Name: ____________________

Date: ____________________

SO-IN EDU. (S.S.) 數研教育(中學部)

S1P10_S

Classwork Solution

Lesson 1

Section 1 A

1. The coordinates of A are (2, 1)

   The coordinates of B are (1, 4)

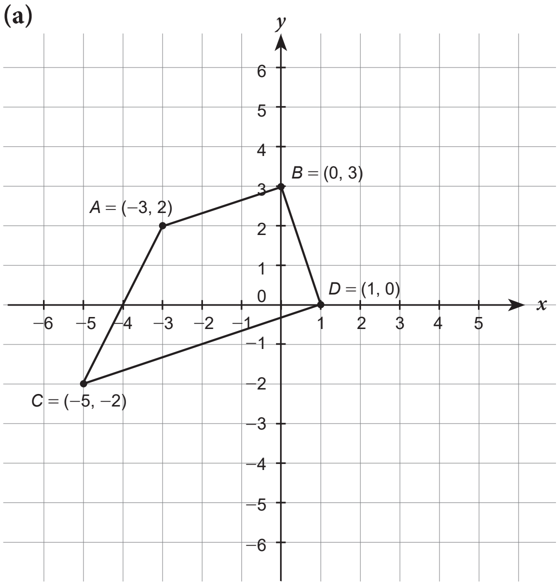
   The coordinates of C are (−4, 2)

   The coordinates of D are (−2, −2)

   The coordinates of E are (1, 0)

   The coordinates of F are (0, 7)

2. **(a)**



   (b) The figure of $ABCD$ is a trapezium.

Section 1 B

1. The coordinates of A are (3, 60°)

   The coordinates of B are (2, 150°)

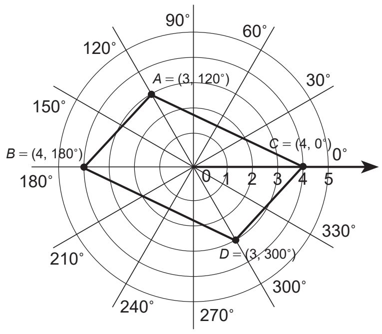
   The coordinates of C are (5, 90°)

   The coordinates of D are (4, 240°)

   The coordinates of E are (3, 270°)

   The coordinates of F are (4, 0°)

2. **(a)**



   (b) The figure of $ABCD$ is a parallelogram.

Section 1 C

1. **(a)** Distance = 10 − 4 = 6 units

   (b) Distance = 8 − 1 = 7 units

   (c) Distance = 5 − (−3) = 8 units

   (d) Distance = 3 − (−5) = 8 units

2. There are 2 cases, the x-coordinate of P and Q may be larger than or lower than the others. Therefore, we have 2 sets of solutions.

   Distance between $PQ = 12$

   $$\begin{aligned} a-(4a-3) &= 12 \\ -3a+3 &= 12 \\ -3a &= 9 \\ a &= -3 \end{aligned}$$

   ∴ The coordinates of P are (−3, 4),

   The coordinates of Q are (−15, 4).

   Distance between $PQ = 12$

   $$\begin{aligned} (4a-3)-a &= 12 \\ 3a-3 &= 12 \\ 3a &= 15 \\ a &= 5 \end{aligned}$$

   ∴ The coordinates of P are (5, 4),

   The coordinates of Q are (17, 4).

3. **(a)** Distance of $AB = 2 - (-3) = 5$ units

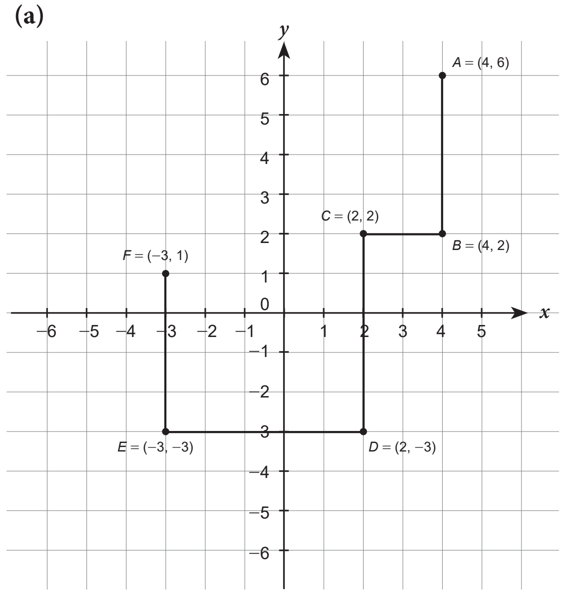
   Distance of $AC = 3 - (-3) = 6$ units

   Distance of $BD = 3 - (-3) = 6$ units

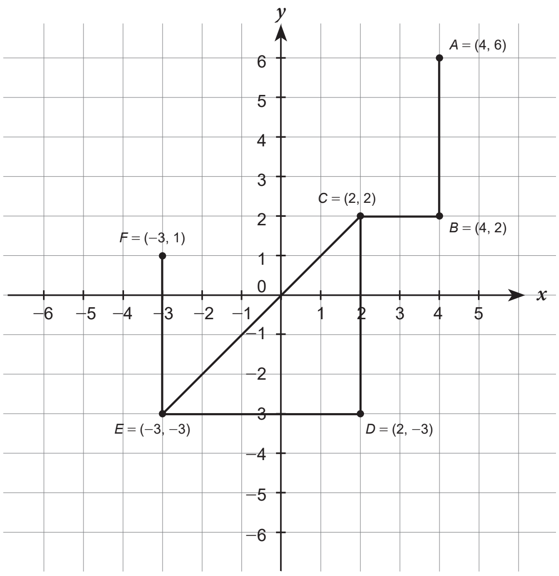
   Distance of $CD = 2 - (-3) = 5$ units

   (b) Perimeter of $ABCD = 5 + 6 + 6 + 5 = 22$ units

4. **(a)**



(b) The intersection point between CE and x-axis is (0, 0).



(c) Distance of $AB = 6 - 2 = 4$ units

Distance of $BC = 4 - 2 = 2$ units

Distance of $CD = 2 - (-3) = 5$ units

Distance of $DE = 2 - (-3) = 5$ units

Distance of $EF = 1 - (-3) = 4$ units

Total distance $= 4 + 2 + 5 + 5 + 4 = 20$ units

5. Although the distance of EF cannot be found, we still can find the perimeter of the figure by shifting EF to DG.

Coordinates of C are $(-4, -3)$.

Distance of $AB = 4 - (-4) = 8$ units

Distance of $AC = 2 - (-3) = 5$ units

Distance of $ED = (-1) - (-3) = 2$ units

Perimeter $= (8 + 5) \times 2 + 2 \times 2 = 30$ units

6. **(a)** By considering the coordinates of B, J and H,

The coordinates of A are $(-6, 12)$

The coordinates of I are $(-12, 8)$

(b) Length of $GH = 3$

$$a - (-12) = 3$$
$$a = -9$$

Length of $GH = 3$

$$-2 - b = 6$$
$$b = -8$$

(c) $d = b = -8$

The coordinates of D are $(c, -4)$.

Length of $DE = c$

$$-4 - d = c$$
$$-4 - (-8) = c$$
$$c = 4$$

The coordinates of E are $(4, -8)$

(d) By shifting the lines and forming a rectangle,

Distance of $IJ = -6 - (-12) = 6$ units

Distance of $AB = 10 - (-6) = 16$ units

Distance of $BC = 12 - (-4) = 16$ units

Distance of $DE = -4 - (-8) = 4$ units

Total length of running trail

$$= \left[(IJ + AB) + (BC + DE)\right] \times 2$$
$$= (6 + 16 + 16 + 4) \times 2$$
$$= 84 \text{ units}$$

Section 1 D

1. Distance of $AB = 2 - (-3) = 5$ units

Distance of $AC = 3 - (-3) = 6$ units

$$\text{Area of } ABCD = AB \times AC = 5 \times 6 = 30 \text{ square units}$$

2. **(a)** The coordinates of A are $(3, 120^\circ)$

The coordinates of B are $(4, 30^\circ)$

The coordinates of C are $(5, 210^\circ)$

The coordinates of D are $(2, 300^\circ)$

(b) $$\text{Area of } \Delta ABC = \frac{(OB + OC) \times OA}{2} = \frac{(4 + 5) \times 3}{2} = 13.5 \text{ square units}$$

(c) $$\text{Area of } \Delta BCD = \frac{(OB + OC) \times OD}{2} = \frac{(4 + 5) \times 2}{2} = 9$$

(d) $$\text{Area of } ABCD = \text{area of } \Delta ABC + \text{area of } \Delta BCD = 13.5 + 9 = 22.5 \text{ square units}$$

3. By considering the points B and D,

the coordinates of J are (3, 6).

By considering the points H and F,

the coordinates of J are $(-4, -2)$.

Moreover, the coordinates of A and E are $(-4, 6)$ and $(3, -2)$ respectively.

Area of $AEIJ$

$$= (AB + BJ) \times (AH + HI)$$
$$= \left[(1 - (-4)) + (3 - 1)\right] \times \left[(6 - 2) + (2 - (-2))\right]$$
$$= 7 \times 8$$
$$= 56 \text{ square units}$$

$$\text{Area of } HGIF = HI \times IF = [2-(-2)] \times [(-1)-(-4)] = 4 \times 3 = 12 \text{ square units}$$

$$\text{Area of } BCDJ = BJ \times JD = (3-1) \times (6-4) = 2 \times 2 = 4 \text{ square units}$$

Area of bounded region

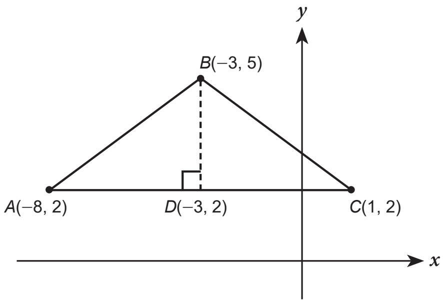
= area of $AEIJ$ − area of $HGIF$ − area of $BCDJ$

= 56 − 12 − 4

= 40 square units

4. Draw a line from B to AC perpendicularly, which is the height BD of triangle ABC. The coordinates of D are (−3, 2).

$$\text{Area of } \Delta ABC = \frac{AC \times BD}{2} = \frac{(1-(-8)) \times (5-2)}{2} = \frac{9 \times 3}{2} = 13.5 \text{ square units}$$



5. Area of ΔABC

$$= \frac{(AB + CD) \times \text{ height}}{2}$$

$$= \frac{\left\{\left[5-(-16)\right]+\left[12-(-30)\right]\right\} \times \left[3-(-10)\right]}{2}$$

$$= \frac{(21+42) \times 13}{2}$$

= 409.5 square units

6. **(a)** The coordinates of G are (10, −6).

(b) By drawing a horizontal line to cut through C and E, the crown can be separated into 3 triangles and 1 rectangle. After finding all important points H, I and J, we can calculate the area.

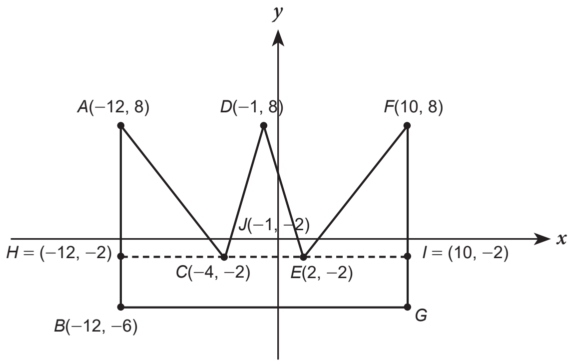
$$\text{Area of } \Delta ACH = \frac{AH \times HC}{2} = \frac{[8-(-2)] \times [(-4)-(-12)]}{2} = \frac{10 \times 8}{2} = 40 \text{ square units}$$

$$\text{Area of } \Delta CDE = \frac{CE \times DJ}{2} = \frac{[2-(-4)] \times [8-(-2)]}{2} = \frac{6 \times 10}{2} = 30 \text{ square units}$$

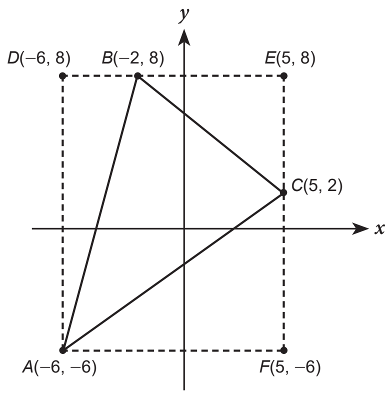
$$\text{Area of } \Delta EFI = \frac{EI \times FI}{2} = \frac{(10-2) \times [8-(-2)]}{2} = \frac{8 \times 10}{2} = 40 \text{ square units}$$

$$\text{Area of } HIBG = HI \times HB = [10-(-12)] \times [-2-(-6)] = 22 \times 4 = 88 \text{ square units}$$

Total area of the crown = 40 + 30 + 40 + 88
= 198 square units



7.



Extend the lines so that the triangle is inside the rectangle. Considering the x-coordinate and y-coordinate of A, B and C,

The coordinates of D are (−6, 8)

The coordinates of E are (5, 8)

The coordinates of F are (5, −6)

$$\text{Area of rectangle } ADEF = AD \times DE = [8-(-6)] \times [5-(-6)] = 14 \times 11 = 154 \text{ square units}$$

$$\text{Area of } \Delta ABD = \frac{AD \times BD}{2}$$
$$= \frac{[8-(-6)] \times [(-2)-(-6)]}{2}$$
$$= \frac{14 \times 4}{2}$$
$$= 28 \text{ square units}$$

$$\text{Area of } \Delta BCE = \frac{BE \times EC}{2}$$
$$= \frac{[5-(-2)] \times (8-2)}{2}$$
$$= \frac{7 \times 6}{2}$$
$$= 21 \text{ square units}$$

$$\text{Area of } \Delta ACF = \frac{AF \times CF}{2}$$
$$= \frac{[5-(-6)] \times [2-(-6)]}{2}$$
$$= \frac{11 \times 8}{2}$$
$$= 44 \text{ square units}$$

Area of ΔABC

= Area of rectangle $ADEF$ − Area of ΔABD − Area of ΔBCE − area of ΔACF

$= 154 - 28 - 21 - 44$

= 61 square units

Section 2 A

1. **(a)** The coordinates of A are (−3, −2)

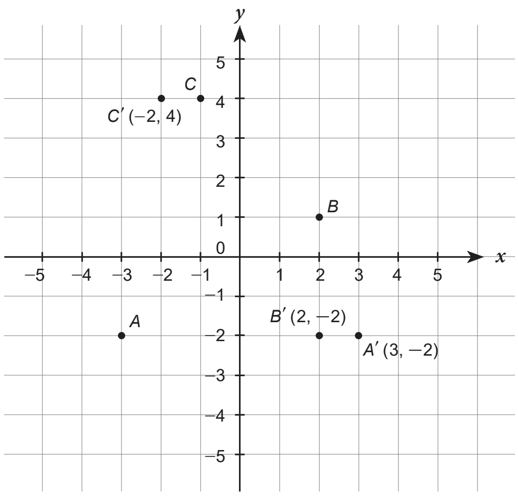
The coordinates of B are (2, 1)

The coordinates of C are (−1, 4)

(b) The coordinates of A' are (3, −2)

The coordinates of B' are (2, −2)

The coordinates of C' are (−2, 4)



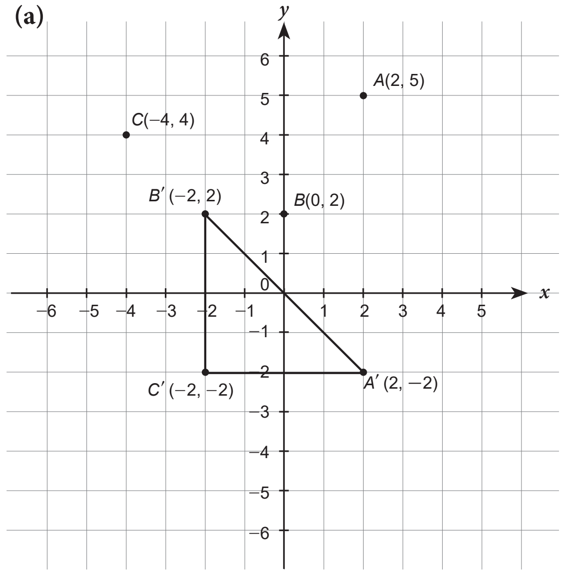
2. A is translated upward by 5 units

B is translated leftwards by 2 units and downwards by 1 unit.

3.

Point	Transformation	Image
$A(3, 5)$	A is translated 3 units to the right	$A'(6, 5)$
$B(-2, -3)$	B is translated upwards by 5 units	$B'(-2, 2)$
$C(4, 1)$	C is translated 2 units to the left	$C'(2, 1)$
$D(4, 9)$	D is translated downwards by 6 units	$D'(4, 3)$
$E(-5, 6)$	E is translated 3 units to the right and 4 units upwards	$E'(-2, 10)$
$F(2, 0)$	F is translated 4 units to the left and 5 units downwards	$F'(-2, -5)$

4. **(a)**



(b) The coordinates of A' are (2, −2)

The coordinates of B' are (−2, 2)

The coordinates of C' are (−2, −2)

(c) $A'B'C'$ form a right-angled isosceles triangle.

(d) A is translated 4 units to the left and 7 units downwards.

Section 2 B

1. **(a)** The coordinates of A are (−3, 3)

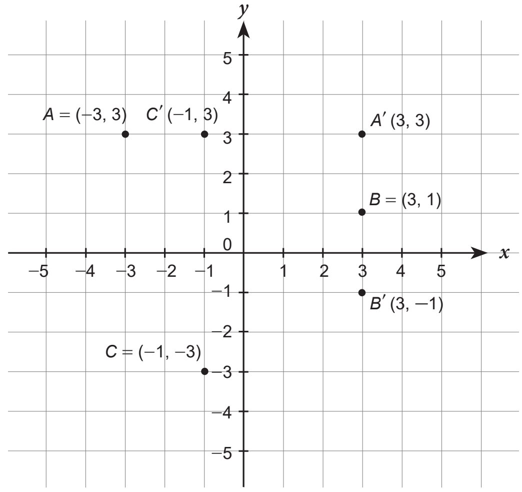
The coordinates of B are (3, 1)

The coordinates of C are (−1, −3)

(b) The coordinates of A' are (3, 3)

The coordinates of B' are (3, −1)

The coordinates of C' are (−1, 3)



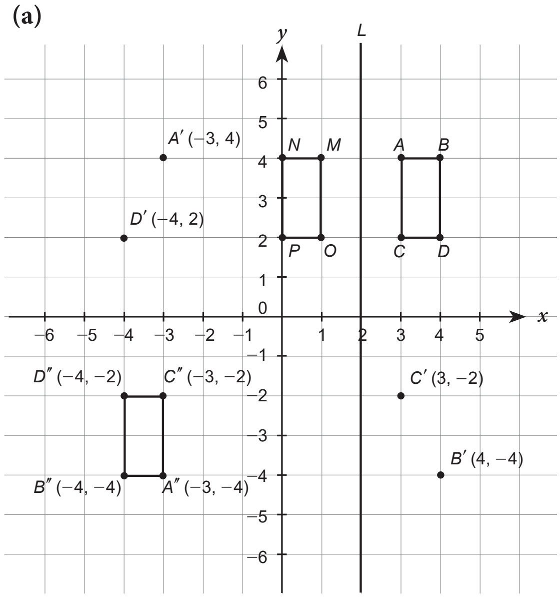
2. A is reflected along the x-axis

B is reflected along the y-axis

3.

Point	Transformation	Image
$A(2, 6)$	A is reflected along the x-axis	$A'(2, -6)$
$B(-7, -8)$	B is reflected along the y-axis	$B'(7, -8)$
$C(3, 5)$	C is reflected along the x-axis	$C'(3, -5)$
$D(2, -3)$	D is reflected along the y-axis	$D'(-2, -3)$

4. (a)



(b) The coordinates of A' are $(-3, 4)$

The coordinates of B' are $(4, -4)$

The coordinates of C' are $(3, -2)$

The coordinates of D' are $(-4, 2)$

(c) The coordinates of A'' are $(-3, -4)$

The coordinates of B'' are $(-4, -4)$

The coordinates of C'' are $(-3, -2)$

The coordinates of D'' are $(-4, -2)$

(d) $A''B''C''D''$ form a rectangle.

(e) The coordinates of M are $(1, 4)$

The coordinates of N are $(0, 4)$

The coordinates of O are $(1, 2)$

The coordinates of P are $(0, 2)$

The shape is the same as the original $ABCD$, and it is the same as part **(d)** as well.

Section 2 C

1. **(a)** The coordinates of A are $(2, 3)$

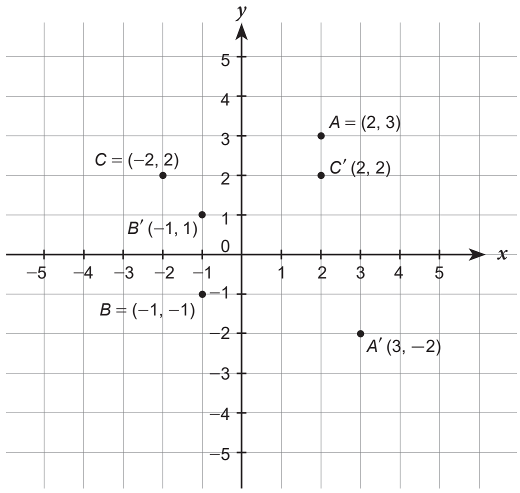
The coordinates of B are $(-1, -1)$

The coordinates of C are $(-2, 2)$

(b) The coordinates of A' are $(3, -2)$

The coordinates of B' are $(-1, 1)$

The coordinates of C' are $(2, 2)$



2. A is rotated about origin by 90° clockwise.

B is rotated about origin by 180° clockwise/anti-clockwise.

3.

Point	Transformation	Image
$A(5, 2)$	A is rotated about the origin by 90° anti-clockwise	$A'(2, -5)$
$B(-2, -3)$	B is rotated about the origin by 270° anti-clockwise	$B'(-3, 2)$
$C(3, -4)$	C is rotated about the origin by 90° clockwise	$C'(-4, -3)$
$D(-3, -2)$	D is rotated about the origin by 90° anti-clockwise	$D'(-2, 3)$
$E(-2, 6)$	E is rotated about the origin by 180° anti-clockwise (or anti-clockwise)	$E'(2, -6)$

4. **(a)** The coordinates of A are $(5, 30°)$

The coordinates of B are $(3, 120°)$

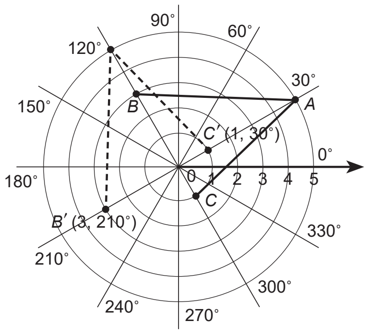
The coordinates of C are $(1, 300°)$

(b) $$\text{Area of } \Delta ABC = \frac{BC \times OA}{2} = \frac{(3+1) \times 5}{2} = 10 \text{ square units}$$

(c) The coordinates of A' are (5, 120°)

The coordinates of B' are (3, 210°)

The coordinates of C' are (1, 30°)



(d) Area of $\Delta A'B'C' = \dfrac{B'C' \times OA'}{2}$

$= \dfrac{(3+1) \times 5}{2} = 10$ square units

Section 2 D

1.

Point	Transformation	Image
A (5, 3)	A is translated 10 units to the left	$A'(-5, 3)$
B (4, −2)	B is translated 10 units upwards	$B'(4, 8)$
C (−3, −1)	C is translated 4 units to the right and 2 units downwards	$C'(1, -3)$

2.

Point	Transformation	Image
D (5, 3)	D is reflected by y-axis	$D'(-5, 3)$
E (−3, −1)	E is rotated about the origin by 90° anti-clockwise.	$E'(1, -3)$
F (−6, −12)	F is rotated about the origin by 90° anti-clockwise.	$F'(12, -6)$

3. (a) The coordinates of A are (4, 60°)

The coordinates of B are (5, 150°)

The coordinates of C are (3, 330°)

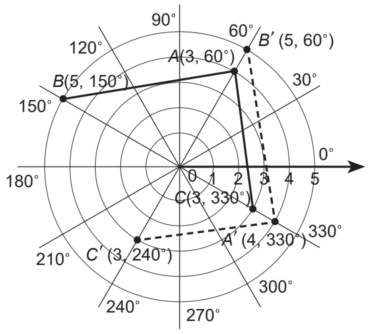
(b) Area of $\Delta ABC = \dfrac{BC \times OA}{2}$

$= \dfrac{(5+3) \times 4}{2} = 16$ square units

(c) The coordinates of A' are (4, 330°)

The coordinates of B' are (5, 60°)

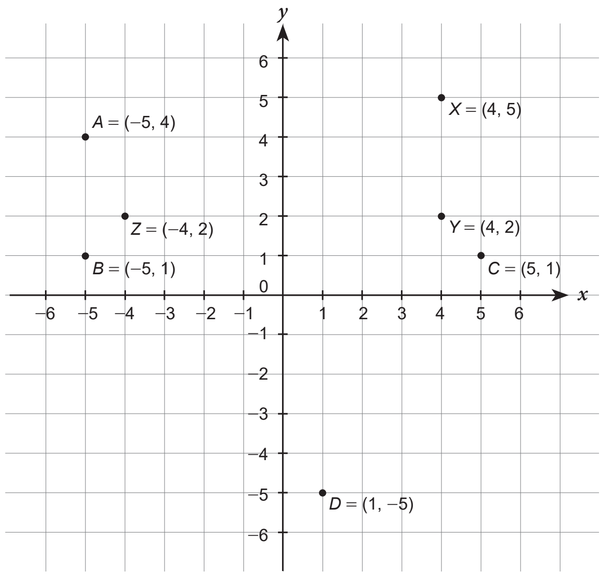
The coordinates of C' are (3, 240°)



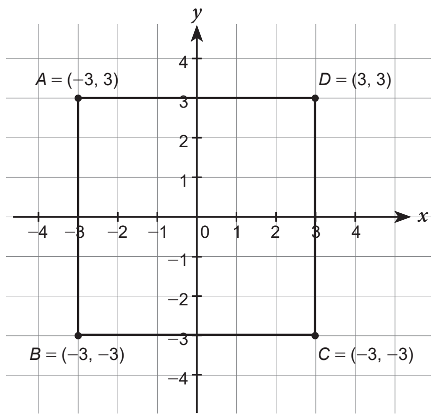
(d) Area of $\Delta A'B'C' = \dfrac{B'C' \times OA'}{2}$

$= \dfrac{(5+3) \times 4}{2}$

$= 16$ square units



5. (a)



(b) Distance of $AB = 3 - (-3) = 6$ units

(c) The coordinates of C are (3, −3).

The coordinates of D are (3, 3).

(d) $ABCD$ is a square with sides of 6 units

(e) Perimeter $= 6 \times 4 = 24$ units

(f) Area $= 6 \times 6 = 36$ square units

Homework Solution

Lesson 1

Section 1 A

1. The coordinates of A are (2, 2)

   The coordinates of B are (5, 0)

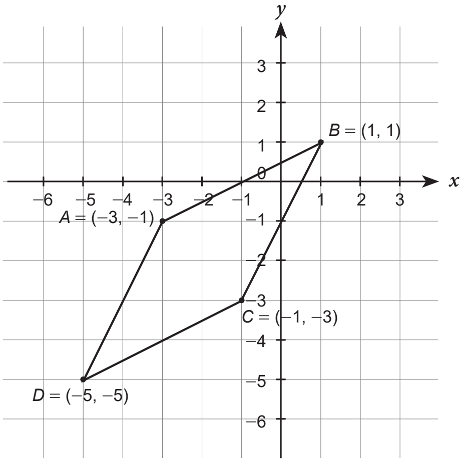
   The coordinates of C are (−4, 1)

   The coordinates of D are (−2, −1)

   The coordinates of E are (−1, −6)

   The coordinates of F are (1, −3)

2. **(a)**



   (b) The figure of $ABCD$ is a parallelogram (or rhombus).

Section 1 B

1. The coordinates of A are (3, 30°)

   The coordinates of B are (4, 180°)

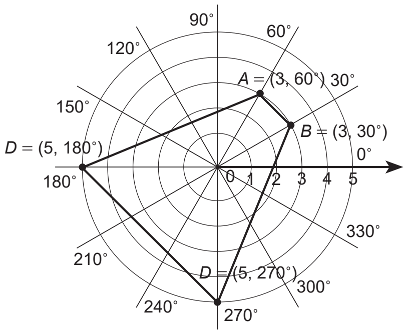
   The coordinates of C are (5, 270°)

   The coordinates of D are (3, 330°)

   The coordinates of E are (1, 90°)

   The coordinates of F are (5, 120°)

2. **(a)**



   (b) The figure of $ABCD$ is a trapezium.

Section 1 C

1. **(a)** Distance = 3 − 1 = 2 units

   (b) Distance = 18 − 2 = 16 units

   (c) Distance = 5 − (−5) = 10 units

   (d) Distance = (−1) − (−7) = 6 units

2. There are 2 cases, the x-coordinate of P and Q may be larger than or smaller than the others. Therefore, we have 2 sets of solutions.

   Distance between $HK = 21$

$$\begin{aligned}(5m-3)-(2m)&=21\\3m-3&=21\\3m&=24\\m&=8\end{aligned}$$

   ∴ The coordinates of P are (5, 16),

   The coordinates of Q are (5, 37).

   Distance between $HK = 21$

$$\begin{aligned}2m-(5m-3)&=21\\-3m+3&=21\\-3m&=18\\m&=-6\end{aligned}$$

   ∴ The coordinates of P are (5, −12),

   The coordinates of Q are (5, −33).

3. **(a)** Since the length is three times of the width,

   $p = 3q$

   Perimeter of $ABCD = 32$

$$\begin{aligned}(p+q)\times 2&=32\\3q+q&=16\\4q&=16\\q&=4\\p&=12\end{aligned}$$

   ∴ The coordinates of B are (12, 0)

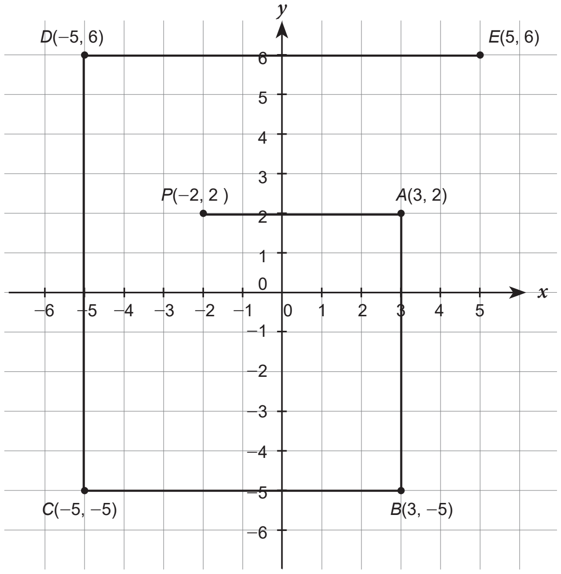
   The coordinates of C are (0, 4)

   The coordinates of D are (12, 4)

   (b) Length = $\frac{32}{4} = 8$ m

   (c) Perimeter = 32 m. It is the same as part **(b)** since the length of the iron wire does not change, which means that the perimeter does not change.

4. **(a)**



(b) Distance of $PA = 3 - (-2) = 5$ units

Distance of $AB = 2 - (-5) = 7$ units

Distance of $BC = 3 - (-5) = 8$ units

Distance of $CD = 6 - (-5) = 11$ units

Distance of $DE = 5 - (-5) = 10$ units

Total distances $= 5 + 7 + 8 + 11 + 10 = 41$ units

5. **(a)** The coordinates of C are $(-2, 6)$

The coordinates of L are $(-10, 6)$

The coordinates of F are $(-2, -2)$

The coordinates of I are $(-10, -2)$

(b) After shifting the lines, we can find the total length by forming a square.

$$\text{Total length} = \left\{\left[2-(-14)\right]+\left[10-(-6)\right]\right\}\times 2$$
$$= (16+16)\times 2$$
$$= 64$$

Section 1 D

1. Area of $ABCD$ = Base × Height

$$= [-6-(-16)]\times[10-(-2)]$$
$$= 10\times 12$$
$$= 120 \text{ square units}$$

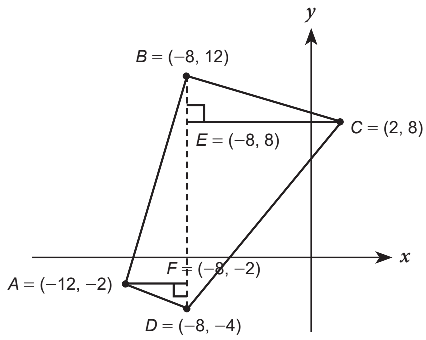
2. We separate $ABCD$ into two triangles. We find the coordinates of $E(-8, 8)$ and $F(-8, -2)$ so that the height can be found easily.

$$\text{Area of } \Delta ABD = \frac{AF\times BD}{2}$$
$$= \frac{\left[(-8)-(-12)\right]\times\left[12-(-4)\right]}{2}$$
$$= \frac{4\times 16}{2}$$
$$= 32 \text{ square units}$$

$$\text{Area of } \Delta BCD = \frac{BD\times CE}{2}$$
$$= \frac{\left[12-(-4)\right]\times\left[2-(-8)\right]}{2}$$
$$= \frac{16\times 10}{2}$$
$$= 80 \text{ square units}$$

Area of $ABCD$ = area of ΔABD + area of ΔBCD

$$= 32 + 80$$
$$= 112 \text{ square units}$$



3. **(a)** The coordinates of A are $(5, 90°)$

The coordinates of B are $(3, 270°)$

The coordinates of C are $(3, 180°)$

The coordinates of D are $(2, 0°)$

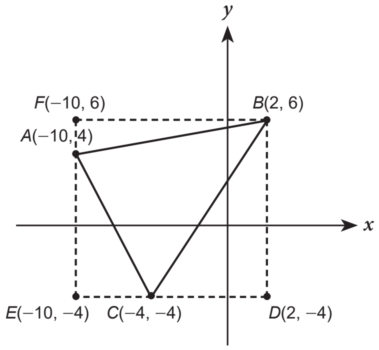
(b) $$\text{Area of } \Delta ABC = \frac{(OA+OB)\times OC}{2}$$
$$= \frac{(5+3)\times 3}{2}$$
$$= 12 \text{ square units}$$

(c) $$\text{Area of } \Delta ABD = \frac{(OA+OB)\times OD}{2}$$
$$= \frac{(5+3)\times 2}{2}$$
$$= 8 \text{ square units}$$

(d) Area of $ABCD$ = Area of ΔABC + Area of ΔABD

$$= 12 + 8$$
$$= 20 \text{ square units}$$

4.



Extend the lines so that the triangle is inside the rectangle. Considering the x-coordinate and y-coordinate of A, B and C,

The coordinates of D are (2, −4)

The coordinates of E are (−10, −4)

The coordinates of F are (−10, 6)

$$\text{Area of rectangle } BDEF = BD \times DE$$
$$= [6-(-4)] \times [2-(-10)]$$
$$= 10 \times 12$$
$$= 120 \text{ square units}$$

$$\text{Area of } \Delta ABF = \frac{AF \times BF}{2}$$
$$= \frac{(6-4) \times [2-(-10)]}{2}$$
$$= \frac{2 \times 12}{2}$$
$$= 12 \text{ square units}$$

$$\text{Area of } \Delta BCD = \frac{BD \times CD}{2}$$
$$= \frac{[6-(-4)] \times [2-(-4)]}{2}$$
$$= \frac{10 \times 6}{2}$$
$$= 30 \text{ square units}$$

$$\text{Area of } \Delta ACE = \frac{AE \times CE}{2}$$
$$= \frac{[4-(-4)] \times [(-4)-(-10)]}{2}$$
$$= \frac{8 \times 6}{2}$$
$$= 24 \text{ square units}$$

Area of ΔABC

= Area of rectangle $BDEF$ − Area of ΔBCD − area of ΔACE

= 120 − 12 − 30 − 24

= 54 square units

Section 2 (A)

1. **(a)** The coordinates of A are (−1, −3)

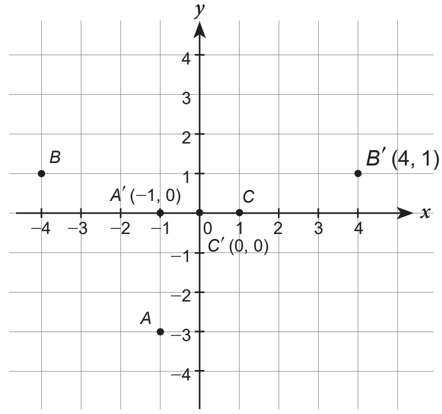
The coordinates of B are (−4, 1)

The coordinates of C are (1, 0)

(b) The coordinates of A' are (−1, 0)

The coordinates of B' are (4, 1)

The coordinates of C' are (0, 0)



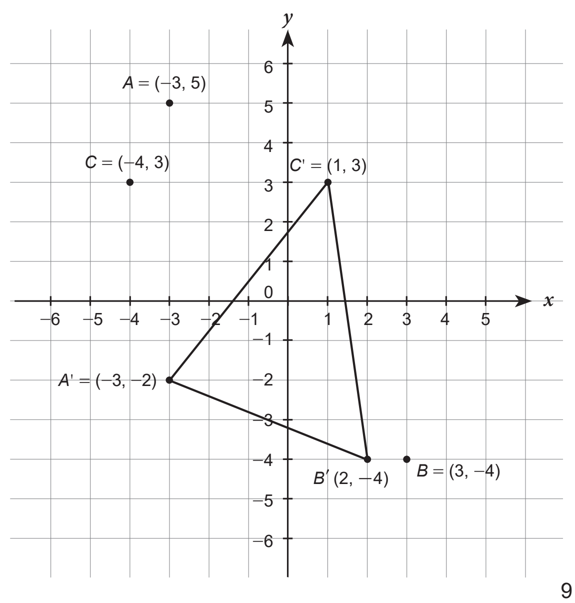
2. A is translated upwards by 5 units

B is translated rightwards by 6 units and upwards by 2 units.

3.

Point	Transformation	Image
$A(0, 2)$	A is translated 5 units to the left	$A'(-5, 2)$
$B(-3, 4)$	B is translated upwards by 2 units	$B'(-3, 6)$
$C(2, -3)$	C is translated upwards by 2 units	$C'(2, -1)$
$D(5, -1)$	D is translated upwards by 4 units	$D'(5, 3)$
$E(-1, -4)$	E is translated 3 units to the left and 4 units downwards	$E'(-4, -8)$
$F(3, 3)$	F is translated 5 units to the left and 5 units downwards	$F'(-2, -2)$

4. **(a)**



(b) The coordinates of A' are $(-3, -2)$

The coordinates of B' are $(2, -4)$

The coordinates of C' are $(1, 3)$

(c) $A'B'C'$ form an acute-angled triangle.

(d) A is translated 5 units to the right and 9 units downwards.

Section 2 B

1. **(a)** The coordinates of A are $(1, -3)$

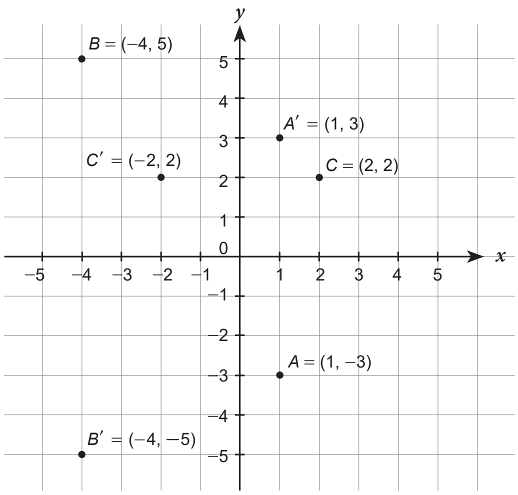
The coordinates of B are $(-4, 5)$

The coordinates of C are $(2, 2)$

(b) The coordinates of A' are $(-3, 3)$

The coordinates of B' are $(-3, -1)$

The coordinates of C' are $(-1, 3)$



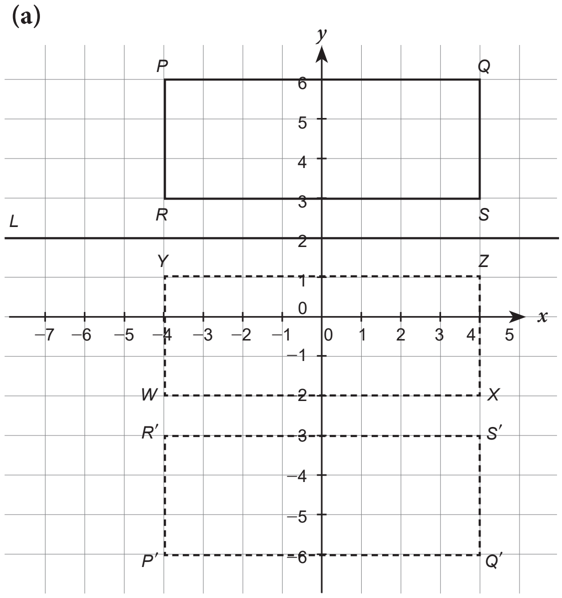
2. A is reflected along the y-axis

B is reflected along the x-axis

3.

Point	Transformation	Image
$A(3, -5)$	A is reflected along the y-axis	$A'(-3, -5)$
$B(-1, -3)$	B is reflected along the y-axis	$B'(1, -3)$
$C(6, 4)$	C is reflected along the x-axis	$C'(6, -4)$
$D(-8, -3)$	D is reflected along the x-axis	$D'(-8, 3)$

4. **(a)**



(b) The coordinates of P' are $(-4, -6)$

The coordinates of Q' are $(4, -6)$

The coordinates of R' are $(-4, -3)$

The coordinates of S' are $(4, -3)$

(c) $P'Q'R'S'$ form a rectangle.

(d) $$\begin{aligned}\text{Area} &= P'Q' \times P'R' \\ &= \left[4-(-4)\right] \times \left[-3-(-6)\right] \\ &= 8 \times 3 \\ &= 24\end{aligned}$$

$$\begin{aligned}\text{perimeter} &= (8+3) \times 2 \\ &= 22\end{aligned}$$

(e) The shape does not change, since the points are just swapping. P and Q swap with each other, R and S swap with each other.

(f) The coordinates of W are $(-4, -2)$

The coordinates of X are $(4, -2)$

The coordinates of Y are $(-4, 1)$

The coordinates of Z are $(4, 1)$

The shape is the same as the original $PQRS$.

Section 2 C

1. **(a)** The coordinates of A are $(-2, 4)$

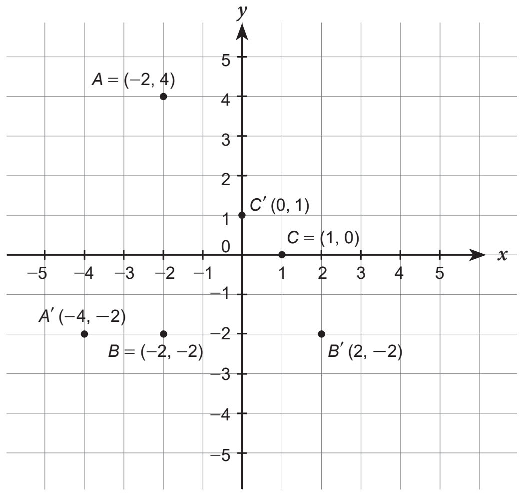
The coordinates of B are $(-2, -2)$

The coordinates of C are $(1, 0)$

(b) The coordinates of A' are $(-4, -2)$

The coordinates of B' are $(2, -2)$

The coordinates of C' are $(0, 1)$



2. A is rotated about origin by 90° anti-clockwise.

B is rotated about origin by 180° clockwise (or anti-clockwise).

3.

Point	Transformation	Image
$A(3, 0)$	A is rotated about the origin by 90° clockwise	$A'(0, -3)$
$B(-1, -4)$	B is rotated about the origin by 90° anti-clockwise	$B'(4, -1)$
$C(2, -8)$	C is rotated about the origin by 90° clockwise	$C'(-8, -2)$
$D(-5, -4)$	D is rotated about the origin by 270° anti-clockwise	$D'(-4, 5)$
$E(-4, 0)$	E is rotated about the origin by 180° clockwise (or anti-clockwise)	$E'(4, 0)$

4. **(a)** The coordinates of A are (4, 210°)

The coordinates of B are (3, 120°)

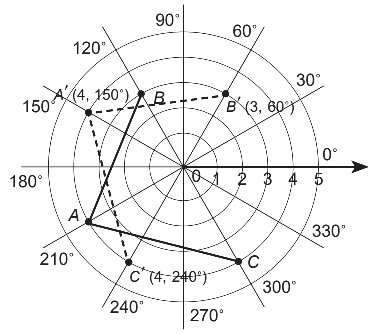
The coordinates of C are (4, 300°)

(b) Area of $\Delta ABC = \dfrac{BC \times OA}{2} = \dfrac{(3+4)\times 4}{2} = 14$ square units

(c) The coordinates of A' are (4, 150°)

The coordinates of B' are (3, 60°)

The coordinates of C' are (4, 240°)



(d) Area of $\Delta A'B'C' = \dfrac{B'C' \times OA'}{2} = \dfrac{(3+4)\times 4}{2} = 14$ square units

Section 2 D

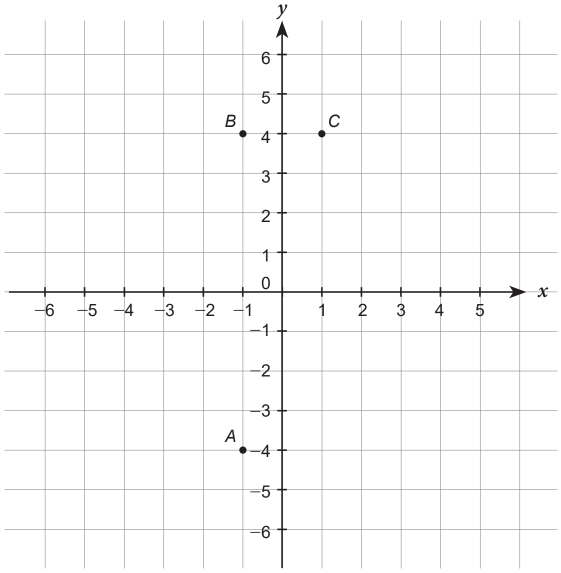
1.

Point	Transformation	Image
A (2, 6)	A is translated 12 units downwards	$A'(2, -6)$
B (1, 2)	B is translated 2 units to the right and 2 units upwards	$B'(3, 4)$
C (−5, −2)	C is translated 3 units to the right and 7 units upwards	$C'(-2, 5)$

2.

Point	Transformation	Image
$D(2, 6)$	D is reflected by x-axis	$D'(2, -6)$
$E(5, 0)$	E is rotated about the origin by 90° clockwise	$E'(0, -5)$
$F(-5, -2)$	F is rotated about the origin by 90° clockwise	$F'(-2, 5)$

3. **(a)**

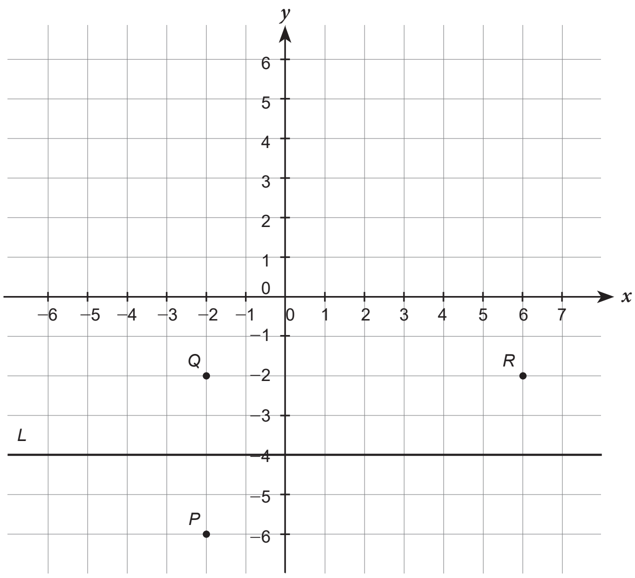


(b) The coordinates of B are $(-1, 4)$

(c) The coordinates of C are $(1, 4)$

(d) The transformation is rotation about the origin by 180° clockwise (or anti-clockwise)

4. **(a)**

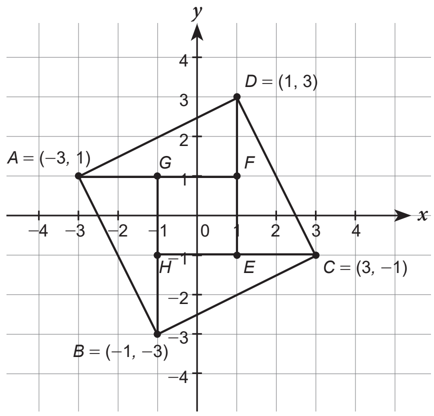


(b) The coordinates of Q are $(-2, -2)$

(c) The coordinates of R are $(6, -2)$

(d) The transformation is rotation about the origin by 90° anti-clockwise.

5. **(a)** The coordinates of B are $(-1, -3)$.



(b) The coordinates of C are $(3, -1)$.

The coordinates of D are $(1, 3)$.

(c) $ABCD$ is a square

(d) By cutting the square into 4 pieces of identical triangles and 1 square,

Area of $ABCD$

$= 4 \times$ Area of triangle $+$ Area of square

$$= 4 \times \frac{[1-(-3)] \times (3-1)}{2} + [1-(-1)]^2$$

$$= 4 \times \frac{4 \times 2}{2} + 2^2$$

$= 16 + 4$

$= 20$ square units