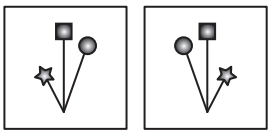
20. [Location / Transformation]

Skill 20.1 Describing the movement of an object.

MM3.2 1 1 2 2 3 3 4 4
MM4.1 1 1 2 2 3 3 4 4

Q. Which movement has transformed this shape?

A) flip (reflection)
B) slide (translation)
C) turn (rotation)



Position 1 Position 2

A. ***A***

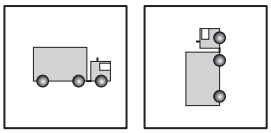
A) Hold a mirror vertically on the right edge of position 1. This shows the object has been reflected to achieve position 2. correct

Sketch the object as in position 1.
B) Try sliding it. Note the change in position as a result. incorrect

C) Try turning it. Note the change in position as a result. incorrect

a) Which movement has transformed this shape?

A) flip (reflection)
B) slide (translation)
C) turn (rotation)

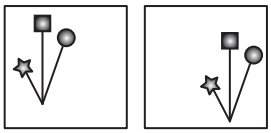


Position 1 Position 2

The truck has been turned a quarter of a turn, anticlockwise.

b) Which movement has transformed this shape?

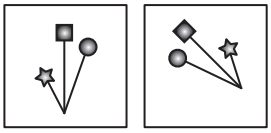
A) flip (reflection)
B) slide (translation)
C) turn (rotation)



Position 1 Position 2

c) Which movement has transformed this shape?

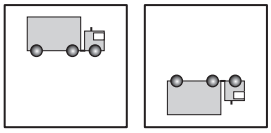
A) flip (reflection)
B) slide (translation)
C) turn (rotation)



Position 1 Position 2

d) Which movement has transformed this shape?

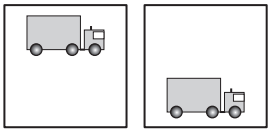
A) flip (reflection)
B) slide (translation)
C) turn (rotation)



Position 1 Position 2

e) Which movement has transformed this shape?

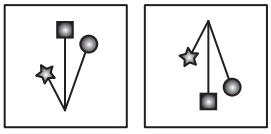
A) flip (reflection)
B) slide (translation)
C) turn (rotation)



Position 1 Position 2

f) Which movement has transformed this shape?

A) flip (reflection)
B) slide (translation)
C) turn (rotation)

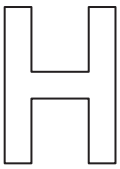


Position 1 Position 2

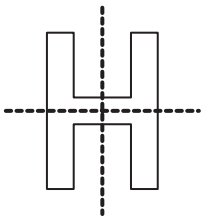
Skill 20.2 Drawing lines of symmetry through a shape.

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

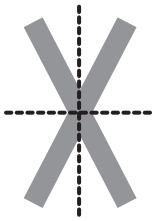
Q. Draw the lines of symmetry through the shape. How many lines of symmetry does the shape have?



A. *2*



a) Draw the lines of symmetry through the shape. How many lines of symmetry does the shape have?



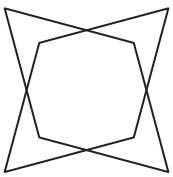
2

b) Draw the lines of symmetry through the shape. How many lines of symmetry does the shape have?

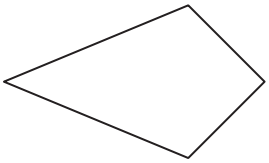
c) Draw the lines of symmetry through the shape. How many lines of symmetry does the shape have?

d) Draw the lines of symmetry through the shape. How many lines of symmetry does the shape have?

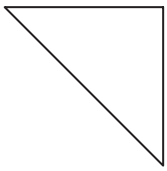
e) Draw the lines of symmetry through the shape. How many lines of symmetry does the shape have?



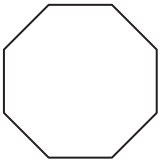
f) Draw the lines of symmetry through the kite. How many lines of symmetry does it have?



g) Draw the lines of symmetry through the triangle. How many lines of symmetry does it have?



h) Draw the lines of symmetry through the octagon. How many lines of symmetry does it have?



Skill 20.3 Locating places using compass bearings N, E, S and W.

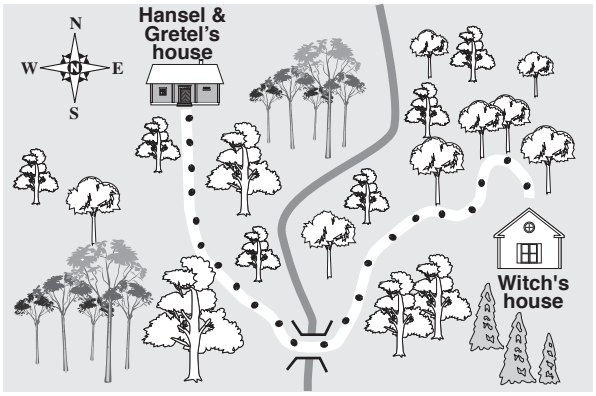
- Refer to the 4 point compass to find your bearings.
  Hint: (Clockwise) - 'Never Eat Sea Weed' - North, East, South, West.

Q. Which capital city is east of Skopje, the capital of Macedonia?

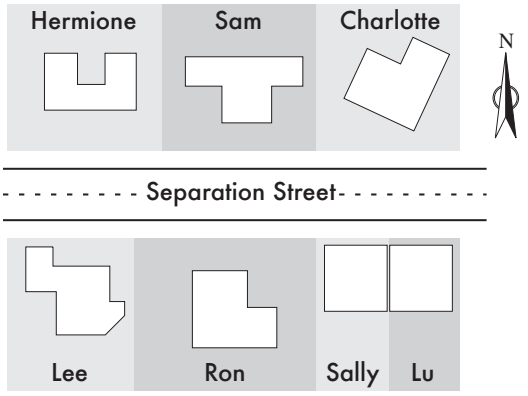
A. ***Istanbul***

Find Skopje on the map.
Consider that you are there.
Imagine the central point of a compass on Skopje.
Turn and face the direction of the arrow pointing east.
Which capital city would you be looking at?

a) Hansel and Gretel left a trail along the forest path. In which direction did they walk when they first left their house?

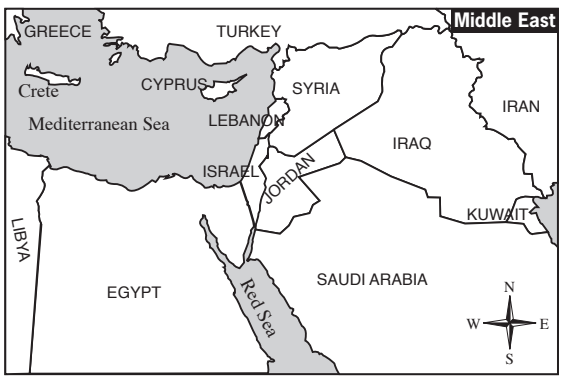


b) Hermione's house is on the north side of Separation Street. On which side of the street is Ron's house?



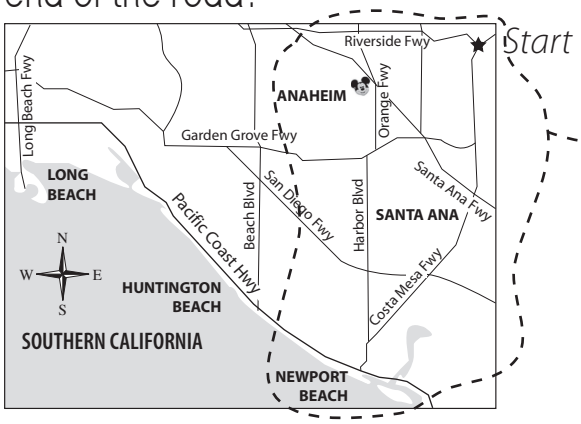
c) Of the Queensland cities shown below, which city is the most northerly?

d) In which direction is the Red Sea from Saudi Arabia?



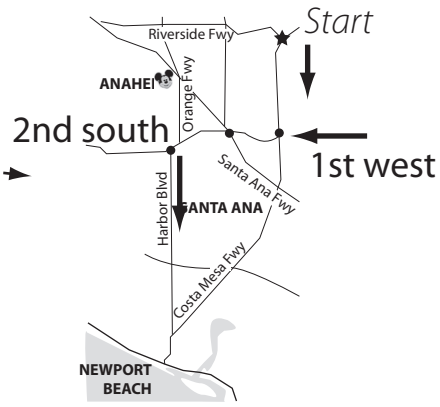
Skill 20.4 Following directions to find a place on a map.

Q. Head south from the starting point. Take the first road west and the second south. Which beach is at the end of the road?



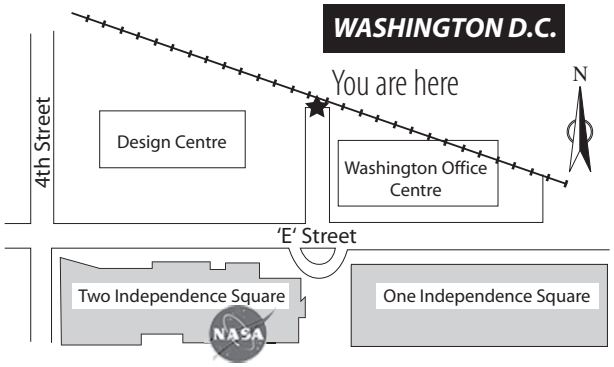
Enlargement

A. ***Newport Beach***

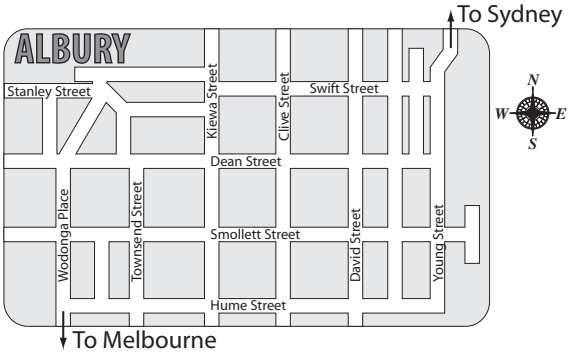


Consider one movement at a time. Mark your position as you go.

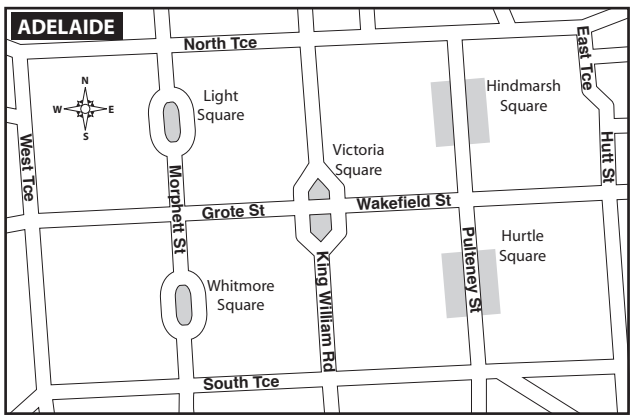
a) You head south towards 'E' street and turn west. To which number Independence Square are you headed?



b) From the corner of Kiewa and Dean Street you walk east for two blocks and then walk south for two blocks. If you then go west, which street are you in?

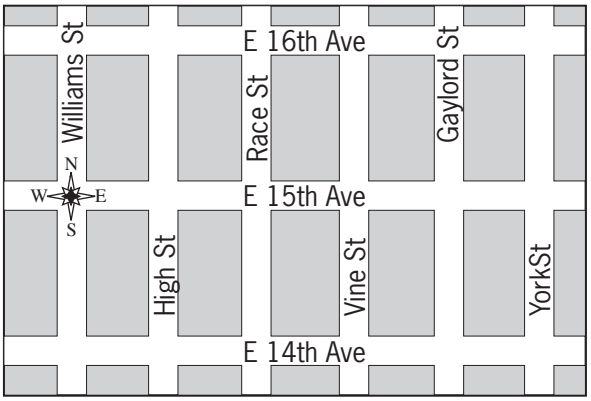


c) Head north on Morphett St. Turn east into North Terrace. Then take the second turn south. Which square are you approaching?



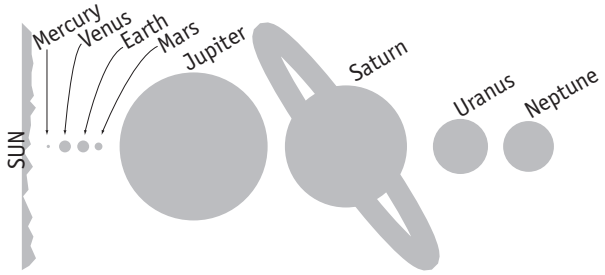
d) Start at the compass. Go east on E 15th Ave and take the second road north. Turn east again at the next corner. Which street are you in?

Denver - Colorado



Skill 20.5 Locating places using simple bearings (closest, left, first turn).

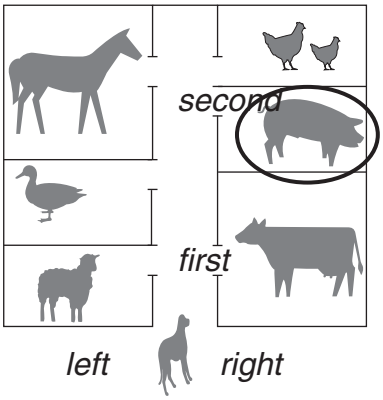
Q. In our Solar System which planet is between Mars and Neptune but closest to Mars?



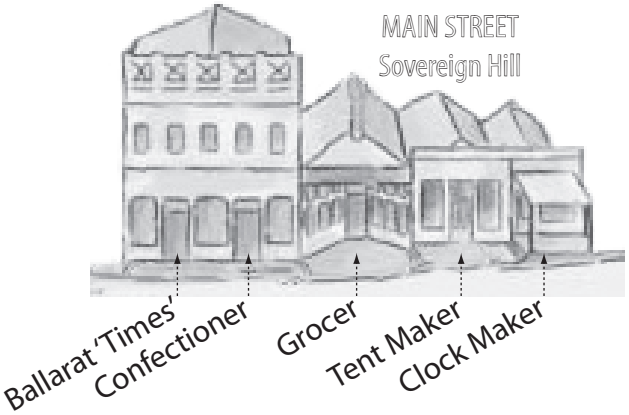
A. ***Jupiter***

Check the meaning of any unknown terms used to describe location.
Between means somewhere in the middle of the boundaries.
Closest means the shortest distance from.

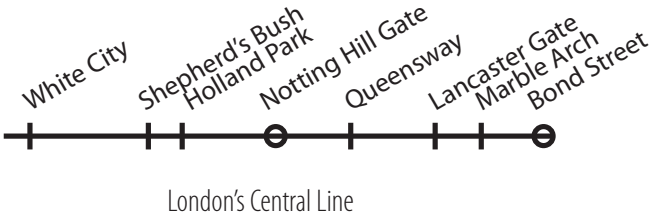
a) A dog enters a shed and goes into the pen that is second on the right. What animal is it now with?



b) At Sovereign Hill, which building is between the Ballarat 'Times' and the Tent Maker but closest to the Tent Maker?

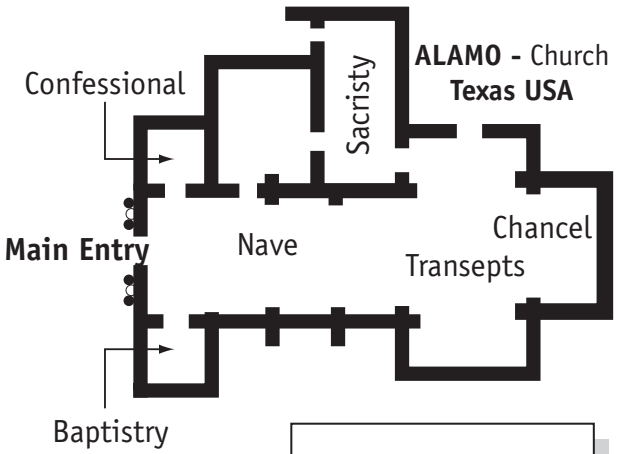


c) On the Central Line in London which station is between White City and Bond Street but closest to Bond Street?



London's Central Line

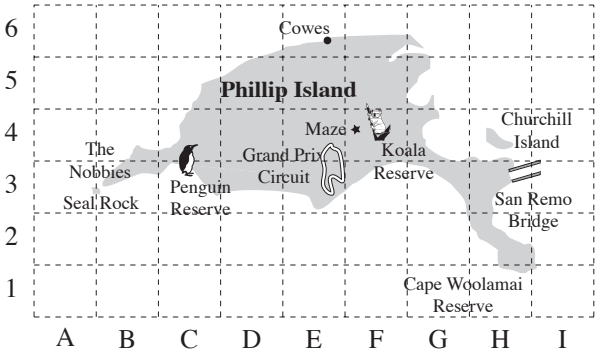
d) From the main entry of the church in the Alamo compound you take the second opening on the left and then the first on the right. Where are you?



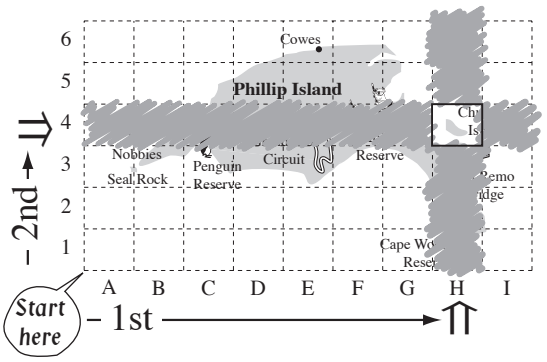
Skill 20.6 Using regions on a grid to describe location, e.g. A3 (1).

- Start at the bottom left corner of the grid.
- First read **across** the horizontal axis to find the letter that matches the column you need.
- Then read **up** the vertical axis to find the number that matches the row you need.
  The grid space that is common to both lines marks the position you are locating.

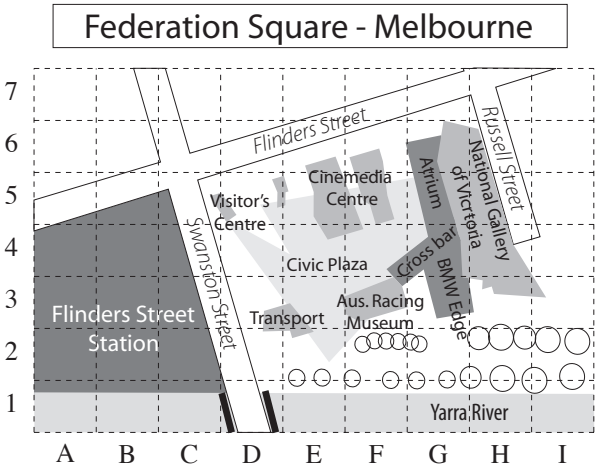
Q. Which Island is found at H4?



A. ***Churchill Island***

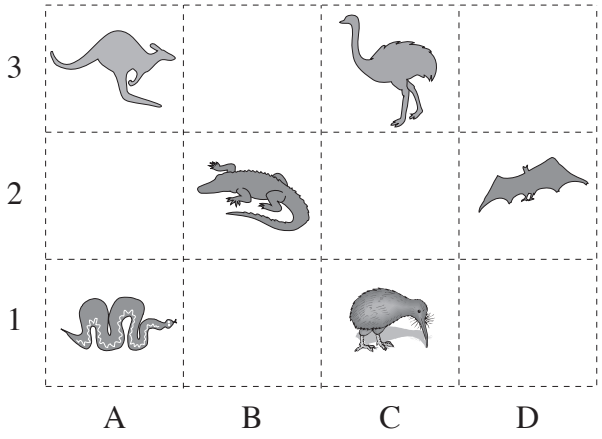


a) Where is the Australian Racing Museum located on the grid?

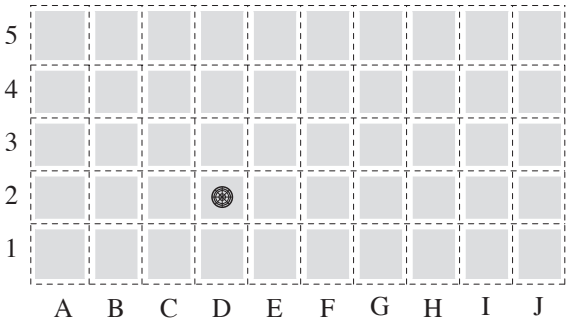


F3

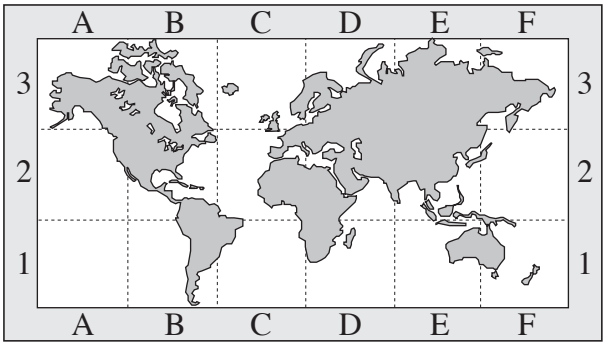
b) Which animal is located at C1?



c) What is the location of the drain on the tiled bathroom floor?

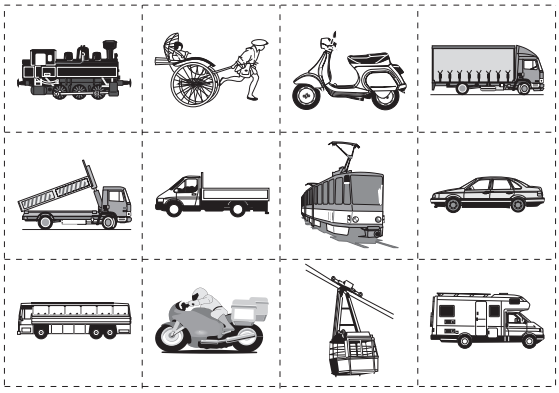


d) Alaska is located at A3 on this map. Where is New Zealand located?

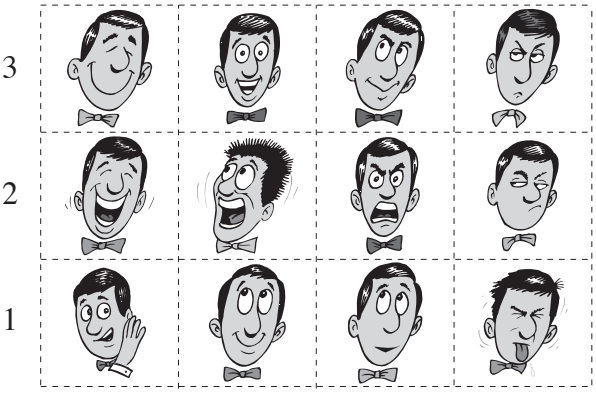


Skill 20.6 Using regions on a grid to describe location, e.g. A3 (2).

e) Where is the rickshaw located on the grid?

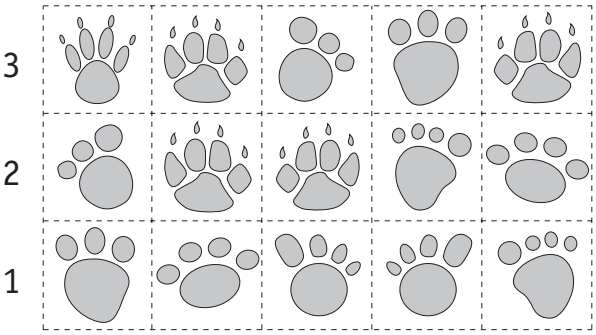


f) Where is the person who is poking out his tongue located on the grid?

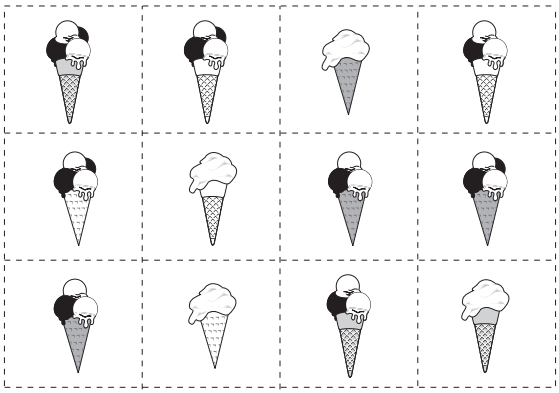


g) Of these fantasy creatures, what would you be if you were at E2?

h) There are 7 pairs of paw prints in this diagram. Find the grid reference of the paw print that has no pair.

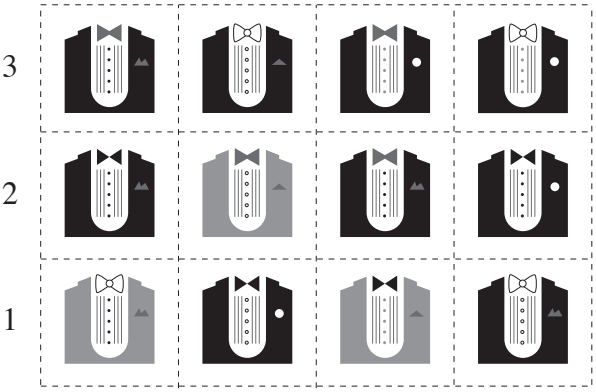


i) Find the coordinates of the only two identical icecreams. [Hint: cone type, cone colour, scoop type and scoop number all vary.]



and

j) Find the coordinates of the only two identical tuxedos. [Hint: suit colour, bow tie, buttons and pocket handkerchief all vary.]

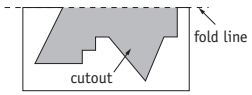


and

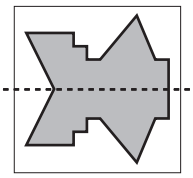
Skill 20.7 Sketching symmetrical shapes.

- Hold a mirror on the fold line to see what you should sketch.
- Sketch this image on the other side of the fold line.

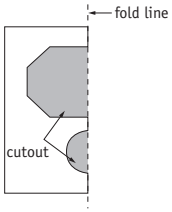
Q. Paper is folded in half. This design is cut out. Draw the paper unfolded with the full cutout.

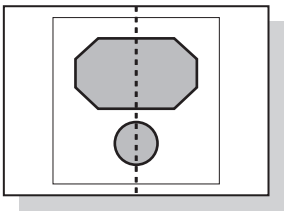


A.

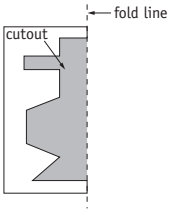


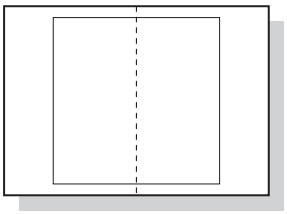
a) Paper is folded in half. This design is cut out. Draw the paper unfolded with the full cutout.



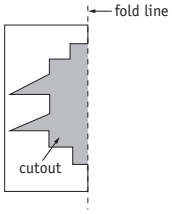


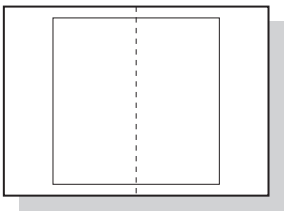
b) Paper is folded in half. This design is cut out. Draw the paper unfolded with the full cutout.



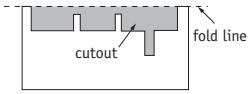


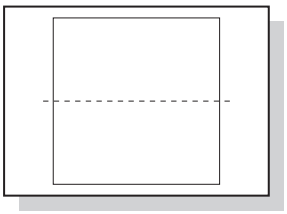
c) Paper is folded in half. This design is cut out. Draw the paper unfolded with the full cutout.



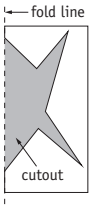


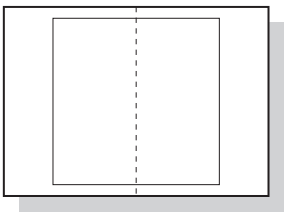
d) Paper is folded in half. This design is cut out. Draw the paper unfolded with the full cutout.



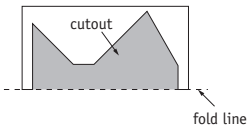


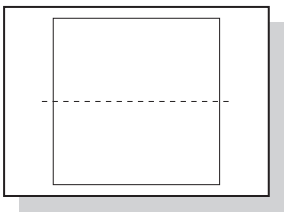
e) Paper is folded in half. This design is cut out. Draw the paper unfolded with the full cutout.



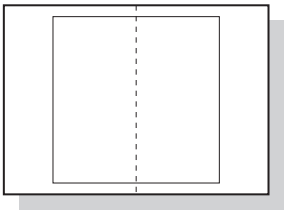


f) Paper is folded in half. This design is cut out. Draw the paper unfolded with the full cutout.

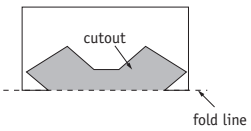


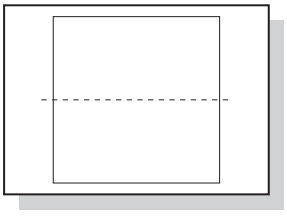


g) Paper is folded in half. This design is cut out. Draw the paper unfolded with the full cutout.



h) Paper is folded in half. This design is cut out. Draw the paper unfolded with the full cutout.

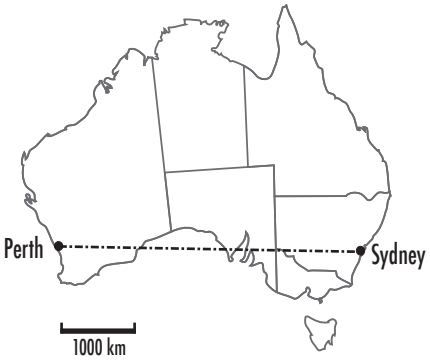




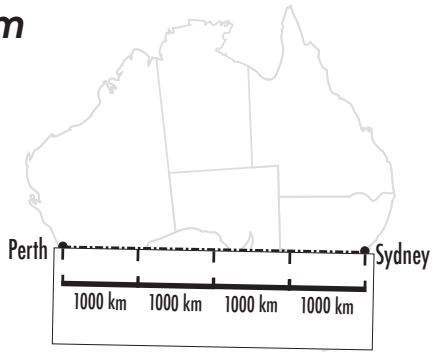
Skill 20.8 Using a linear scale to calculate distance (1).

- Put a piece of paper along the distance to be measured.
- Mark the start and end points on the paper.
- Place the paper against the scale matching the starting points.
- Slide the paper across the length of the scale marking the start and end points as you go.
- Add together the distance covered.

Q. Using the scale, what is the marked distance from Perth to Sydney?
[Round off to the nearest 500 km.]

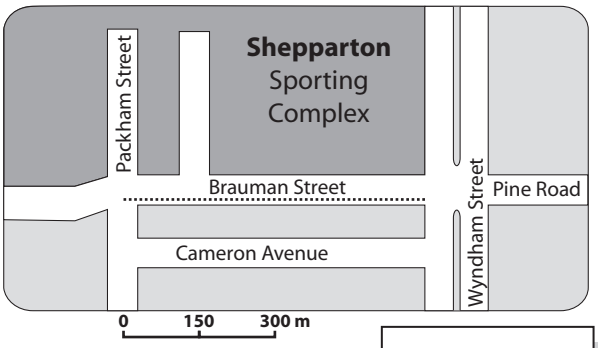


A. ***4000 km***



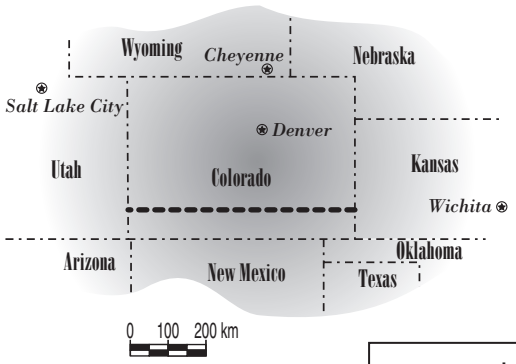
Check the scale against the length of the line. Slide the scale as necessary.
$4 \times 1000 = 4000$

a) Use the scale to find the length of Brauman Street.
[Round off to the nearest 50 m.]



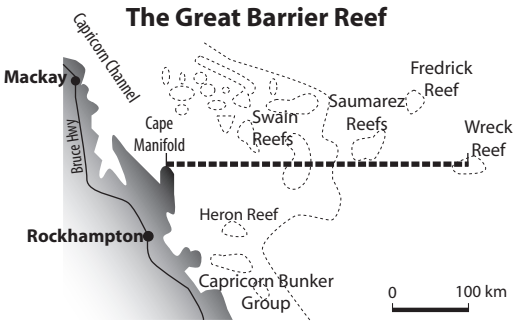
m

b) Use the scale to find the width of Colorado. [Round off to the nearest 100 km.]



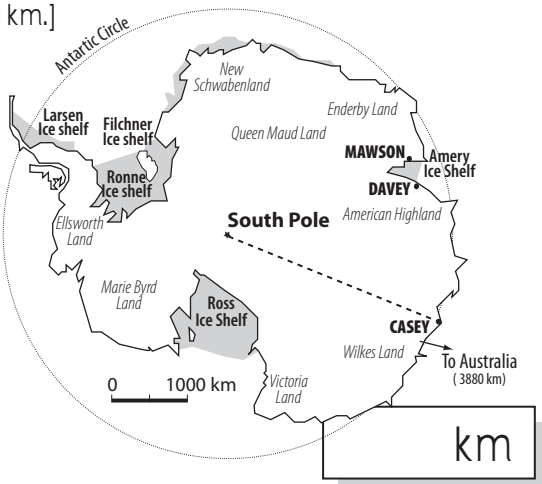
km

c) Using the scale, what is the marked distance from Cape Manifold to Wreck Reef? [Round off to the nearest 100 km.]



km

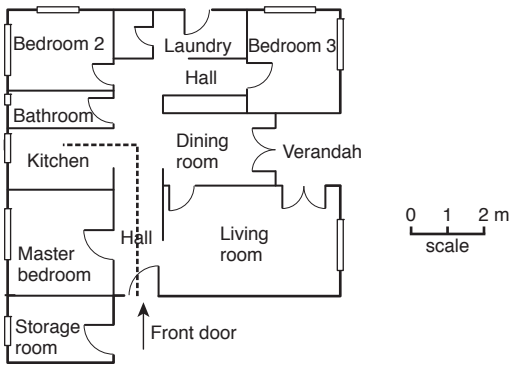
d) Using a ruler and the scale, find the distance between the South Pole and Casey Station. [Round off to the nearest 1000 km.]



km

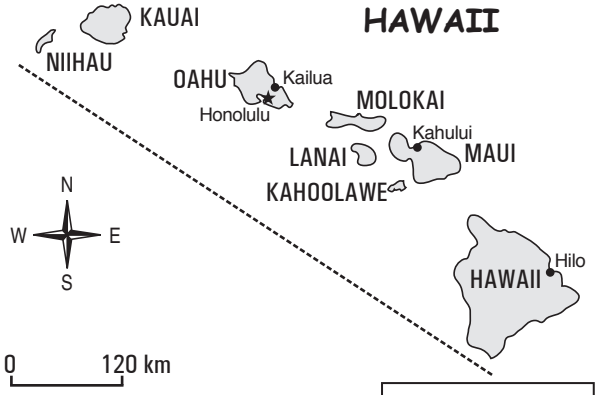
Skill 20.8 Using a linear scale to calculate distance (2).

e) Calculate the marked distance from the front door to the kitchen. [Round off to the nearest 1 m.]



m

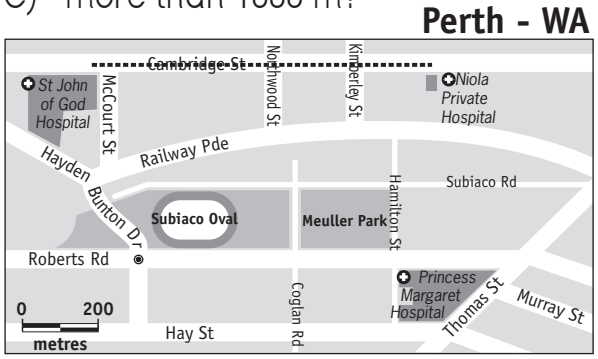
f) What is the marked distance from end to end of the Hawaiian islands? [Round off to the nearest 20 km.]



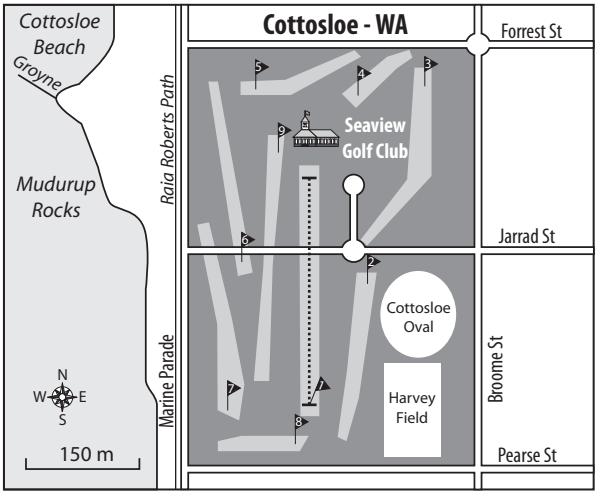
km

g) Is the distance between St John of God Hospital and Niola Private Hospital

A) less than 800 m,
B) between 800 m and 1000 m or
C) more than 1000 m?

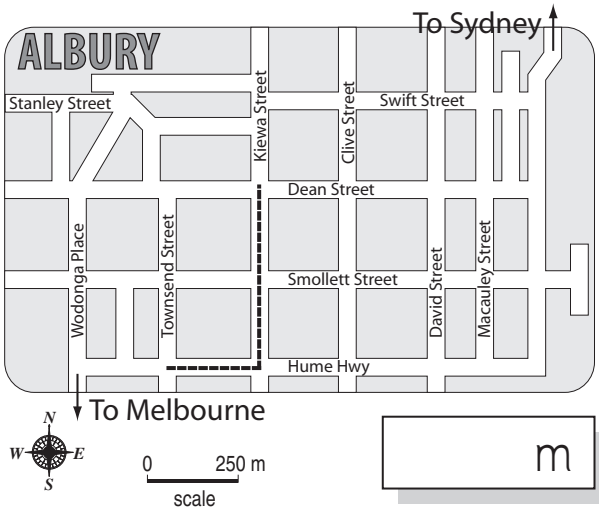


h) Using the scale, what is the distance from the tee to the hole on the first fairway? [Round off to the nearest 1 m.]



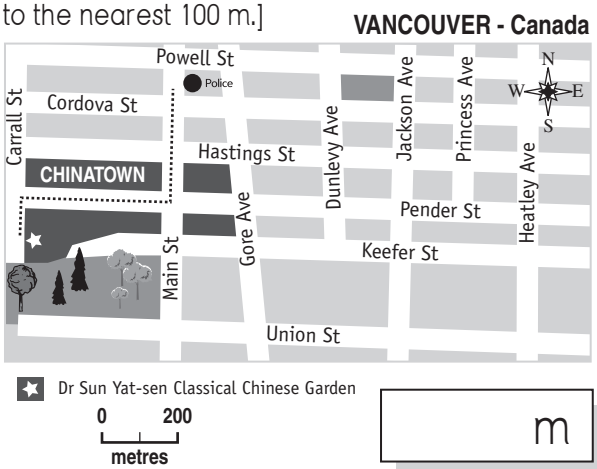
m

i) What is the marked distance from the intersection of the Hume Highway and Townsend Street to Dean Street in Albury? [Round off to the nearest 50 m.]



m

j) What is the marked distance from Dr Sun Yat-sen Classical Chinese Garden to the Police station? [Round off to the nearest 100 m.]

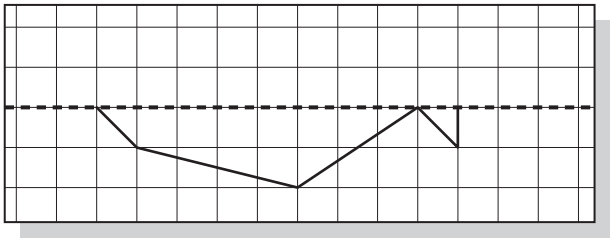


m

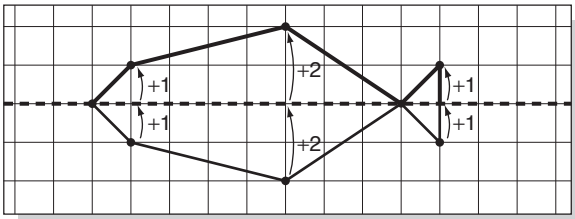
Skill 20.9 Drawing reflections on a grid (1).

- Mark every vertex on the shape.
- Measure the distance to the dashed line.
- Measure the same distance on the other side of the dashed line.
- Draw a point.
- Join the points.

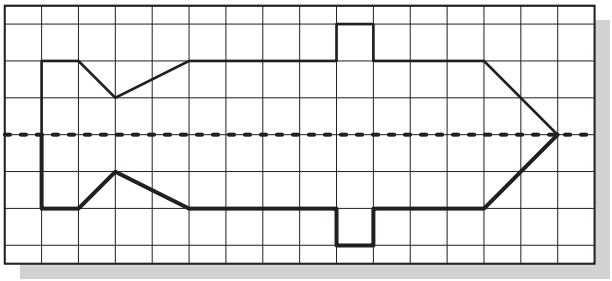
Q. Complete the drawing so that it has a line of symmetry as shown by the dotted line.



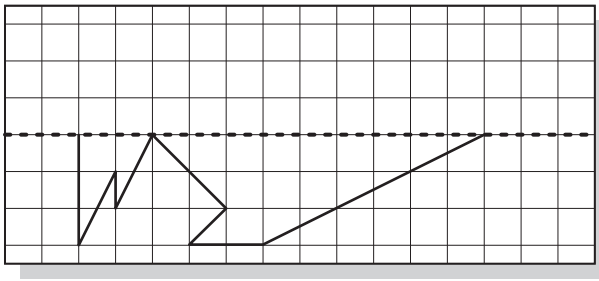
A.



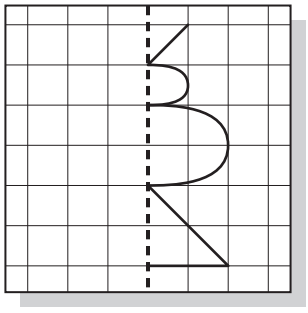
a) Complete the drawing so that it has a line of symmetry as shown by the dotted line.



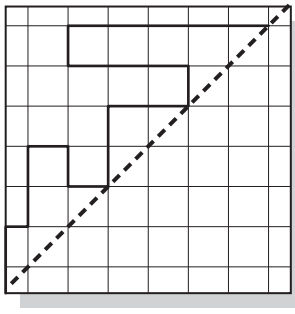
b) Complete the drawing so that it has a line of symmetry as shown by the dotted line.



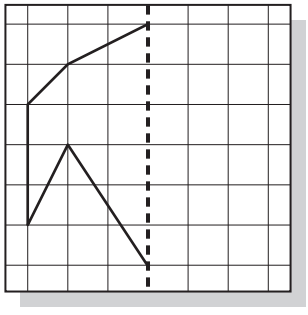
c) Complete the drawing so that it has a line of symmetry as shown by the dotted line.



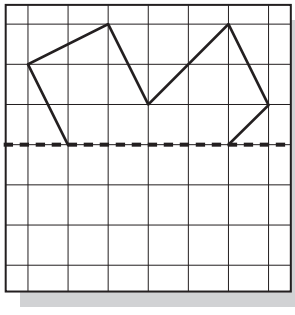
d) Complete the drawing so that it has a line of symmetry as shown by the dotted line.



e) Complete the drawing so that it has a line of symmetry as shown by the dotted line.

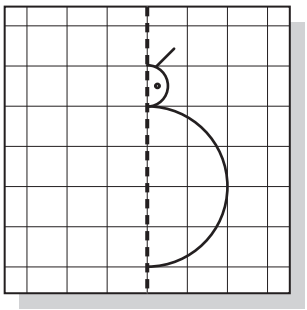


f) Complete the drawing so that it has a line of symmetry as shown by the dotted line.

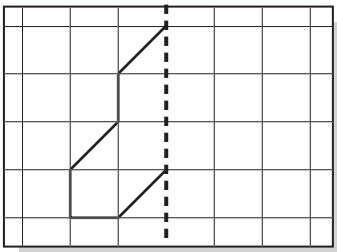


Skill 20.9 Drawing reflections on a grid (2).

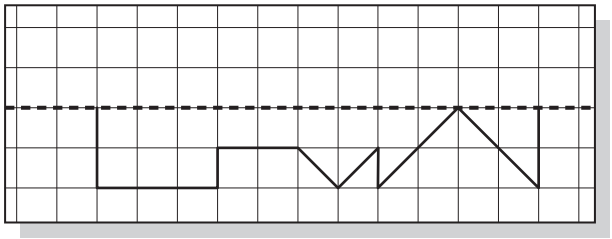
g) Complete the drawing so that it has a line of symmetry as shown by the dotted line.



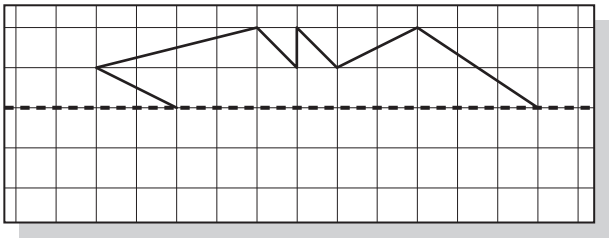
h) Complete the drawing so that it has a line of symmetry as shown by the dotted line.



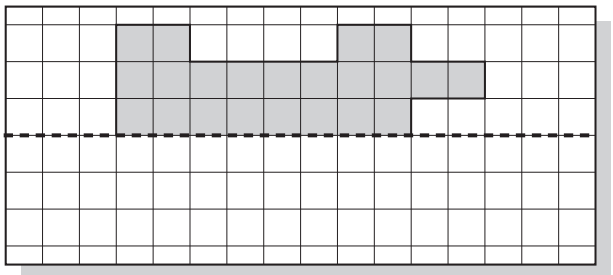
i) Complete the drawing so that it has a line of symmetry as shown by the dotted line.



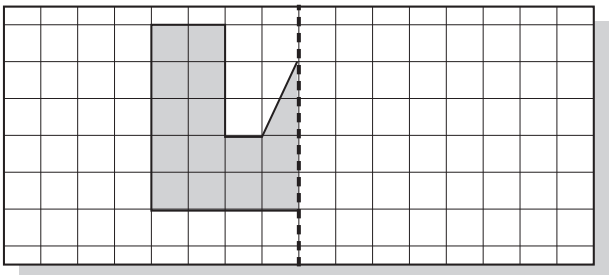
j) Complete the drawing so that it has a line of symmetry as shown by the dotted line.



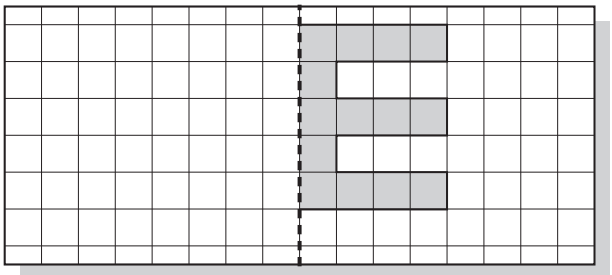
k) Draw the reflection of this shape in the dotted line.



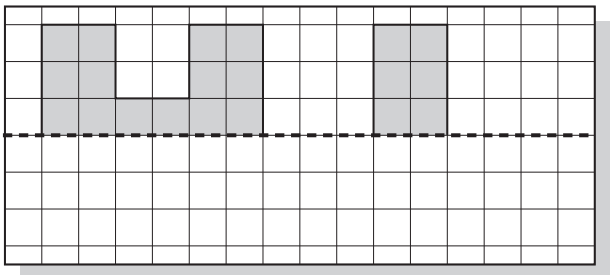
l) Draw the reflection of this shape in the dotted line.



m) Draw the reflection of this shape in the dotted line.

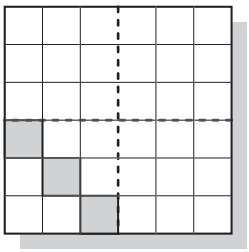


n) Draw the reflection of this shape in the dotted line.

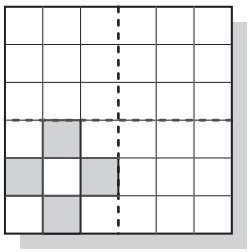


Skill 20.9 Drawing reflections on a grid (3).

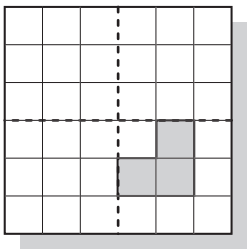
o) Complete this design so that it has two lines of symmetry as shown by the dotted lines.



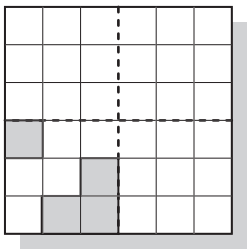
p) Complete this design so that it has two lines of symmetry as shown by the dotted lines.



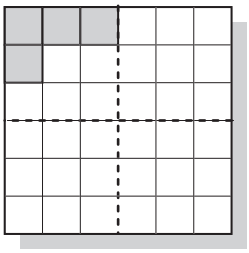
q) Complete this design so that it has two lines of symmetry as shown by the dotted lines.



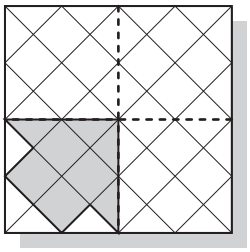
r) Complete this design so that it has two lines of symmetry as shown by the dotted lines.



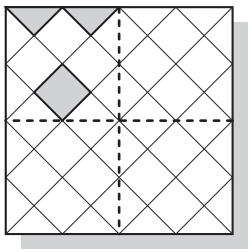
s) Complete this design so that it has two lines of symmetry as shown by the dotted lines.



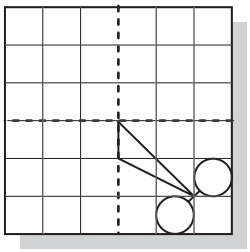
t) Complete this design so that it has two lines of symmetry as shown by the dotted lines.



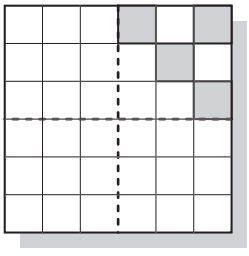
u) Complete this design so that it has two lines of symmetry as shown by the dotted lines.



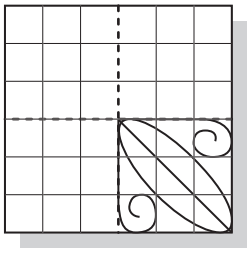
v) Complete this design so that it has two lines of symmetry as shown by the dotted lines.



w) Complete this design so that it has two lines of symmetry as shown by the dotted lines.



x) Complete this design so that it has two lines of symmetry as shown by the dotted lines.



Skill 20.10 Drawing reflections, translations, rotations, enlargements and reductions on a grid (1).

To draw a shape moved by a reflection

- Mark every vertex on the shape.
- Measure the distance to the dashed line.
- Measure the same distance on the other side of the dashed line.
- Draw a point.
- Join the points.

To draw a shape moved by a rotation

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

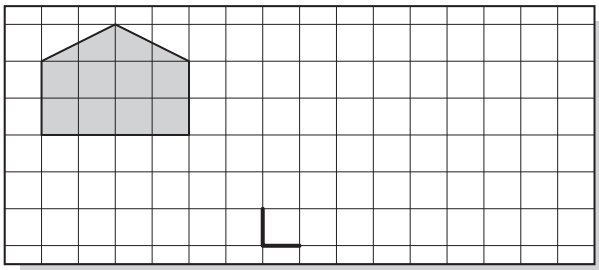
To draw a shape moved by a translation

- Mark every vertex on the shape.
- From each vertex move across the required number of units.
- Draw a point.
- Join the points.

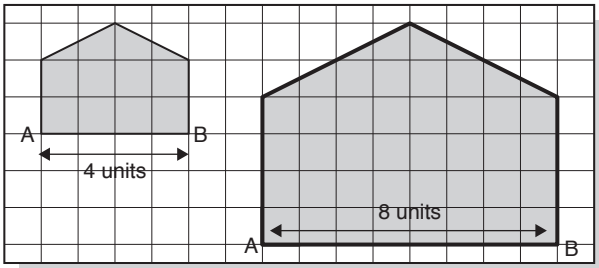
To draw a reduced or enlarged shape

- Measure the length of one side.
- Calculate the reduction or enlargement for this side.
- Repeat for all sides of the shape.
- Redraw the shape.

Q. Redraw this shape after doubling its size.

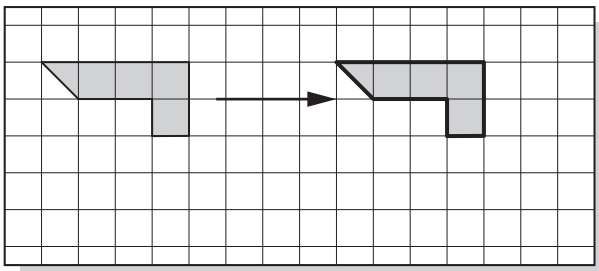


A.

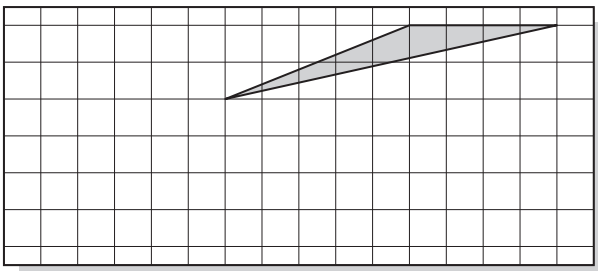


Doubling means ×2.
The distance from A to B is 4 units.
$4 \times 2 = 8$ units
Start drawing the enlargement, 8 units long, from the given corner.
Repeat for all sides of the shape.

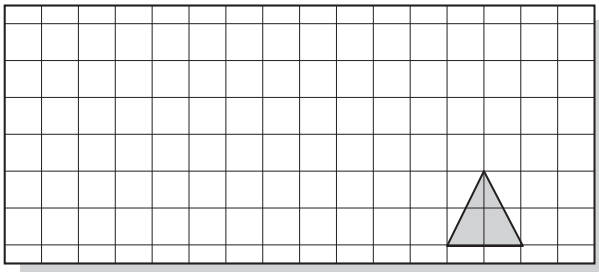
a) Redraw this shape after translating it 8 units to the right.



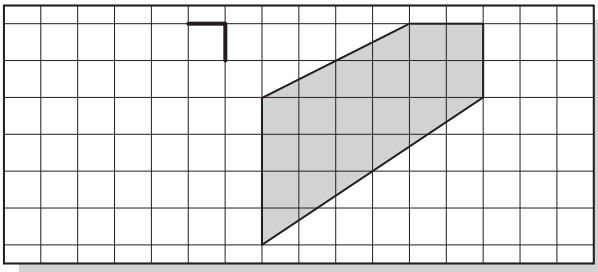
b) Redraw this shape after translating it 4 units down.



c) Redraw this shape after translating it 7 units to the left and then 3 units up.

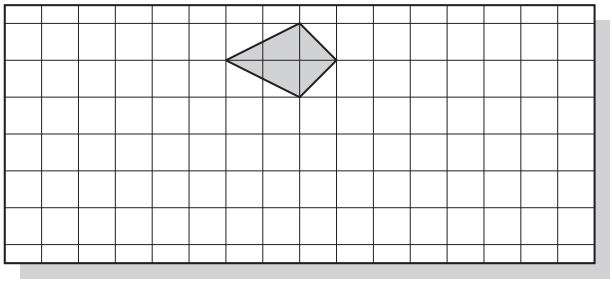


d) Redraw this shape after halving its size.

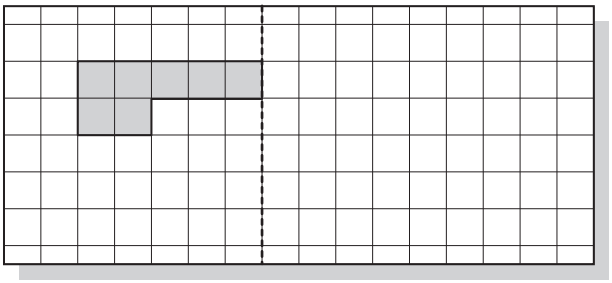


Skill 20.10 Drawing reflections, translations, rotations, enlargements and reductions on a grid (2).

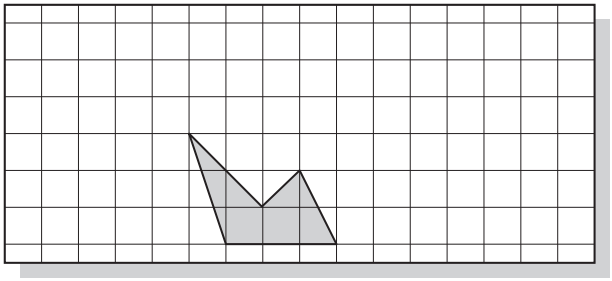
e) Redraw this shape after translating it 6 units to the right and then 3 units down.



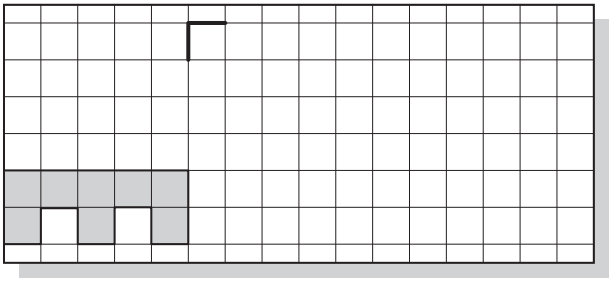
f) Redraw this shape after reflecting it in the dotted line, and then translating it 3 units down.



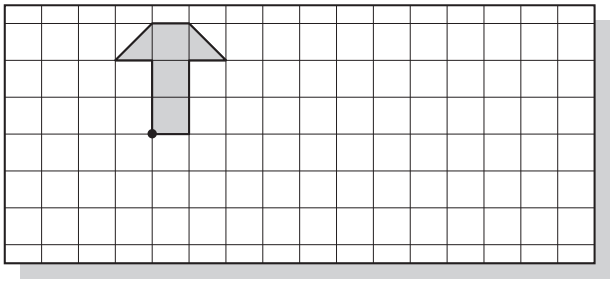
g) Redraw this shape after translating it 3 units up and then 5 units to the left.



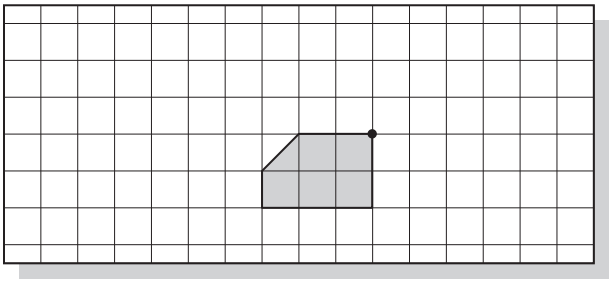
h) Redraw this shape after doubing its size.



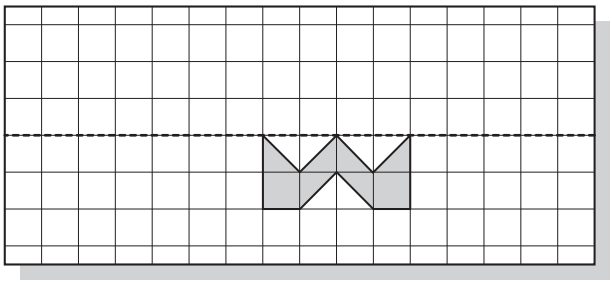
i) Redraw this shape after turning it 90° anticlockwise around the marked point.



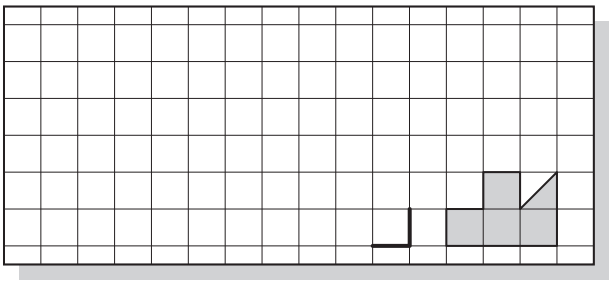
j) Redraw this shape after turning it 90° clockwise around the marked point and then translating it 4 units to the right.



k) Redraw this shape after reflecting it in the dotted line, and then translating it 6 units to the left.



l) Redraw this shape after tripling its size.



Skill 20.11 Identifying line and rotational symmetry.

For line symmetry

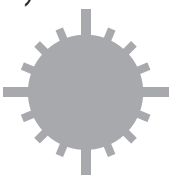
- Imagine a line along which the shape can be folded to have one part fit exactly over the other part.

For rotational symmetry

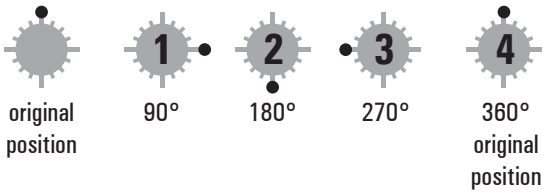
- Try to visualise the shape during a full turn of 360° and make sure that the shape could cover itself at least once before the full turn is completed.

Q. The shape has:

A) line symmetry
B) rotational symmetry
C) both line and rotational symmetry



A. *C*



This shape covers itself 4 times before a full 360° turn.
The shape has also line symmetry.

a) The shape has:

A) line symmetry
B) rotational symmetry
C) both line and rotational symmetry

A

b) The shape has:

A) line symmetry
B) rotational symmetry
C) both line and rotational symmetry

c) The shape has:

A) line symmetry
B) rotational symmetry
C) both line and rotational symmetry

d) The shape has:

A) line symmetry
B) rotational symmetry
C) both line and rotational symmetry

e) The shape has:

A) line symmetry
B) rotational symmetry
C) both line and rotational symmetry

f) The shape has:

A) line symmetry
B) rotational symmetry
C) both line and rotational symmetry

g) The shape has:

A) line symmetry
B) rotational symmetry
C) both line and rotational symmetry

h) The shape has:

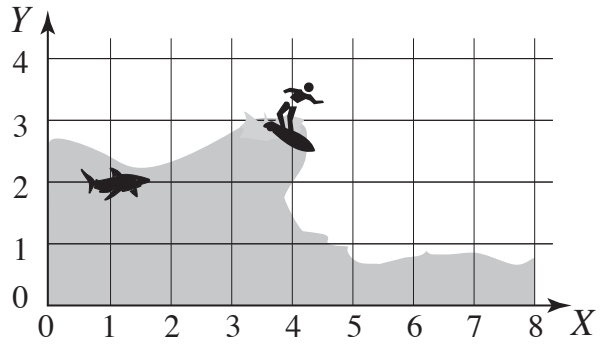
A) line symmetry
B) rotational symmetry
C) both line and rotational symmetry

Skill 20.12 Finding the coordinates of a point on a Cartesian plane, first quadrant.

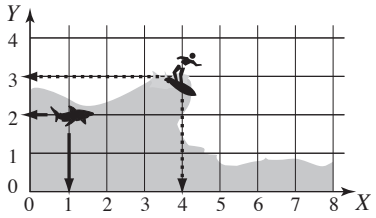
- Read the coordinate along the horizontal or *x*-axis first.
- Then read the coordinate on the vertical or *y*-axis.

Hint: x comes before y in the alphabet.

Q. What are the coordinates of the shark and the surfer on the grid?



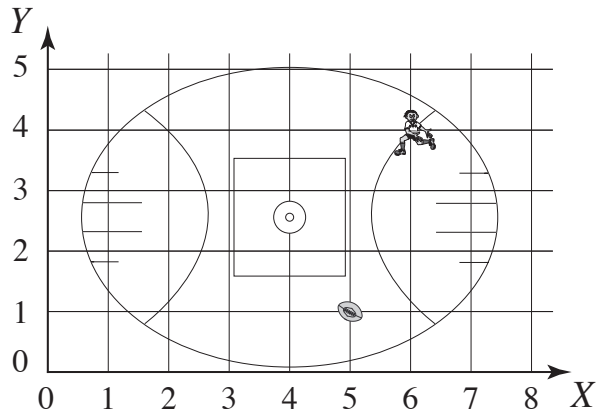
A. *shark* = ***(1,2)*** *surfer* = ***(4,3)***



Trace down from the shark to the *x*-axis. Write the number (1,).
1 is the *x*-coordinate for the shark.

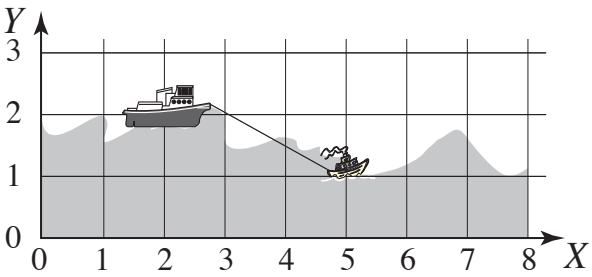
Trace across from the shark to the *y*-axis. Add the number 2 to the coordinate pair (1,2). 2 is the *y*-coordinate for the shark.
Repeat for the surfer: (4,3)

a) What are the coordinates of the umpire and the football on the oval?



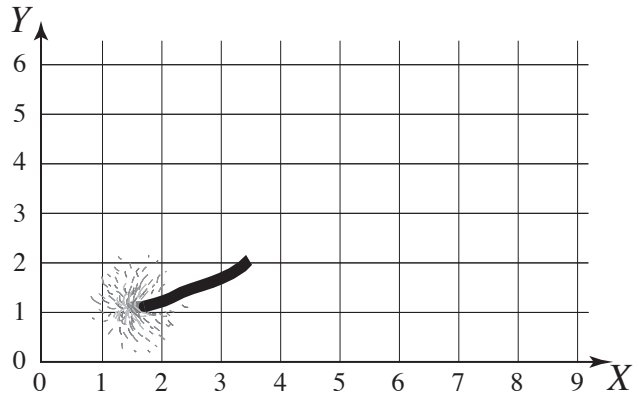
umpire = football =

b) What are the coordinates of the ship and the tugboat on the grid?

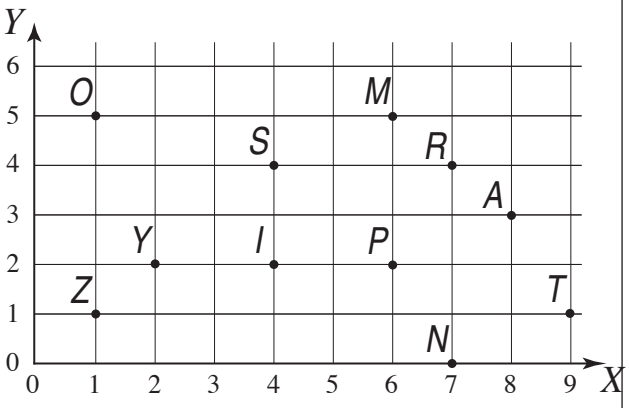


ship = tugboat =

c) Start at (4,1). Draw a line to (3,3) and continue to (6,5), (8,5), (7,3) and (4,1).



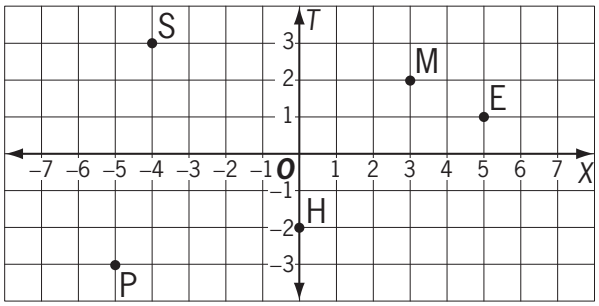
d) Find the letter at each pair of coordinates to decode the word.
(4,2) (7,4) (1,5) (7,0) (6,5) (8,3) (7,0)



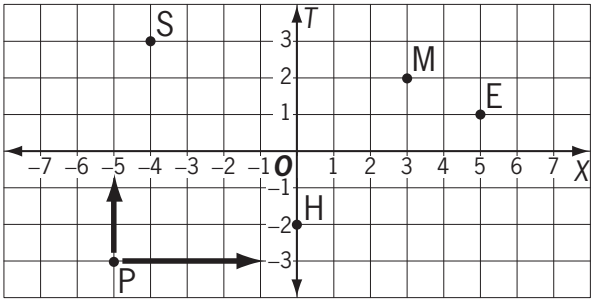
Skill 20.13 Finding the coordinates of a point on a Cartesian plane, all quadrants.

- Read the coordinate along the horizontal or *x*-axis first.
- Then read the coordinate on the vertical or *y*-axis.
  Hint: x comes before y in the alphabet.

Q. What are the coordinates of the point labelled P on the Cartesian plane?



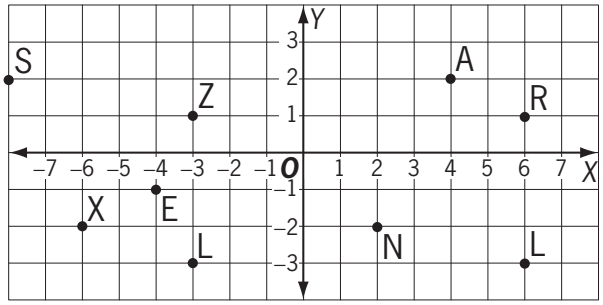
A. *P* = ***(–5,–3)***



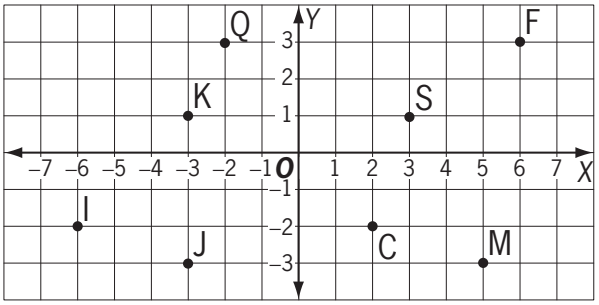
Trace toward the *x*-axis.
Write the number (–5,).
–5 is the *x*-coordinate for P.

Trace across from P to the *y*-axis.
Add the number –3 to the coordinate pair.
–3 is the *y*-coordinate for P.

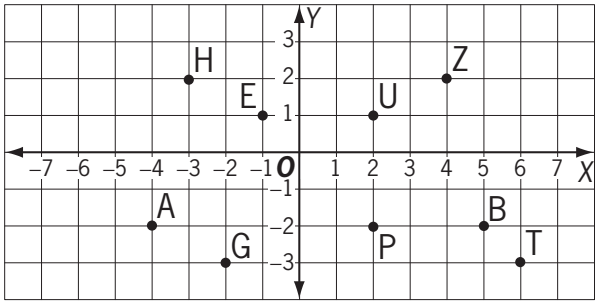
a) List the points in the second quadrant.



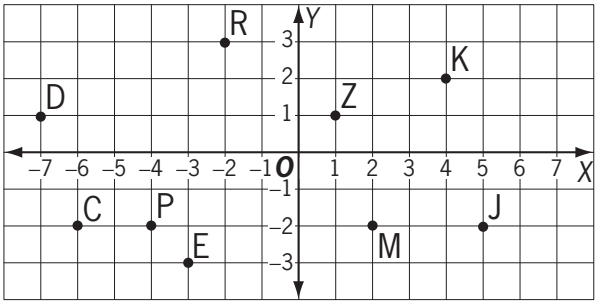
b) What are the coordinates of the point labelled M on the Cartesian plane?



c) List the points in the fourth quadrant.



d) What are the coordinates of the point labelled C on the Cartesian plane?



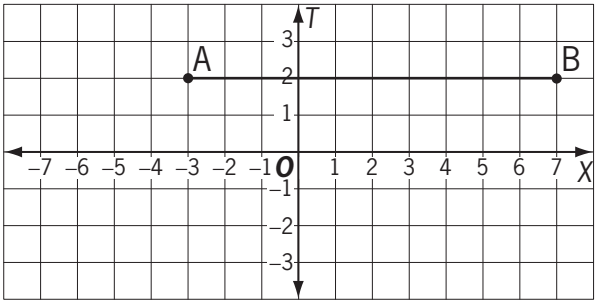
Skill 20.14 Measuring distance on a Cartesian plane.

- Count the number of grid spaces along the line.

OR

- If the line crosses an axis, add the number of grid spaces from either side of the axis.

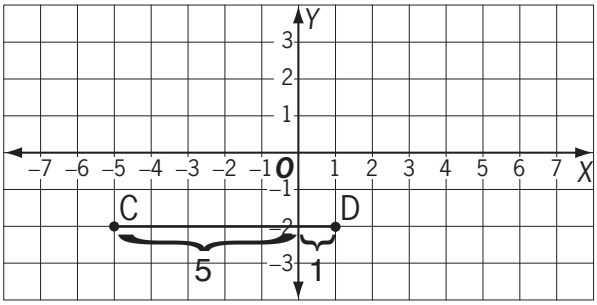
Q. What is the length in units of the segment AB?



A. *Length of AB =* ***10 units***

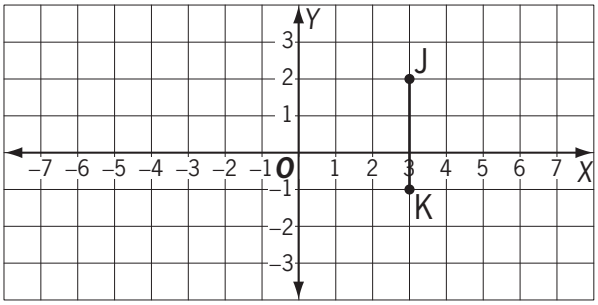
There are 3 grid spaces from A to the x-axis.
There are 7 grid spaces from the x-axis to B.
$3 + 7 = 10$

a) What is the length in units of the segment CD?



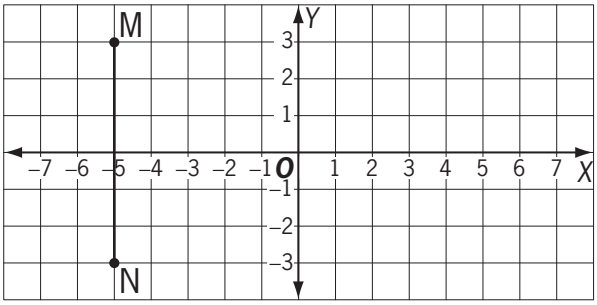
units

b) What is the length in units of the segment JK?



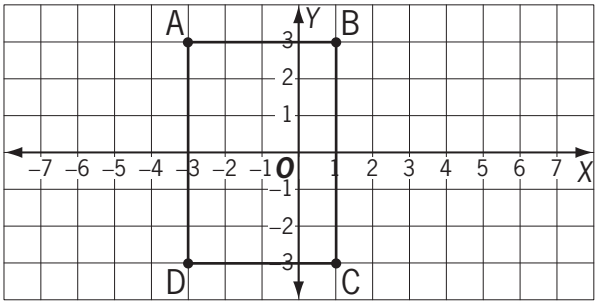
units

c) What is the length in units of the segment MN?



units

d) What is the perimeter in units of the rectangle ABCD?



units

