



G3-G4  
Basic

G5-G6  
Advanced

# Helping With Math

GRADES

## Spatial Skill: Area

*Suitable for students*  
**aged 7-11**



This pack is suitable for learners aged 7-11 years old or 3rd to 6th grades. The content covers fact files and relevant basic and advanced activities of area topics that aim to develop and strengthen the learners' spatial skills.

### ***Valor, Sacrifice and Peace***

December 7 is Pearl Harbor Remembrance Day



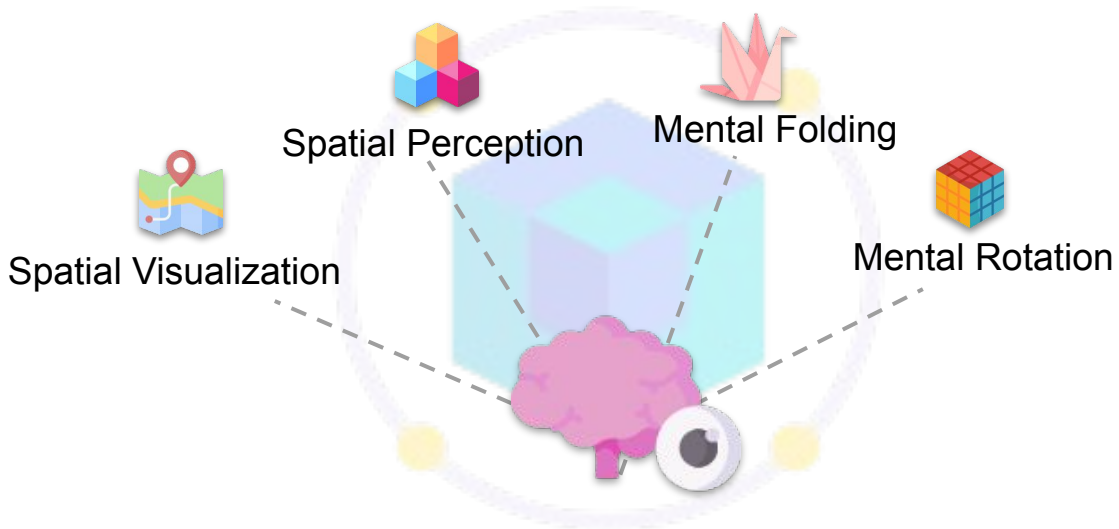
On December 7, 1941, the Japanese imperial forces attacked the Pearl Harbor naval base located on the island of Oahu, Hawaii just West of Honolulu. Around 2,400 servicemen and civilians were killed in this attack and many more were injured.

The US government declared December 7 as **Pearl Harbor Remembrance Day** as a way to honor those killed during the bombing of Pearl Harbor. A special ceremony and other events take place during this day in the Pearl Harbor National Memorial.



## SPATIAL SKILL

**Spatial skills**, also called visuo-spatial intelligence, is the ability to visualize and remember shapes, the positions of objects, and their spatial relations.



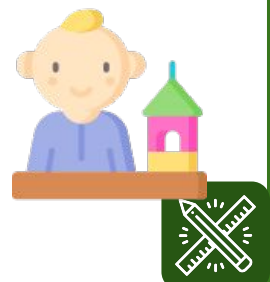
If you are in a new place and you are reading a map to figure out your way around, you visualize and remember the positioning of landmarks and streets in your mind. This is an example of how we can use our spatial skills in our everyday life.



When we nurture and develop this ability, you can easily excel in advanced levels of science, technology, engineering, or math. Jobs in these fields can make use of spatial skills when building structures, creating machines, understanding the human body, or developing new technologies.



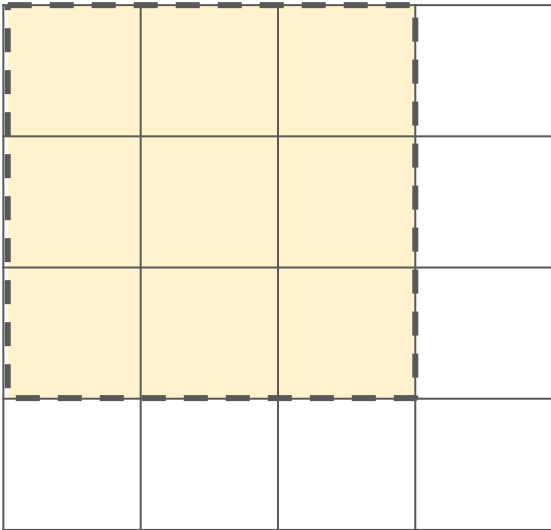
From a young age, we can develop our spatial skills by doing a variety of activities like playing with building blocks, learning how to sketch, doing origami, or playing video games.



# AREA

## What is Area?

Area is the space that is occupied by a flat shape or the size of an object's surface.

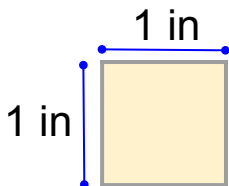


Area is learning what is the measurement of the space that this yellow square occupies.

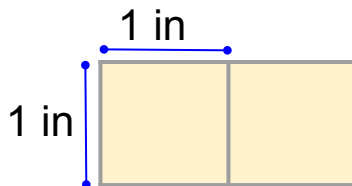


The unit of measurement for area is *square units*. For example, square centimeters, square inches, square meters, or square feet.

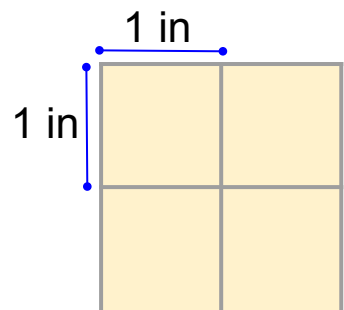
Example:  $\text{cm}^2$   $\text{in}^2$   $\text{m}^2$   $\text{ft}^2$



Area =  $1 \text{ in}^2$



Area =  $2 \text{ in}^2$



Area =  $4 \text{ in}^2$



# AREA OF A SQUARE

A square's area is based on the number of square units that fill up the square or simply the square of the measurement of a side.

$$\text{Area of a square} = s^2 \text{ (or side}^2\text{)}$$

**Example 1:**



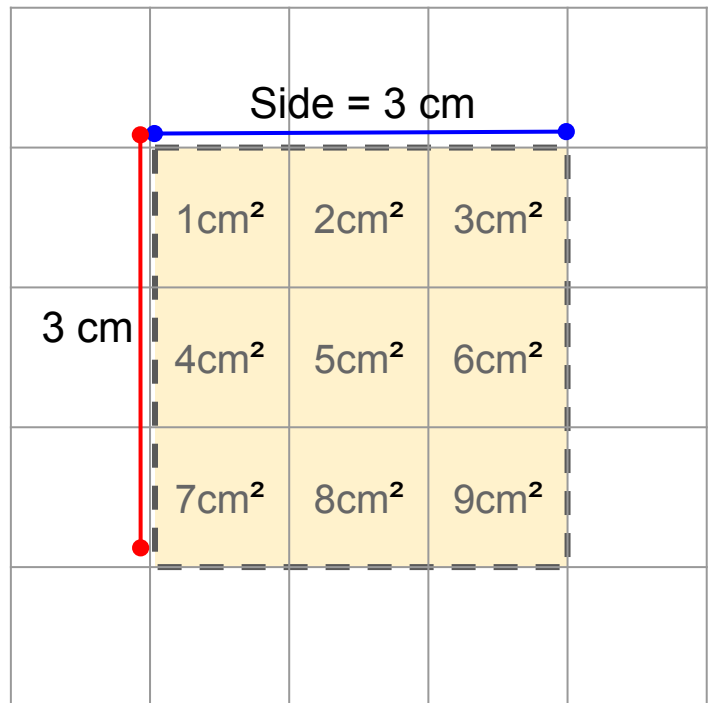
Side = 3 cm

$$\text{Area} = (3 \text{ cm})^2$$

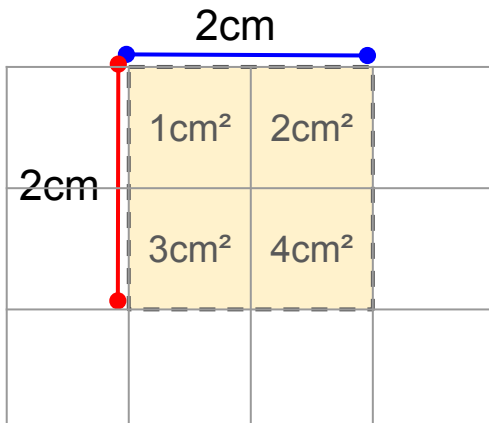
$$\text{Area} = 9 \text{ cm}^2$$

Based on the measurement of the side of this square, each square unit is  $1\text{cm}^2$ . The shaded area occupies nine square units.

Therefore, the area is  $9\text{cm}^2$



Since the square has the same measurement for all of its four sides, by knowing the measurement of one side, we can just simply square this or multiply the measurement twice to get the area.



**Example 2:**



The shaded area fills four square units. Therefore, the area is  $4\text{cm}^2$

$$\text{Side} = 2\text{cm}$$

$$\text{Area} = (2 \text{ cm})^2$$

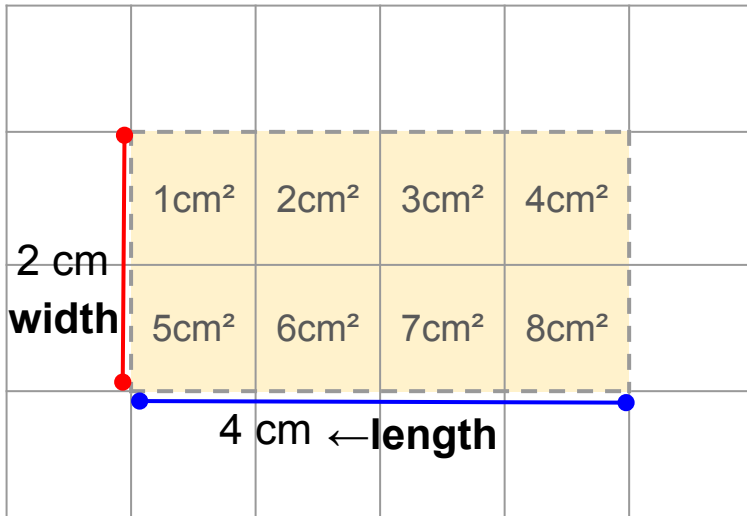
$$\text{Area} = 4 \text{ cm}^2$$



## AREA OF A RECTANGLE

The area of a rectangle is similar to how we calculate the area of a square, which is based on the length of its sides. Since a rectangle has sides with a different length and width, the area formula is the product of its length and width.

**Area of a rectangle = length x width**

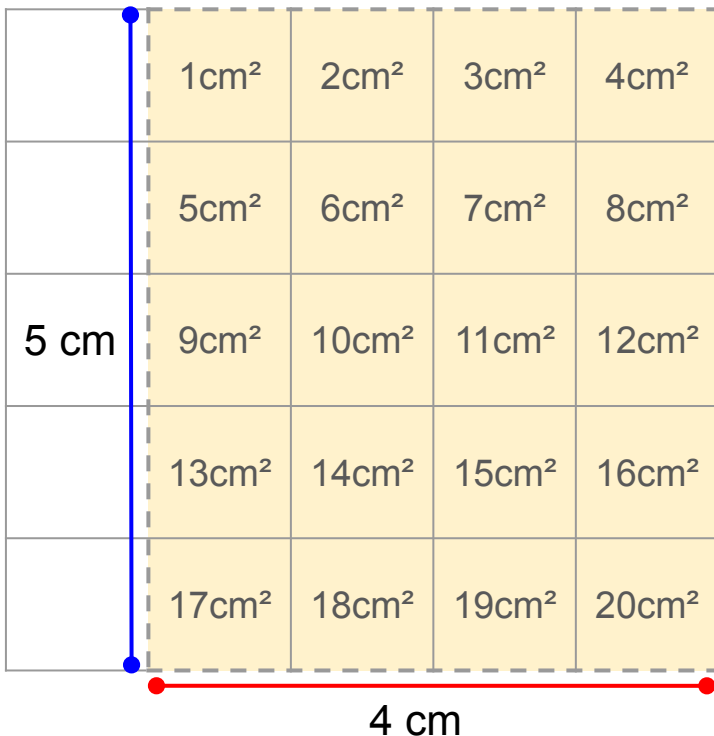


**Example 1**



Width = 2 cm  
Length = 4 cm

Area = 4 cm x 2 cm  
**Area = 8 cm²**



**Example 2**



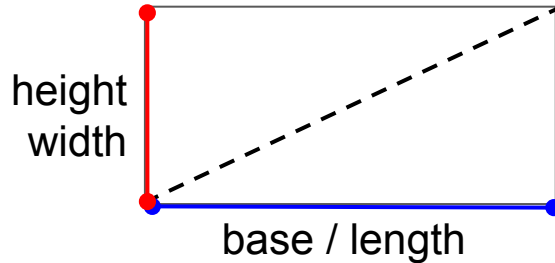
Width = 4 cm  
Length = 5 cm

Area = 5 cm x 4 cm  
**Area = 20 cm²**



# AREA OF A TRIANGLE

The formula for the area of a triangle is based on the the area formula of the rectangle, which is base measurement multiplied by height (or length multiplied by width)



If we draw a diagonal line on a rectangle, we create two congruent triangles. Therefore, the area of the triangle is half of the area of a rectangle.

$$\text{Area of a triangle} = \frac{1}{2} (\text{base} \times \text{height})$$

## Example 1:

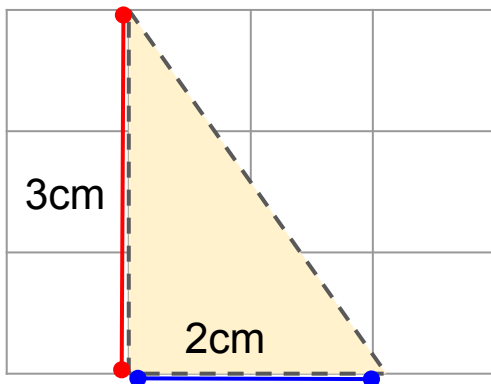
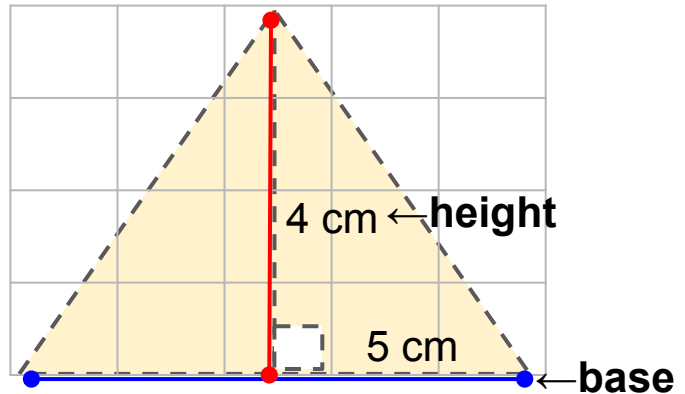
Height = 4 cm

Base = 5 cm

Area =  $\frac{1}{2}$  (5 cm x 4 cm)

Area =  $\frac{1}{2}$  (20 cm<sup>2</sup>)

Area = 10 cm<sup>2</sup>



## Example 2:

Height = 3 cm Base = 2 cm

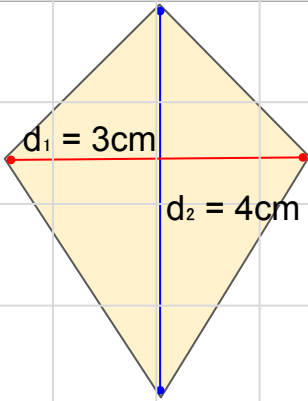
Area =  $\frac{1}{2}$  (2 cm x 4 cm)

Area =  $\frac{1}{2}$  (8 cm<sup>2</sup>)

Area = 4 cm<sup>2</sup>



## AREA OF OTHER BASIC POLYGONS



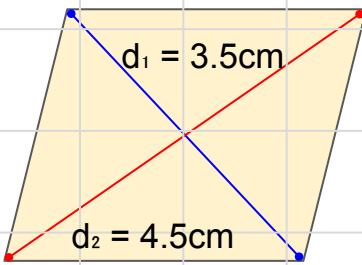
### Kite

$$\text{Area} = \frac{d_1 \times d_2}{2} \quad | \quad d_1 \text{ \& } d_2 = \text{diagonals}$$

### Example:

$$\frac{3\text{ cm} \times 4\text{ cm}}{2} \rightarrow \frac{12\text{ cm}^2}{2} \rightarrow 6\text{ cm}^2$$

$$\text{Area} = 6\text{ cm}^2$$



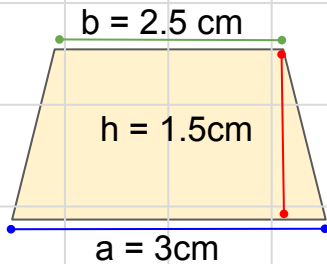
### Rhombus

$$\text{Area} = \frac{d_1 \times d_2}{2} \quad | \quad d_1 \text{ \& } d_2 = \text{diagonals}$$

### Example:

$$\frac{3.5\text{ cm} \times 4.5\text{ cm}}{2} \rightarrow \frac{15.75\text{ cm}^2}{2} \rightarrow 7.86\text{ cm}^2$$

$$\text{Area} = 7.86\text{ cm}^2$$



### Trapezoid

$$\text{Area} = \frac{1}{2} (a + b) \times h$$

$a$  = long base,  $b$  = short base,  $h$  = height

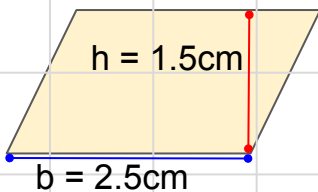
### Example:

$$\rightarrow \frac{1}{2} (3\text{cm} + 2.5\text{cm}) \times 1.5\text{cm}$$

$$\rightarrow \frac{1}{2} (5.5\text{cm}) \times 1.5\text{cm}$$

$$\rightarrow \frac{1}{2} (8.25\text{cm}^2)$$

$$\text{Area} = 4.125\text{ cm}^2$$



### Parallelogram

$$\text{Area} = b \times h$$

$b$  = base,  $h$  = height

### Example:

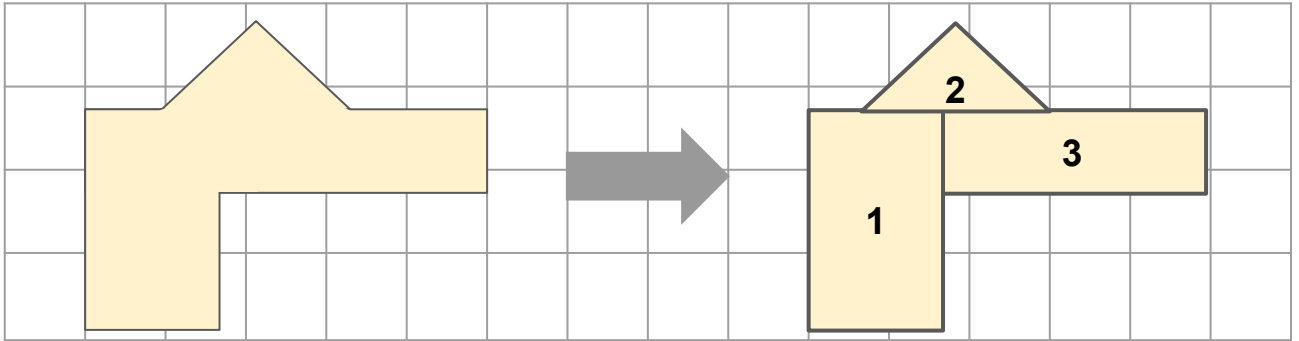
$$2.5\text{cm} \times 1.5\text{cm} = 3.75\text{cm}^2$$

$$\text{Area} = 3.75\text{cm}^2$$

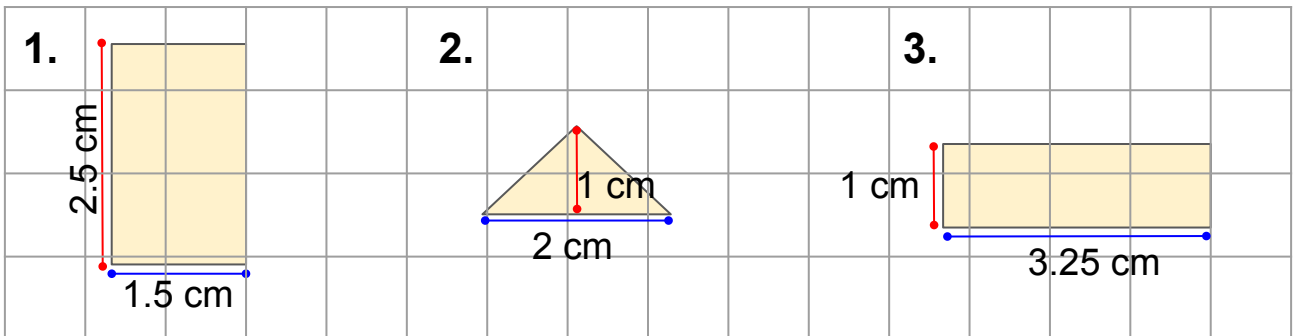


## AREA OF IRREGULAR POLYGONS

When finding the area for irregular polygons, you have to first divide the irregular polygon into regular shapes such as triangles, squares, rectangles, etc.



Once you have done this, you will have to find the area for each shape and then get the sum of all areas to get the total area of the irregular polygon.



*Area of a rectangle*  
Length x Width  
 $A = 2.5 \text{ cm} \times 1.5 \text{ cm}$   
 **$A = 3.75 \text{ cm}^2$**

*Area of a triangle*  
 $\frac{1}{2}$  (Base x Height)  
 $A = \frac{1}{2} (2 \text{ cm} \times 1 \text{ cm})$   
 **$A = 1 \text{ cm}^2$**

*Area of a rectangle*  
Length x Width  
 $A = 3.25 \text{ cm} \times 1 \text{ cm}$   
 **$A = 3.25 \text{ cm}^2$**

**Total Area:  $3.75 \text{ cm}^2 + 1 \text{ cm}^2 + 3.25 \text{ cm}^2 = 8 \text{ cm}^2$**

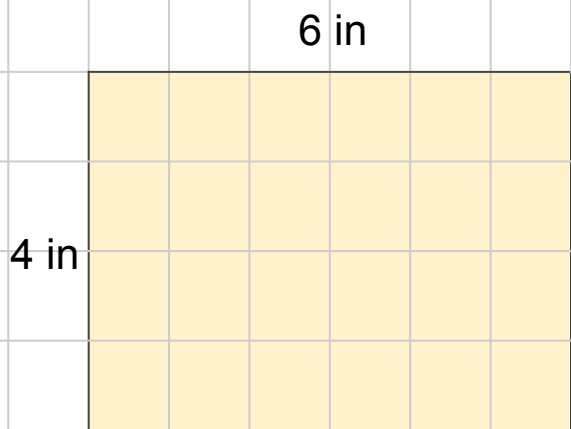




## EXERCISES ON AREA

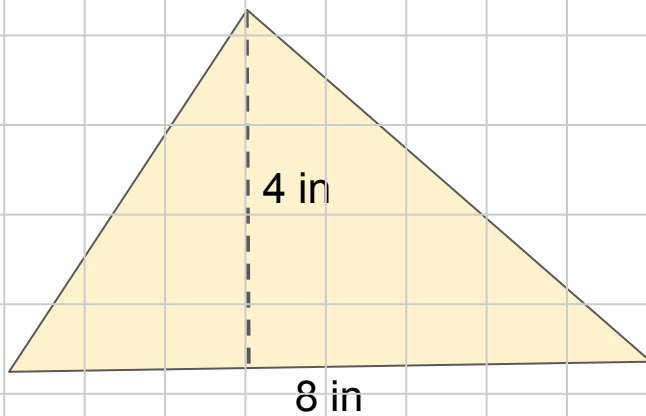
Solve for the area of the following polygons:

1.



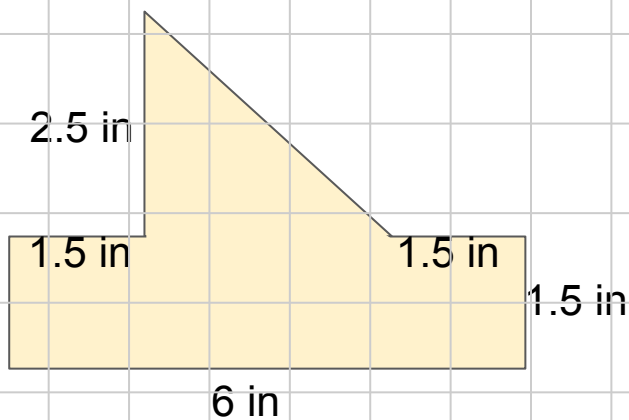
Solution:

2.

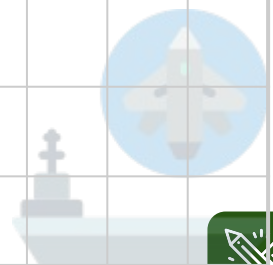


Solution:

3.



Solution:



# TABLE OF ACTIVITIES

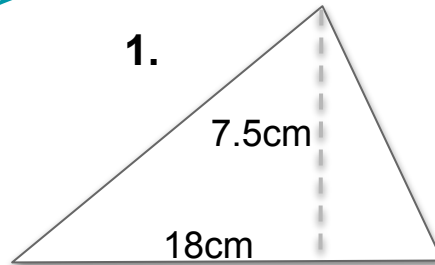
<b>Ages 7-9 (Basic)</b>		<u>G3 - G4</u>
1	Pearl Harbor Remembrance Day	
2	Wai Momi	
3	U.S.S.	
4	Medal of Honor	
5	In The Navy	
<b>Ages 9-11 (Advanced)</b>		<u>G5 - G6</u>
6	Navy Exercises	
7	Submarine	
8	Naval Aviation	
9	Pearl Harbor National Memorial	
10	Valor, Sacrifice and Peace	



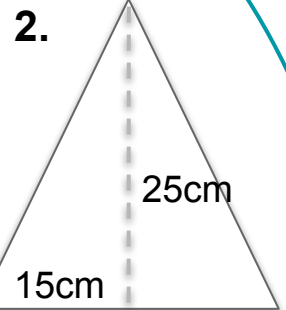
# PEARL HARBOR REMEMBRANCE DAY

G3-G4  
Basic

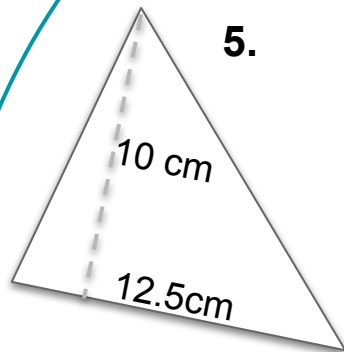
Dec 7 is Pearl Harbor Remembrance Day. A wreath-laying ceremony usually takes place as a way to honor those killed during the attack. Calculate the area for each triangle in the wreath below.



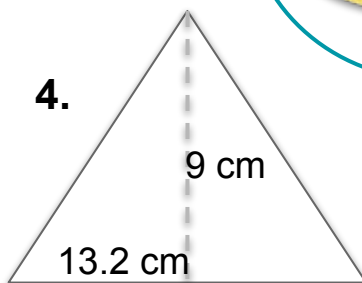
Area = \_\_\_\_\_



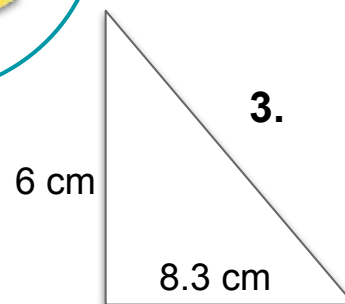
Area = \_\_\_\_\_



Area = \_\_\_\_\_



Area = \_\_\_\_\_



Area = \_\_\_\_\_



*Pearl Harbor Remembrance Day*

*Valor, Sacrifice & Peace*

*December 7*



# WAI MOMI

G3-G4  
Basic

**Wai Momi** is the Hawaiian name for Pearl Harbor, which means 'waters of pearl'. Based on the area provided in each number, draw and shade the corresponding rectangle or square shape then label the side measurements.

*Note: Each square on the grid is 1cm<sup>2</sup>.*



Pearl Harbor is also called Pu'uloa.  
This means "long hill" in Hawaiian.

The land area of Pearl Harbor is 4,000 hectares.



1. **Rectangle**  
Area = 18 cm<sup>2</sup>

2. **Square**  
Area = 36 cm<sup>2</sup>

3. **Square**  
Area = 16 cm<sup>2</sup>

4. **Rectangle**  
Area = 10 cm<sup>2</sup>

Pearl Oysters once grew in Wai Momi, thus the meaning "waters of pearl" or the name Pearl Harbor.



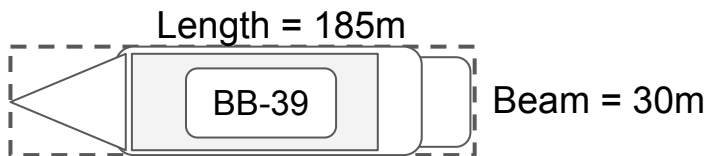
Hawaiian legend regards Pu'uloa as the home of the shark goddess, Ka'ahupahau.



In the attack on Pearl Harbor, a lot of ships were unfortunately destroyed. Below are some of the ships present at that time. Calculate the rectangular area that was covered by each ship.

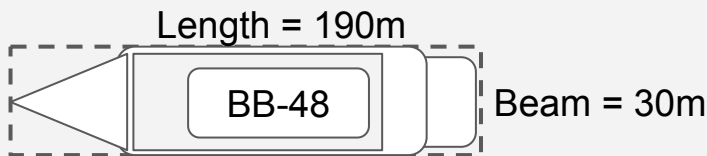
*Note: A beam is the width of a ship.*

### 1. USS Arizona



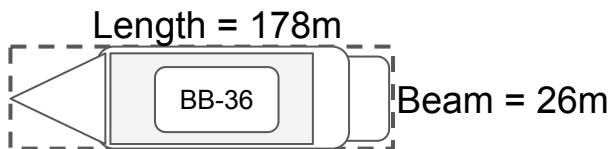
Solution:

### 2. USS West Virginia



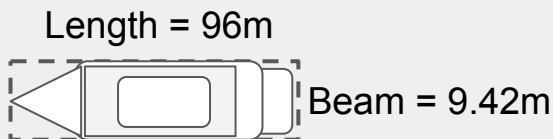
Solution:

### 3. USS Nevada



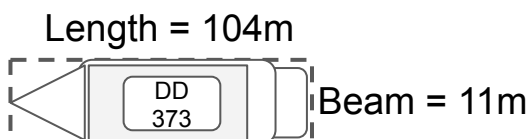
Solution:

### 4. USS Ward



Solution:

### 5. USS Shaw



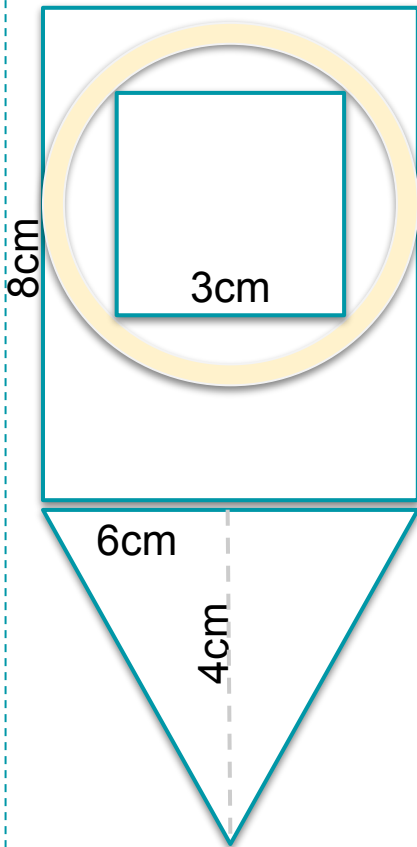
Solution:



# MEDAL OF HONOR

G3-G4  
Basic

The survivors of the Pearl Harbor attack were given a commemorative medal. Below are several medals each with a square, triangle, and rectangle shape. Calculate the area for each shape based on the measurements provided.



1.

Square:

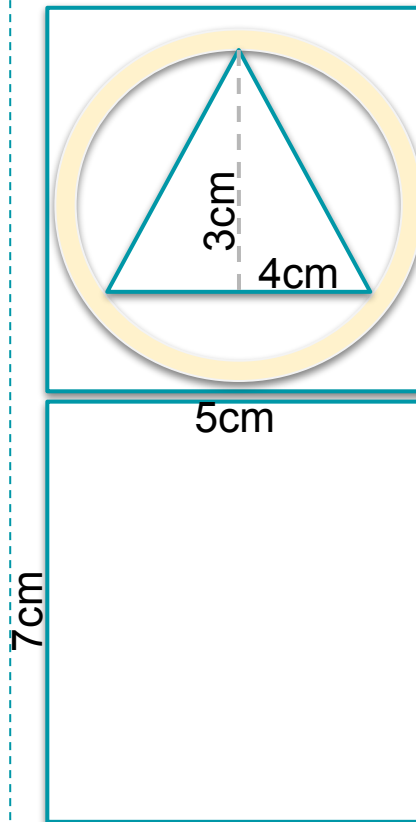
\_\_\_\_\_

Triangle:

\_\_\_\_\_

Rectangle:

\_\_\_\_\_



2.

Square:

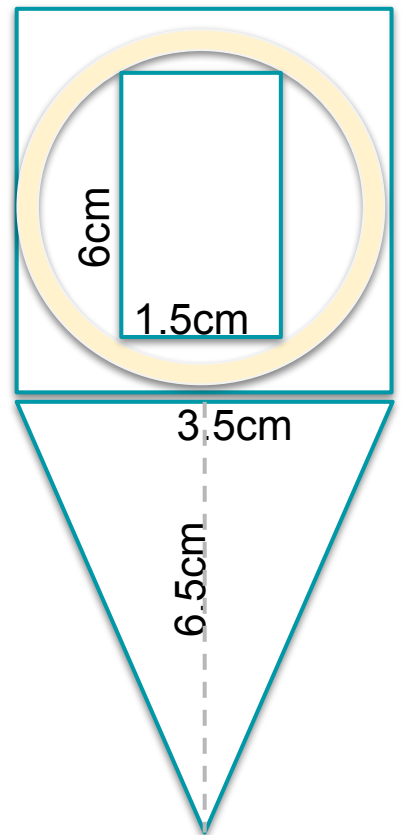
\_\_\_\_\_

Triangle:

\_\_\_\_\_

Rectangle:

\_\_\_\_\_



3.

Square:

\_\_\_\_\_

Triangle:

\_\_\_\_\_

Rectangle:

\_\_\_\_\_

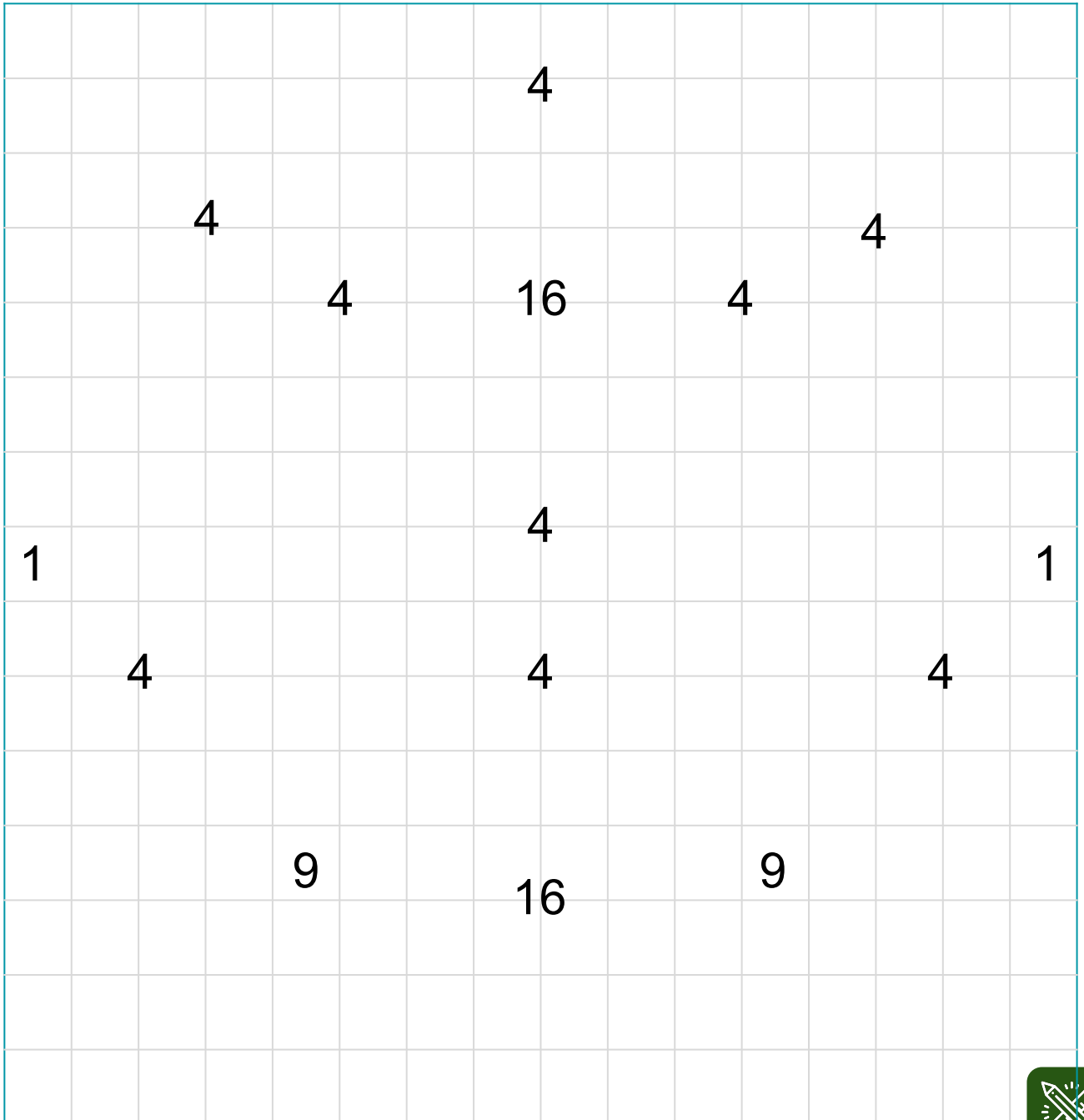


# IN THE NAVY

G3-G4  
Basic

Pearl Harbor is the headquarters of the United States Pacific Fleet. The numbers in the grid indicate the area square unit of a square to be drawn around the number. Trace and shade the squares based on their area to reveal the navy's symbol.

*Note: Each square on the grid represents one square unit.*



# NAVY EXERCISES

G5-G6  
Advanced

The navy like all of the military may get into exercises from time to time to keep them combat-ready. Draw the shapes described in the word problems and include their measurements. Solve for the area. Show your solutions.

1. The navy is practicing to navigate their security measures. Ship A is sailing beside Ship B and are 4.5 kilometers away from each other. While Ship C and Ship D are also distanced the same way but are parallel to the Ship A & B. The four ships are forming a rhombus. The distance from Ship A to Ship D is 3 km while the distance from Ship B to Ship C is 5.5 km. What is the area covered by these four ships?

Solution:



2. The navy aviation team is testing their new jets. You see the four aircrafts flying over the naval base forming the shape of a trapezoid. Plane A & Plane B are leading the team side by side at 700 meters apart while Plane C & Plane D are flying right behind also side by side at 800 meters apart. Plane A & B are 650 meters away from Plane C & D. What is the area covered by these four jets?

Solution:

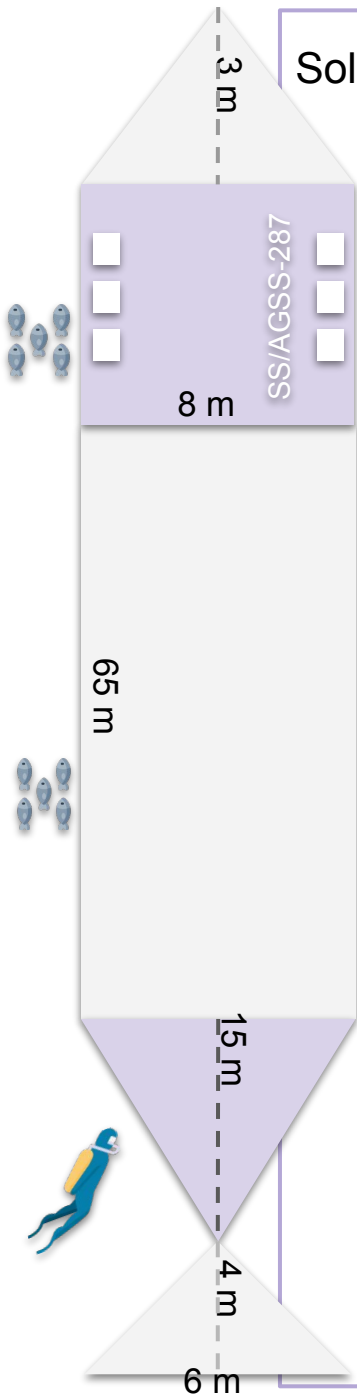




# SUBMARINE

G5-G6  
Advanced

Aside from ships, the navy also uses submarines to patrol ocean waters. Calculate the total area of the irregular-shaped submarine based on the measurements given. Show your detailed solution in the space provided below.



Solution:

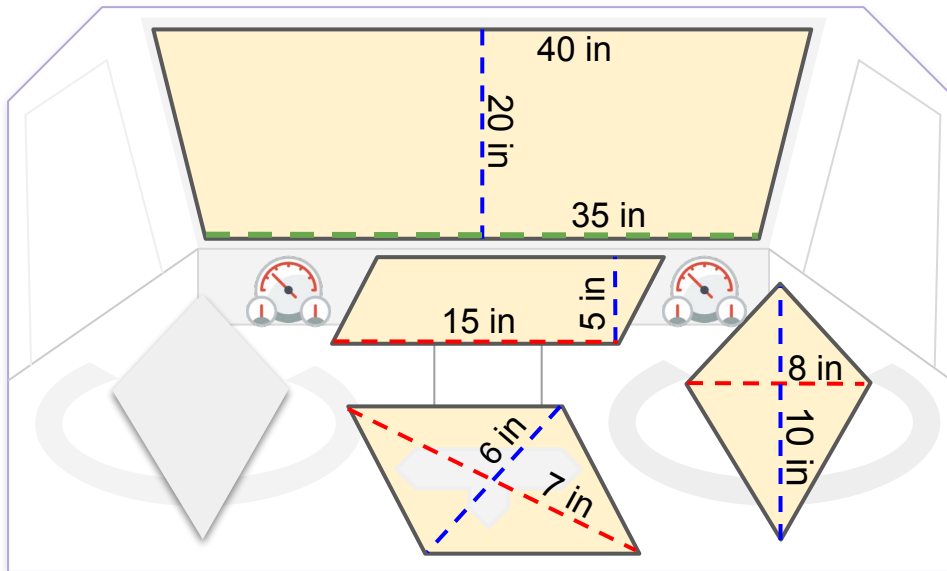
What is the total area of this submarine?



# NAVAL AVIATION

G5-G6  
Advanced

The navy mostly works at sea but they also carry planes and have naval aviators. Calculate the area of the highlighted polygons in the aircraft cockpit area based on the measurements given. Show your solution.



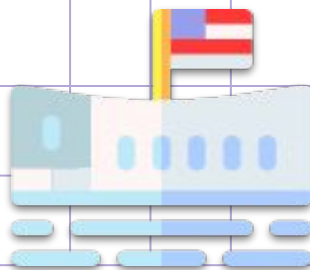
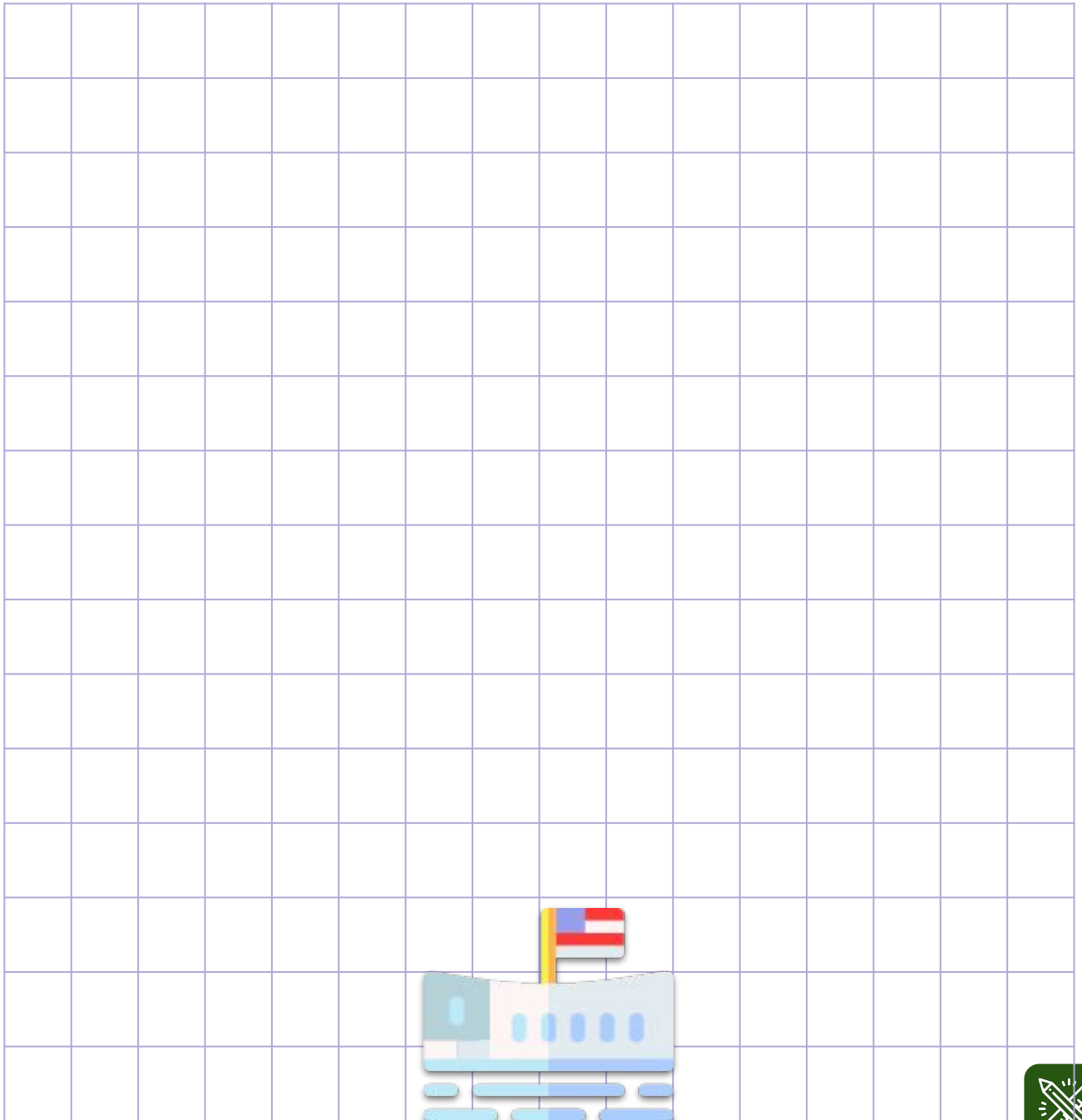
Polygon	Solution:
1. Trapezoid	
2. Parallelogram	
3. Kite	
4. Rhombus	

# PEARL HARBOR NATIONAL MEMORIAL

G5-G6  
Advanced

The Pearl Harbor National Memorial is comprised of three memorials - USS Arizona, USS Oklahoma, and USS Utah. Draw a memorial to honor our fallen heroes by shading the squares in the grid and then calculating its area.

*Note: Each square in the grid is  $1m^2$ .*

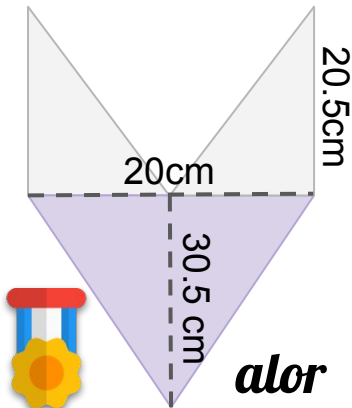


# VALOR, SACRIFICE & PEACE

G5-G6  
Advanced

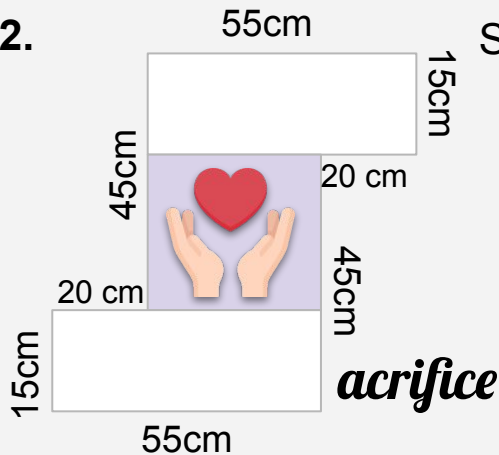
Valor, Sacrifice & Peace is this year's theme for Pearl Harbor Remembrance Day. Calculate the total area of the capital letter of each word listed below. Show your solution.

1.



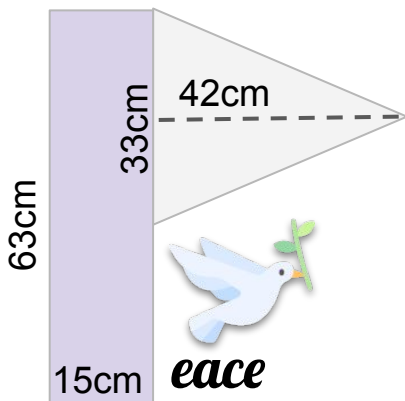
Solution:

2.



Solution:

3.



Solution:

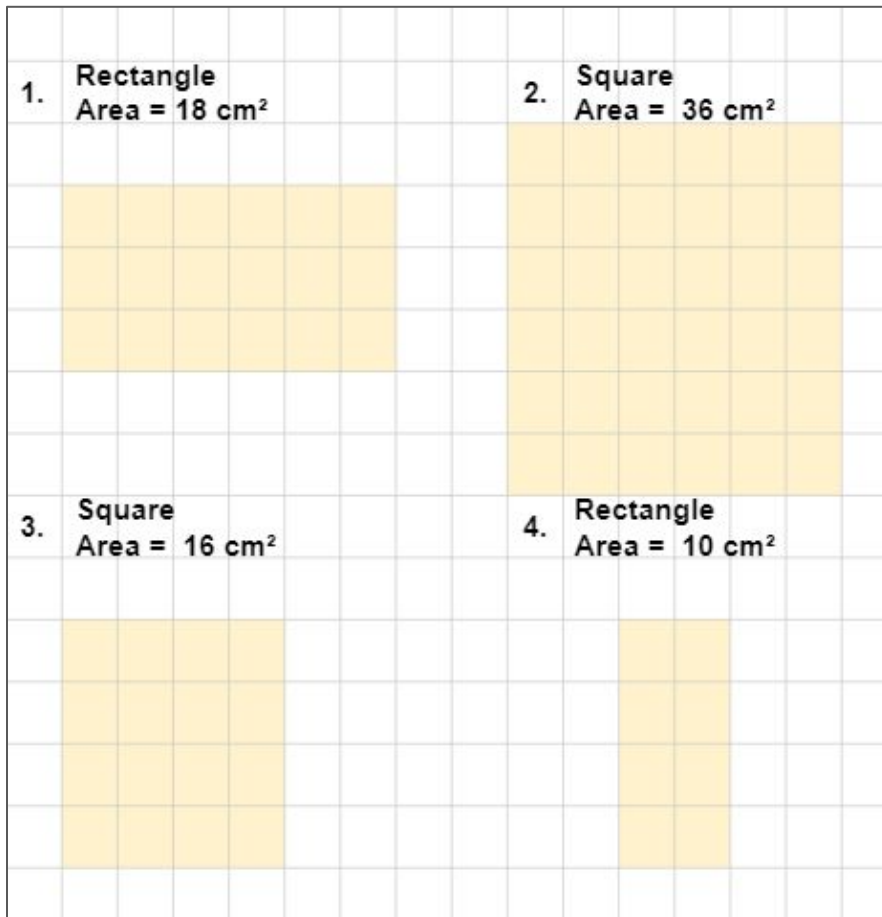


# ANSWER GUIDE

## Activity 1

1.  $67.5 \text{ cm}^2$
2.  $187.5 \text{ cm}^2$
3.  $24.9 \text{ cm}^2$
4.  $14.4 \text{ cm}^2$
5.  $62.5 \text{ cm}^2$

## Activity 2



# ANSWER GUIDE

## Activity 3

1.  $5,550 \text{ m}^2$
2.  $5,700 \text{ m}^2$
3.  $4,628 \text{ m}^2$
4.  $904.32 \text{ m}^2$
5.  $1,144 \text{ m}^2$

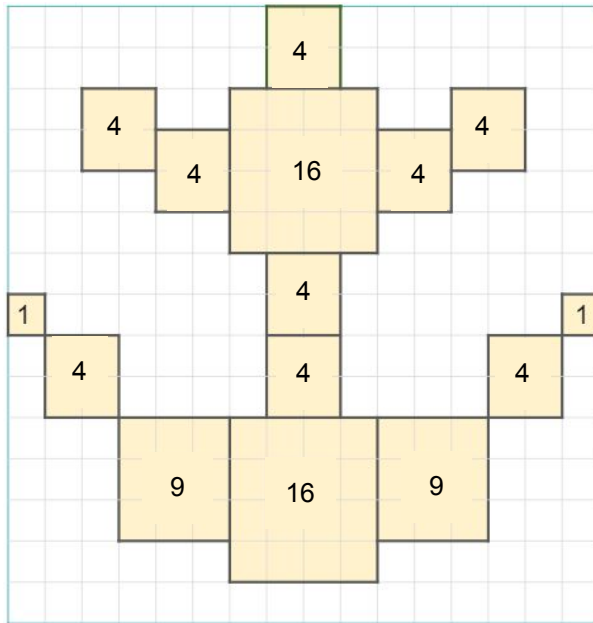
## Activity 4

1. **Square:**  $(3\text{cm})^2 = 9 \text{ cm}^2$   
**Triangle:**  $(6 \text{ cm} \times 4 \text{ cm})/2 = 12 \text{ cm}^2$   
**Rectangle:**  $8\text{cm} \times 6\text{cm} = 48 \text{ cm}^2$
2. **Square:**  $(5\text{cm})^2 = 25 \text{ cm}^2$   
**Triangle:**  $(3\text{cm} \times 4\text{cm})/2 = 6 \text{ cm}^2$   
**Rectangle:**  $5\text{cm} \times 7\text{cm} = 35\text{cm}^2$
3. **Square:**  $(3.5\text{cm})^2 = 12.25 \text{ cm}^2$   
**Triangle:**  $(3.5\text{cm} \times 6.5\text{cm})/2 = 11.375 \text{ cm}^2$  or  $11.38 \text{ cm}^2$   
**Rectangle:**  $6\text{cm} \times 1.5\text{cm} = 9 \text{ cm}^2$



# ANSWER GUIDE

## Activity 5



## Activity 6

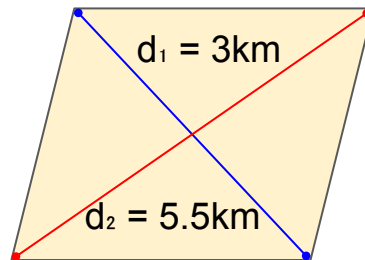
1. Solution: Area of a rhombus:  $\text{Area} = d_1 \times d_2 / 2$  |  $d_1$  &  $d_2$  = diagonals

Ship A to Ship D: diagonal 1 = 3 km  
Ship B to Ship C: diagonal 2 = 5.5 km

$$3 \text{ km} \times 5.5 \text{ km} / 2 = 8.25 \text{ km}^2$$

$$16.5 \text{ km}^2 / 2 = 8.25 \text{ km}^2$$

**Area = 8.25 km<sup>2</sup>**



2. Solution: Area of trapezoid:  $\text{Area} = \frac{1}{2} (a + b) \times h$

Plane C to Plane D: long base or  $a = 800 \text{ m}$

Plane A to Plane B: short base or  $b = 700 \text{ m}$

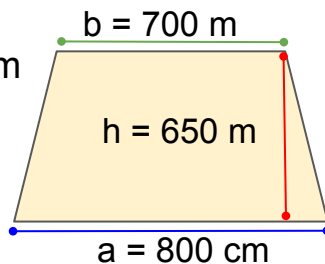
Distance from Plane A & B to Plane C & D: height or  $h = 650 \text{ m}$

$$\frac{1}{2} (800 \text{ m} + 700 \text{ m}) \times 650 \text{ m}$$

$$\frac{1}{2} (1500 \text{ m} \times 650 \text{ m})$$

$$\frac{1}{2} (975000)$$

**Area = 487,500 m<sup>2</sup>**



# ANSWER GUIDE

## Activity 7



1. Triangle:  $\frac{1}{2} (b \times h)$   
Base: 8m  
Height: 3m  
 $\frac{1}{2} (8 \times 3)$   
 $\frac{1}{2} (24)$   
**Area = 12m<sup>2</sup>**
2. Square:  $s^2$   
Side: 8m  
 $8^2$   
**Area = 64m<sup>2</sup>**
3. Rectangle:  $l \times w$   
Length: 65m  
Width: 8m  
 $65m \times 8m$   
**Area = 520m<sup>2</sup>**
4. Triangle:  $\frac{1}{2} (b \times h)$   
Base: 8m  
Height: 15m  
 $\frac{1}{2} (8m \times 15m)$   
 $\frac{1}{2} (120m^2)$   
**Area = 60m<sup>2</sup>**
5. Triangle:  $\frac{1}{2} (b \times h)$   
Base: 6m  
Height: 4m  
 $\frac{1}{2} (6m \times 4m)$   
 $\frac{1}{2} (24m^2)$   
**Area = 12m<sup>2</sup>**

Total Area =  $12m^2 + 64m^2 + 520m^2 + 60m^2 + 12m^2$   
**Total Area of Submarine = 668 m<sup>2</sup>**





# ANSWER GUIDE

## Activity 8

**1. Trapezoid:  $\frac{1}{2} (a + b) \times h$**

Long base:  $a = 40$  in

Short base:  $b = 35$  in

Height:  $h = 20$  in

$$\frac{1}{2} (40 \text{ in} + 35 \text{ in}) \times 20 \text{ in}$$

$$\frac{1}{2} (75 \text{ in} \times 20 \text{ in})$$

$$\frac{1}{2} (1500 \text{ in}^2)$$

$$\text{Area} = 750 \text{ in}^2$$

**2. Parallelogram:  $b \times h$**

Base = 15 in

Height = 5 in

$$\text{Area: } 15 \text{ in} \times 5 \text{ in} = 75 \text{ in}^2$$

**3. Kite:  $d_1 \times d_2 / 2$**

Diagonal 1:  $d_1 = 8$  in

Diagonal 2:  $d_2 = 10$  in

$$8 \text{ in} \times 10 \text{ in} / 2$$

$$\text{Area: } 80 \text{ in}^2 / 2 = 40 \text{ in}^2$$

**4. Rhombus:  $d_1 \times d_2 / 2$**

Diagonal 1:  $d_1 = 6$  in

Diagonal 2:  $d_2 = 7$  in

$$6 \text{ in} \times 7 \text{ in} / 2$$

$$\text{Area: } 42 \text{ in}^2 / 2 = 21 \text{ in}^2$$

## Activity 9

Answers may vary.



# ANSWER GUIDE

## Activity 10

### 1. Triangle 1 & 2: $\frac{1}{2} (b \times h)$

Base:  $b = 10\text{cm}$  (half of 20 cm)

Height:  $h = 20.5\text{ cm}$

$\frac{1}{2} (10\text{ cm} \times 20.5\text{ cm})$

$\frac{1}{2} (205\text{ cm}^2)$

Area 1:  $102.5\text{ cm}^2 \times 2\text{ triangles} = 205\text{ cm}^2$

### Triangle 3:

Base:  $b = 20\text{cm}$

Height:  $h = 30.5\text{cm}$

$\frac{1}{2} (20\text{ cm} \times 30.5\text{ cm})$

$\frac{1}{2} (70\text{ cm}^2)$

Area 2:  $35\text{ cm}^2$

Area 1 + Area 2

$205\text{ cm}^2 + 35\text{ cm}^2 = 240\text{cm}^2$

**Total Area:  $240\text{cm}^2$**

### 2. Rectangle 1 & 2: $l \times w$

Length:  $l = 55\text{ cm}$

Width:  $w = 15\text{ cm}$

$55\text{ cm} \times 15\text{ cm} = 825\text{ cm}^2$

Area 1:  $825\text{ cm}^2 \times 2\text{ rectangles} = 1650\text{ cm}^2$

### Square: $s^2$

Side:

$s = 45\text{ cm} - 15\text{ cm} = 30\text{ cm}$

or  $55\text{ cm} - 20\text{ cm} = 30\text{ cm}$

$s^2 = (30\text{ cm})^2$

Area 2:  $900\text{ cm}^2$

Area 1 + Area 2

$1650\text{ cm}^2 + 900\text{ cm}^2 = 2550\text{ cm}^2$

**Total Area:  $2550\text{ cm}^2$**

### 3. Rectangle: $l \times w$

Length:  $63\text{ cm}$

Width:  $15\text{ cm}$

Area 1:  $63\text{ cm} \times 15\text{ cm} = 945\text{ cm}^2$

### Triangle: $\frac{1}{2} (b \times h)$

Base:  $b = 33\text{ cm}$

Height:  $h = 42\text{ cm}$

$\frac{1}{2} (33\text{ cm} \times 42\text{ cm})$

$\frac{1}{2} (1386\text{ cm}^2)$

Area 2:  $693\text{ cm}^2$

Area 1 + Area 2

$945\text{ cm}^2 + 693\text{ cm}^2 = 1638\text{ cm}^2$

**Total Area:  $1638\text{ cm}^2$**



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