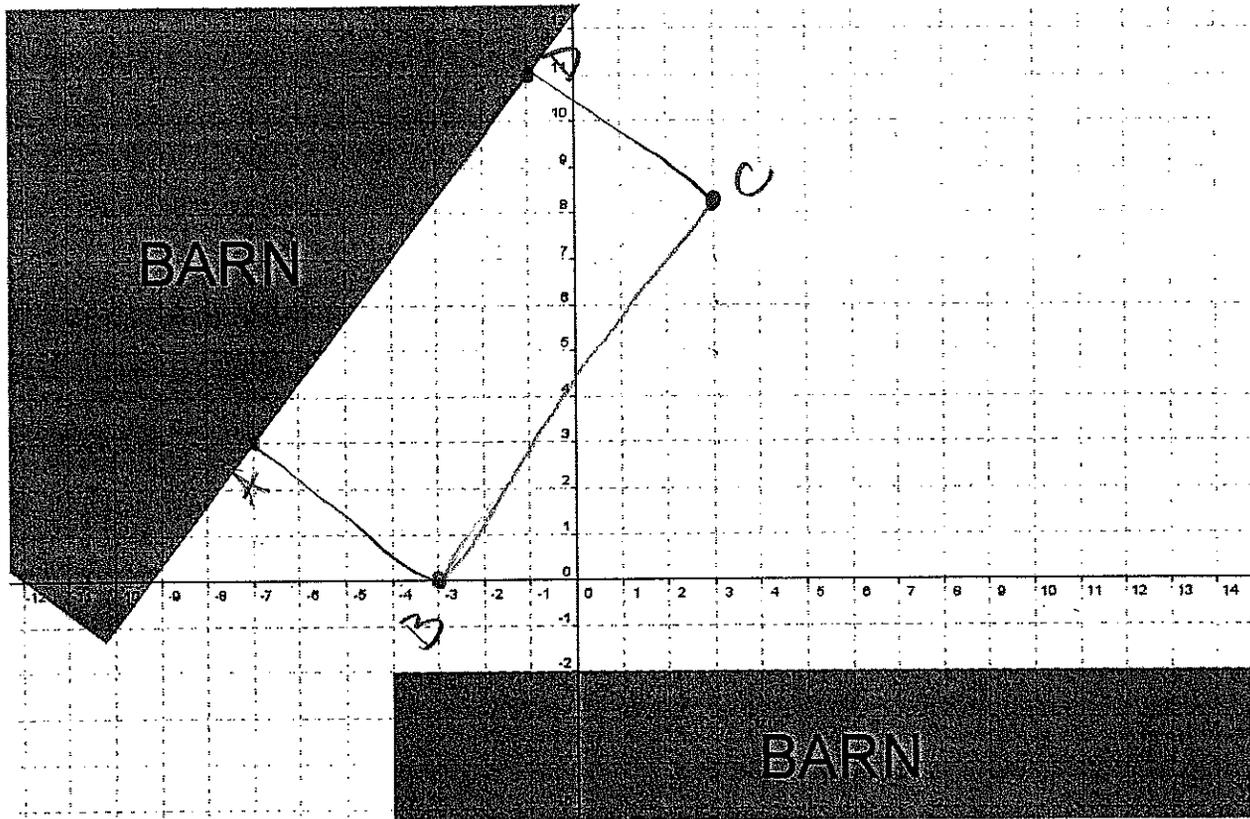


A farmer is adding two enclosed containers to collect rainwater on his farm. In order to make sure the containers are placed at precise locations beside two barns, he uses a coordinate system to build the containers.



The base of the first container connects vertices A, B, C, and D as listed:

$$A(-7, 3)$$

$$B(-3, 0)$$

$$C(3, 8)$$

$$D(-1, 11)$$

1: What shape is the farmer constructing as the base of this container? Use as specific a name as possible for the quadrilateral. Prove mathematically that this name is appropriate.

The shape is a rectangle. A rectangle is a quadrilateral where opposite sides are congruent and parallel, as shown below:

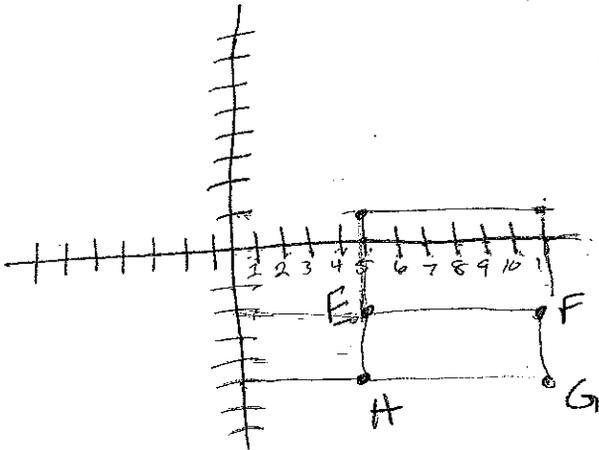
$$\begin{aligned} \text{length AD} &= \sqrt{(-7+1)^2 + (3-11)^2} \\ &= \sqrt{-6^2 + 8^2} \\ &= \sqrt{36 + 64} \\ &= \sqrt{100} = 10 \end{aligned}$$

$$\begin{aligned} \text{length BC} &= \sqrt{(-3-3)^2 + (0-8)^2} \\ &= \sqrt{(-6)^2 + 8^2} \\ &= \sqrt{36 + 64} \\ &= \sqrt{100} = 10 \end{aligned}$$

$$\begin{aligned} \text{length AB} &= \sqrt{(-7+3)^2 + (3-0)^2} \\ &= \sqrt{4^2 + 3^2} \\ &= \sqrt{16 + 9} \\ &= \sqrt{25} = 5 \end{aligned}$$

$$\begin{aligned} \text{length DC} &= \sqrt{(-1-3)^2 + (11-8)^2} \\ &= \sqrt{(-4)^2 + (3)^2} \\ &= \sqrt{16 + 9} \\ &= \sqrt{25} = 5 \end{aligned}$$

- 2: The second container has a base that connects vertices E, F, G, and H, such that quadrilateral EFGH is similar to quadrilateral ABCD. Vertex E has coordinates (5, -2) and vertex F has coordinates (11, -2). Give all possible coordinates for points G and H.



$$H = (5, 1) \text{ or } (5, -5)$$

$$G = (11, 1) \text{ or } (11, -5)$$

$$\frac{5}{10} = \frac{x}{6}$$

$$\frac{30}{10} = \frac{10x}{10}$$

$$x = 3$$

- 3: The first container (with base ABCD) is an enclosed prism that has a special quality: the number of square units in the surface area is equal to the number of cubic units in the volume. Find the height of the container.

$$L = 10 \quad W = 5 \quad h = ?$$

$$= a \quad = b \quad = c$$

$$V = lwh$$

$$SA = 2ab + 2bc + 2ac$$

$$(10)(5)c = 2(10)(5) + 2(5)(c) + 2(10)c$$

$$50c = 100 + 10c + 20c$$

$$-30c \quad -30c$$

$$\frac{20c}{20} = \frac{100}{20}$$

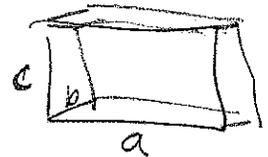
$$c = 5$$

$$10(5)(5) = 250$$

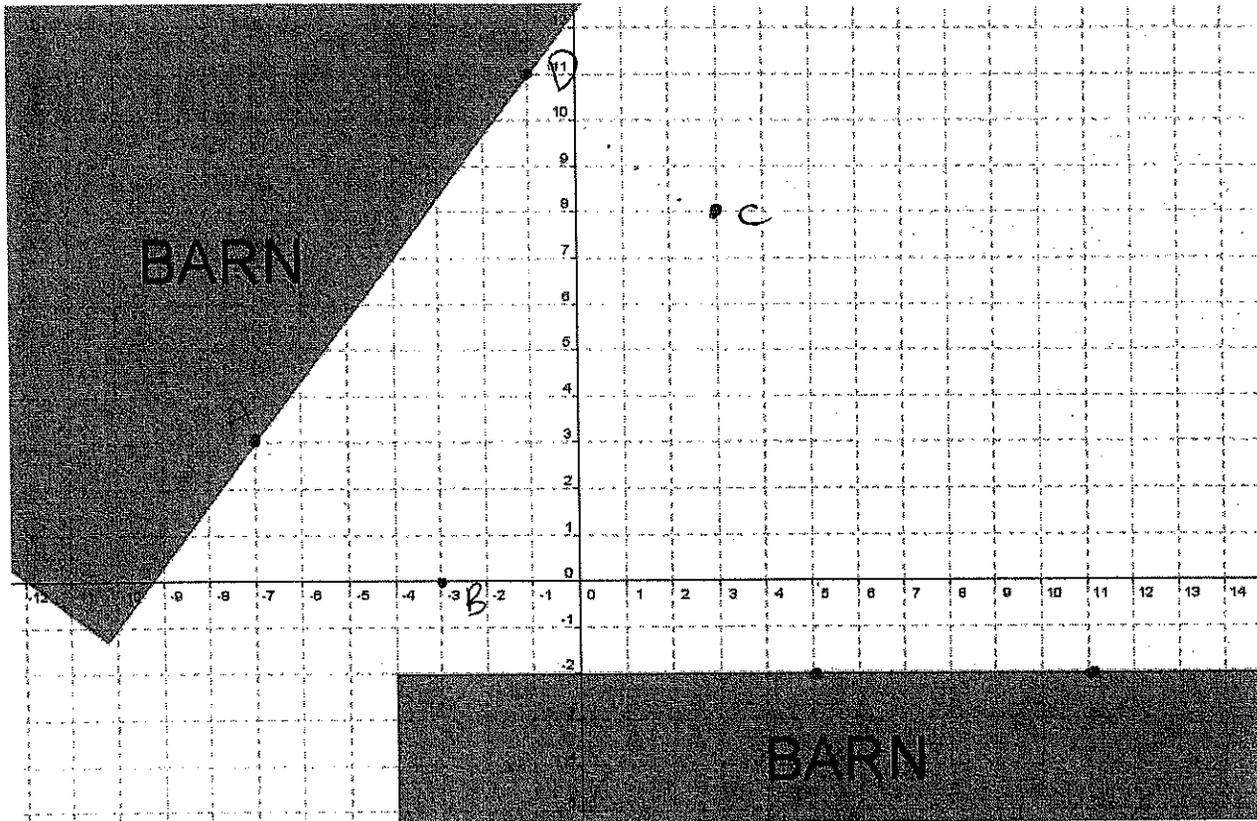
$$2(10)(5) + 2(5)(5) + 2(10)(5) = 250$$

$$250 = 250$$

height of the container = 5 units



A farmer is adding two enclosed containers to collect rainwater on his farm. In order to make sure the containers are placed at precise locations beside two barns, he uses a coordinate system to build the containers.



The base of the first container connects vertices A, B, C, and D as listed:

$x_1, y_1$        $x_2, y_2$        $x_3, y_3$        $x_4, y_4$   
 A(-7, 3)      B(-3, 0)      C(3, 8)      D(-1, 11)

- 1: What shape is the farmer constructing as the base of this container? Use as specific a name as possible for the quadrilateral. Prove mathematically that this name is appropriate.

$$\begin{aligned}
 D &= (x_2 - x_1)^2 + (y_2 - y_1)^2 \\
 &= (3 - (-7))^2 + (8 - 3)^2 \\
 &= 100 + 25 \\
 &= 125
 \end{aligned}$$

$$\begin{aligned}
 D &= (-1 - 3)^2 + (11 - 0)^2 \\
 &= 4 + 121 \\
 &= 125
 \end{aligned}$$

Rectangle because diagonals are equal.

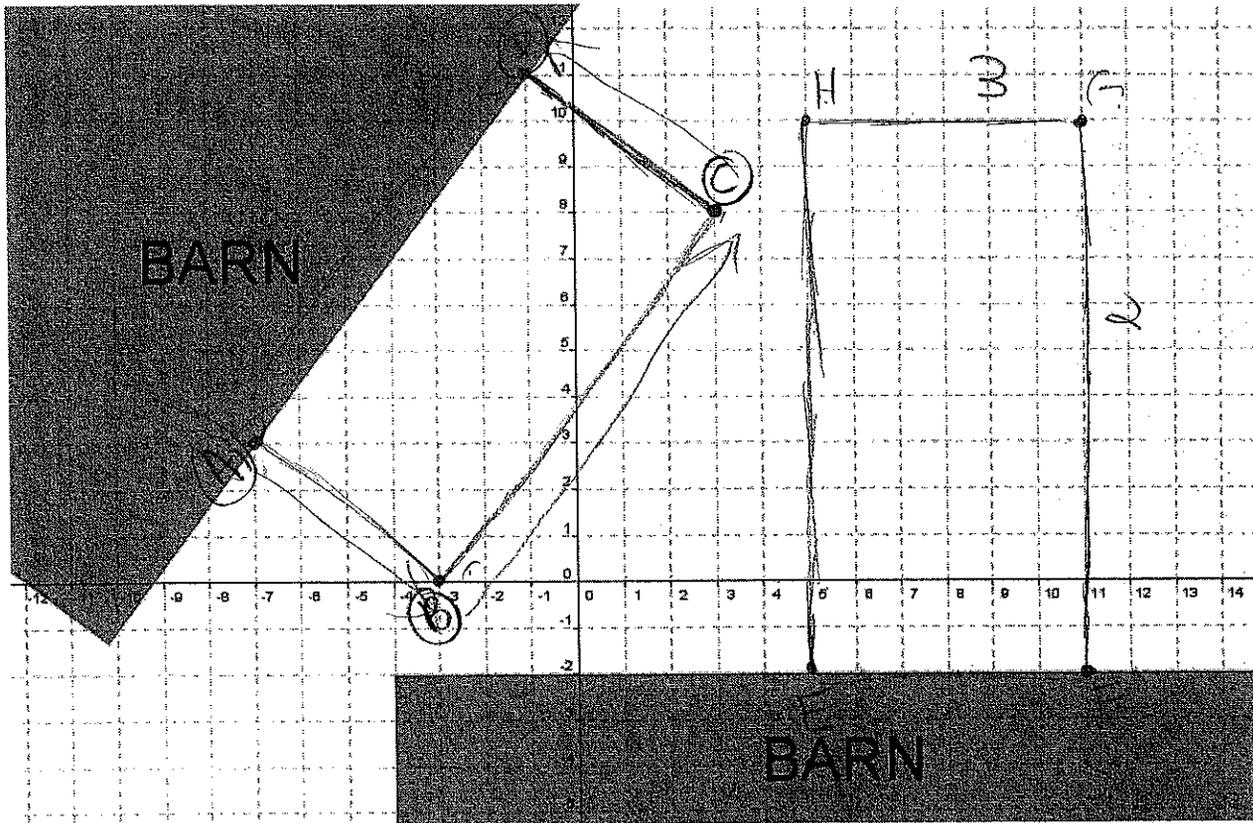
- 2: The second container has a base that connects vertices E, F, G, and H, such that quadrilateral EFGH is similar to quadrilateral ABCD. Vertex E has coordinates (5, -2) and vertex F has coordinates (11, -2). Give all possible coordinates for points G and H.

$$(5, -5), (11, -5), (5, 1), (11, 1)$$

- 3: The first container (with base ABCD) is an enclosed prism that has a special quality: the number of square units in the surface area is equal to the number of cubic units in the volume. Find the height of the container.

$$10$$

A farmer is adding two enclosed containers to collect rainwater on his farm. In order to make sure the containers are placed at precise locations beside two barns, he uses a coordinate system to build the containers.



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A(-7, 3)

B(-3, 0)

C(3, 8)

D(-1, 11)

- 1: What shape is the farmer constructing as the base of this container? Use as specific a name as possible for the quadrilateral. Prove mathematically that this name is appropriate.

Parallel Rectangle,

$$d = \sqrt{(-3 - 7)^2 + (0 - 3)^2} = \sqrt{(-1 - 3)^2 + (11 - 8)^2}$$

$$\sqrt{16 + 9} = \sqrt{16 + 9}$$

$$5 = 5$$

$$d = \sqrt{(3 - -3)^2 + (8 - 0)^2} = \sqrt{(-1 + 7)^2 + (11 - 3)^2}$$

$$d = \sqrt{(6)^2 + (8)^2} = \sqrt{(6)^2 + (8)^2}$$

$$10 = 10$$

2: The second container has a base that connects vertices E, F, G, and H, such that quadrilateral EFGH is similar to quadrilateral ABCD. Vertex E has coordinates (5, -2) and vertex F has coordinates (11, -2). Give all possible coordinates for points G and H.

$$(11, 10) \quad (5, 10)$$

3: The first container (with base ABCD) is an enclosed prism that has a special quality: the number of square units in the surface area is equal to the number of cubic units in the volume. Find the height of the container.

$$S = 2lw + 2lh + 2wh = lwh$$

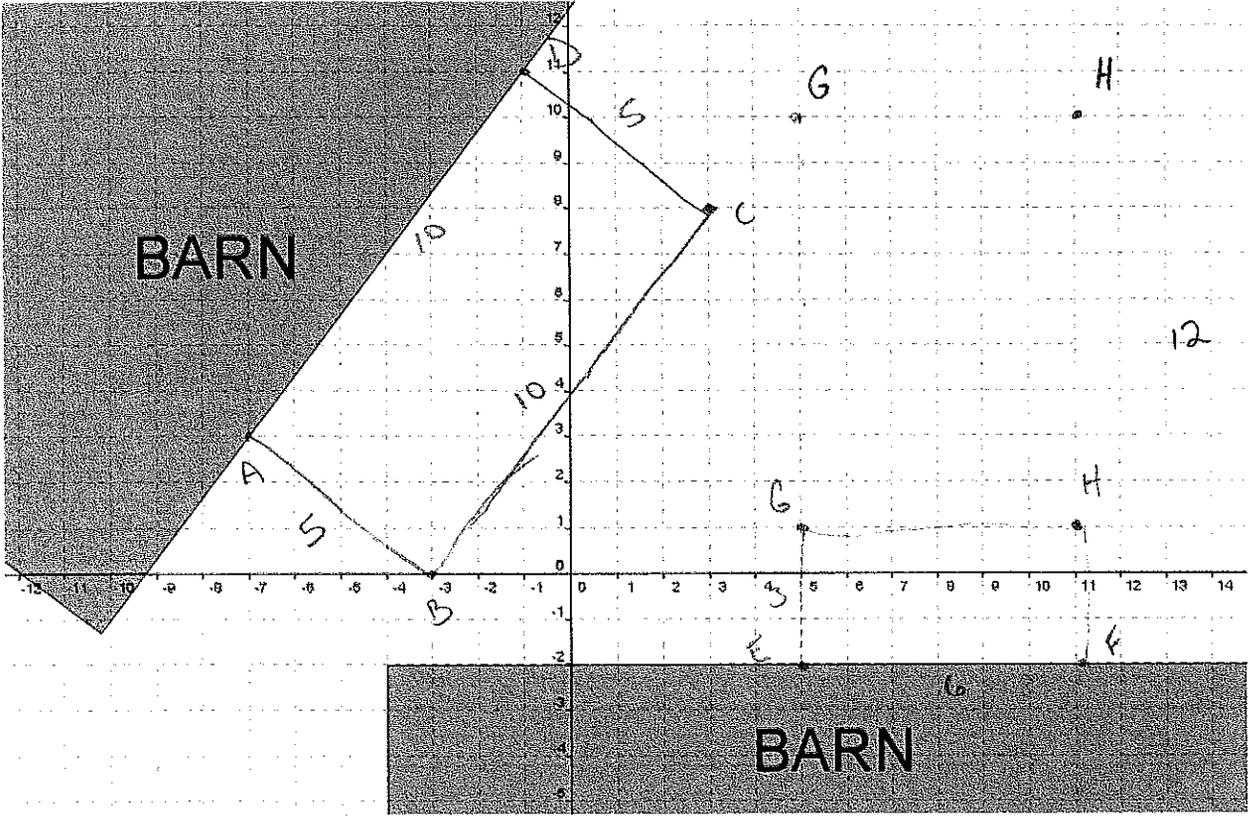
$$2(10)5 + 2(10)h + 2(5)h = (10)(5)h$$

$$100 + \cancel{20h} + \cancel{10h} = 50h - 30h$$

$$\frac{100}{20} = \frac{20h}{20}$$

$$5 = h$$

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- A(-7, 3)
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- C(3, 8)
- D(-1, 11)

1: What shape is the farmer constructing as the base of this container? Use as specific a name as possible for the quadrilateral. Prove mathematically that this name is appropriate.

$\sqrt{16} = 4$        $\sqrt{36+64} = 10$        $\sqrt{16+9} = 5$        $\sqrt{36+64} = 10$

$m_{AB} = \frac{3-0}{-7+3} = -\frac{3}{4}$

$m_{BC} = \frac{0-8}{-3-3} = \frac{4}{3}$

opposite reciprocal slopes  
 so  $\perp$

$4 + 121 = \sqrt{125}$

since  $BC^2 + DC^2 = BD^2$ , it's a right  $\Delta$ , so  $\angle DCB = 90$   
 likewise  $\angle DAB = 90$

\* so 4 right angles  
It's a rectangle

2: The second container has a base that connects vertices E, F, G, and H, such that quadrilateral EFGH is similar to quadrilateral ABCD. Vertex E has coordinates (5, -2) and vertex F has coordinates (11, -2). Give all possible coordinates for points G and H.

length of EF = 6

$$G(5, 1) \text{ and } H(11, 1)$$

or

$$G(5, 10) \text{ and } H(11, 10)$$

so can have sides of 3 and 6 or 6 and 12

3: The first container (with base ABCD) is an enclosed prism that has a special quality: the number of square units in the surface area is equal to the number of cubic units in the volume. Find the height of the container.

$$2lw + 2hw + 2hl = lwh$$

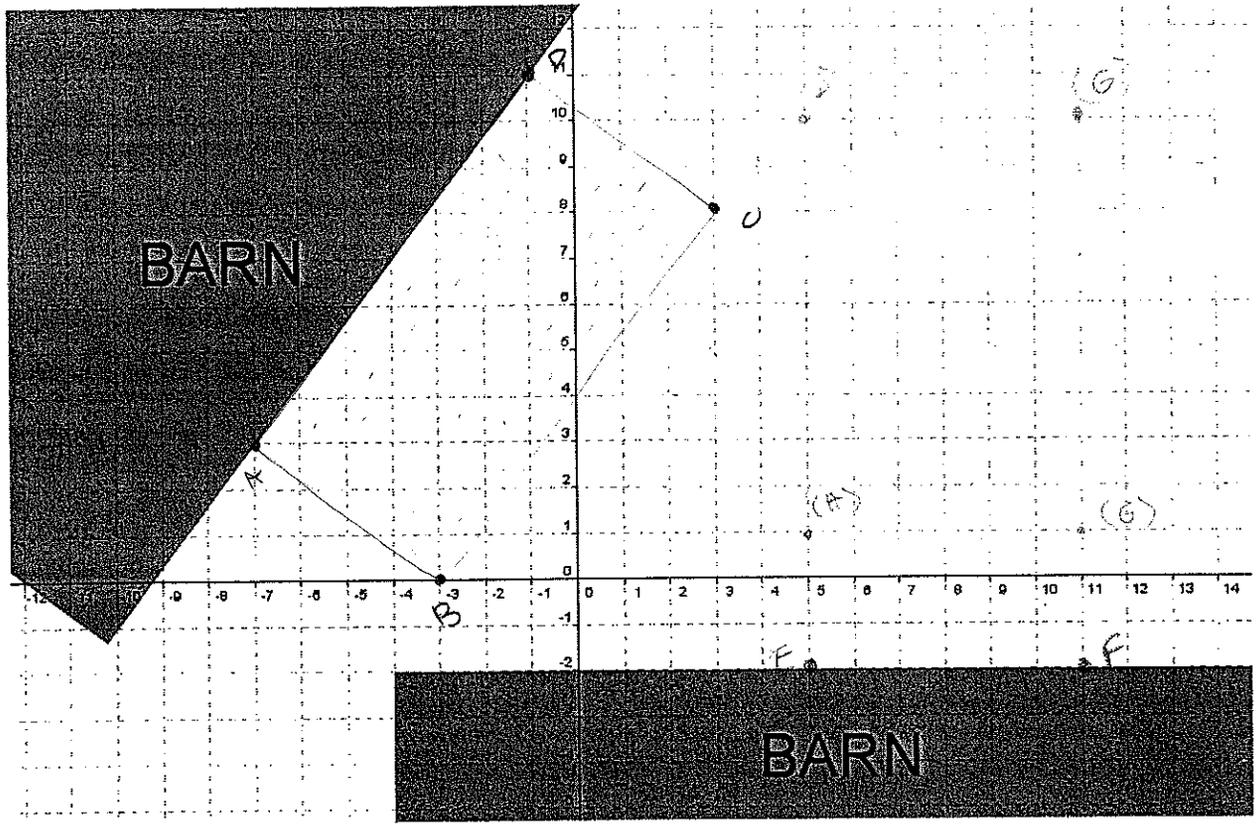
$$100 + 10h + 20h = 50h$$

$$100 + 30h = 50h$$

$$100 = 20h$$

$$h = 5 \text{ units}$$

A farmer is adding two enclosed containers to collect rainwater on his farm. In order to make sure the containers are placed at precise locations beside two barns, he uses a coordinate system to build the containers.



The base of the first container connects vertices A, B, C, and D as listed:

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- C(3, 8)
- D(-1, 11)

1: What shape is the farmer constructing as the base of this container? Use as specific a name as possible for the quadrilateral. Prove mathematically that this name is appropriate.

the shape is a rectangle:

81  
64  
145

distance

$$BC \rightarrow \sqrt{(-3-3)^2 + (0-8)^2}$$

$$\sqrt{0^2 + 8^2}$$

$$\sqrt{36 + 64} = \sqrt{100} = 10$$

distance

$$AD \rightarrow \sqrt{(-7+1)^2 + (3-11)^2}$$

$$\sqrt{6^2 + 8^2}$$

$$\sqrt{36 + 64} = \sqrt{100} = 10$$

the distance of BC and the distance of AD are equal; also, the distance of AB and DC are the same

distance

$$AB \rightarrow \sqrt{(-7-3)^2 + (3-0)^2}$$

$$\sqrt{-4^2 + 3^2}$$

$$\sqrt{16 + 9} = \sqrt{25} = 5$$

distance

$$DC \rightarrow \sqrt{(3-1)^2 + (8-11)^2}$$

$$\sqrt{-4^2 + 3^2}$$

$$\sqrt{16 + 9} = \sqrt{25} = 5$$

2: The second container has a base that connects vertices E, F, G, and H, such that quadrilateral EFGH is similar to quadrilateral ABCD. Vertex E has coordinates (5, -2) and vertex F has coordinates (11, -2). Give all possible coordinates for points G and H.

$$\frac{10}{5} = \frac{x}{6}$$

$$20 = 5x$$

$$x = 12$$

G can be: (11, 1) or (11, 10)

H can be: (5, 1) or (5, 10)

$$\frac{10}{5} = \frac{6}{x}$$

$$30 = 10x$$

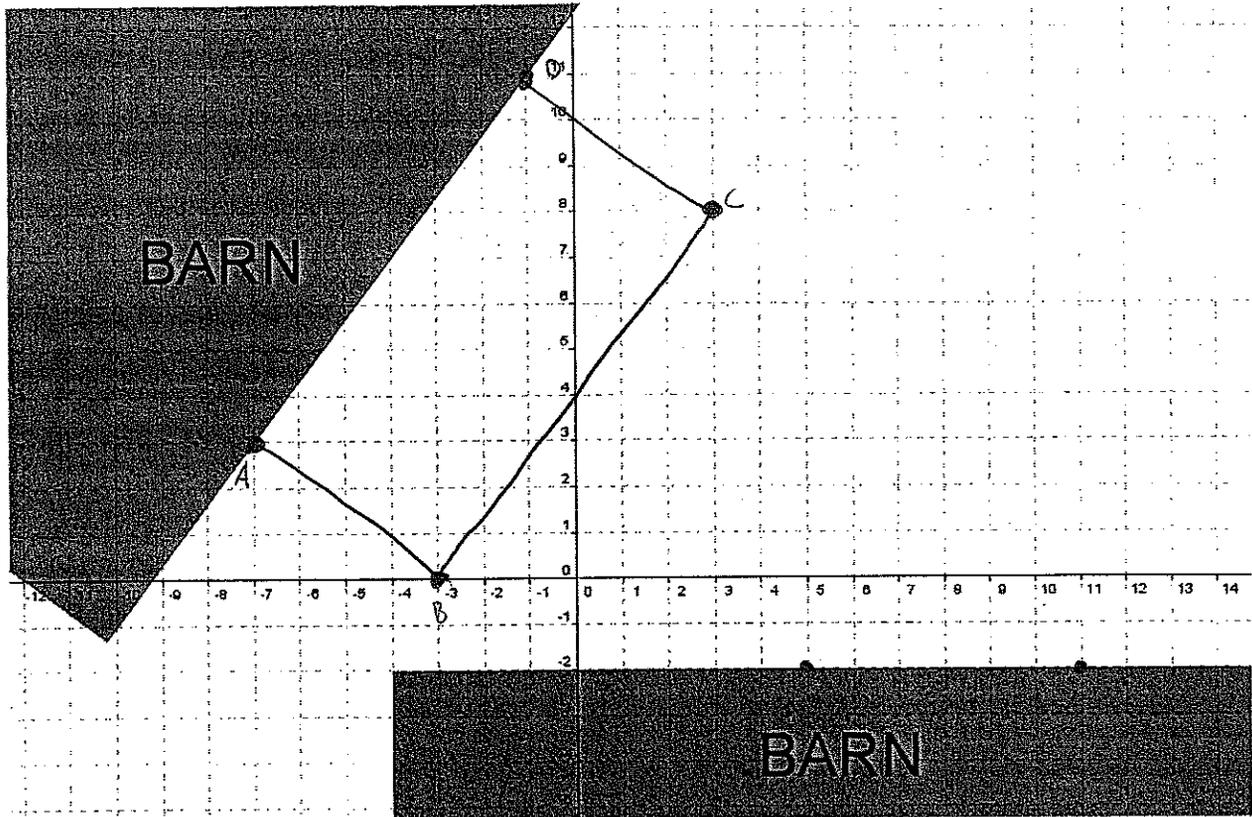
$$x = 3$$

3: The first container (with base ABCD) is an enclosed prism that has a special quality: the number of square units in the surface area is equal to the number of cubic units in the volume. Find the height of the container.

height = 5 square units

$$\begin{aligned} \text{height} &\rightarrow \sqrt{(-7-3)^2 + (3-0)^2} \\ &\sqrt{10^2 + 3^2} \\ &\sqrt{100 + 9} \\ &\sqrt{109} = 5 \end{aligned}$$

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The base of the first container connects vertices A, B, C, and D as listed:

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$$C(3, 8)$$

$$D(-1, 11)$$

- 1: What shape is the farmer constructing as the base of this container? Use as specific a name as possible for the quadrilateral. Prove mathematically that this name is appropriate.

Rectangle; the distance AB is equal to CD, and the distance BC is equal to AD.

$$\overline{AB}: \sqrt{4^2 + 3^2} = \sqrt{25} = 5$$

$$\overline{CD}: \sqrt{4^2 + 3^2} = \sqrt{25} = 5$$

$$\overline{AD}: \sqrt{6^2 + 8^2} = 10$$

$$\overline{BC}: \sqrt{6^2 + 8^2} = 10$$

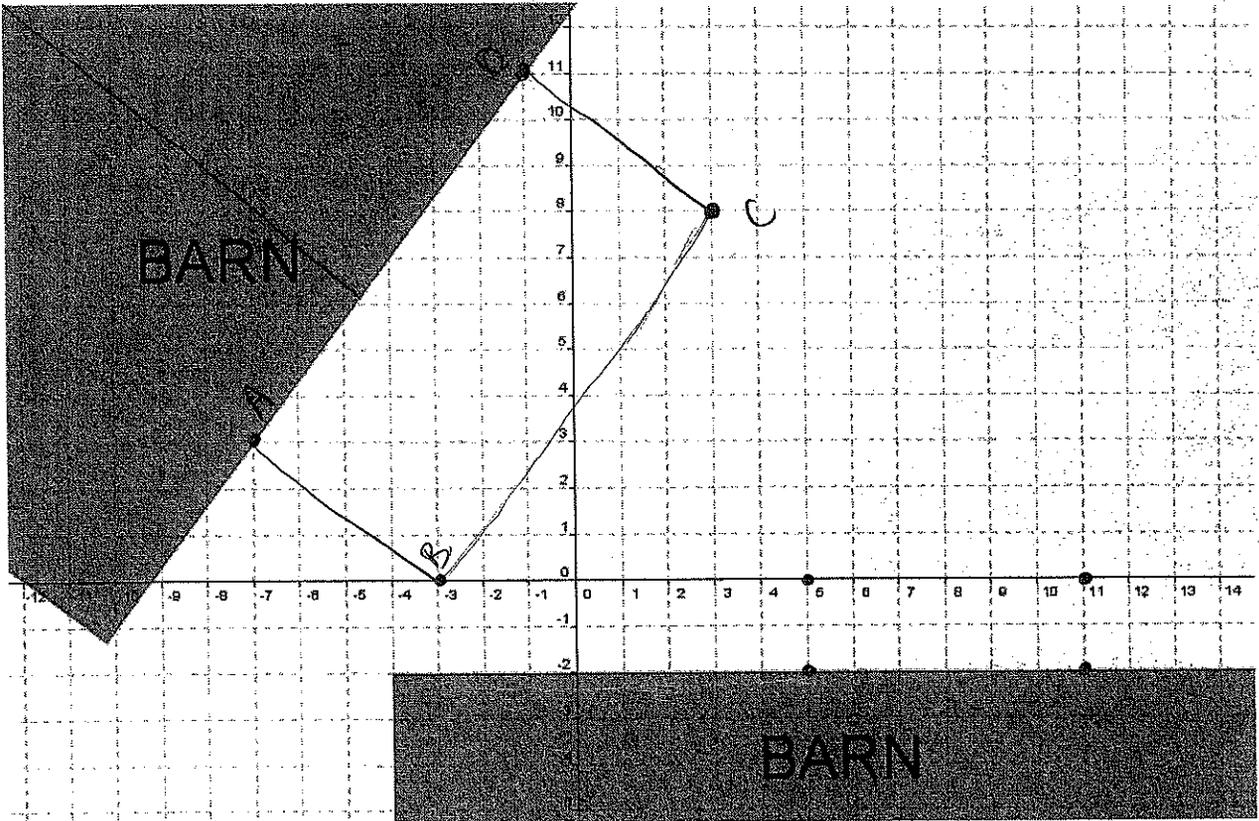
- 2: The second container has a base that connects vertices E, F, G, and H, such that quadrilateral EFGH is similar to quadrilateral ABCD. Vertex E has coordinates (5, -2) and vertex F has coordinates (11, -2). Give all possible coordinates for points G and H.

$\frac{5}{10} = \frac{6}{12}$ , so the coordinates for G & H could be one of two solutions  $\rightarrow$  ① G & H are (5, 10) and (11, 10) or ② G & H are (5, -14) and (11, -14)

- 3: The first container (with base ABCD) is an enclosed prism that has a special quality: the number of square units in the surface area is equal to the number of cubic units in the volume. Find the height of the container.

- ABCD is  $50 \text{ un}^2$ , so volume of ABCD is  $50 \text{ un}^3$   
 - Volume of rectangular prism is  $V = lwh$ , so  $5 \cdot 10 \cdot h = 50 \text{ un}^3$ ,  
 therefore the height is 1.

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B(-3, 0)

C(3, 8)

D(-1, 11)

- 1: What shape is the farmer constructing as the base of this container? Use as specific a name as possible for the quadrilateral. Prove mathematically that this name is appropriate.

Rectangle, it has two pairs of sides that are perpendicular and parallel

- 2: The second container has a base that connects vertices E, F, G, and H, such that quadrilateral EFGH is similar to quadrilateral ABCD. Vertex E has coordinates (5, -2) and vertex F has coordinates (11, -2). Give all possible coordinates for points G and H.

$$\{x \mid 5 \leq x \leq \infty\}, \{x \mid 11 \leq x \leq \infty\}$$

- 3: The first container (with base ABCD) is an enclosed prism that has a special quality: the number of square units in the surface area is equal to the number of cubic units in the volume. Find the height of the container.

$$\text{units}^2 = \text{cubic units in volume}$$

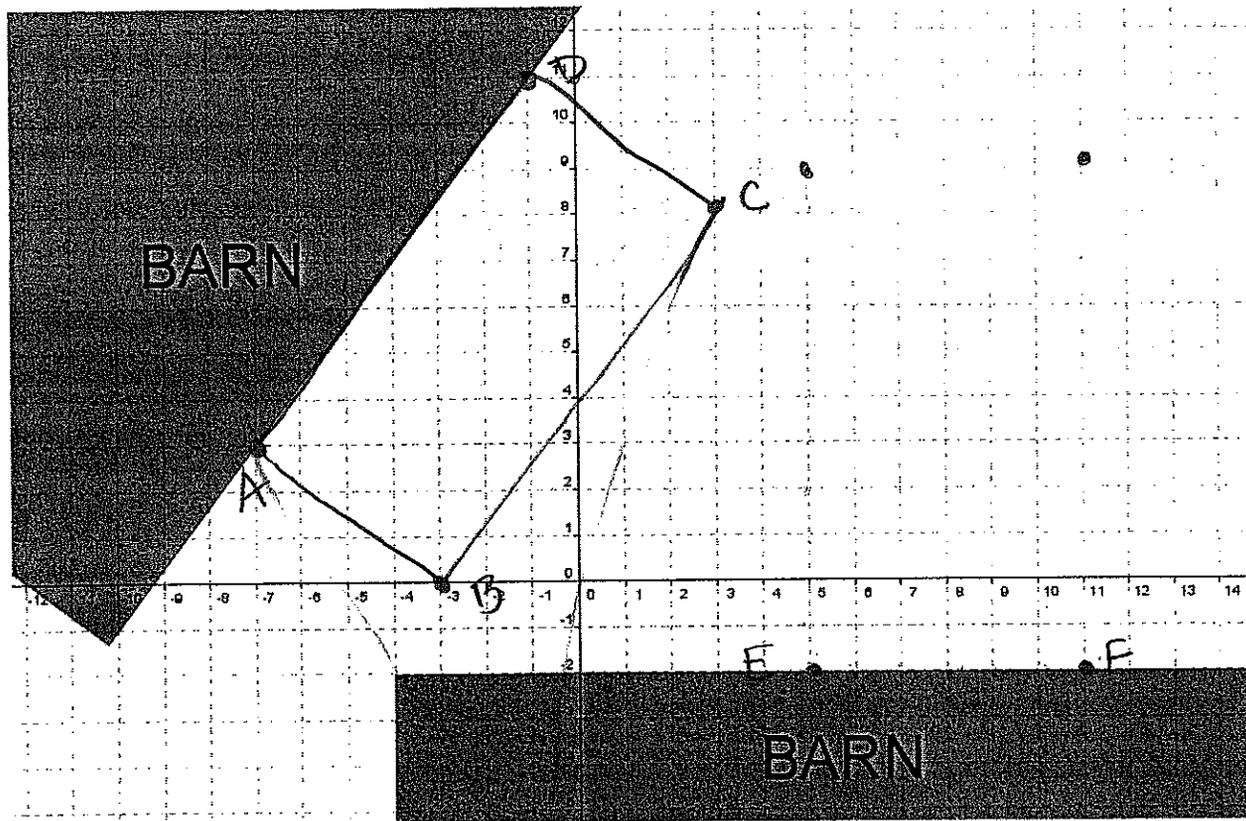
$$\sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$$

$$\sqrt{(-3 + 7)^2 + (0 + 3)^2}$$

$$\begin{array}{c} \sqrt{4^2 + (-3)^2} = \sqrt{16 + 9} = 25 \quad 5 \\ \begin{array}{cc} x & y \\ (-7, 3) & (-3, 0) \end{array} \end{array}$$

$$\text{Height} = 5 \text{ units}$$

A farmer is adding two enclosed containers to collect rainwater on his farm. In order to make sure the containers are placed at precise locations beside two barns, he uses a coordinate system to build the containers.



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C(3, 8)

D(-1, 11)

- 1: What shape is the farmer constructing as the base of this container? Use as specific a name as possible for the quadrilateral. Prove mathematically that this name is appropriate.

The name is a rectangle.  
 This is because it has 4 90° angle corners, and the distance between A and D and B and C are equal, and the distances between D and C and A and B are the same

AD  
 $d = \sqrt{(-1+7)^2 + (11-3)^2} = \sqrt{100} = 10$

BC  
 $d = \sqrt{(3+3)^2 + (8-0)^2} = \sqrt{100} = 10$

DC  
 $\sqrt{(-1-3)^2 + (11-8)^2} = \sqrt{25} = 5$

AB  
 $\sqrt{(-3+7)^2 + (0-3)^2} = \sqrt{25} = 5$

- 2: The second container has a base that connects vertices E, F, G, and H, such that quadrilateral EFGH is similar to quadrilateral ABCD. Vertex E has coordinates (5, -2) and vertex F has coordinates (11, -2). Give all possible coordinates for points G and H.

$$\begin{array}{cc} (5, 9) & (11, 9) \\ G & H \end{array}$$

$$\begin{array}{cc} (5, 2) & (11, 2) \\ G & H \end{array}$$

$$\begin{array}{cc} (5, -13) & (11, -13) \\ G & H \end{array}$$

$$\begin{array}{cc} (5, -6) & (11, -6) \\ G & H \end{array}$$

- 3: The first container (with base ABCD) is an enclosed prism that has a special quality: the number of square units in the surface area is equal to the number of cubic units in the volume. Find the height of the container.

$$V = L \cdot W \cdot h$$

$$50 = 5 \cdot 10 \cdot h$$

$$\boxed{1 = h}$$