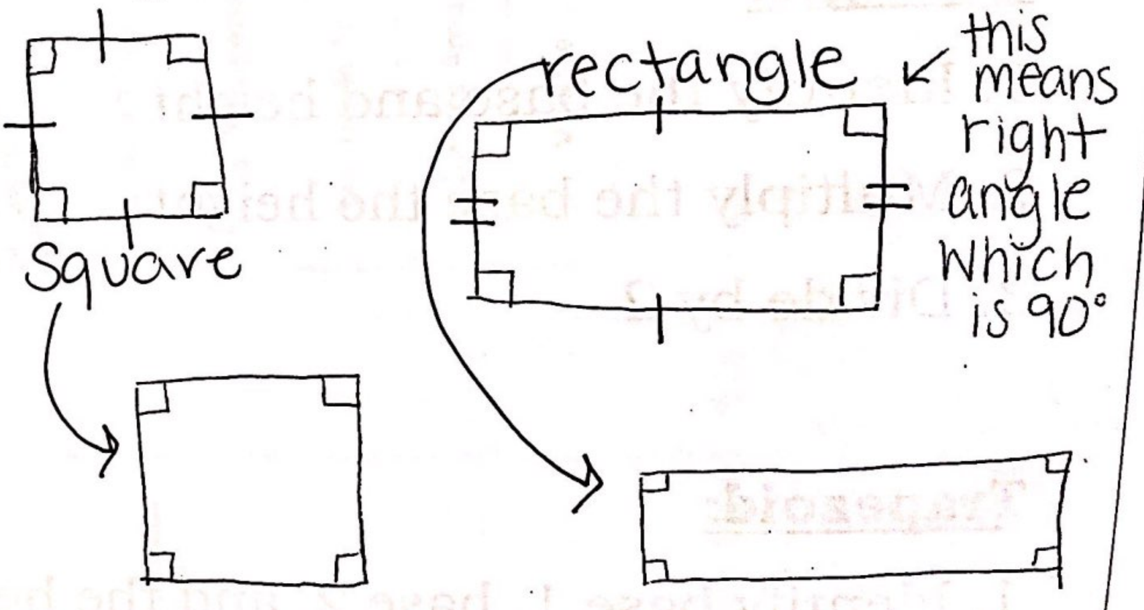
Area of Parallelograms

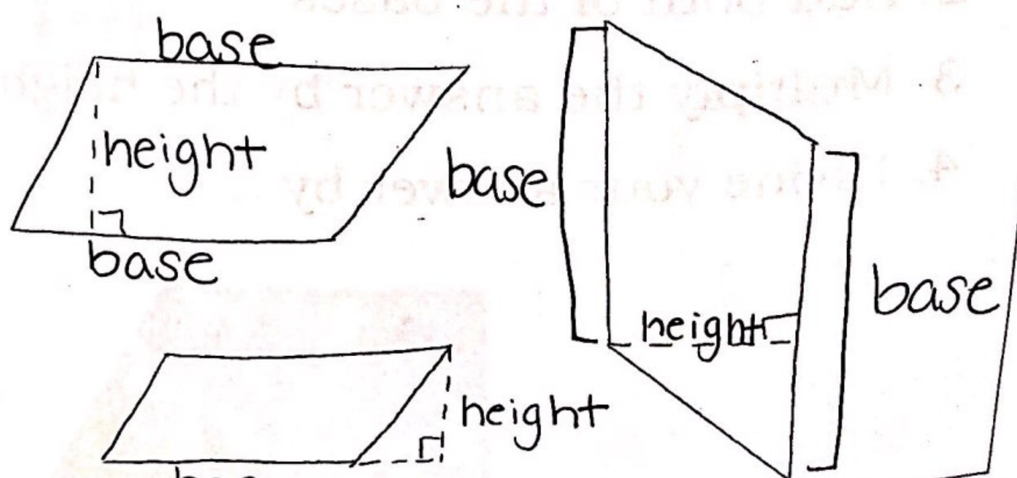
- Parallelograms are polygons with 4 sides and 2 sets of parallel sides
- square, rectangle, and rhombus are all parallelograms
- Area is the number of square units it takes to cover a polygon (imagine tiles covering the space)

↳ the space inside

Box 1



Box 2



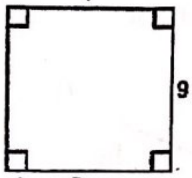
This means that to find the area of the parallelogram (the number of square units needed to cover the figure) we multiply base times height

<u>Area of a Parallelogram = Base · Height</u>

Sample problems: Find the area of each parallelogram

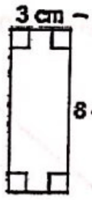
Level 1:

Square



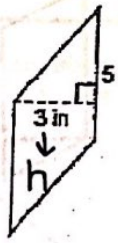
$9 \cdot 9 = 81 m^2$

rectangle



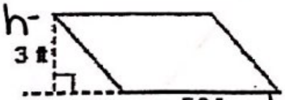
$3 \cdot 8 = 24 cm^2$

Parallelogram

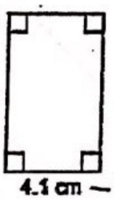


$5 \cdot 3 = 15 in^2$

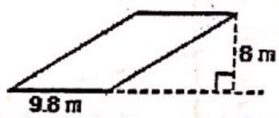
Level 2:



$5.9 \cdot 3 = 17.3 ft^2$

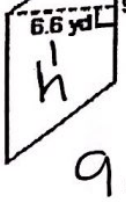


$4.1 \times 6.8 = 27.88 cm^2$

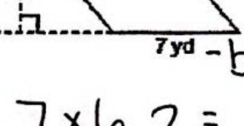


$9.8 \times 8 =$
$78.4 m^2$

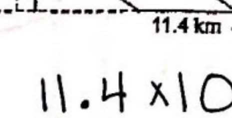
Level 3:



9.7×6.6
$= 64.02 yd^2$



$7 \times 6.2 =$
$43.4 yd^2$



11.4×10
$= 114 Km^2$ 2

Lesson Summary

The formula to calculate the area of a parallelogram is $A = bh$, where b represents the base and h represents the height of the parallelogram.

The height of a parallelogram is the line segment perpendicular to the base. The height is usually drawn from a vertex that is opposite the base.

Problem Set

Draw and label the height of each parallelogram.

1.

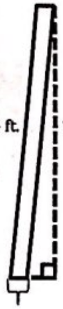
2.

Calculate the area of each parallelogram. The figures are not drawn to scale.

3.

$13 \cdot 6 = 78$ cm^2

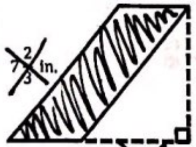
4.



$1.2 \cdot 12.8$

$= 15.36 ft^2$

5.



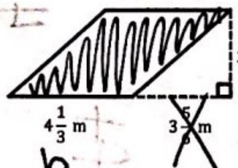
h

b

$2\frac{1}{2}$ $5\frac{1}{4}$

(3) $\frac{5}{2} \times \frac{21}{4} = \frac{105}{8} = 13\frac{1}{8} in^2$

6.



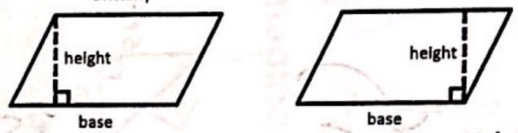
h

b

$\frac{13}{3} \times \frac{7}{2} = \frac{91}{6}$

$= 15\frac{1}{6} m^2$

7. Brittany and Sid were both asked to draw the height of a parallelogram. Their answers are below.



Are both Brittany and Sid correct? If not, who is correct? Explain your answer. yes

8. Do the rectangle and parallelogram below have the same area? Explain why or why not.

$120 ft^2$ $120 ft^2$ yes

9. A parallelogram has an area of 20.3 cm^2 and a base of 2.5 cm. Write an equation that relates the area to the base and height, h. Solve the equation to determine the height of the parallelogram.

$$\frac{20.3}{2.5} = \frac{2.5h}{2.5}$$

$8.12 = h$

$A = bh$

Name________________________________ Date__________

AREA OF TRIANGLES

To find the area of any triangle, simply multiply the base and the height of the triangle together. Take the resulting product and divide by two.

We can use the following formula to calculate the area of any triangle.

$$\text{Area} = \frac{b \cdot h}{2}$$

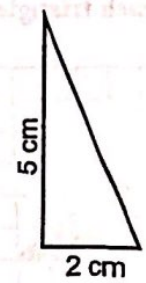
① b × h
② ÷ 2

Example: $\text{Area} = \frac{b \cdot h}{2}$

$\text{Area} = \frac{2 \cdot 5}{2}$

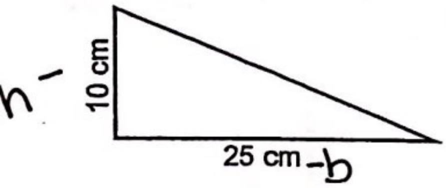
$\text{Area} = \frac{10}{2}$

Area = 5 cm²



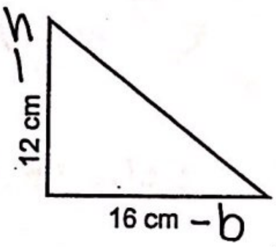
Directions: Find the area of each of the following triangles. Show your work like the example given above.

1)



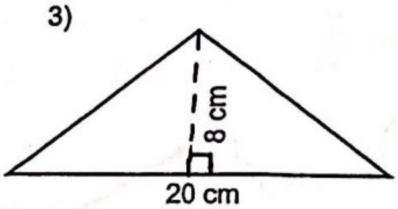
$25 \cdot 10 = 250$
$250 \div 2 = 125 cm^2$

2)



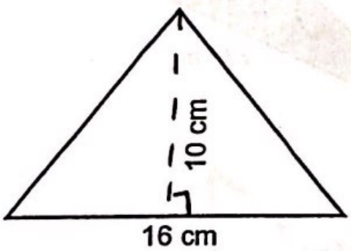
$16 \cdot 12 = 192$
$192 \div 2 = 96 cm^2$

3)



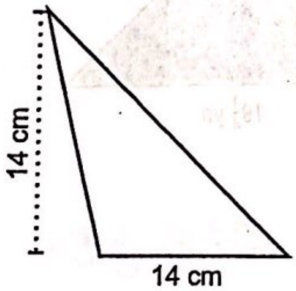
$20 \cdot 8 = 160$
$160 \div 2 = 80 cm$

4)



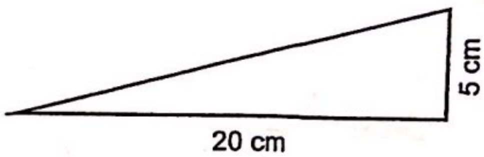
$16 \cdot 10 = 160$
$160 \div 2 = 80 cm^2$

5)



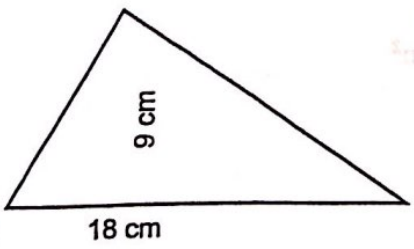
$14 \cdot 14 = 196$
$196 \div 2 = 98 cm^2$

6)

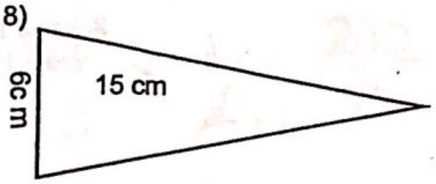


$20 \cdot 5 = 100$
$100 \div 2 = 50 cm$

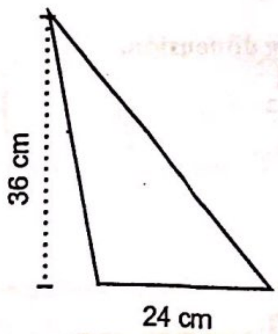
7)



8)



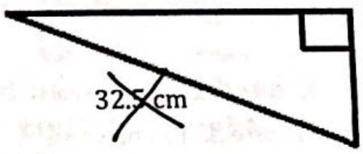
9)



Problem Set

Calculate the area of each right triangle below. Note that the figures are not drawn to scale.

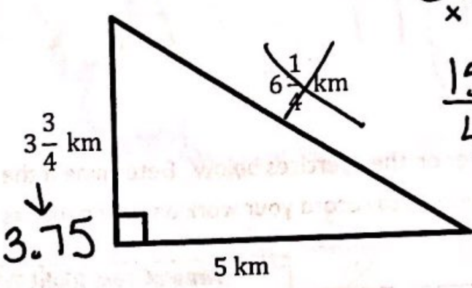
1.



$31.2 \times 9.1 = 283.92$

$283.92 \div 2 = 141.96 \text{ cm}^2$

2.



$3\frac{3}{4} \rightarrow 3.75$

$3\frac{3}{4} \times 5$

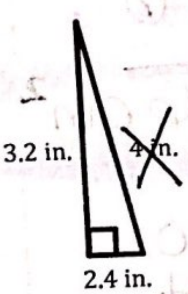
$\frac{15}{4} \times \frac{5}{1} = \frac{75}{4}$

$\frac{75}{4} \div 2$ KCF

$\frac{75}{4} \times \frac{1}{2} = \frac{75}{8}$

$9\frac{3}{8}$ Km

3.

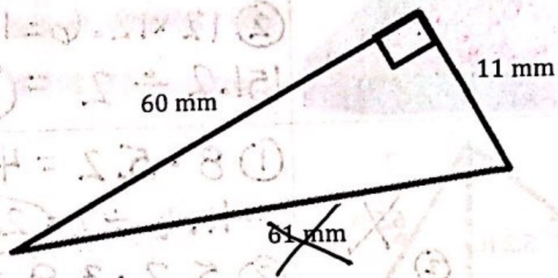


$3.2 \times 2.4 = 7.68$

$7.68 \div 2$

$= 3.84 \text{ in}^2$

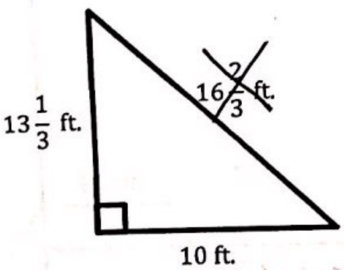
4.



$60 \times 11 = 660$

$660 \div 2 = 330 \text{ mm}^2$

5.



$13\frac{1}{3} \times 10$

$\frac{40}{3} \times \frac{10}{1} = \frac{400}{3}$

$\frac{400}{3} \div 2$

$\frac{\cancel{400}^{200}}{3} \times \frac{1}{\cancel{2}_1} = \frac{200}{3}$

$= 66\frac{2}{3} \text{ ft}^2$

$200 \div 3 = 066$ R 2

-18

20

-18

2

$66\frac{2}{3}$

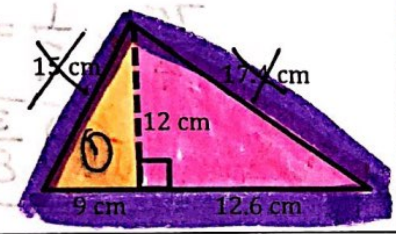
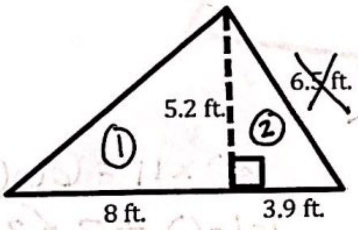
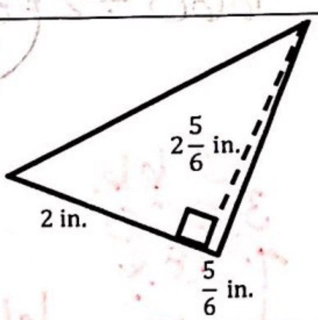
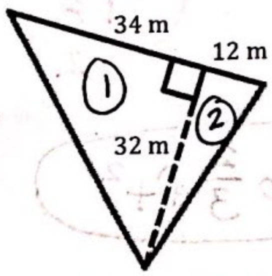
6

Lesson 3: The Area of Acute Triangles Using Height and Base

Classwork

Exercises

1. Work with a partner on the exercises below. Determine if the area formula $A = \frac{1}{2}bh$ is always correct. You may use a calculator, but be sure to record your work on your paper as well. Figures are not drawn to scale.

	Area of Two Right Triangles	Area of Entire Triangle
① 	① 12 × 9 = 108 108 ÷ 2 = 54 ② 12 × 12.6 = 151.2 151.2 ÷ 2 = 75.6	54.0 + 75.6 129.6 cm^2
② 	① 8 • 5.2 = 41.6 41.6 ÷ 2 = 20.8 ② 5.2 • 3.9 = 20.28 20.28 ÷ 2 = 10.14	20.80 + 10.14 30.94 ft^2
③ 		
④ 	① 34 • 32 = 1088 1088 ÷ 2 = 544 ② 12 • 32 = 384 384 ÷ 2 = 192	544 + 192 736 m^2

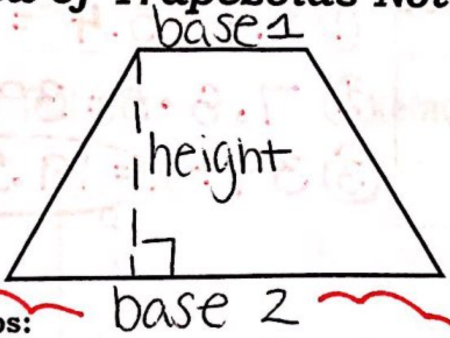
7

Scanned with CamScanner

NAME ____________________ DATE ____________________ PERIOD ________

Area of Trapezoids Notes

Quadrilateral



How To Write The Area Formula:

$$A = \frac{1}{2}h(b_1 + b_2)$$

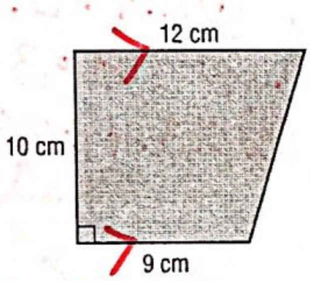
Steps:

1. **Add base 1 and base 2**
2. **Multiply by height**
3. **Divide by 2**

* bases are parallel lines

Find the area of each figure. Round to the nearest tenth if necessary.

1.

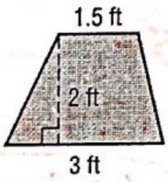


① $12 + 9 = 21$

② $21 \cdot 10 = 210$

③ $210 \div 2 = 105\ cm^2$

2.

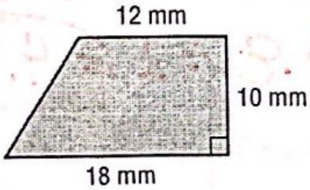


① $3 + 1.5 = 4.5$

② $4.5 \cdot 2 = 9$

③ $9 \div 2 = 4.5\ ft^2$

3.

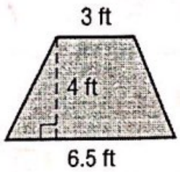


① $18 + 12 = 30$

② $30 \cdot 10 = 300$

③ $300 \div 2 = 150\ mm^2$

4.



① $6.5 + 3 = 9.5$

② $9.5 \cdot 4 = 38$

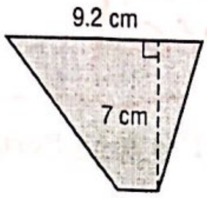
③ $38 \div 2 = 19\ ft^2$

8

Scanned with CamScanner

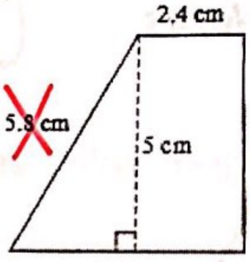
NAME ____________________ DATE ____________________ PERIOD ________

5.



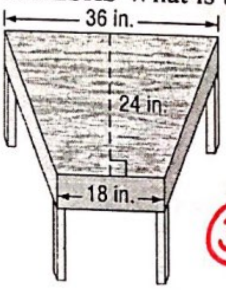
① $9.2 + 2 = 11.2$
② $11.2 \cdot 7 = 78.4$
③ $78.4 \div 2 = 39.2\text{cm}^2$

6.



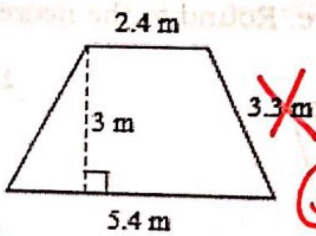
① $2.4 + 5.4 = 7.8$
② $7.8 \cdot 5 = 39$
③ $39 \div 2 = 19.5\text{cm}^2$

7. **DESKS** What is the area of the top of the desk shown?



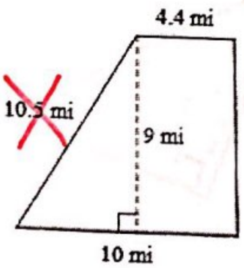
① $36 + 18 = 54$
② $54 \cdot 24 = 1296$
③ $1296 \div 2 = 648\text{in}^2$

8.



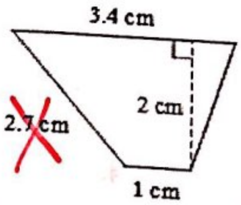
① $2.4 + 5.4 = 7.8$
② $7.8 \cdot 3 = 23.4$
③ $23.4 \div 2 = 11.7\ \text{m}^2$

9.



① $4.4 + 10 = 14.4$
② $14.4 \cdot 9 = 129.6$
③ $129.6 \div 2 = 64.8\text{mi}^2$

10.

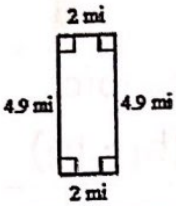
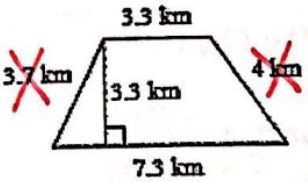
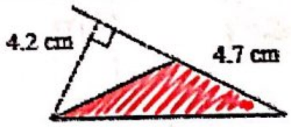
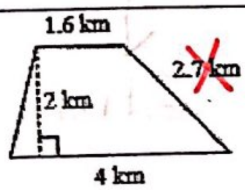
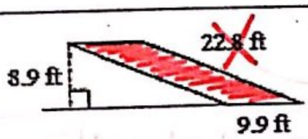
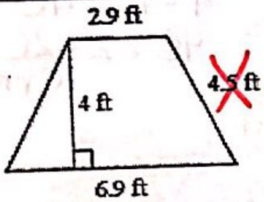
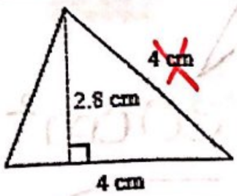
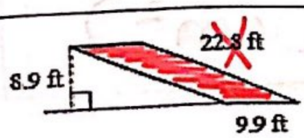


① $3.4 + 1 = 4.4$
② $4.4 \cdot 2 = 8.8$
③ $8.8 \div 2 = 4.4\text{cm}^2$

9

Practicing Area B

Name:________________________________ Date:__________

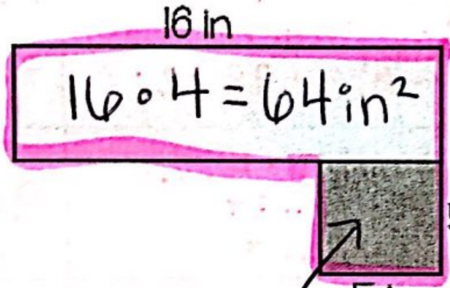
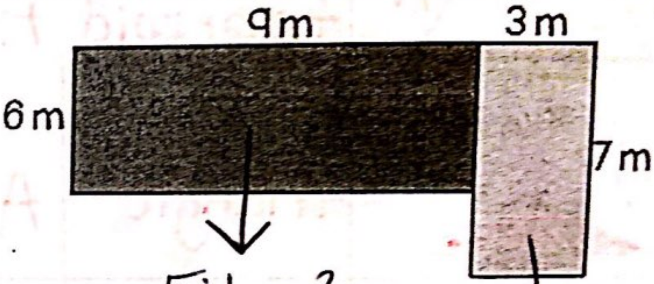
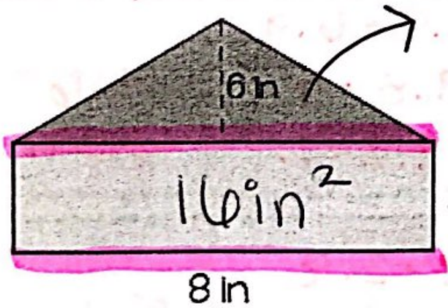
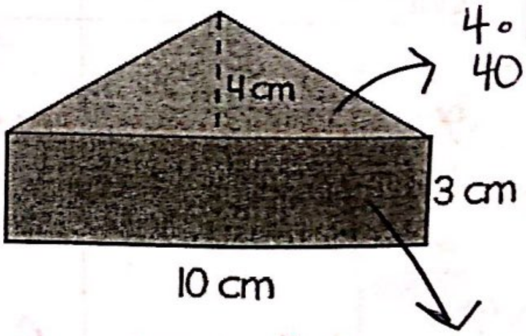
Polygon	Name	Area Formula	Substitution (Work)	Area with Units
	rectangle	$A=b \cdot h$	$A=2 \cdot 4.9$	$=9.8$ mi^2
	trapezoid	$A=\frac{1}{2}h(b_1+b_2)$	① $3.3+7.3=10.6$ ② $10.6 \cdot 3.3 = 34.98$ ③ $34.98 \div 2$;	17.49 Km^2
	triangle	$A=\frac{1}{2}bh$	$4.7 \cdot 4.2 = 19.74$ $\div 2 =$	9.87 cm^2
	trapezoid	$A=\frac{1}{2}h(b_1+b_2)$	① $1.6+4=5.6$ ② $5.6 \cdot 2=11.2$ ③ $11.2 \div 2$	5.6 Km^2
	parallelogram	$A=bh$	① $8.9 \cdot 9.9$	88.11 ft^2
	trapezoid	$A=\frac{1}{2}h(b_1+b_2)$	① $2.9+6.9$ ② $9.8 \cdot 4$ ③ $39.2 \div 2$	19.6 ft^2
	triangle	$A=\frac{1}{2}bh$	① $4 \cdot 2.8$ ② $11.2 \div 2$	5.6 cm^2
	Parallelogram	$A=bh$	① $8.9 \cdot 9.9$	88.11 ft^2

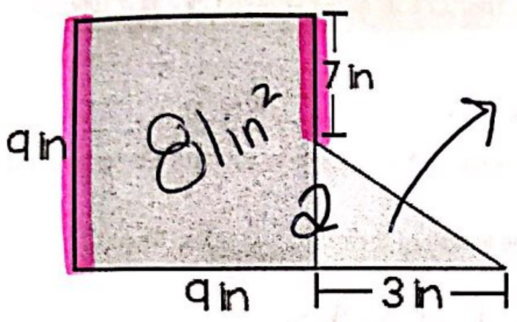
10

Points

A **composite figure** is a figure made up of two or more two-dimensional shapes. To find the composite area, break down the shape into smaller pieces. Then add the area of each shape together to find the total.

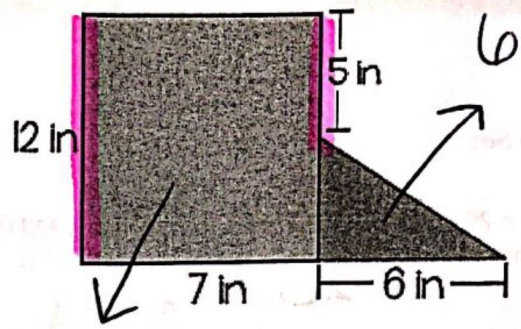
Parallelogram:	Triangle:	Trapezoid:
$A=bh$	$A=\frac{1}{2}bh$	$A=\frac{1}{2}h(b_1+b_2)$

Let's Do as a Class:	I'll Try On My Own:
	
$16 \cdot 4 = 64 in^2$ $5 \cdot 5 = 25 in^2$ 64 +25 89 in²	54 m² 21 m² = 75 m²
	
$8 \cdot 6 = 48$ $48 \div 2 = 24$ in² 16 in² $16+24 = 40 in^2$	$4 \cdot 10 = 40$ $40 \div 2 = 20$ cm² 30 cm² $20+30 = 50 cm^2$



$2 \cdot 3 = 6$
$6 \div 2$
$= 3 in^2$

$81 + 3 = 84 in^2$

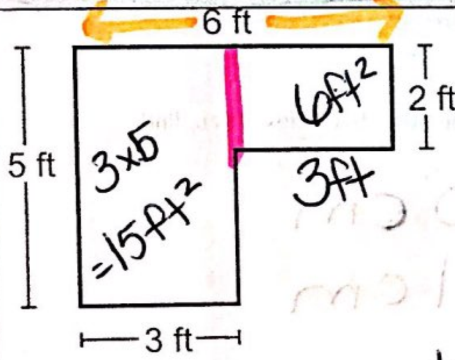


$6 \cdot 7 = 42$
$42 \div 2 =$
$21 in^2$

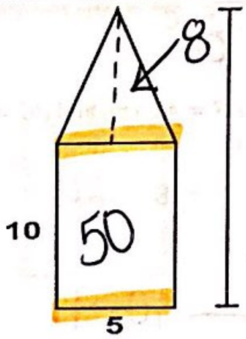
$84 in^2$

$$\begin{array}{r} 84 \\ +21 \\ \hline 105 in^2 \end{array}$$

Challenge Problems:

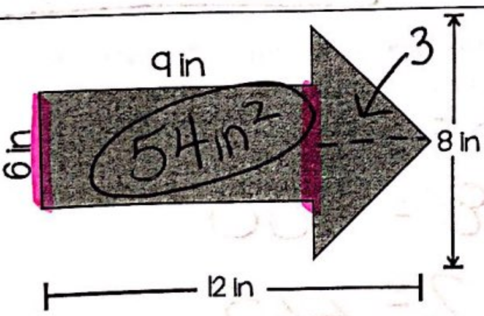


$$\begin{array}{r} 15 \\ +6 \\ \hline 21 ft^2 \end{array}$$



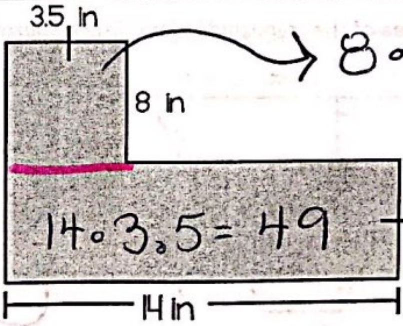
$8 \cdot 5 = 40$
$40 \div 2 = 20$

$$\begin{array}{r} 50 \\ +20 \\ \hline 70 units^2 \end{array}$$



$8 \cdot 3 = 24$
$24 \div 2 =$
$12 in^2$

$54 + 12 = \boxed{66 in^2}$



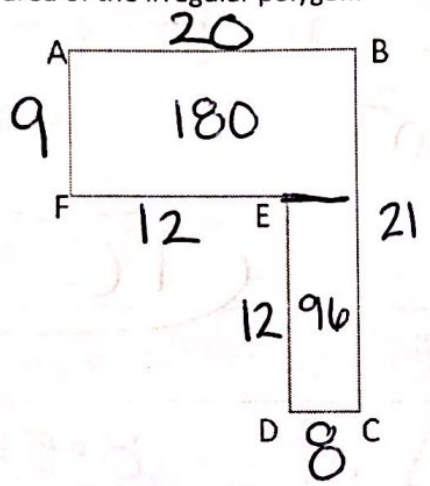
$8 \cdot 3.5 = 28$

$$\begin{array}{r} 49 \\ +28 \\ \hline 77 \end{array}$$

$77 in^2$

Problem Set

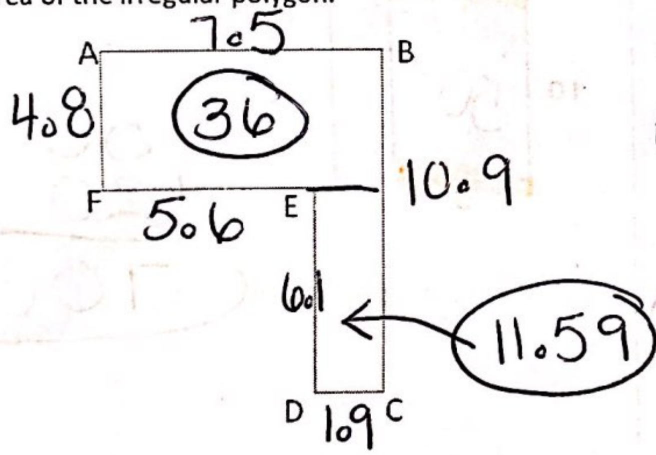
1. If $AB = 20$ units, $FE = 12$ units, $AF = 9$ units, and $DE = 12$ units, find the length of the other two sides. Then, find the area of the irregular polygon.



BC = 21 units
DC = 8 units

180 + 96 = 276 units^2

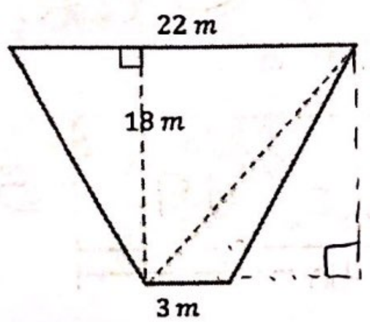
2. If $DC = 1.9$ cm, $FE = 5.6$ cm, $AF = 4.8$ cm, and $BC = 10.9$ cm, find the length of the other two sides. Then, find the area of the irregular polygon.



AB = 7.5 cm
ED = 6.1 cm

36 + 11.59 =
47.59 cm^2

3. Determine the area of the trapezoid below. The trapezoid is not drawn to scale.

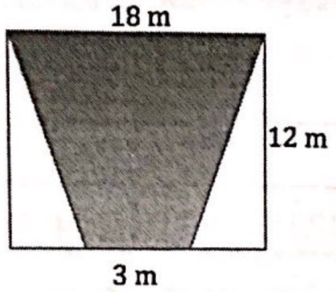


① 22 + 3 = 25
② 25 • 18 = 450
③ 450 ÷ 2 = 225

225 m^2

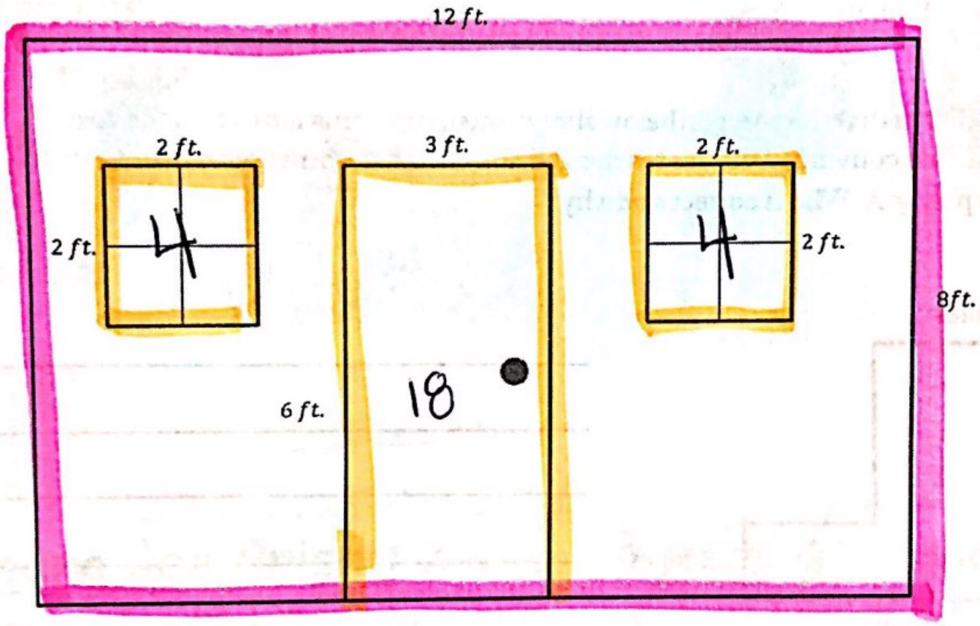
13

4. Determine the area of the shaded isosceles trapezoid below. The image is not drawn to scale.



① $18+3=21$
② $21 \cdot 12 = 252$
③ $252 \div 2 = 126\text{ m}^2$

5. Here is a sketch of a wall that needs to be painted:



Wall = 96
-18
4
4
70

a. The windows and door will not be painted. Calculate the area of the wall that will be painted. → 70 ft^2

b. If a quart of Extra-Thick Gooey Sparkle paint covers 30 ft², how many quarts must be purchased for the painting job?

3 quarts

14

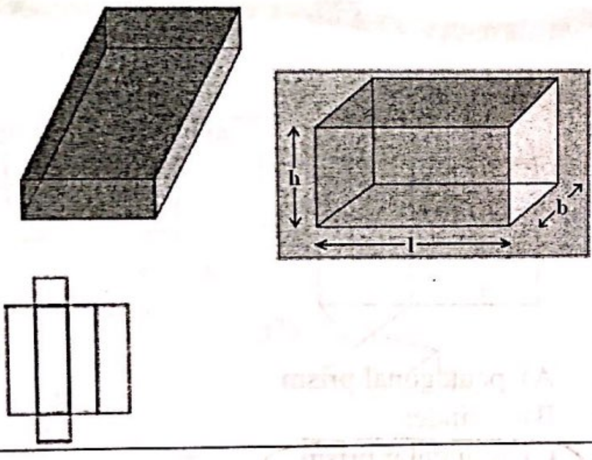
Identifying Three Dimensional Figures:

A three-dimensional figure has length, width, and height. Examples include anything you can hold- a box, a book, a cup, etc. Three-dimensional figures have faces which are the sides that make up the surface of the figure. In 6th grade math, we study the following three-dimensional figures:

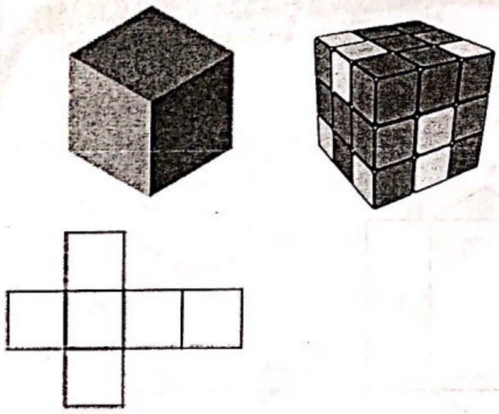
net - unfolded shape

faces = sides

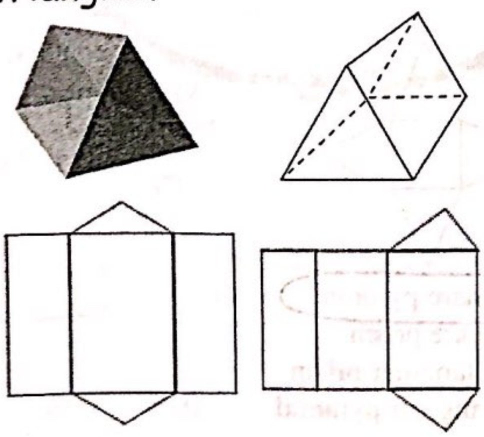
Rectangular Prism: A solid (3-dimensional) object which has six faces that are rectangles.



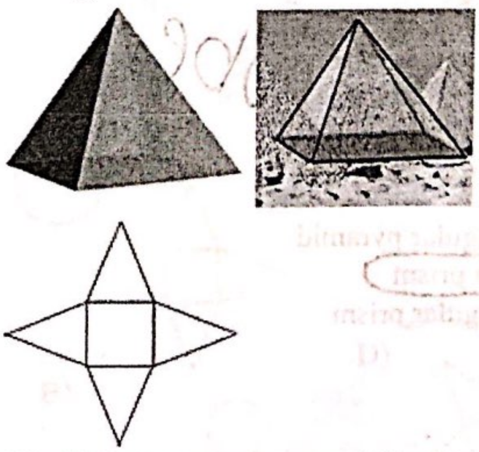
Cube: A solid (3-dimensional) object which has six faces that are squares.



Triangular Prism: A solid (3-dimensional) object which has five faces that are rectangles and triangles.



Pyramid: A solid (3-dimensional) object which has five faces that are rectangles and triangles.



Geometry

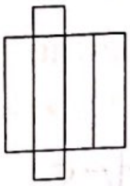
Name ____________

Date ____________ Period ____

Labeling Nets

Identify each solid given its net.

1)

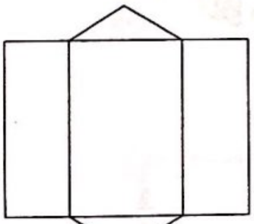


~~A) pentagonal pyramid~~
~~B) pentagonal prism~~
C) rectangular prism
D) square pyramid

2)

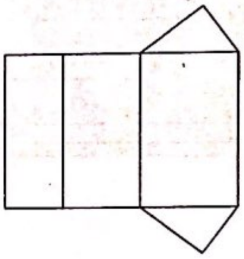
A) square prism
B) square pyramid
C) triangular prism
D) pentagonal prism

3)



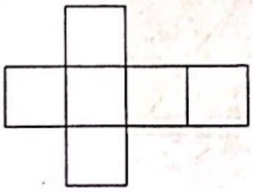
A) triangular prism
B) cylinder
C) cone
D) hexagonal pyramid

4)



A) pentagonal prism
B) cylinder
C) triangular prism
D) rectangular pyramid

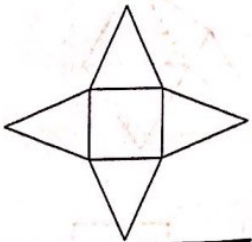
5)



cube

A) rectangular pyramid
B) square prism
C) rectangular prism
D) cone

6)

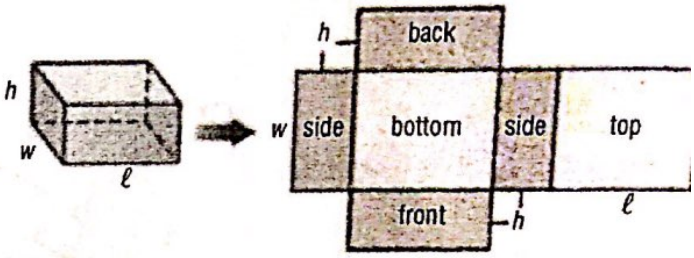


A) square pyramid
B) square prism
C) rectangular prism
D) triangular pyramid

17

Surface Area of a Three Dimensional Figure

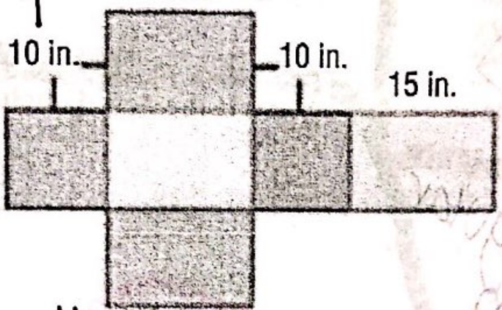
The surface area is the sum of the area all the faces (sides) of a three dimensional shape. We can use the following formula to find the surface area of a rectangular prism or cube.



S.A. = 2LW + 2LH + 2HW

L= Length W= Width H= Height

1.

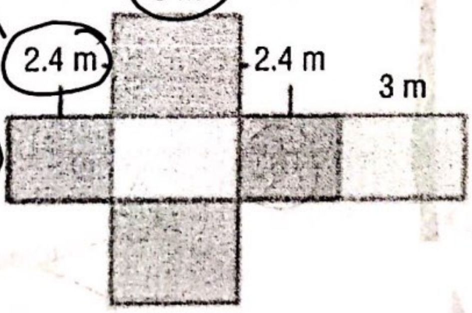


h L W

$(2\cdot15\cdot10)+(2\cdot15\cdot10)+$
$(2\cdot10\cdot10)$

$300 + 300 + 200$
$= 800 in^2$

2.

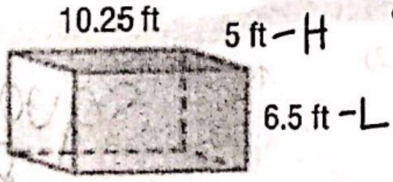


W H L

$(2\cdot2\cdot2.4)+(2\cdot2\cdot3)$
$+(2\cdot3\cdot2.4)$

$9.6 + 12 + 14.4$
$= 36 m^2$

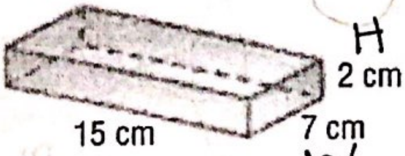
3.



W H L

$SA=(2\cdot6.5\cdot10.25)+$
$(2\cdot6.5\cdot5)+(2\cdot5\cdot10.25)$
$133.25 + 65 + 102.5$
$= 300.75 ft^2$

4.



H L W

$SA=(2\cdot15\cdot7)+(2\cdot15\cdot2)$
$+(2\cdot2\cdot7)$
$210 + 60 + 28$
$= 298 cm^2$

Geometry

Name________________________

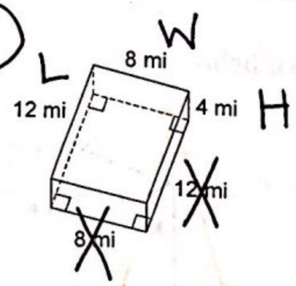
Surface Area

Date________________ Period____

Find the surface area of each figure. Round your answers to the nearest whole, if necessary.

S.A.= 2LW + 2LH + 2HW

1)

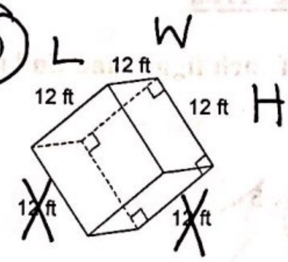


$(2\cdot 12\cdot 8)+(2\cdot 12\cdot 4)+(2\cdot 4\cdot 8)$

$192 + 96 + 64$

$= 352\,mi^2$

2)

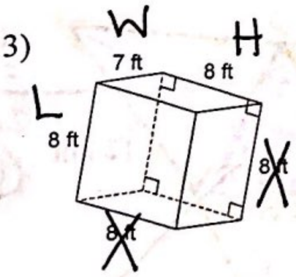


$(2\cdot 12\cdot 12)+(2\cdot 12\cdot 12)$

$+(2\cdot 12\cdot 12)$

$= 864\,ft^2$

3)

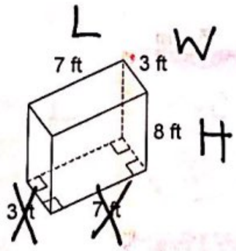


$2\cdot 8\cdot 7)+(2\cdot 8\cdot 8)+(2\cdot 8\cdot 7)$

$112 + 128 + 112$

$= 352\,ft^2$

4)



$(2\cdot 7\cdot 3)+(2\cdot 7\cdot 8)+$

$(2\cdot 8\cdot 3)$

$42 + 112 + 48$

$= 202\,ft^2$

20

Scanned with CamScanner

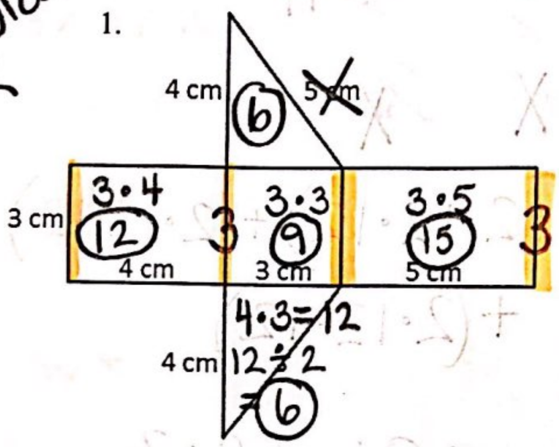
Name

Finding Surface Area

Write the name of each figure and find the surface area of the nets drawn below.

triangular prism

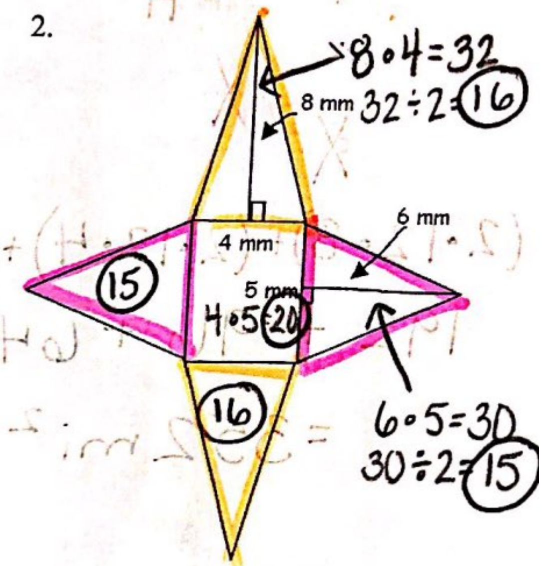
1.



6+6+12+9+15= 48cm^2

Name triangular prism Surface Area 48cm^2

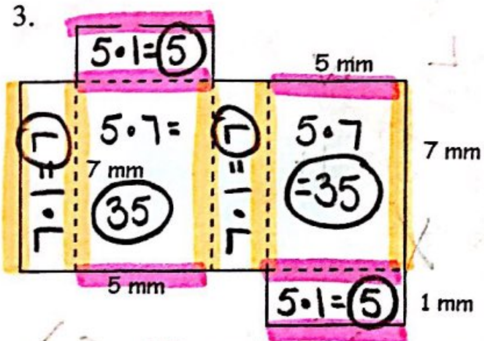
2.



$$\begin{array}{r} 16 \\ 15 \\ 16 \\ 15 \\ +\ 20 \\ \hline 82 \end{array}$$

Name square pyramid Surface Area 82mm^2

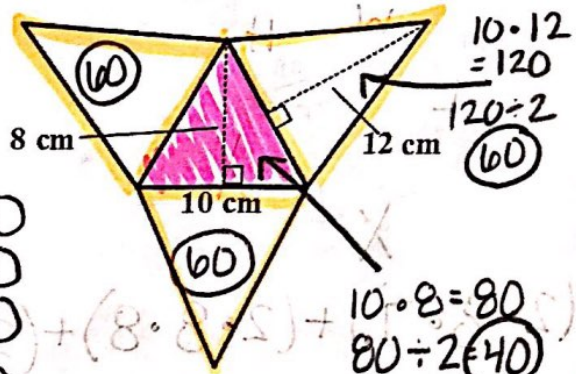
3.



$$\begin{array}{r} 35 \\ 35 \\ 5 \\ 5 \\ 7 \\ +\ 7 \\ \hline 94 \end{array}$$

Name rectangular prism Surface Area 94mm^2

4.

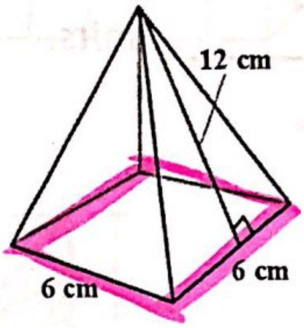


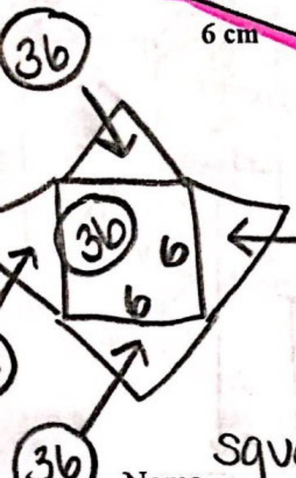
$$\begin{array}{r} 60 \\ 60 \\ +\ 60 \\ 40 \\ \hline 220 \end{array}$$

Name triangular pyramid Surface Area 220cm^2

21

8.

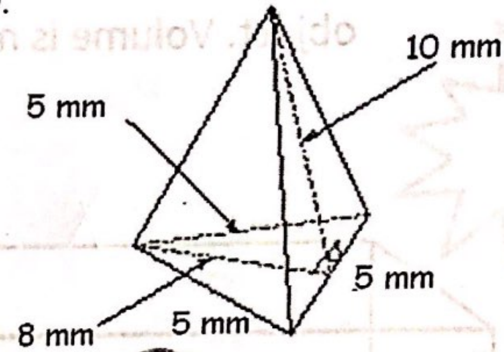


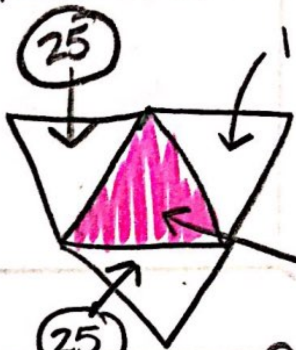


$12 \cdot 6 = 72$
$72 \div 2 = 36$

Name square pyramid Surface Area 180 cm²

9.



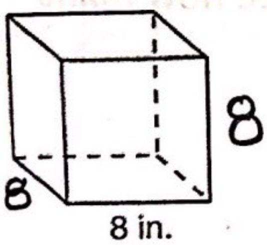


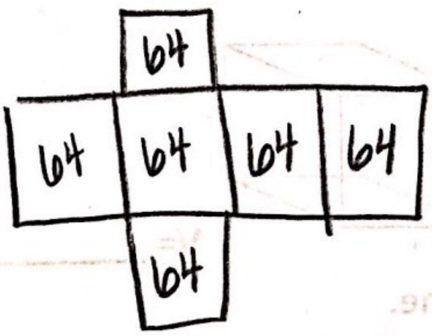
$10 \cdot 5 = 50$
$50 \div 2 = 25$

$5 \cdot 8 = 40$
$40 \div 2 = 20$

Name triangular pyramid Surface Area 95 mm²

10.



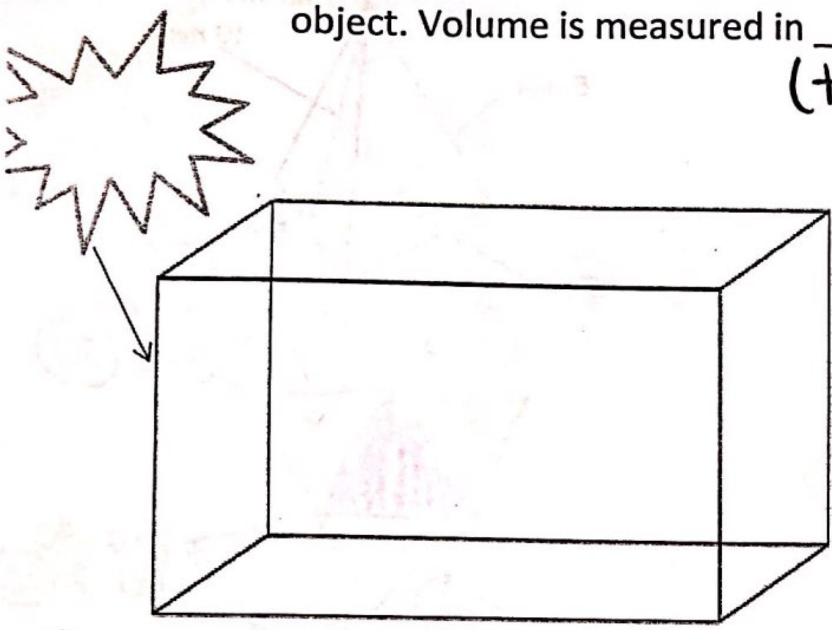


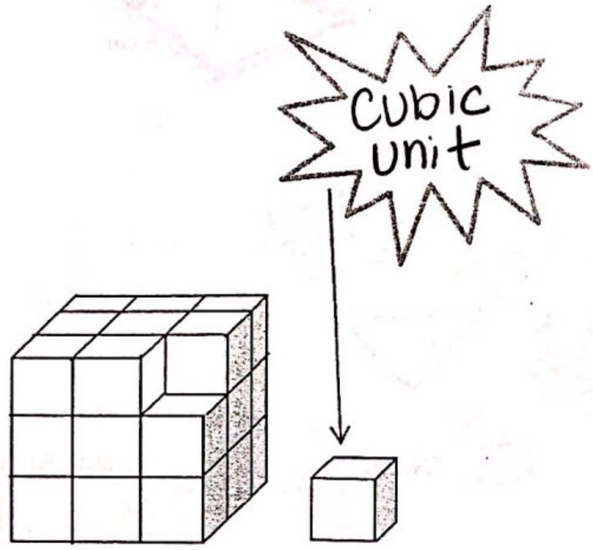
Name Cube Surface Area 384 in²

22

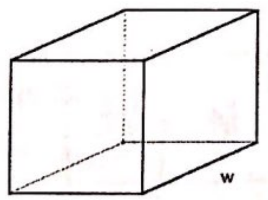
VOLUME OF PRISMS

The total space inside of a 3D figure is the Volume of an object. Volume is measured in Cubic units.
(to the 3rd Power





To find the volume of a rectangular prism, we have to see how many Cubic units fit inside the shape.

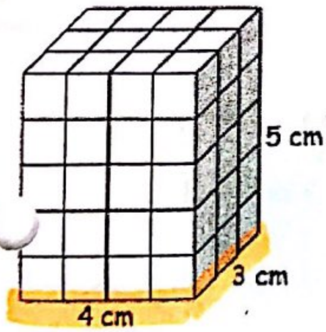


$V = B \cdot h$
(area of base)

Volume formula

V= Length x Width x Height
(rectangular prism)

Example: Find the volume.



$V = B \cdot h$

$B = 4 \cdot 3$

$B = 12 \quad h = 5$

$V = 12 \cdot 5$

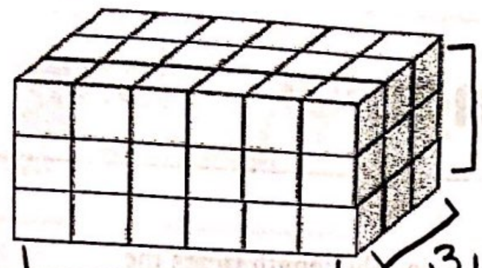
$V = 60\ cm^3$

$V = 4 \cdot 3 \cdot 5$

$V = 4 \cdot 15$

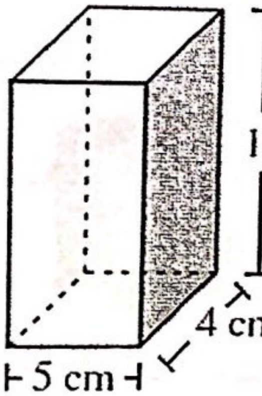
$V = 60\ cm^3$

Let's Practice



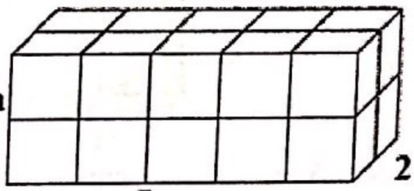
$V = 6 \cdot 3 \cdot 3$

$V = 54 \text{ units}^3$



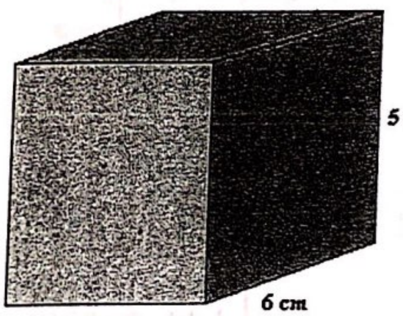
$V = 10 \cdot 4 \cdot 5$

$V = 200 \text{ cm}^3$



$V = 2 \cdot 5 \cdot 2$

$V = 20 \text{ cm}^3$

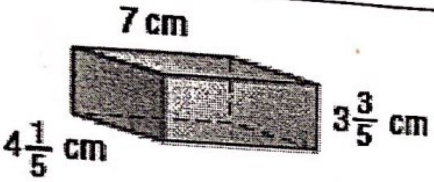
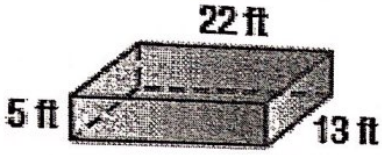
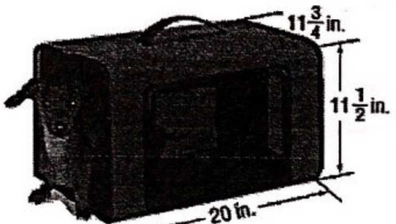
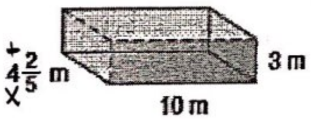
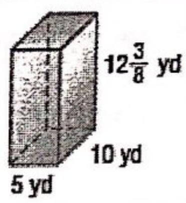
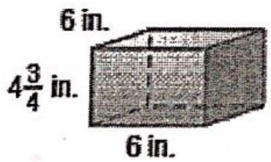


$V = 4 \cdot 6 \cdot 5$

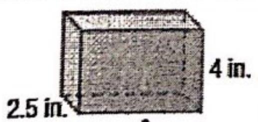
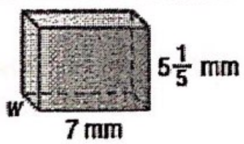
$V = 120 \text{ cm}^3$

25

Volume Practice: Find the volume of each. Be sure to include units, simplify your answer, and circle it.

	$V = \frac{21}{5} \times \frac{18}{5} \times \frac{7}{1} = \frac{2646}{25}$ $= 105\frac{21}{25}\ cm^3$
* 	$V = 5 \cdot 22 \cdot 13$ $V = 1{,}430\ ft^3$
	$\frac{47}{4} \times \frac{23}{2} \times \frac{20}{1} = \frac{21620}{8}$ $= 2{,}702\frac{4}{8} \rightarrow 2{,}702\frac{1}{2}\ in^3$ $8\overline{)21620}$ = 02702; −16, 56, −56, 02, −0, 20, −16, 4
* The Palo Duro Canyon is 120 miles long, as much as 20 miles wide, and has a maximum depth of 0.15 mile. What is the approximate volume?	$120 \cdot 20 \cdot 0.15$ $V = 360\ miles^3$
* 	$V = \frac{22}{5} \cdot \frac{10}{1} \cdot \frac{3}{1} = \frac{660}{5}$ $= 132\ m^3$
* 	$V = \frac{5}{1} \cdot \frac{10}{1} \cdot \frac{99}{8} = \frac{4950}{8}$ $= 618\ 3/4\ yd^3$
	$\frac{19}{4} \times \frac{6}{1} \times \frac{6}{1} = \frac{684}{4}$ $4\overline{)684}$ = 171; −4, 28, −28, 04, 4, 0 $= 171\ in^3$

Challenge: Find the missing dimension using inverse operations.

 $V = 60\ in^3$	 $V = 109\frac{1}{5}\ mm^3$