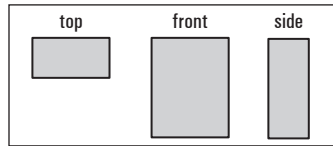
Q. Draw the top view of this solid.



A.



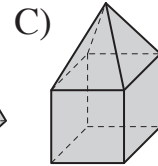
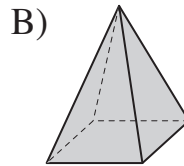
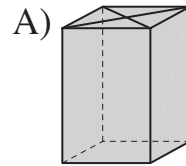
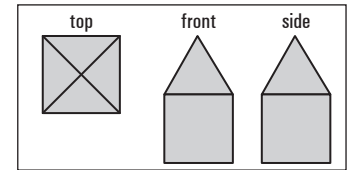
a) Which solid has the top, front and side views shown?



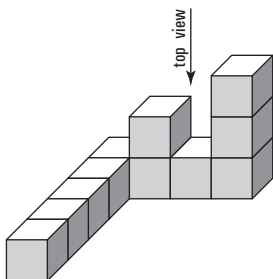
*T F S
as above*



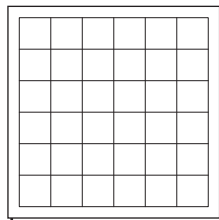
b) Which solid has the top, front and side views shown?



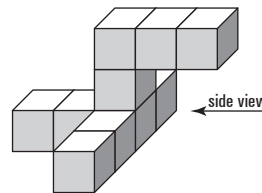
c) Draw the top view of this solid.



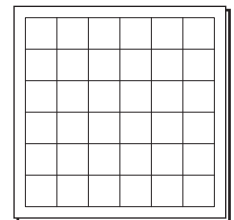
top view



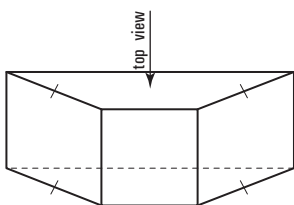
d) Draw the side view of this solid.



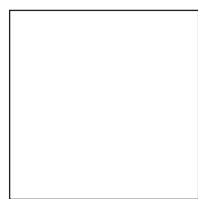
side view



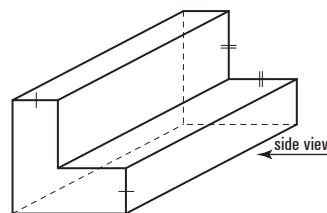
e) Draw the top view of this solid.



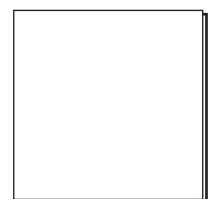
top view



f) Draw the side view of this solid.



side view

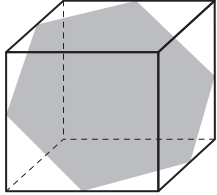


Skill 25.10 Recognizing the shapes of cross sections through three-dimensional shapes (1).

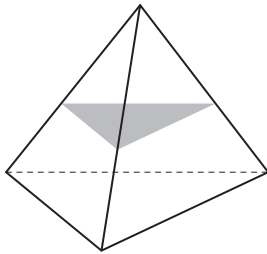
- To name the shape of a cross section through a 3D shape, imagine that you cut the solid through that section, then separate the two parts and look at the shape of the slice.

Q. What shape is the cross section drawn through this cube?

A. *hexagon*

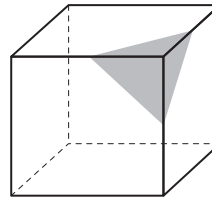


a) What shape is the cross section drawn through this pyramid?

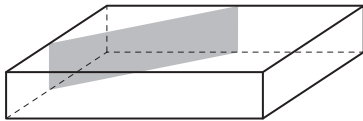


triangle

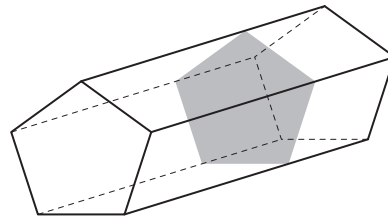
b) What shape is the cross section drawn through this cube?



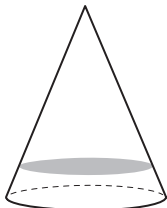
c) What shape is the cross section drawn through this prism?



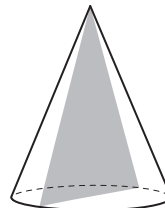
d) What shape is the cross section drawn through this prism?



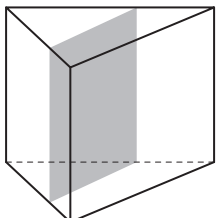
e) What shape is the cross section drawn through this cone?



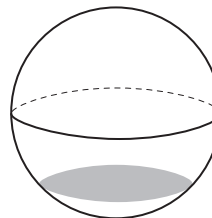
f) What shape is the cross section drawn through this cone?



g) What shape is the cross section drawn through this prism?



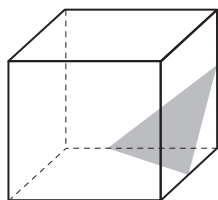
h) What shape is the cross section drawn through this sphere?



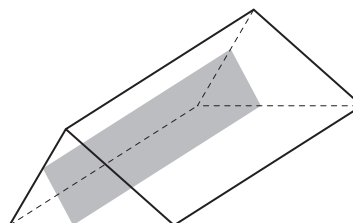
Skill 25.10 Recognizing the shapes of cross sections through three-dimensional shapes (2).

MMBlue 11 22 33 44
MMGreen 11 22 33 44

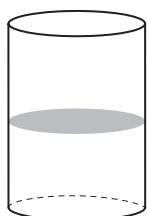
i) What shape is the cross section drawn through this cube?



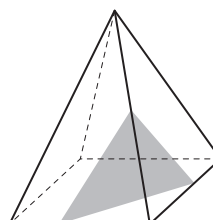
j) What shape is the cross section drawn through this prism?



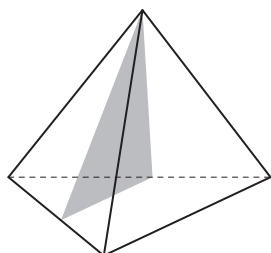
k) What shape is the cross section drawn through this cylinder?



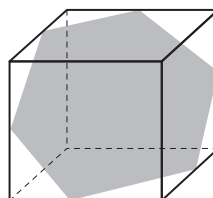
l) What shape is the cross section drawn through this pyramid?



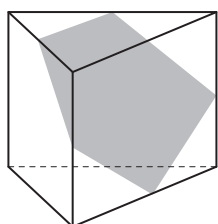
m) What shape is the cross section drawn through this pyramid?



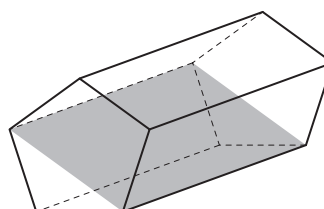
n) What shape is the cross section drawn through this cube?



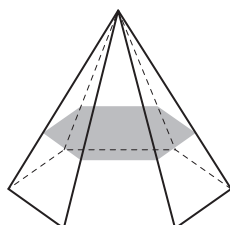
o) What shape is the cross section drawn through this prism?



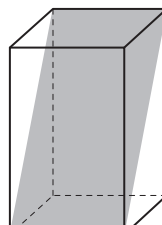
p) What shape is the cross section drawn through this prism?



q) What shape is the cross section drawn through this pyramid?



r) What shape is the cross section drawn through this prism?



Skill 25.11 Recognizing rotational symmetry in two-dimensional shapes.

- Try to visualize the shape during a full turn of 360° and make sure that the shape could cover itself at least once before the full turn is completed.

Q. Which shapes have rotational symmetry.

A)



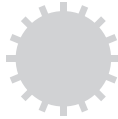
B)



C)



D)



A. A)

B)

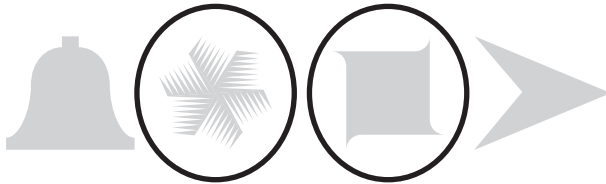
C)

D)

A & D

Sample rotations of 90° show only A & D get back to their original position before the full, 360° turn.

a) Circle the shapes which have rotational symmetry.



b) Circle the shapes which have rotational symmetry.



c) Circle the shapes which have rotational symmetry.



d) Circle the shapes which have rotational symmetry.



e) Which shapes have rotational symmetry?

A)



B)



C)



D)



f) Which shapes have rotational symmetry?

A)



B)



C)



D)



g) Circle the shape which does **not** have rotational symmetry.



h) Circle the shape which does **not** have rotational symmetry.

