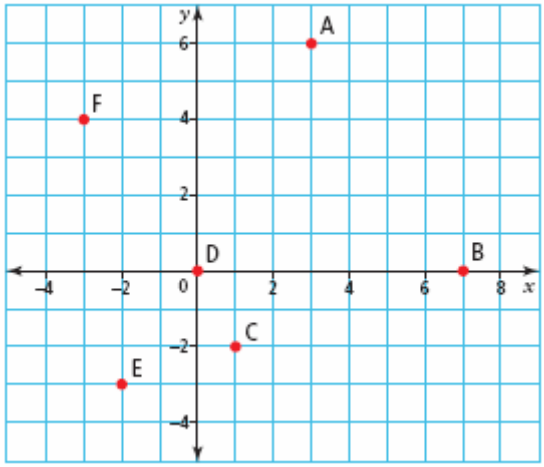
Chapter 1 Coordinates and Design

Section 1.1 The Cartesian Plane

Section 1.1 Page 9 Question 5



Point A is 3 units to the right of the origin. The *x*-coordinate is 3. Point A is 6 units up from the origin. The *y*-coordinate is 6. Point A has the coordinates A(3, 6).

Point B is 7 units to the right of the origin. The *x*-coordinate is 7. Point B is 0 units up from the origin. The *y*-coordinate is 0. Point B has the coordinates B(7, 0).

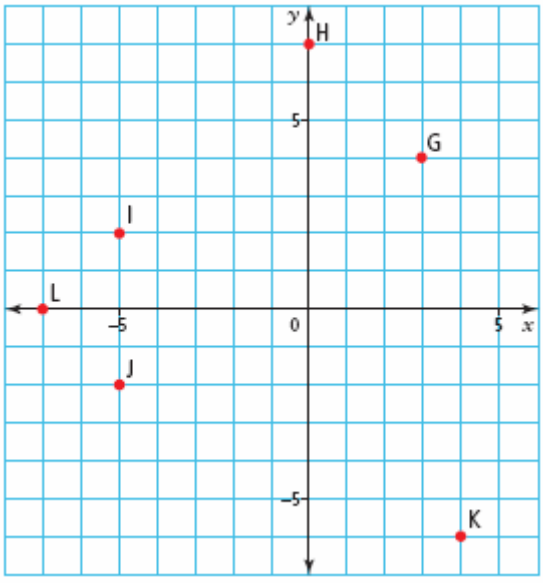
Point C is 1 unit to the right of the origin. The *x*-coordinate is 1. Point C is 2 units down from the origin. The *y*-coordinate is –2. Point C has the coordinates C(1, –2).

Point D is 0 units to the right of the origin. The *x*-coordinate is 0. Point D is 0 units up from the origin. The *y*-coordinate is 0. Point D has the coordinates D(0, 0).

Point E is 2 units to the left of the origin. The *x*-coordinate is –2. Point E is 3 units down from the origin. The *y*-coordinate is –3. Point E has the coordinates E(–2, –3).

Point F is 3 units to the left of the origin. The *x*-coordinate is –3. Point F is 4 units up from the origin. The *y*-coordinate is 4. Point F has the coordinates F(–3, 4).

Section 1.1 Page 9 Question 6



Point G is 3 units to the right of the origin. The *x*-coordinate is 3. Point G is 4 units up from the origin. The *y*-coordinate is 4. Point G has the coordinates G(3, 4).

Point H is 0 units to the right of the origin. The *x*-coordinate is 0. Point H is 7 units up from the origin. The *y*-coordinate is 7. Point H has the coordinates H(0, 7).

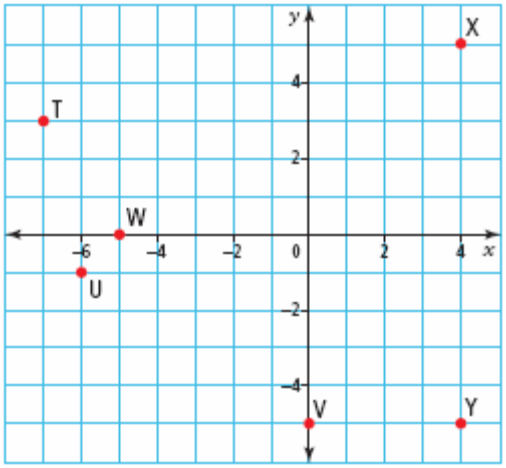
Point I is 5 units to the left of the origin. The *x*-coordinate is –5. Point I is 2 units up from the origin. The *y*-coordinate is 2. Point I has the coordinates I(–5, 2).

Point J is 5 units to the left of the origin. The *x*-coordinate is –5. Point J is 2 units down from the origin. The *y*-coordinate is –2. Point J has the coordinates J(–5, –2).

Point K is 4 units to the right of the origin. The *x*-coordinate is 4. Point K is 6 units down from the origin. The *y*-coordinate is –6. Point K has the coordinates K(4, –6).

Point L is 7 units to the left of the origin. The *x*-coordinate is –7. Point L is 0 units up from the origin. The *y*-coordinate is 0. Point L has the coordinates L(–7, 0).

Section 1.1 Page 9 Question 7



a) T(–7, 3); From the origin, move 7 units to the left. Then, move 3 units up.

b) X(4, 5); From the origin, move 4 units to the right. Then, move 5 units up.

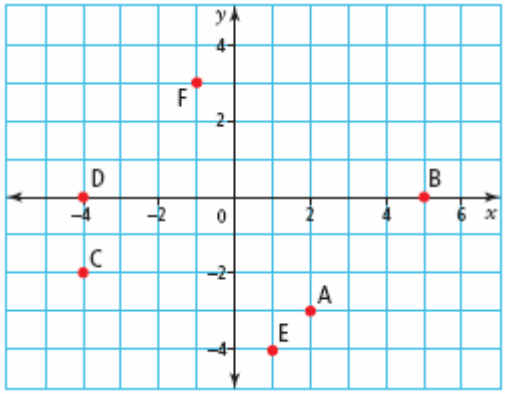
c) U(–6, –1); From the origin, move 6 units to the left. Then, move 1 unit down.

d) W(–5, 0); From the origin, move 5 units to the left.

e) Y(4, –5); From the origin, move 4 units to the right. Then, move 5 units down.

f) V(0, –5); From the origin, move 5 units down.

Section 1.1 Page 9 Question 8



a) E(1, –4); From the origin, move 1 unit to the right. Then, move 4 units down.

b) A(2, –3); From the origin, move 2 units to the right. Then, move 3 units down.

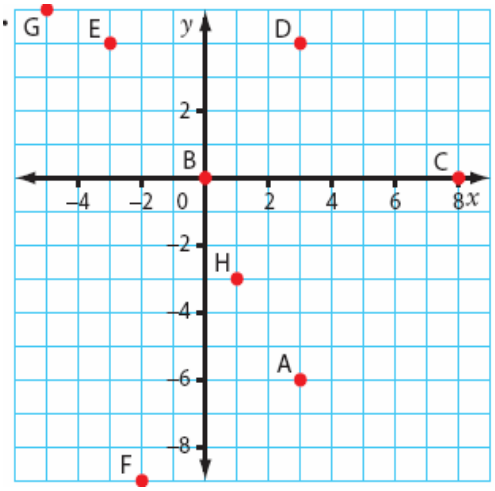
c) F(–1, 3); From the origin, move 1 unit to the left. Then, move 3 units up.

d) B(5, 0); From the origin, move 5 units to the right.

e) C(–4, –2); From the origin, move 4 units to the left. Then, move 2 units down.

f) D(–4, 0); From the origin, move 4 units to the left.

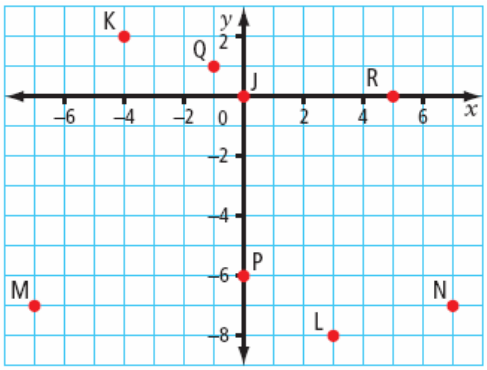
Section 1.1 Page 9 Question 9



The following points are located on the coordinate grid as illustrated.

A(3, –6); From the origin, move 3 units to the right. Then, move 6 units down.
B(0, 0) is at the origin.
C(8, 0); From the origin, move 8 units to the right. The point is on the *x*-axis.
D(3, 4); From the origin, move 3 units to the right. Then, move 4 units up.
E(–3, 4); From the origin, move 3 units to the left. Then, move 4 units up.
F(–2, –9); From the origin, move 2 units to the left. Then, move 9 units down.
G(–5, 5); From the origin, move 5 units to the left. Then, move 5 units up.
H(1, –3); From the origin, move 1 unit to the right. Then, move 3 units down.

Section 1.1 Page 9 Question 10



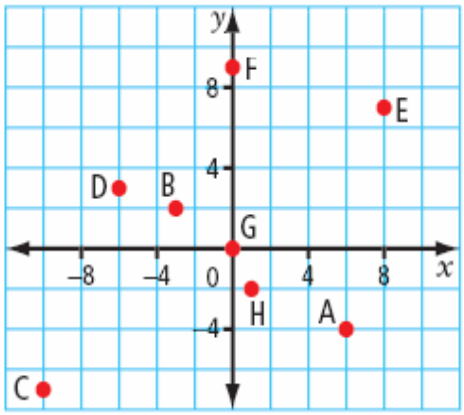
The following points are located on the coordinate grid as illustrated.

J(0, 0) is at the origin.
K(–4, 2); From the origin, move 4 units to the left. Then, move 2 units up.
L(3, –8); From the origin, move 3 units to the right. Then, move 8 units down.
M(–7, –7); From the origin, move 7 units to the left. Then, move 7 units down.
N(7, –7); From the origin, move 7 units to the right. Then, move 7 units down.
P(0, –6); From the origin, move 6 units down. Point P will be on the *y*-axis since the *x*-coordinate is 0.
Q(–1, 1); From the origin, move 1 unit to the left. Then, move 1 unit up.
R(5, 0); From the origin, move 5 units to the right. Point R will be on the *x*-axis since the *y*-coordinate is 0.

Section 1.1 Page 10 Question 11

a) A(6, –4); quadrant IV
B(–3, 2); quadrant II
C(–10, –7); quadrant III
D(–6, 3); quadrant II
E(8, 7); quadrant I
F(0, 9); no quadrant
G(0, 0); no quadrant
H(1, –2); quadrant IV

b) A(6, –4); From the origin, move 6 units to the right. Then, move 4 units down.
B(–3, 2); From the origin, move 3 units to the left. Then, move 2 units up.
C(–10, –7); From the origin, move 10 units to the left. Then, move 7 units down.
D(–6, 3); From the origin, move 6 units to the left. Then, move 3 units up.
E(8, 7); From the origin, move 8 units to the right. Then, move 7 units up.
F(0, 9); From the origin, move 9 units up. Point F will be on the *y*-axis since the *x*-coordinate is 0.
G(0, 0) is at the origin.
H(1, –2); From the origin, move 1 unit to the right. Then, move 2 units down.

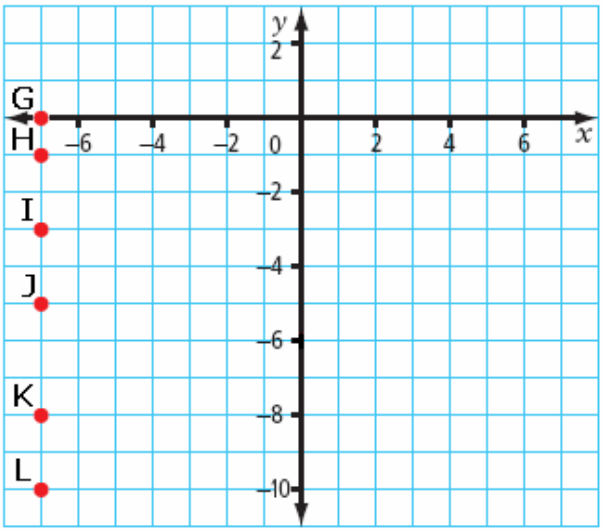


c) Answers may vary, depending on the accuracy of your predictions.

d) Points F and G do not lie in any quadrant. Point F lies on the *y*-axis, and G lies on the origin.

Section 1.1 Page 10 Question 12

G(–7, 0); From the origin, move 7 units to the left.
H(–7, –1); From the origin, move 7 units to the left. Then, move 1 unit down.
I(–7, –3); From the origin, move 7 units to the left. Then, move 3 units down.
J(–7, –5); From the origin, move 7 units to the left. Then, move 5 units down.
K(–7, –8); From the origin, move 7 units to the left. Then, move 8 units down.
L(–7, –10); From the origin, move 7 units to the left. Then, move 10 units down.



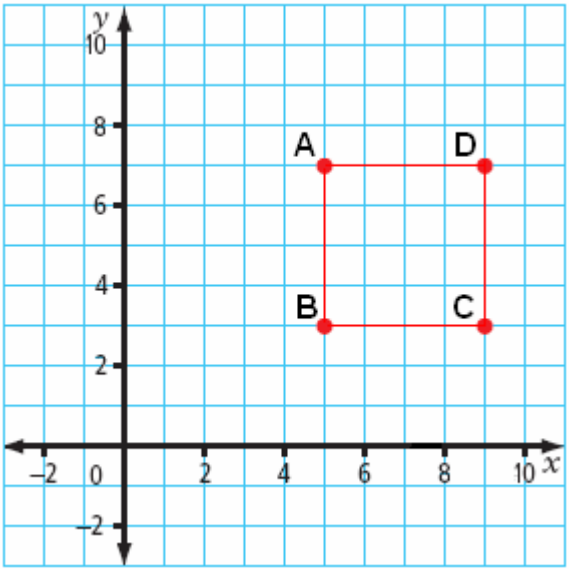
a) The points form a vertical dotted line.

b) The x-coordinate of each point is –7.

c) Answers may vary. For example, (–7, –2), (–7, –4).

Section 1.1 Page 10 Question 13

A(5, 7); From the origin, move 5 units to the right. Then, move 7 units up.
B(5, 3); From the origin, move 5 units to the right. Then, move 3 units up.
C(9, 3); From the origin, move 9 units to the right. Then, move 3 units up.
D(9, 7); From the origin, move 9 units to the right. Then, move 7 units up.



a) The points form a square.

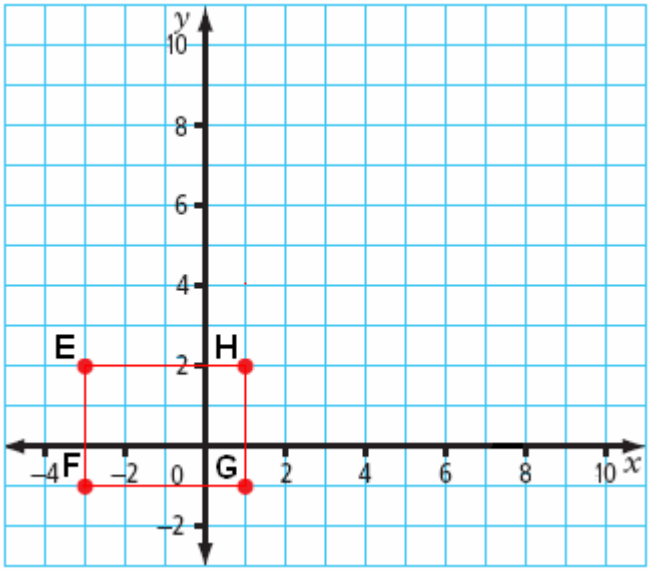
b) The shape is located in quadrant I.

c) The side lengths of the shape are 4 units.

d) The pairs of points are similar in the following ways: A and B have the same x-coordinate; C and D have the same x-coordinate; A and D have the same y-coordinate; B and C have the same y-coordinate.

Section 1.1 Page 10 Question 14

E(–3, 2); From the origin, move 3 units to the left. Then, move 2 units up.
F(–3, –1); From the origin, move 3 units to the left. Then, move 1 unit down.
G(1, –1); From the origin, move 1 unit to the right. Then, move 1 unit down.
H(1, 2); From the origin, move 1 unit to the right. Then, move 2 units up.



The rectangle measures 4 units by 3 units.

$$\begin{aligned}\text{Area} &= \text{length} \times \text{width} \\ &= 4 \times 3 \\ &= 12\end{aligned}$$

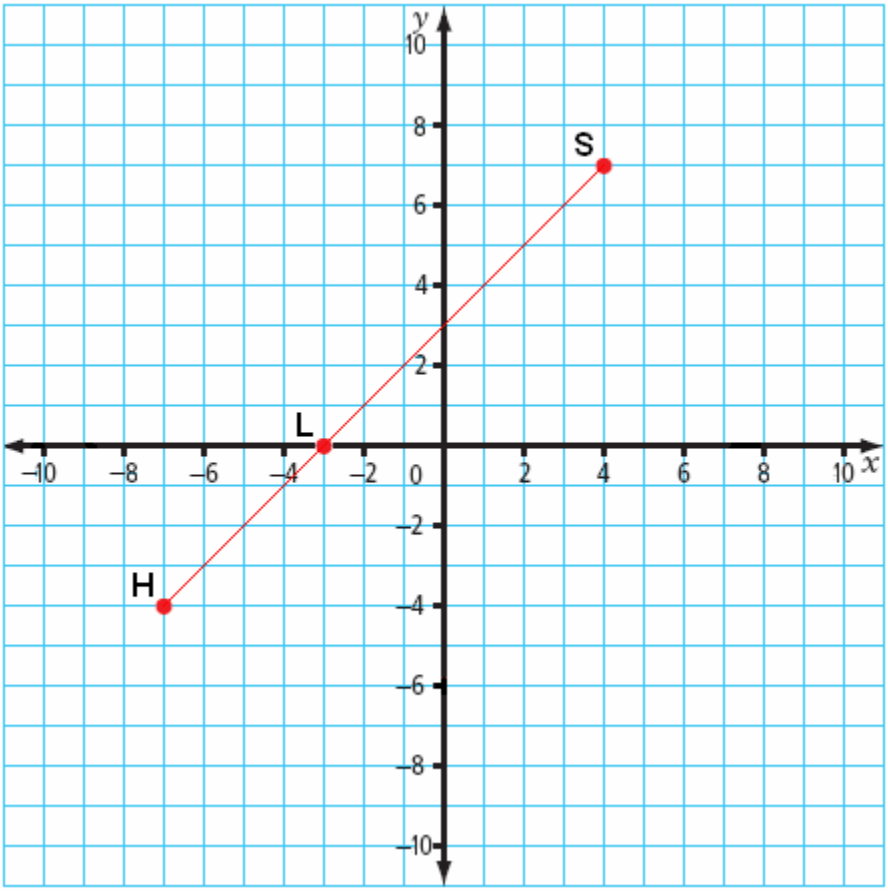
The area of the rectangle is 12 square units.
Answers may vary. You can check the area by counting all of the squares inside the marked area.

Section 1.1 Page 10 Question 15

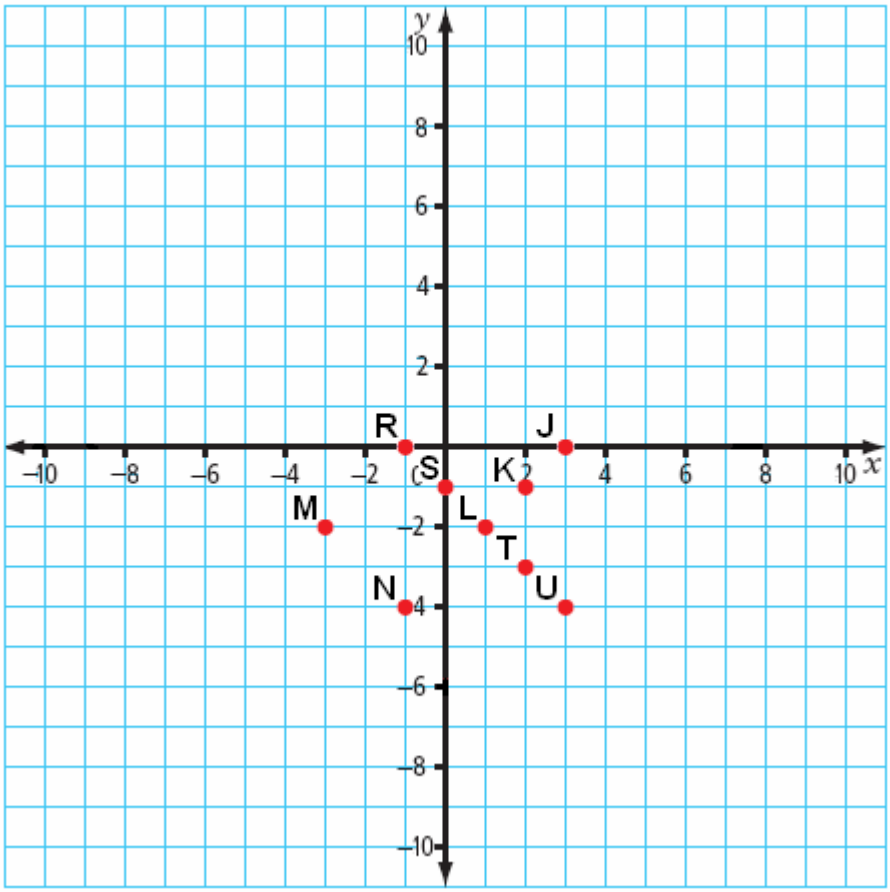
a) They have to cross a street 20 times, assuming that they do not cross diagonally.

b) They will cross at the traffic light at L(–3, 0).

c) They will cross at point W(0, 3) but not at C(0, 5).



Section 1.1 Page 10 Question 16



Plot the points as shown.

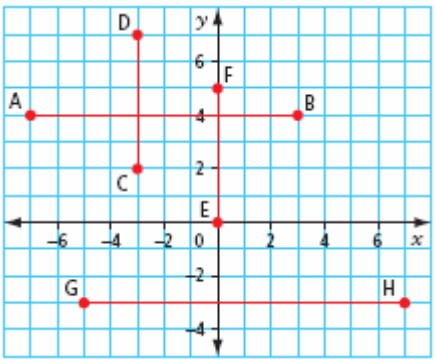
a) No, she will not make an X.

b) She needs to change M(–3, –2) if she wants to fix it.

c) The correct ordered pair is M(0, –3).

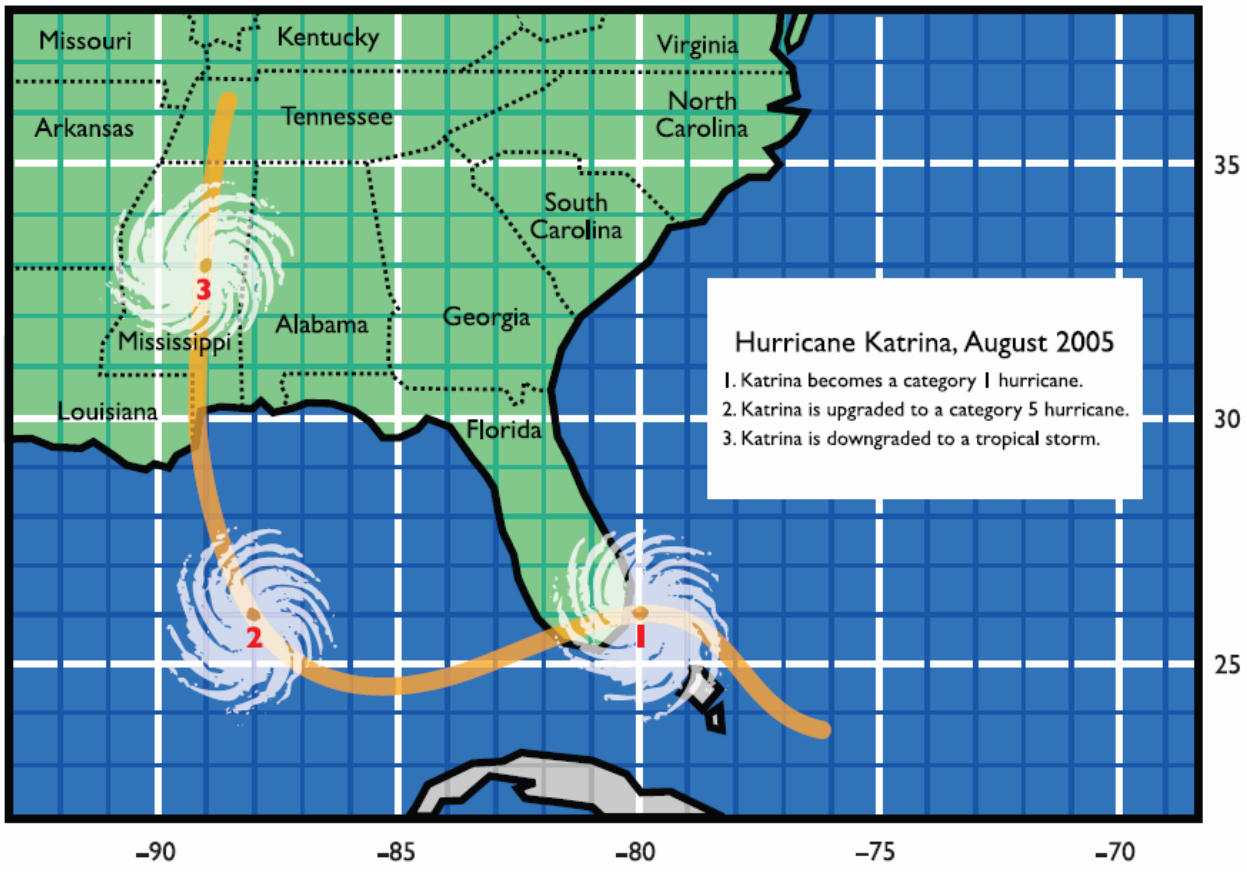
Section 1.1 Page 11 Question 17

a)



b) AB is a horizontal line. The distance between the points can be found by counting 10 units from A to B.
CD is a vertical line. The distance between the points can be found by counting 5 units from C to D.
EF is a vertical line. The distance between the points can be found by counting 5 units from E to F.
GH is a horizontal line. The distance between the points can be found by counting 12 units from G to H.

Section 1.1 Page 11 Question 18



a) Find the hurricane symbol labelled 1. When the storm became a category 1 hurricane, the coordinates were (–80, 26).

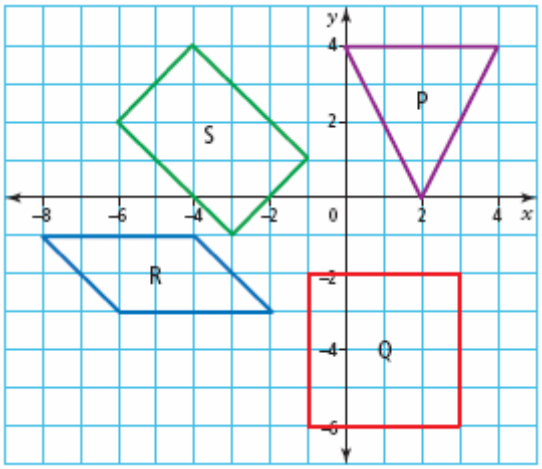
b) Find the hurricane symbol labelled 2. When the storm became upgraded to a category 5 hurricane, the coordinates were (–88, 26).

c) Find the hurricane symbol labelled 3. When the storm became downgraded to a tropical storm, the coordinates were (–89, 33).

Section 1.2 Create Designs

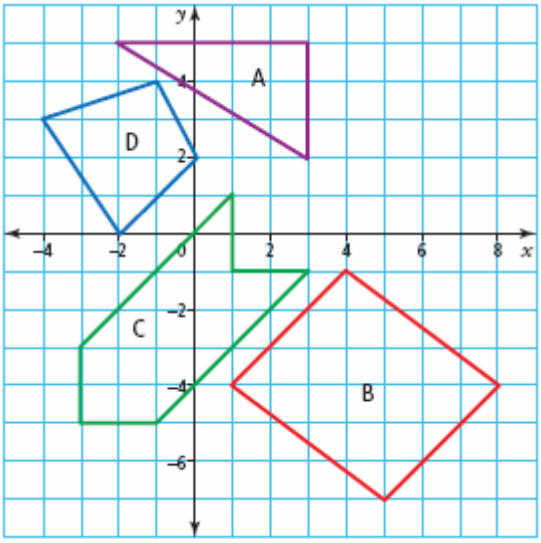
Section 1.2 Page 15 Question 3

The coordinates of the vertices of figure P are (2, 0), (4, 4), and (0, 4).
The coordinates of the vertices of figure Q are (–1, –2), (–1, –6), (3, –2), and (3, –6).
The coordinates of the vertices of figure R are (–2, –3), (–6, –3), (–8, –1), and (–4, –1).
The coordinates of the vertices of figure S are (–3, –1), (–1, 1), (–6, 2), and (–4, 4).



Section 1.2 Page 15 Question 4

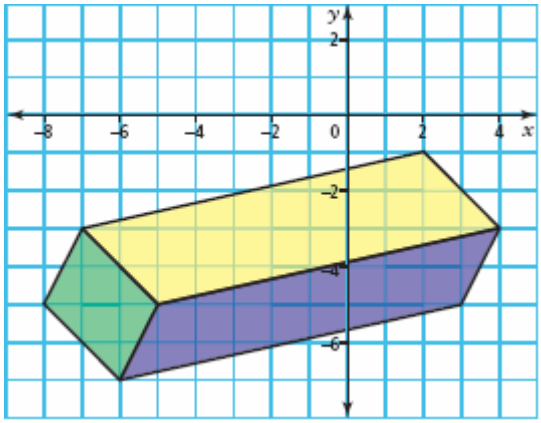
The coordinates of the vertices of figure A are (3, 2), (3, 5), and (–2, 5).
The coordinates of the vertices of figure B are (4, –1), (1, –4), (5, –7), and (8, –4).
The coordinates of the vertices of figure C are (–3, –3), (–3, –5), (–1, –5), (3, –1), (1, –1), and (1, 1).
The coordinates of the vertices of figure D are (0, 2), (–1, 4), (–4, 3), and (–2, 0).



Section 1.2 Page 15 Question 5

a) The coordinates of the vertices are (4, –3), (–8, –5), (–6, –7), (–5, –5), (2, –1), (3, –5), and (4, –3).

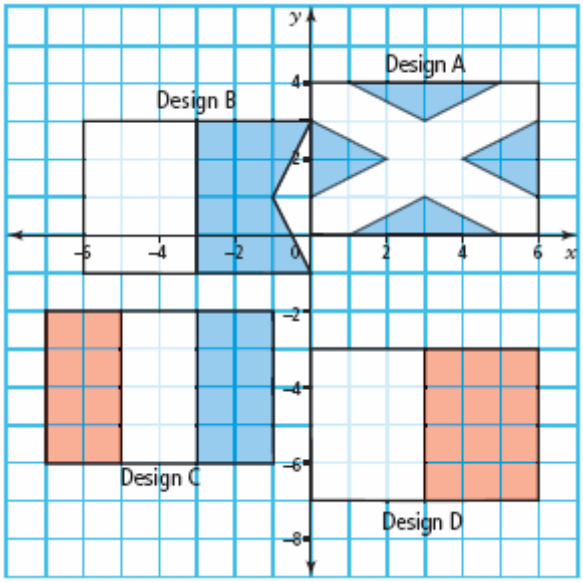
b) Plot the points from part a). Join vertices as required to reproduce the design.



Section 1.2 Page 15 Question 6

Answers may vary. A sample solution is shown.

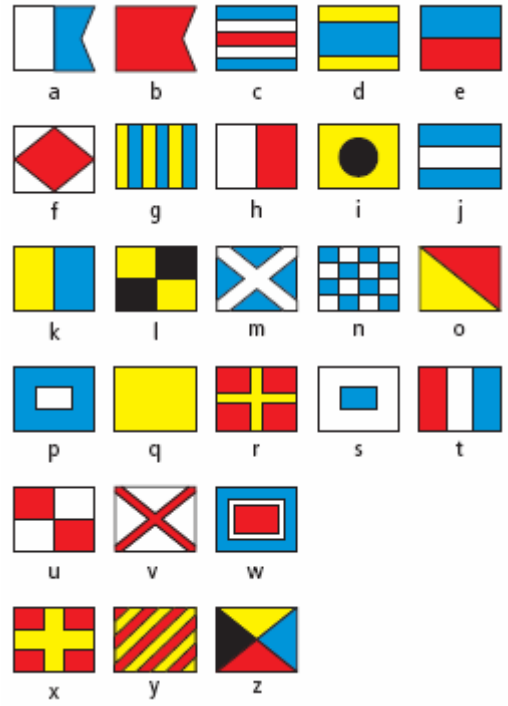
The coordinates of the vertices to connect for Design A are (1, 0) to (3, 1) to (5, 0), then (6, 1) to (4, 2) to (6, 3), then (5, 4) to (3, 3) to (1, 4), then (0, 3) to (2, 2) to (0, 1). Colour the triangles.
The coordinates of the vertices to connect for Design B are (0, 3) to (–3, 3) to (–6, 3) to (–6, –1) to (–3, –1) to (0, –1) to (–1, 1) to (0, 3), then (–3, 3) to (–3, –1). Colour the right side of the design.
The coordinates of the vertices to connect for Design C are to plot and connect all 8 vertices around the outside edge of the design. Connect (–3, –2) to (–3, –6), then connect (–5, –2) to (–5, –6). Colour the left and right rectangles.
The coordinates of the vertices to connect for Design D are (0, –3) to (0, –7) to (3, –7) to (6, –7) to (6, –3) to (3, –3) to (0, –3). Colour the rectangle on the right.



Section 1.2 Page 16 Question 7

The flags in #6 spell math.

Quadrant I spells m.
Quadrant II spells a.
Quadrant III spells t.
Quadrant IV spells h.



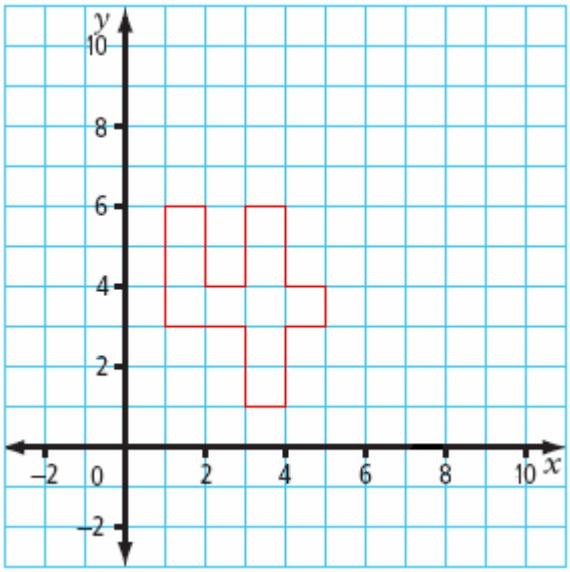
Section 1.2 Page 16 Question 8

a) Answers may vary. A sample answer is shown.
To design a word on the coordinate grid, such as the word BOAT, create the letters as follows:
B: connect (2, 6) to (2, 2) to (8, 2) to (5, 4) to (8, 6) to (2, 6).
O: connect (–2, 2) to (–2, 6) to (–8, 6) to (–8, 2) to (–2, 2), and connect (–8, 6) to (–2, 2).
A: connect (–2, –2) to (–8, –2) to (–8, –6) to (–2, –6) to (–3, –4) to (–2, –2), and connect (–5, –2) to (–5, –6).
T: connect (2, –2) to (8, –2) to (8, –6) to (2, –6) to (2, –2), connect (4, –2) to (4, –6), and connect (6, –2) to (6, –6).

b) Answers may vary depending upon what each student has designed.

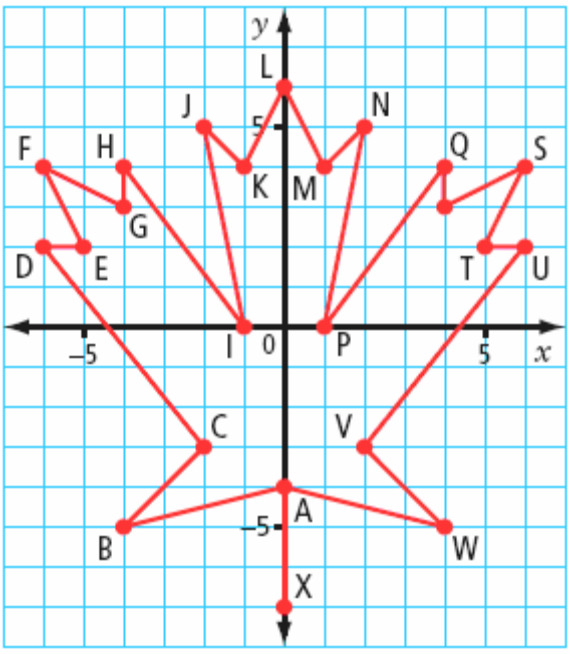
Section 1.2 Page 16 Question 9

Answers may vary. For example, to draw the number 4, the instructions might be to plot and join the following points in order: (1, 6), (2, 6), (2, 4), (3, 4), (3, 6), (4, 6), (4, 4), (5, 4), (5, 3), (4, 3), (4, 1), (3, 1), (3, 3), (1, 3). Join (1, 3) to (1, 6).



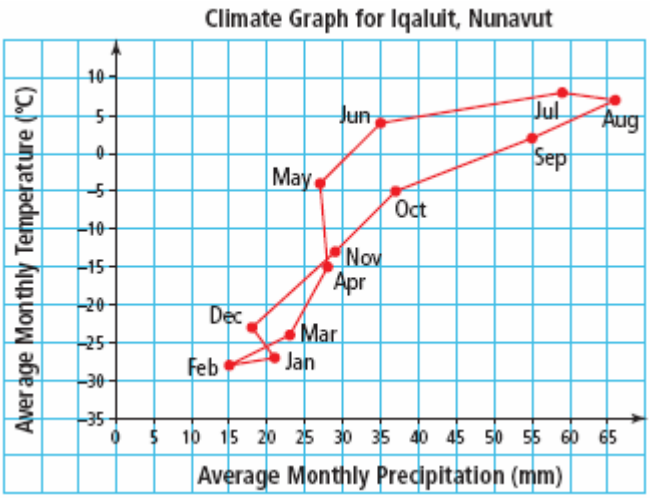
Section 1.2 Page 16 Question 10

a)



b) The symbol is a maple leaf.

Section 1.2 Page 16 Question 11



a) Find the point labelled January. Look down to find the monthly precipitation. It is about 21 mm. Look to the left to find the average monthly temperature. It is about –27°C. The ordered pair for January is (21, –27).

b) Find the point labelled April. Look down to find the monthly precipitation. It is about 28 mm. Look to the left to find the average monthly temperature. It is about –15°C. The ordered pair for April is (21, –27).

c) Find the point labelled July. Look down to find the monthly precipitation. It is about 59 mm. Look to the left to find the average monthly temperature. It is about 8°C. The ordered pair for July is (59, 8).

d) Find the point labeled October. Look down to find the monthly precipitation. It is about 37 mm. Look to the left to find the average monthly temperature. It is about –5°C. The ordered pair for October is (37, –5).

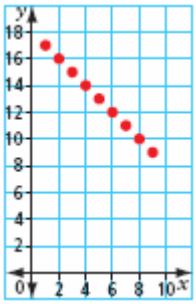
Section 1.2 Page 17 Question 12

a) All possible whole number values for the length and width of the rectangle are shown in the table:

l	*w*
1	17
2	16
3	15
4	14
5	13
6	12
7	11
8	10
9	9

b) All possible whole number values for the length and width of the rectangle are expressed in the following ordered pairs (l, w): (1, 17), (2, 16), (3, 15), (4, 14), (5, 13), (6, 12), (7, 11), (8, 10), (9, 9).

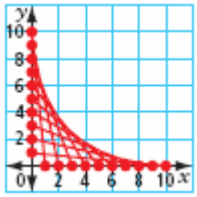
c)



d) The points are located in quadrant I. Length and width are always positive values.

Section 1.2 Page 17 Question 13

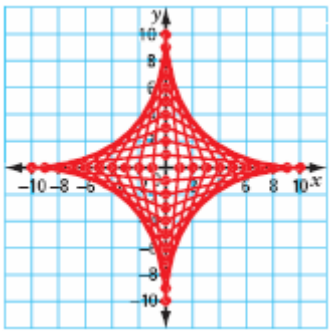
a)



b) The coordinates of the endpoints of the lines that complete the design are (0, 6) and (5, 0), (0, 5) and (6, 0), (0, 4) and (7, 0), (0, 3) and (8, 0), (0, 2) and (9, 0), (0, 1) and (10, 0).

Section 1.2 Page 17 Question 14

a)



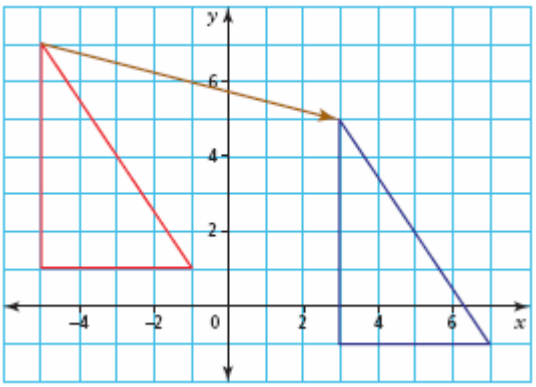
b) The ordered pairs on the *y*-axis for the shapes in quadrant I and III have the same *x*-values and opposite *y*-values. The ordered pairs on the *x*-axis for the shapes in quadrants I and III have opposite *x*-values and opposite *y*-values.

c) The design is a 4 point star shape with concave sides.

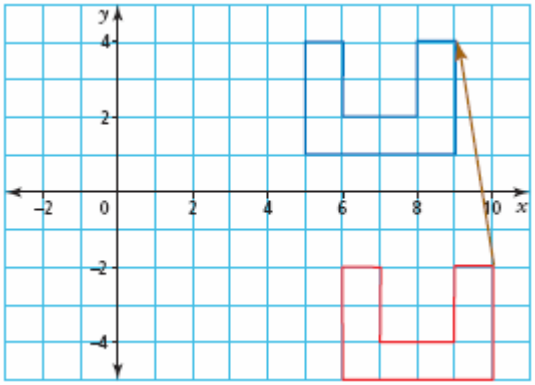
Section 1.3 Transformations

Section 1.3 Page 24 Question 3

a) Count the number of horizontal units and vertical units represented by the translation arrow. The horizontal distance is 8 units to the right, and the vertical distance is 2 units down.

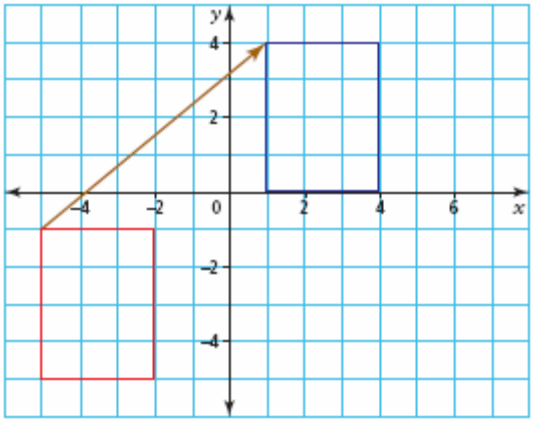


b) Count the number of horizontal units and vertical units represented by the translation arrow. The horizontal distance is 1 unit to the left, and the vertical distance is 6 units up.

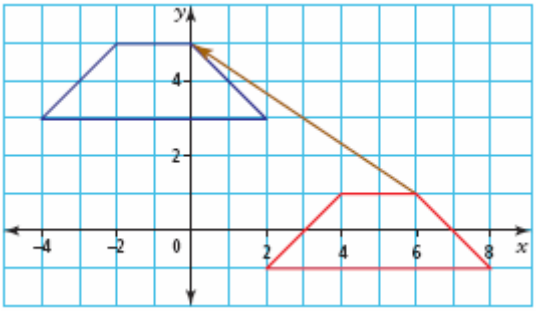


Section 1.3 Page 25 Question 4

a) Count the number of horizontal units and vertical units represented by the translation arrow. The horizontal distance is 6 units to the right, and the vertical distance is 5 units up.

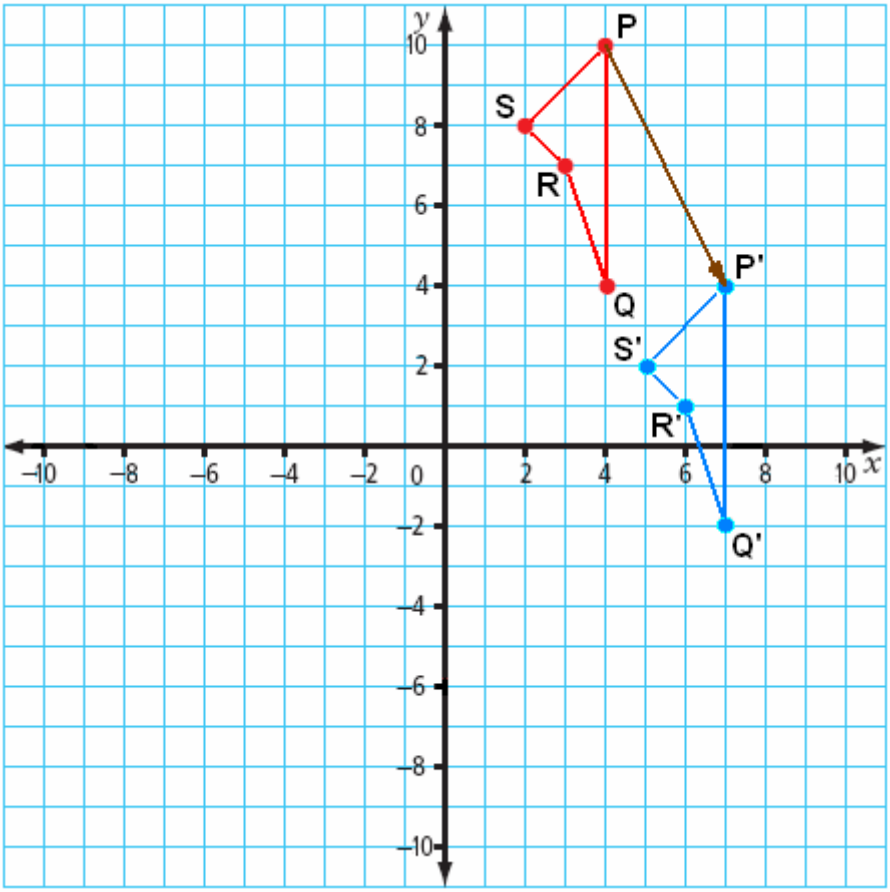


b) Count the number of horizontal units and vertical units represented by the translation arrow. The horizontal distance is 6 units to the left, and the vertical distance is 4 units up.



Section 1.3 Page 25 Question 5

a)

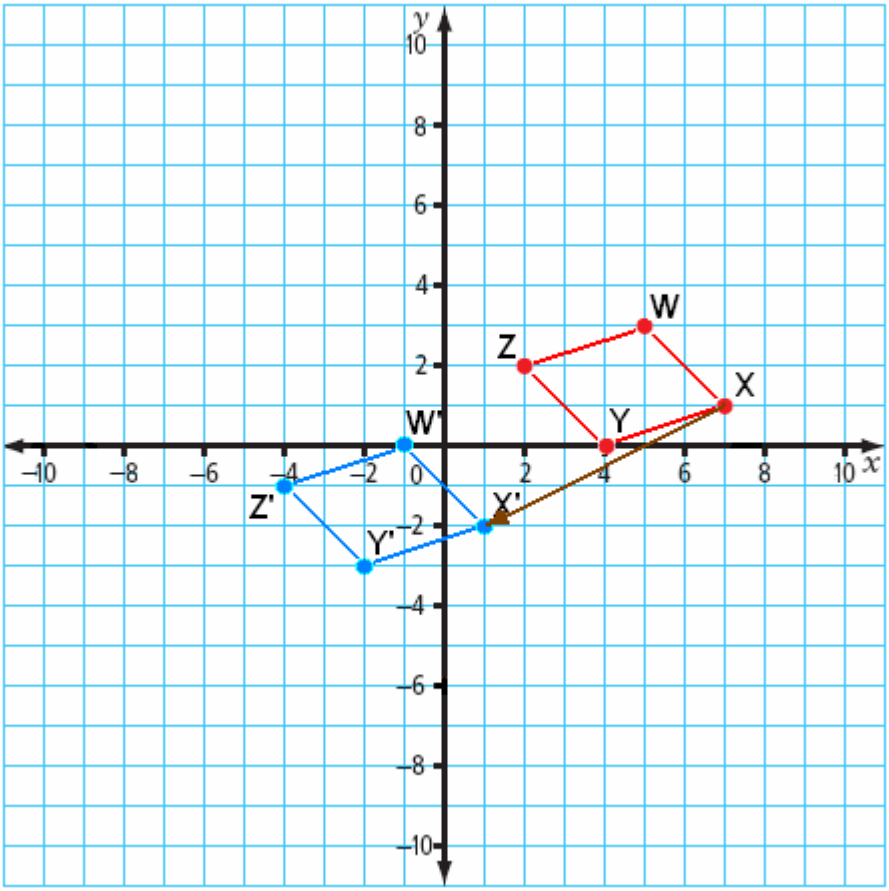


b) The coordinates of the translation image are P'(7, 4), Q'(7, –2), R'(6, 1), and S'(5, 2).

c) The translation arrow is shown: 3 units right and 6 units down.

Section 1.3 Page 25 Question 6

a)

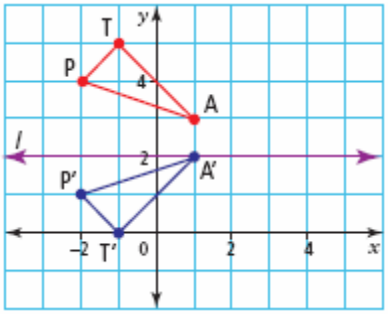


b) The coordinates of the translation image are W'(–1, 0), X'(1, –2), Y'(–2, –3), and Z'(–4, –1).

c) The translation arrow is shown: 6 units left and 3 units down

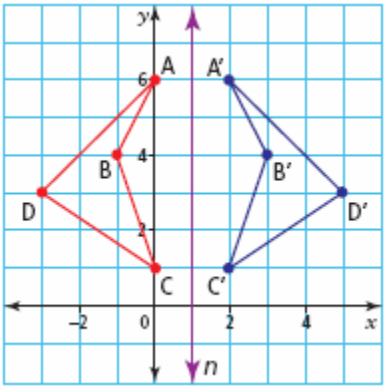
Section 1.3 Page 25 Question 7

$\Delta T'A'P'$ is not a reflection image of ΔTAP in the line of reflection, l. Each vertex is not the same distance from the line of reflection, l, as its reflected vertex.



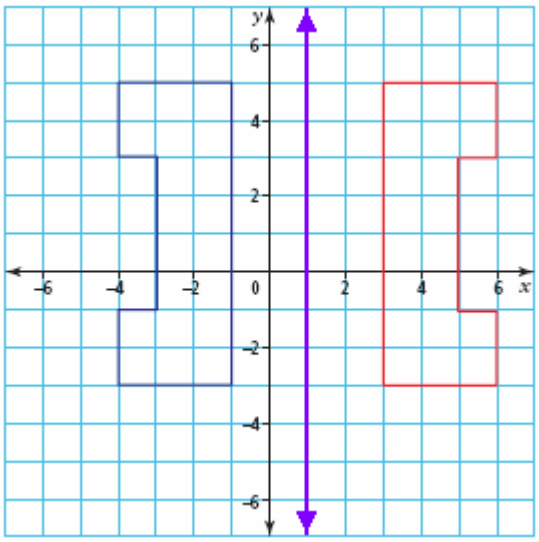
Section 1.3 Page 25 Question 8

Figure A'B'C'D' is a reflection image of figure ABCD in the line of reflection, n. Each vertex in the red figure is the same distance from the line of reflection, n, as its reflected vertex in the blue image.



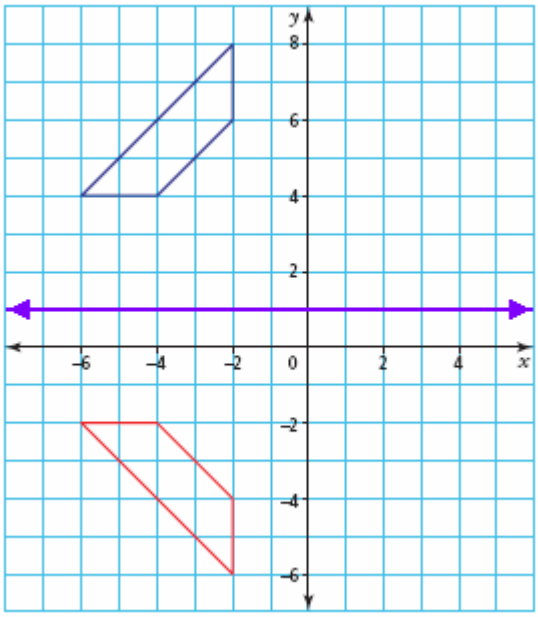
Section 1.3 Page 26 Question 9

Choose any vertex in the red figure. Find the corresponding vertex in the blue image. Find the halfway point between the two vertices. Repeat this process for another vertex. Create a line joining the two points that were found at the halfway point. This is the line of reflection. The line of reflection is the line $x = 1$ as shown in purple.



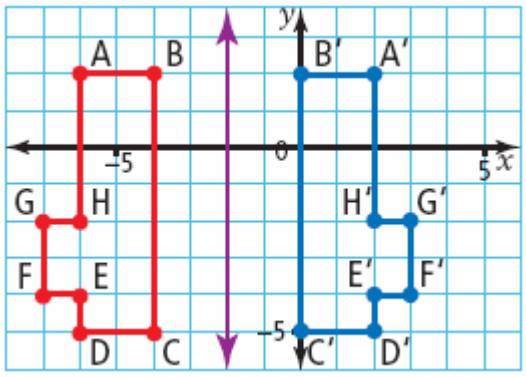
Section 1.3 Page 26 Question 10

Choose any vertex in the red figure. Find the corresponding vertex in the blue image. Find the halfway point between the two vertices. Repeat this process for another vertex. Create a line joining the two points that were found at the halfway point. This is the line of reflection. The line of reflection is the line $y = 1$ as shown in purple.



Section 1.3 Page 26 Question 11

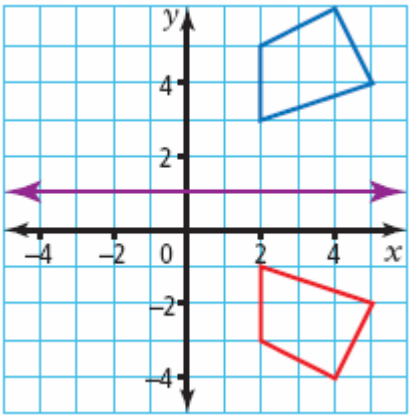
a)



b) The coordinates of A'B'C'D'E'F'G'H' are A'(2, 2), B'(0, 2), C'(0, –5), D'(2, –5), E'(2, –4), F'(3, –4), G'(3, –2), and H'(2, –2).

Section 1.3 Page 26 Question 12

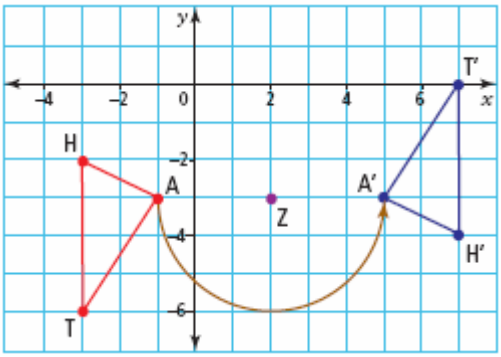
The blue figure is the reflection image of the red quadrilateral.



Section 1.3 Page 27 Question 13

a) The coordinates for ΔHAT are H(–3, –2), A(–1, –3), and T(–3, –6). The coordinates for ΔH'A'T' are H'(7, –4), A'(5, –3), and T'(7, 0).

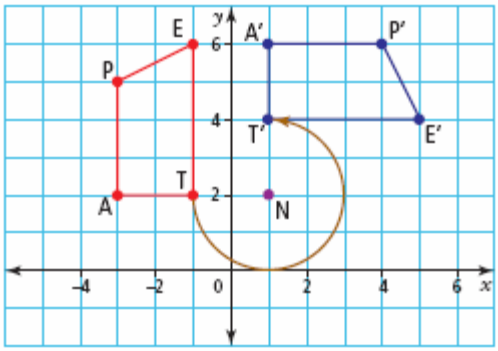
b) The rotation is 180° counterclockwise.



Section 1.3 Page 27 Question 14

a) The coordinates for figure TAPE are T(–1, 2), A(–3, 2), P(–3, 5), and E(–1, 6). The coordinates for figure T'A'P'E' are T'(1, 4), A'(1, 6), P'(4, 6), and E'(5, 4).

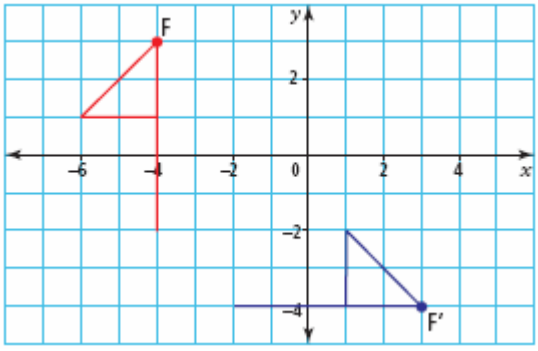
b) The rotation is 270° counterclockwise.



Section 1.3 Page 27 Question 15

a) The coordinates for the centre of rotation are (–4, –4).

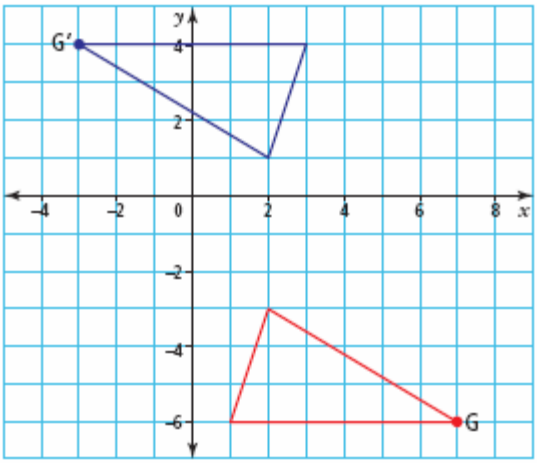
b) Rotating the figure 90° clockwise will produce the same image as rotating it 270° in the opposite direction, or counterclockwise.



Section 1.3 Page 27 Question 16

a) The coordinates for the centre of rotation are (2, –1).

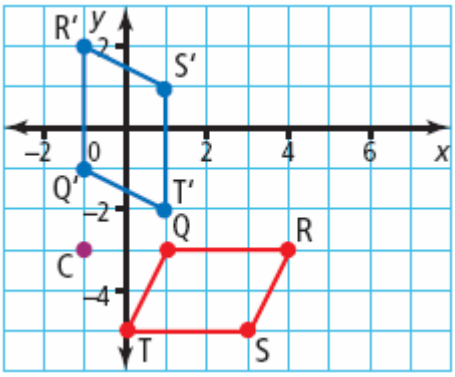
b) The direction and angle of the rotation could be 180° clockwise or 180° counterclockwise.



Section 1.3 Page 28 Question 17

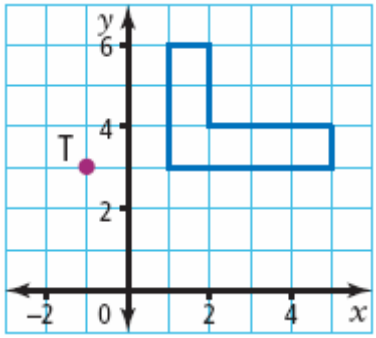
a) The figure represents the parallelogram rotated about C, 270° clockwise.

b) The coordinates for Q'R'S'T' are Q'(–1, –1), R'(–1, 2), S'(1, 1), and T'(1, –2).



Section 1.3 Page 28 Question 18

a)

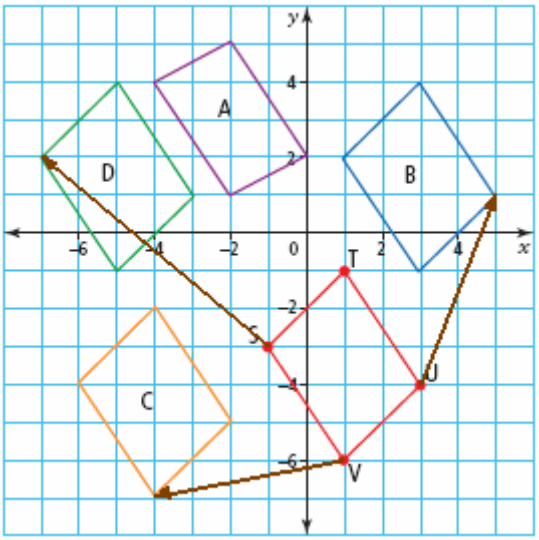


b) The rotation image is identical to the original image.

Section 1.3 Page 28 Question 19

a) By comparing the vertical and horizontal shift of the vertices in parallelogram STUV, you see that figures B, C and D are translation images.

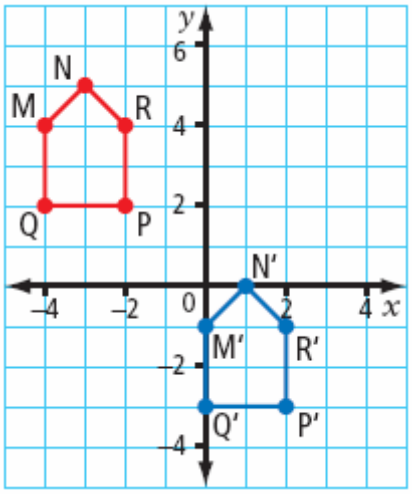
b)



c) B results from a translation of 2 units right and 5 units up.
C results from a translation of 5 units left and 1 unit down.
D results from a translation of 6 units left and 5 units up.

Section 1.3 Page 28 Question 20

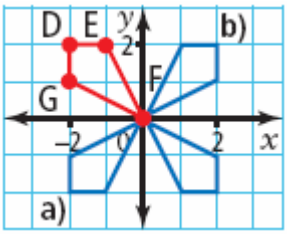
a)–b)



c) The translation that would create this new position would be to move 4 units right and 5 units down.

Section 1.3 Page 29 Question 21

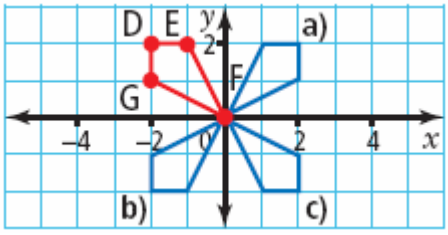
a)–b)



c) The figures are the same since they have the same shape. They are different because they are located at different positions on the coordinate grid.

Section 1.3 Page 29 Question 22

a)–c)

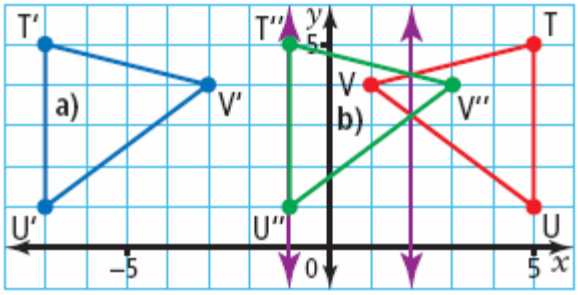


Section 1.3 Page 29 Question 23

The final designs in #21 and #22 are the same because they have the same coordinates. The designs are different because in quadrants I and III, the reflected vertices E and G are in opposite positions from the rotated vertices E and G.

Section 1.3 Page 29 Question 24

a)–b)



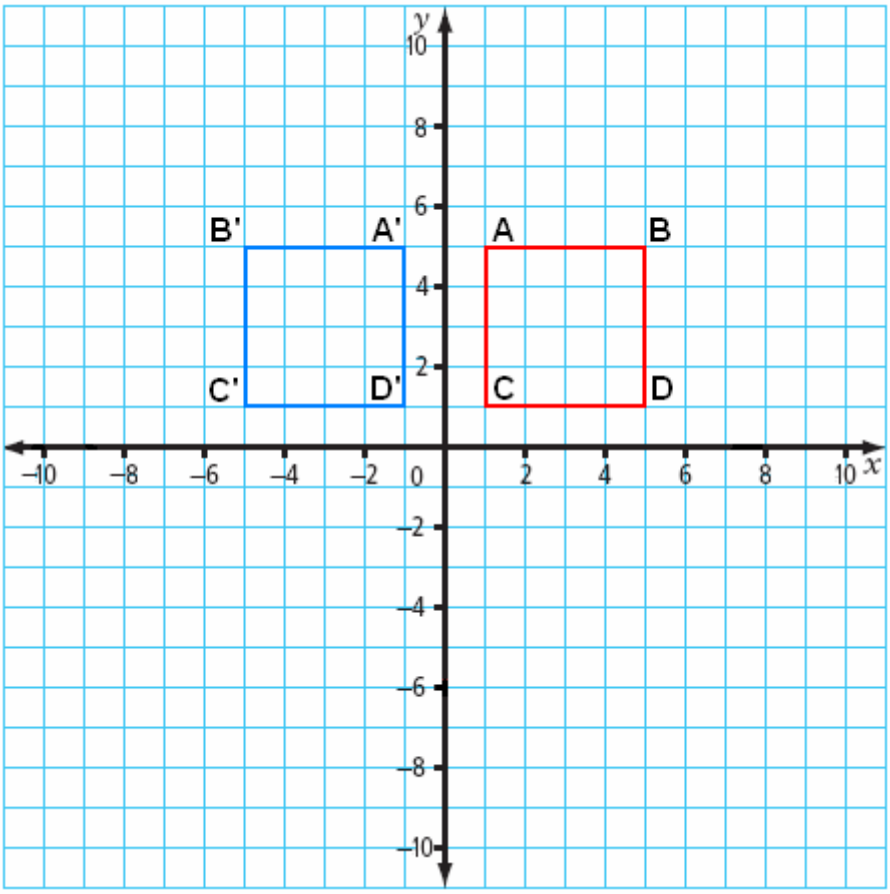
c) The reflection in part b) has overlap and the reflection in part a) does not.

Section 1.3 Page 29 Question 25

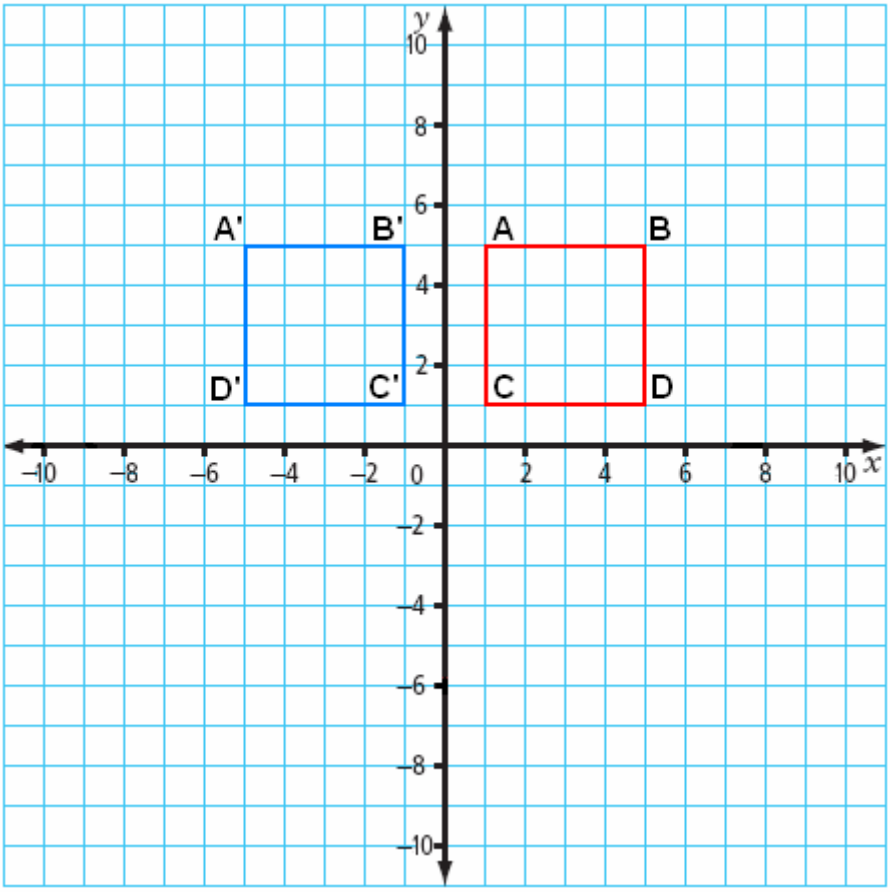
a) Answers may vary. A translation and a reflection can make images look the same if the shape is symmetrical.

b) Answers may vary.

Square ABCD is reflected in the *y*-axis.



Square ABCD is translated left 6 units.



In both cases, the image square is the same.

c) The coordinates are the same for the reflection and translation images.

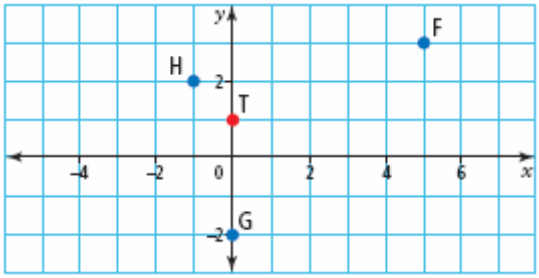
Section 1.4 Horizontal and Vertical Distances

Section 1.4 Page 34 Question 3

a) From point T to point F, there are 5 units horizontally right and 2 units vertically up.

b) From point T to point G, there are 3 units vertically down.

c) From point T to point H, there is 1 unit horizontally left and 1 unit vertically up.

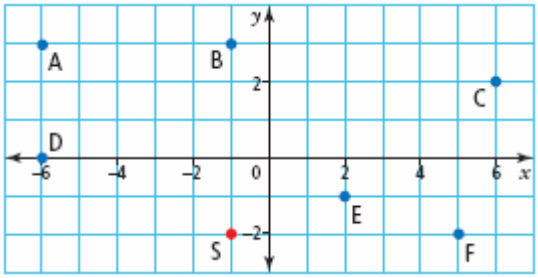


Section 1.4 Page 34 Question 4

a) From point S to point A, there are 5 units horizontally left and 5 units vertically up.

b) From point S to point B, there are 5 units vertically up.

c) From point S to point C, there are 7 units horizontally right and 4 units vertically up.



d) From point S to point D, there are 5 units horizontally left and 2 units vertically up.

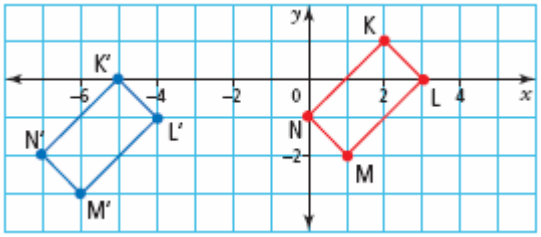
e) From point S to point E, there are 3 units horizontally right and 1 unit vertically up.

f) From point S to point F, there are 6 units horizontally right.

Section 1.4 Page 34 Question 5

a) The coordinates of K'L'M'N' are K'(–5, 0), L'(–4, –1), M'(–6, –3), and N'(–7, –2).

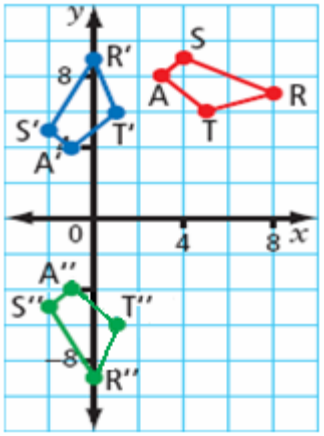
b) The horizontal and vertical movements of KLMN to K'L'M'N' have been translated to 7 units horizontally left and 1 unit vertically down.



Section 1.4 Page 34 Question 6

a) The coordinates of A"S"R"T" are A"(–1, –4), S"(–2, –5), R"(0, –9), and T"(1, –6).

b) The horizontal and vertical movements of ASRT to A"S"R"T" are from S to S": 6 units horizontally left, 14 units vertically down; from T to T": 4 units horizontally left, 12 units vertically down; from A to A": 4 units horizontally left, 12 units vertically down; from R to R": 8 units horizontally left, 16 units vertically down.

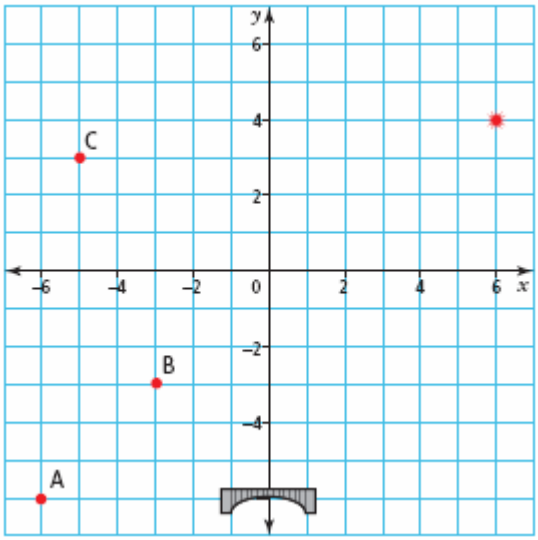


Section 1.4 Page 34 Question 7

a) Car C is closest to the accident.

b) Car A would be sent to the accident. Car A is closest to the bridge (Car B is equal in distance but must make a left turn, which may slow it down).

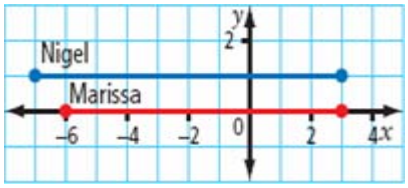
c) Answers may vary. Using car A, the movements would be 12 units horizontally right and 10 units vertically up.



Section 1.4 Page 35 Question 8

a) The figure represents the start and finish points of each person's car.

Competitor	Start	Finish
Marissa	(3, 0)	(−6, 0)
Nigel	(3, 1)	(−7, 1)



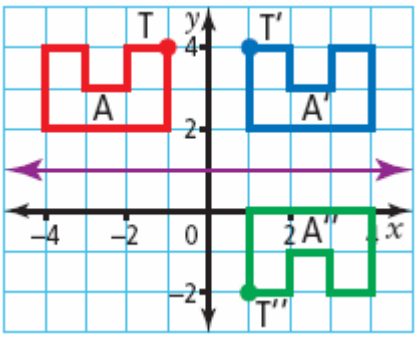
b) The distances can be found by counting. Marissa's car travelled a distance of 9 units. Nigel's car travelled a distance of 10 units.

c) Nigel won since he travelled one unit farther than Marissa did.

Section 1.4 Page 35 Question 9

a) The change in position from T to T" is described as 2 units horizontally right and 6 units vertically down.

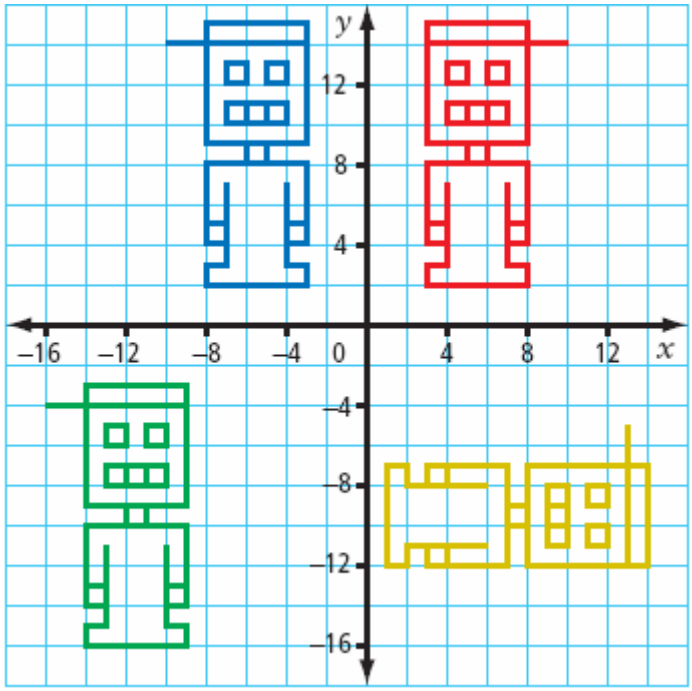
b) Yes, it is possible to get from A to A" in one transformation. It can be done by rotating the figure by 180° clockwise about the point (0, 1).



Section 1.4 Page 35 Question 10

Answers will vary. A sample sketch is shown.

quadrant I: original
quadrant II: reflection of original in *y*-axis
quadrant III: translation from quadrant II, 17 units down and 6 units left
quadrant IV: rotation 90° clockwise about the lower right vertex, followed by a translation down 14 units and right 4 units, from quadrant III



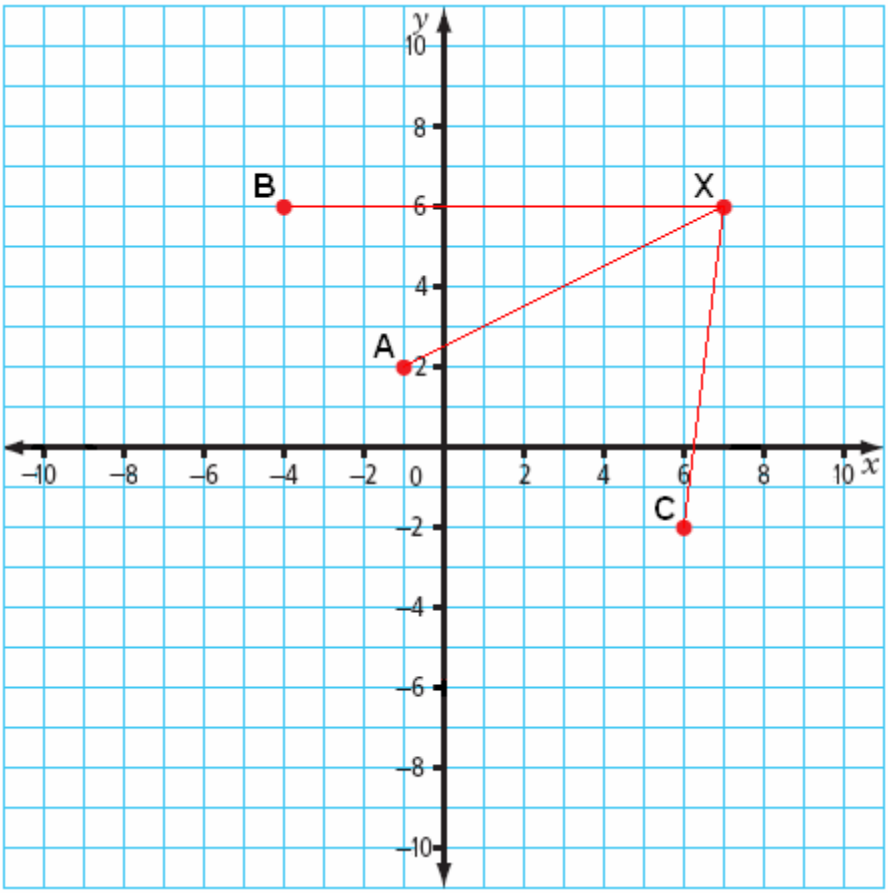
c) Answers may vary for the comic strip.

Section 1.4 Page 35 Question 11

Answers may vary. For example, work with translations and reflections because it is easier to predict the resulting image.

Section 1.4 Page 35 Question 12

Using a ruler, measure each distance between the points and point X. Point C(6, –2) is closest to point X(7, 6).



Section 1.4 Page 35 Question 13

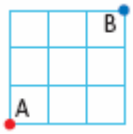
a) By doing the translation in reverse, the coordinates of the original point A(6, 4) can be found. Reflect Point A'(4, 6) in the *x*-axis to obtain (4, –6). Then, rotate 90° counterclockwise about (0, 0) to obtain (6, 4).

b) The change in position from point A to point A' is 2 units horizontally left and 2 units vertically up.

c) One translation that would have the same effect as the rotation and reflection would be to translate 2 units horizontally left and 2 units vertically up.

Section 1.4 Page 35 Question 14

a) The shortest distance from A to B is 6 units.



b) Use an organizer to count the paths. The start of a sample organizer is shown.

UUURRR
UURURR
UURRUR
…

There are 20 paths in total that can be taken to get from A to B.

Chapter 1 Review

Chapter 1 Review Page 36 Question 1

Answer: **B**
A pair of numbers in the form (x, y) is an ordered pair.

Chapter 1 Review Page 36 Question 2

Answer: **A**
Another name for a Cartesian plane is a coordinate grid.

Chapter 1 Review Page 36 Question 3

Answer: **G**
A translation, a reflection, or a rotation is a transformation.

Chapter 1 Review Page 36 Question 4

Answer: **H**
A slide along a straight line is a translation.

Chapter 1 Review Page 36 Question 5

Answer: **I**
Looking in a mirror is a reflection.

Chapter 1 Review Page 36 Question 6

Answer: **J**
Doing a "360" on a skateboard is a rotation.

Chapter 1 Review Page 36 Question 7

Answer: **E**
The horizontal axis of a coordinate grid is the x-axis.

Chapter 1 Review Page 36 Question 8

Answer: **F**
The vertical axis of a coordinate grid is the y-axis.

Chapter 1 Review Page 36 Question 9

Answer: **C**
The name for the point (0, 0) is the origin.

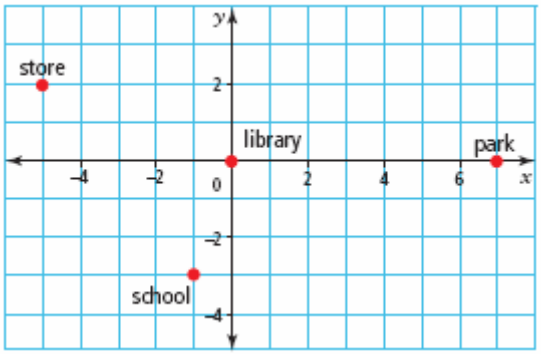
Chapter 1 Review Page 36 Question 10

a) The library is at the origin, (0, 0).

b) From the origin, the school is 1 unit to the left and 3 units down, or (–1, –3).

c) From the origin, the park is 7 units to the right and on the *x*-axis, or (7, 0).

d) From the origin, the store is 5 units to the left and 2 units up, or (–5, 2).



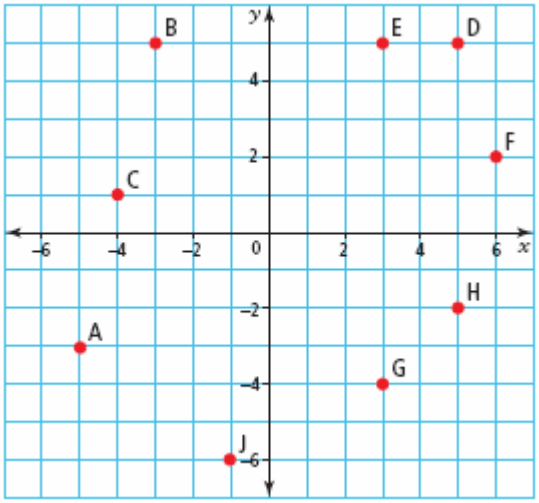
Chapter 1 Review Page 36 Question 11

a) Points E, D, and F are in quadrant I.

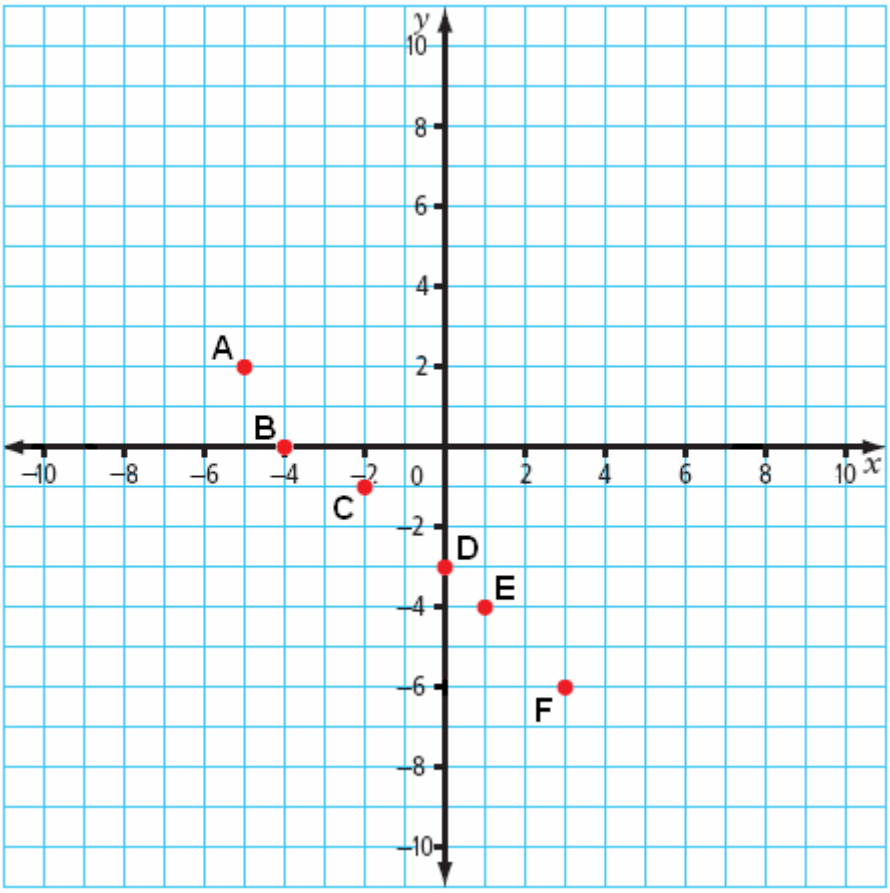
b) Points B and C are in quadrant II.

c) Points A and J are in quadrant III.

d) Points G and H are in quadrant IV.



Chapter 1 Review Page 36 Question 12

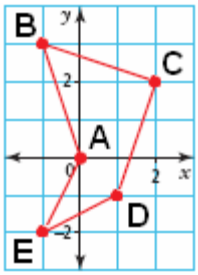


a) Point B seems out of place.

b) The other points appear to lie along a straight line.

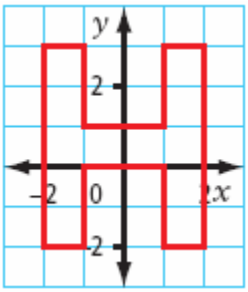
Chapter 1 Review Page 36 Question 13

The coordinate pairs for the figure are A(0, 0), B(–1, 3), C(2, 2), D(1, –1), and E(–1, –2).



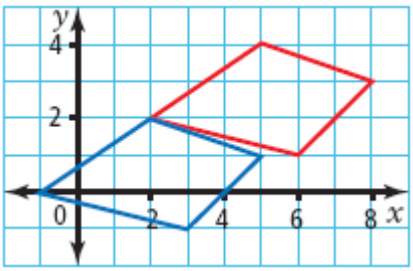
Chapter 1 Review Page 36 Question 14

This is a design of the letter H starting at (2, –2). It is 5 units high and 4 units wide, ensuring that points lie in all four quadrants.

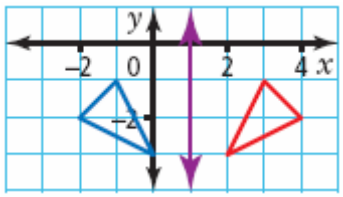


Chapter 1 Review Page 37 Question 15

The coordinates of the translation image are (2, 2), (5, 1), (3, –1), and (–1, 0).

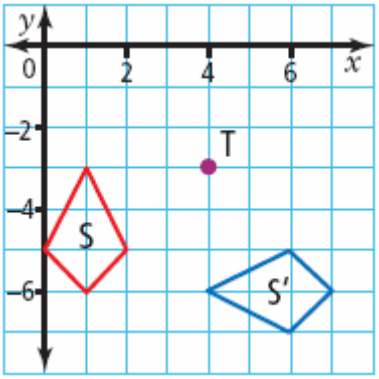


Chapter 1 Review Page 37 Question 16



Chapter 1 Review Page 37 Question 17

The coordinates of the vertices of the rotation image are (6, –5), (7, –6), (6, –7), and (4, –6).



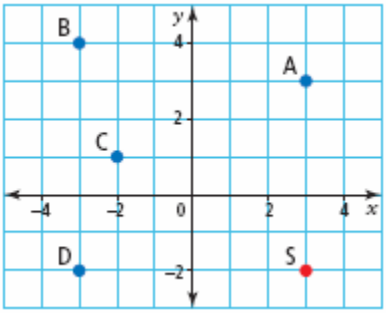
Chapter 1 Review Page 37 Question 18

a) From point S to point A, the movement is 5 units vertically up.

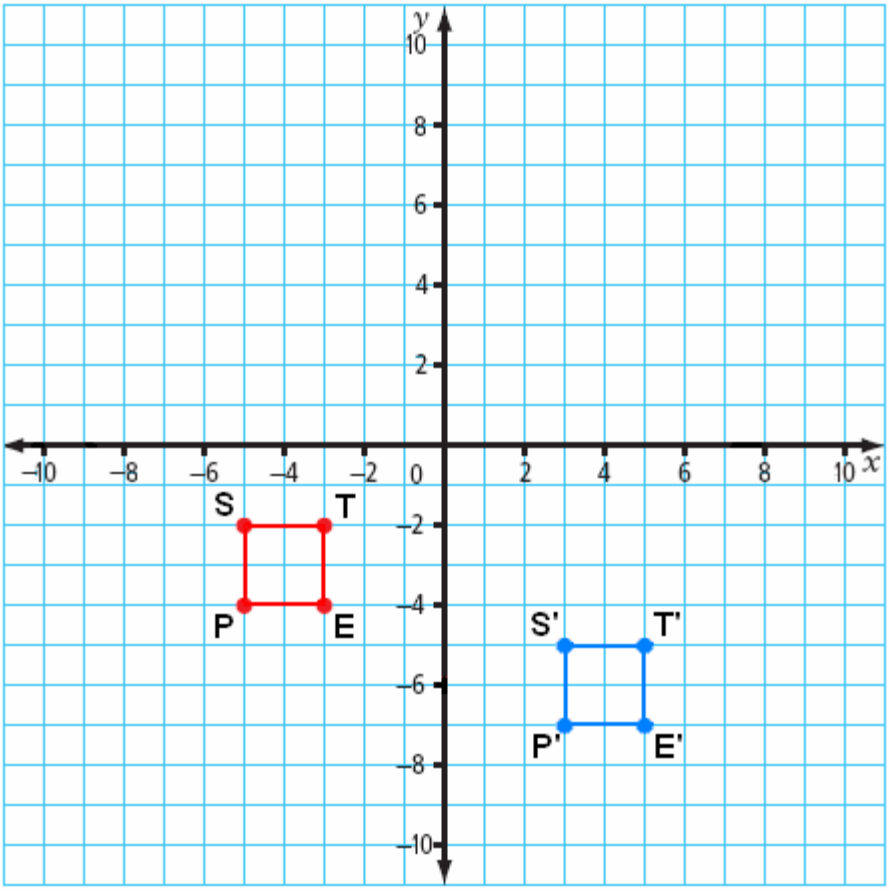
b) From point S to point B, the movement is 6 units horizontally left and 6 units vertically up.

c) From point S to point C, the movement is 5 units horizontally left and 3 units vertically up.

d) From point S to point D, the movement is 6 units horizontally left.



Chapter 1 Review Page 37 Question 19

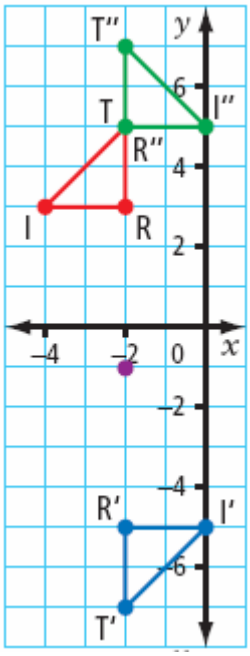


a) The change in position from S to S' is 8 units horizontally right and 3 units vertically down.

b) The change in position from T to T' is 8 units horizontally right and 3 units vertically down.

Chapter 1 Review Page 37 Question 20

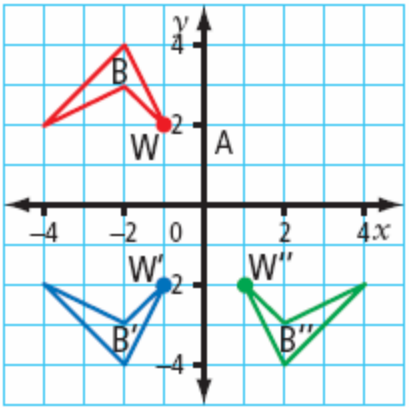
The change in position from T to T" is 2 units vertically up.
The change in position from R to R" is 2 units vertically up.
The change in position from I to I" is 4 units horizontally right and 2 units vertically up.



Chapter 1 Review Page 37 Question 21

a) The change in position from W to W" is 2 units horizontally right and 4 units vertically down.

b) It is possible to get from B to B" in one transformation by rotating 180° clockwise about the point (0, 0).



Chapter 1 Practice Test

Chapter 1 Practice Test Page 38 Question 1

Answer: **C**
The signs of the coordinates in quadrant I are (+, +).

Chapter 1 Practice Test Page 38 Question 2

Answer: **D**
The point (0, 3) lies on the *y*-axis.

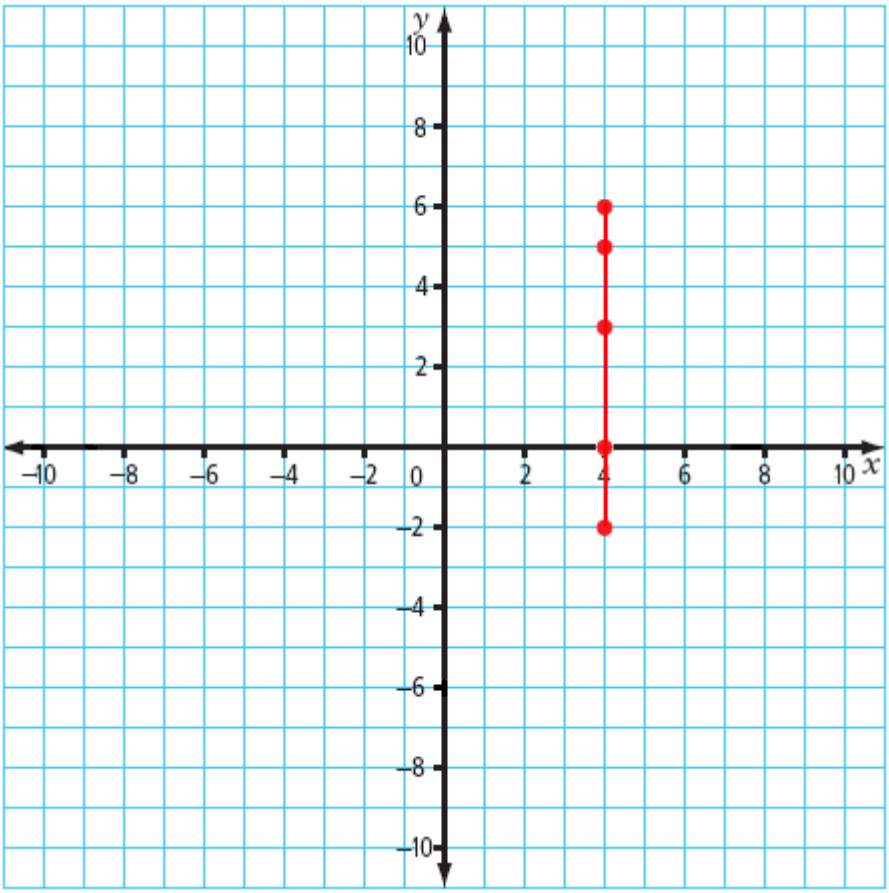
Chapter 1 Practice Test Page 38 Question 3

Answer: **B**
If ΔXYZ is reflected in a line, then a line connecting X to X' will be perpendicular to the line of reflection.

Chapter 1 Practice Test Page 38 Question 4

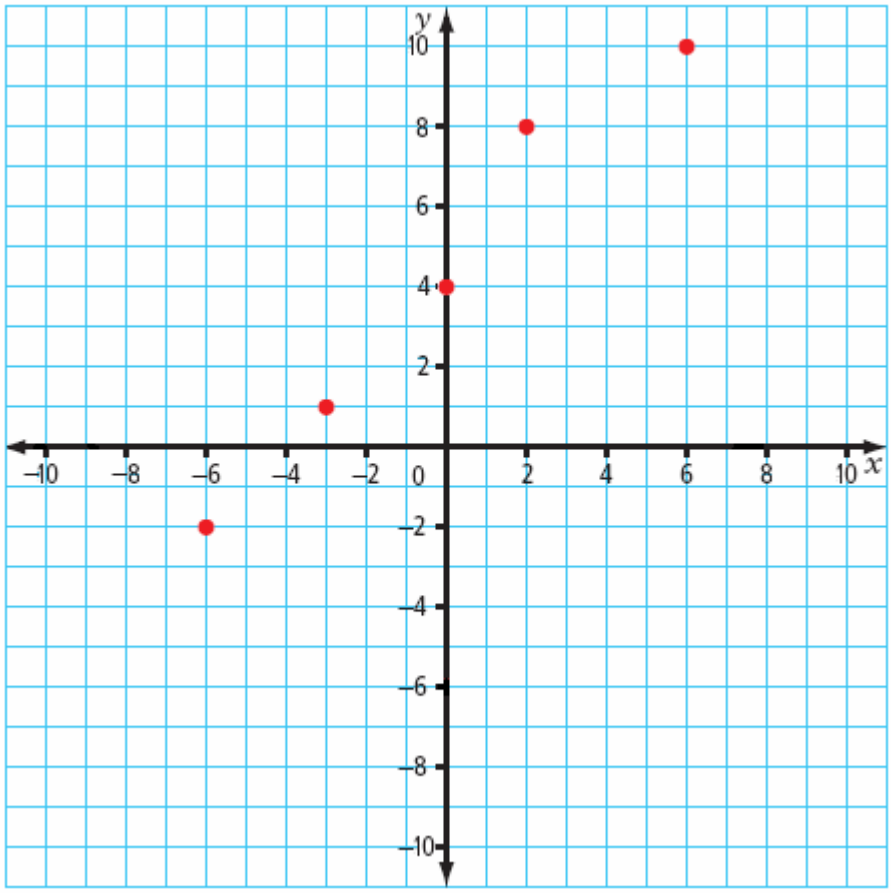
Answer: **B**
The turning of a fan's blades is an example of a rotation.

Chapter 1 Practice Test Page 38 Question 5



Answer: **D**
The points form a line that goes through the *x*-axis.

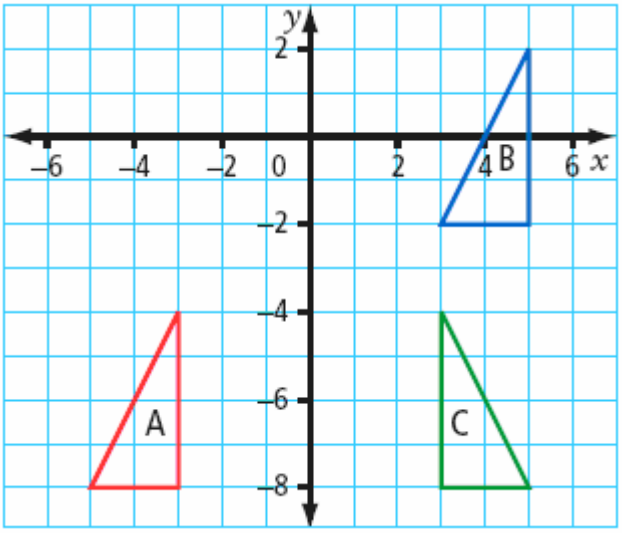
Chapter 1 Practice Test Page 38 Question 6



The point (2, 8) seems out of place.

Chapter 1 Practice Test Page 38 Question 7

a)



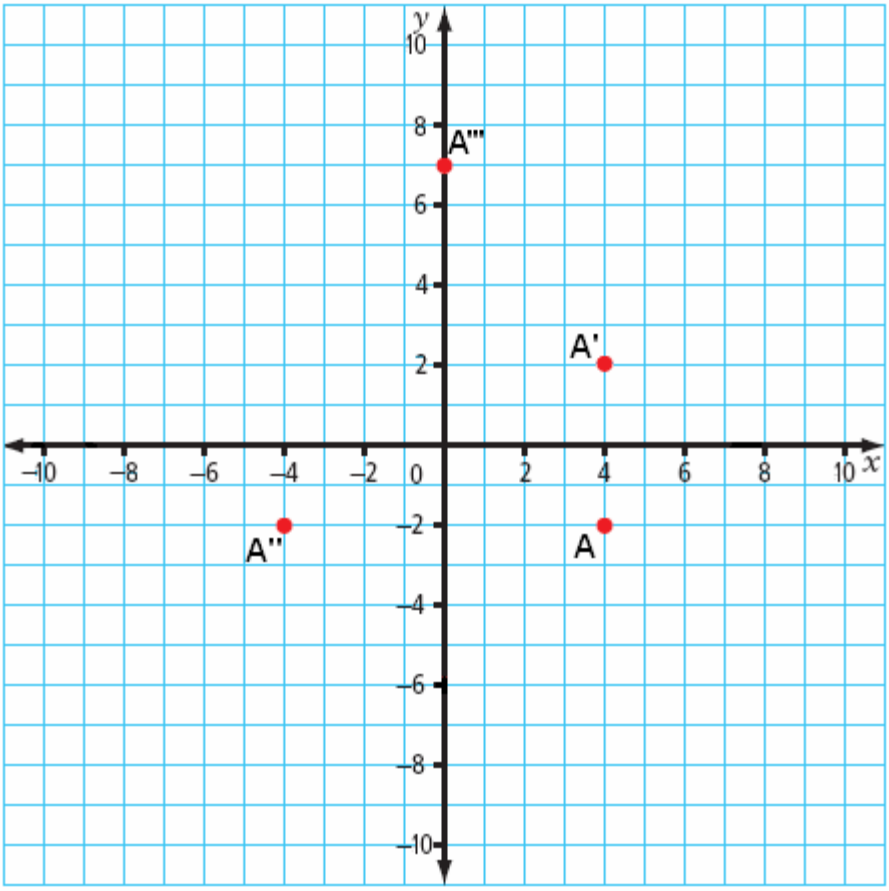
b) A translation of 8 units horizontally right and 6 units vertically up would move ΔA to ΔB.

c) A reflection in the *y*-axis would move ΔA to ΔC.

Chapter 1 Practice Test Page 38 Question 8

The coordinates of the other three vertices are (2, 4), (2, –2), and (–4, –2). These can be found by counting and marking a vertex. Start at (–4, 4), and count 6 units to the right. Make this point a vertex (2, 4). From (2, 4), count 6 units down. Make this point a vertex (2, –2). From (2, –2), count 6 units to the left. Make this point a vertex (–4, –2).

Chapter 1 Practice Test Page 38 Question 9



a) The coordinates of A' after a reflection in the *x*-axis are (4, 2).

b) The coordinates of A" after a reflection in the *y*-axis are (–4, –2).

c) The coordinates of A''' after a translation of 4 units left and 9 units up are (0, 7).

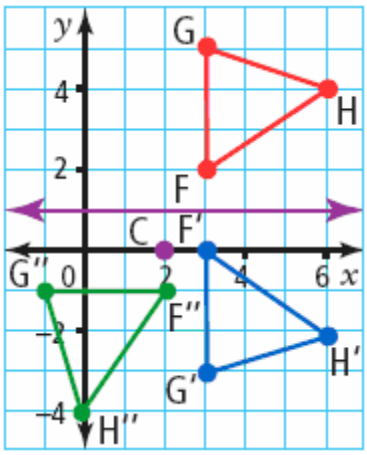
Chapter 1 Practice Test Page 39 Question 10

a) The coordinates of the vertices for $\Delta F'G'H'$ are F'(3, 0), G'(3, –3), and H'(6, –2).

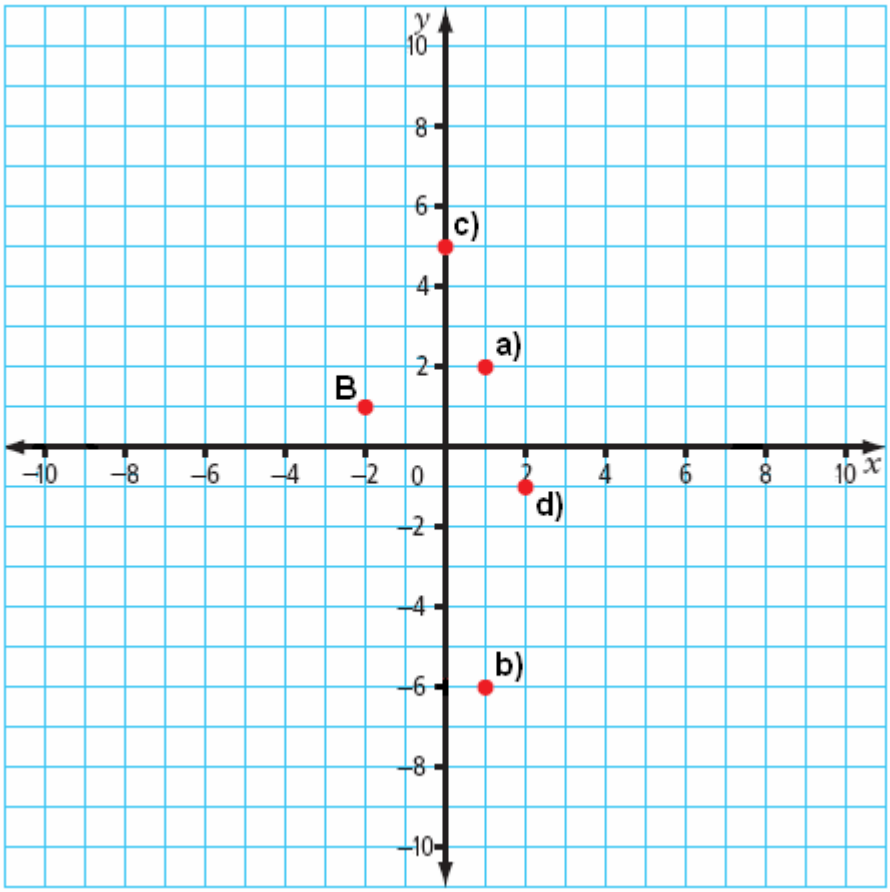
b) The coordinates of the vertices for $\Delta F''G''H''$ are F''(2, –1), G''(–1, –1), and H''(0, –4)

c) The movement from F to F'' is 1 unit horizontally left and 3 units vertically down.

d) The movement from H to H'' is 6 units horizontally left and 8 units vertically down.



Chapter 1 Practice Test Page 39 Question 11



a) Plot point B on grid paper. Trace point B on a piece of transparency or tracing paper. On the transparency, draw a line diagonally to the point of rotation (0, 0). Firmly place a pencil point on the transparency at (0, 0). Begin rotating the transparency clockwise using the grid paper to indicate when 90° has been reached. Look at the location where point B has moved. Remove the transparency and label the point B'(1, 2).

b) Repeat the steps in part a) using (3, –1) as the point of rotation and rotating 90° counterclockwise. Label the point B'(1, –6).

c) Repeat the steps in part a) using (–3, 4) as the point of rotation and rotating 270° clockwise. Label the point B'(0, 5).

d) Repeat the steps in part a) using (0, 0) as the point of rotation and rotating 180° counterclockwise. Label the point B'(2, –1).

Chapter 1 Practice Test Page 39 Question 12

Answers may vary. Translation: riding an elevator; reflection: looking in a mirror; rotation: riding a carousel.

Chapter 1 Practice Test Page 39 Question 13

a) The movements from A to A' are 1 unit horizontally right and 6 units vertically down.

b) Answers may vary. One possible answer is to reflect in the *x*-axis, then translate 1 unit horizontally right and translate 2 units vertically down.

Chapter 1 Practice Test Page 39 Question 14

Answers may vary. If the line of reflection in the second reflection is parallel to the first line of reflection, the figure will regain its original orientation. If an image retains the orientation of the original figure, then the image can be obtained using a single translation as well.

Example:
Start with the red triangle. Reflect in the *y*-axis to obtain the blue triangle. Reflect the blue triangle in the purple line to obtain the green triangle. The orientation of the green triangle is the same as the orientation of the original red triangle. The red triangle can be mapped onto the green triangle by translating left 12 units.