11. Perimeter/ Area/ Volume/ Geometry Word Problems/ Circles

Formula Sheet

Perimeter / Circumference

Rectangle

$Perimeter = 2(length) + 2(width)$

Circle

$Circumference = 2\pi(radius)$

Area

Circle

$Area = \pi(radius)^2$

Triangle

$Area = \frac{1}{2}(base)(height)$

Parallelogram

$Area = (base)(height)$

Trapezoid

$Area = \frac{1}{2}(base_1 + base_2)(height)$

Volume

Prism/Cylinder

$Volume = (area\ of\ the\ base)(height)$

Pyramid/Cone

$Volume = \frac{1}{3}(area\ of\ the\ base)(height)$

Sphere

$Volume = \frac{4}{3}\pi(radius)^3$

Length

1 foot = 12 inches

1 yard = 3 feet

1 mile = 5,280 feet

1 meter = 1,000 millimeters

1 meter = 100 centimeters

1 kilometer = 1,000 meters

1 mile ≈ 1.6 kilometers

1 inch = 2.54 centimeters

1 foot ≈ 0.3 meter

Capacity / Volume

1 cup = 8 fluid ounces

1 pint = 2 cups

1 quart = 2 pints

1 gallon = 4 quarts

1 gallon = 231 cubic inches

1 liter = 1,000 milliliters

1 liter ≈ 0.264 gallon

Weight

1 pound = 16 ounces

1 ton = 2,000 pounds

1 gram = 1,000 milligrams

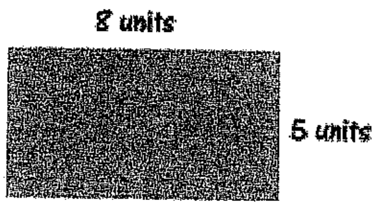
1 kilogram = 1,000 grams

1 kilogram ≈ 2.2 pounds

1 ounce ≈ 28.3 grams

Area & Perimeter

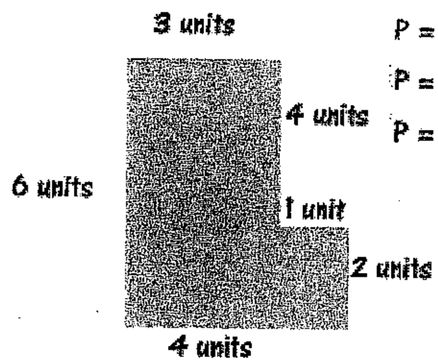
Perimeter (P): The distance around the outside of a shape



P = 2 x (side + side)

P = 2 (8+5)

P = 26 units

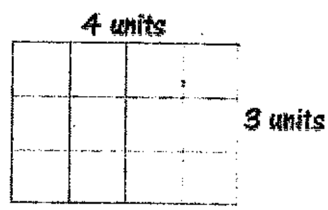


P = Sum of all sides

P = 3+4+1+2+4+6

P = 20 units

Area (A): The number of square units inside a shape. A = length x width

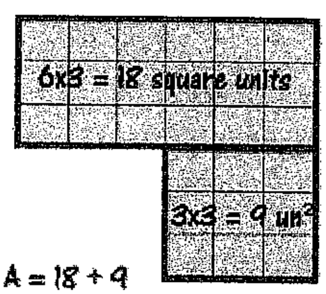


A = 3 x 4

A = 12 square units

or 12 un^2

To find the area of an irregular shape: Isolate rectangles, find the area of each, then find the total.



A = 18 + 9

A = 27 square units

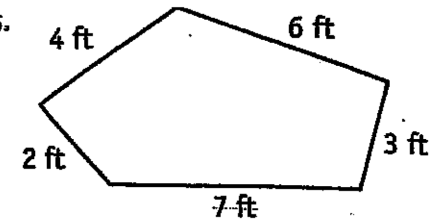
Perimeter

The distance around a flat (plane) object is known as its **perimeter.** For example, the distance around a field or a lake is called its perimeter. The symbol for perimeter is *P.*

Perimeter is measured in length units. To find the perimeter of a many-sided figure, add the lengths of the sides.

EXAMPLE 1 What is the perimeter of the figure at the right?

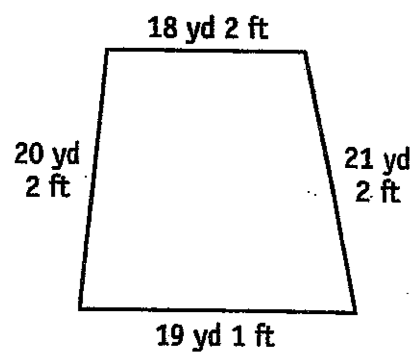
To find the perimeter, add the lengths of the five sides.



$$\begin{array}{r} 6 \text{ ft} \\ 3 \text{ ft} \\ 7 \text{ ft} \\ 2 \text{ ft} \\ +\ 4 \text{ ft} \\ \hline P = \mathbf{22 \text{ ft}} \end{array}$$

ANSWER: The perimeter is 22 ft or 7 yd 1 ft

EXAMPLE 2 Find the perimeter of the field at the right.



STEP 1 Add the lengths of the four sides.

$$\begin{array}{r} 18 \text{ yd } 2 \text{ ft} \\ 21 \text{ yd } 2 \text{ ft} \\ 19 \text{ yd } 1 \text{ ft} \\ +\ 20 \text{ yd } 2 \text{ ft} \\ \hline 78 \text{ yd } 7 \text{ ft} \end{array}$$

STEP 2 Simplify the answer.

a. Change 7 ft to 2 yd 1 ft.

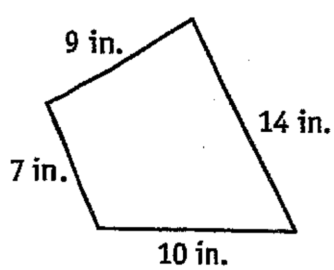
b. Add 2 yd 1 ft to 78 yd.

$$\begin{array}{r} 78 \text{ yd} \\ +\ \ 2 \text{ yd } 1 \text{ ft} \\ \hline \mathbf{80 \text{ yd } 1 \text{ ft}} \end{array}$$

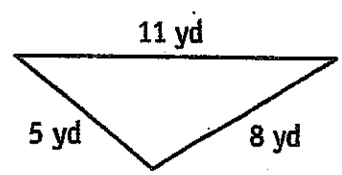
ANSWER: The perimeter is 80 yd 1 ft.

Find the perimeter of each figure.

1. *P* = ____________



2. *P* = ____________



(1.) 40 in or 3 ft 4 in (2) 24 yd

Recognizing Common Polygons

*Pay attention to the names of the shapes on the formula sheet.

A **polygon** is a plane (flat) figure formed by three or more lines. A **regular polygon** is a polygon that has equal sides and equal angles. Several types of polygons are given special names.

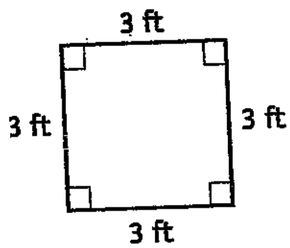
Below are listed the names and descriptions of five polygons with which you should become familiar.

Name | **Example** | **Description**

Triangle

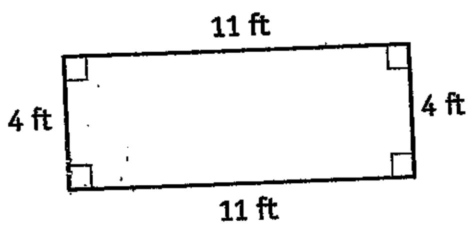
A **triangle** is a polygon formed by three lines.

Square



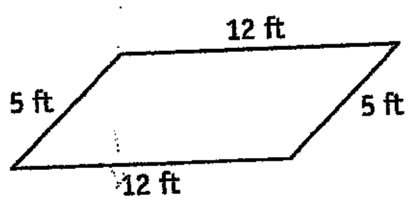
A **square** is a regular polygon with four equal sides, two pairs of parallel sides, and four right angles.

Rectangle



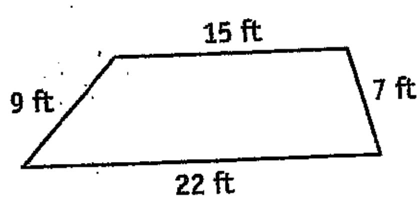
A **rectangle** is a four-sided polygon with two pairs of parallel sides and four right angles. The opposite sides of a rectangle have equal lengths.

Parallelogram



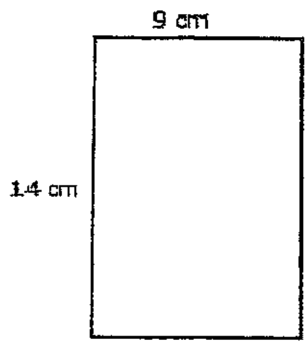
A **parallelogram** is a four-sided polygon with two pairs of parallel sides. The opposite sides are equal, and the opposite angles are equal. If all four sides of a parallelogram are equal, the parallelogram is called a **rhombus.**

Trapezoid

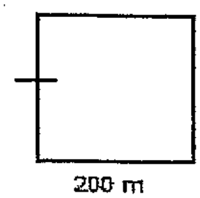


A **trapezoid** is a four-sided polygon with one pair of parallel sides called **bases.** All four sides of a trapezoid can have different lengths.

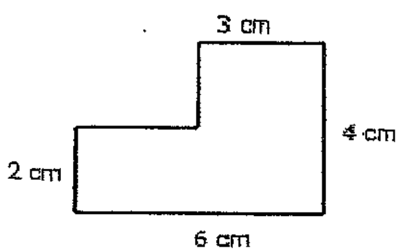
Calculate and write the *perimeter* for each of the shapes below. (Do not measure)



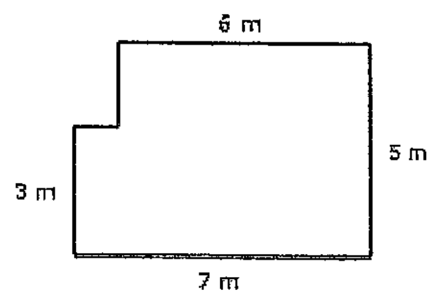
perimeter = cm



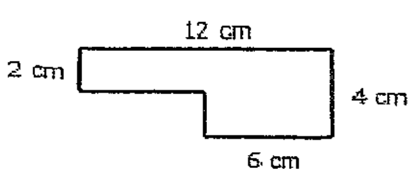
perimeter = m



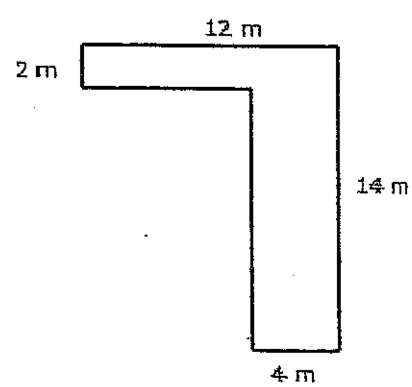
perimeter = cm



perimeter = m

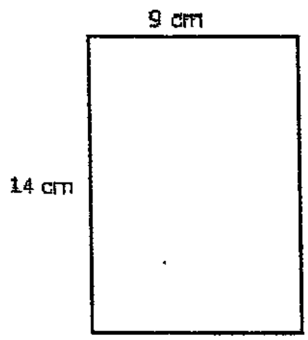


perimeter = cm

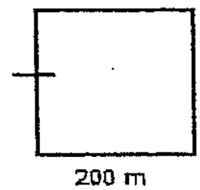


perimeter = cm

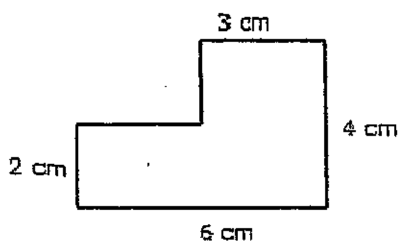
Calculate and write the *perimeter* for each of the shapes below. (Do not measure)



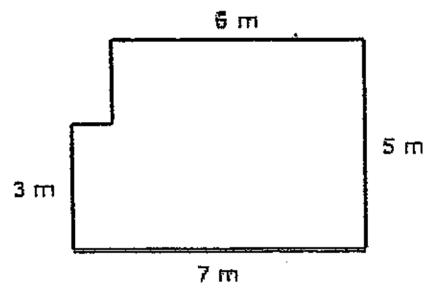
perimeter = 46 cm



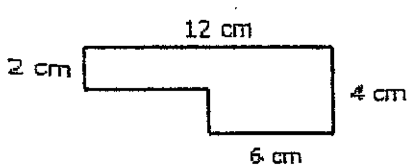
perimeter = 800 m



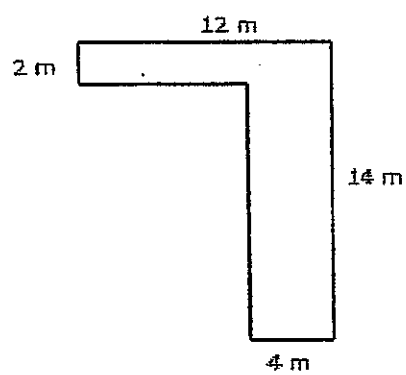
perimeter = 20 cm



perimeter = 24 m



perimeter = 32 cm



perimeter = 52 cm

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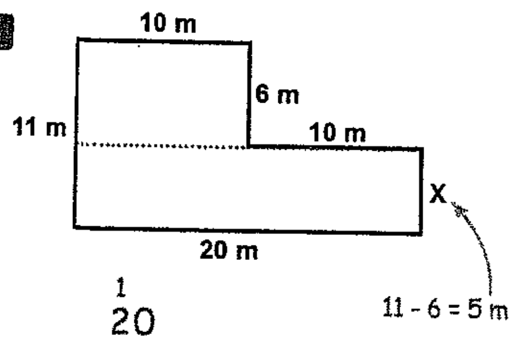
Perimeter : Missing Information Problems

PER 6

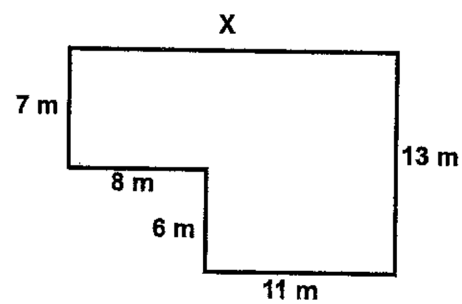
Instructions: Find the perimeter of each polygon. (Hint: Use what you *do* know to figure out what you *don't* know.) Remember that you can add up the sides in any order that is easiest for you.

1

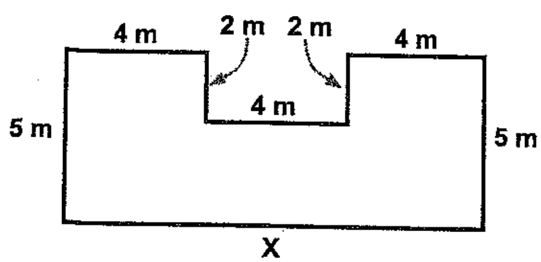


20
10
10
11
5
+ 6
62 m

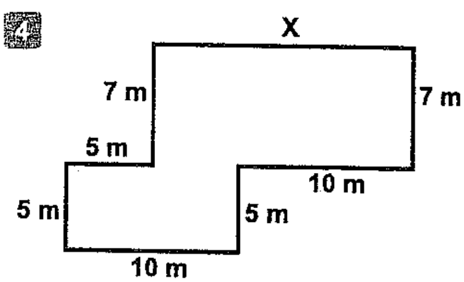
2



3



4



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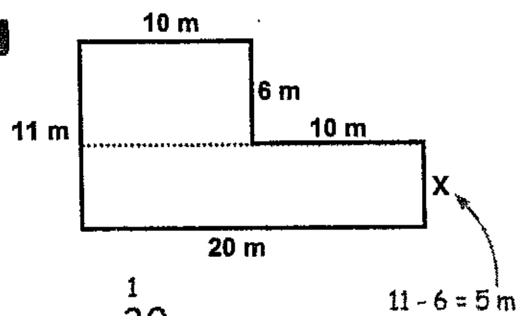
Date: ____________________

Perimeter : Missing Information Problems

PER 6

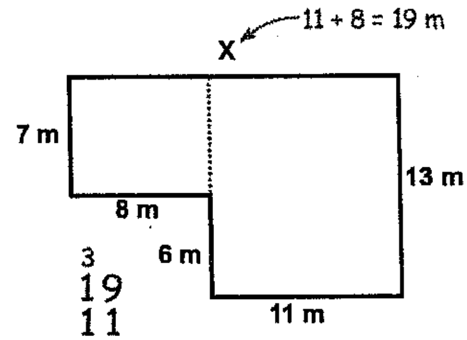
Instructions: Find the perimeter of each polygon. (Hint: Use what you *do* know to figure out what you *don't* know.) Remember that you can add up the sides in any order that is easiest for you.

1



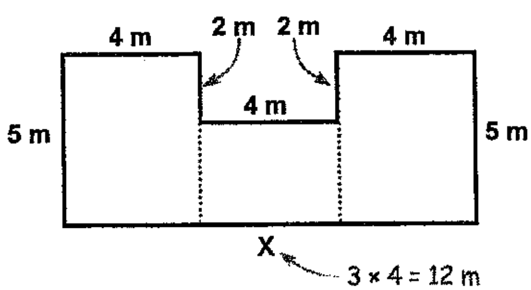
20 + 10 + 10 + 11 + 5 + 6 = **62 m**

2



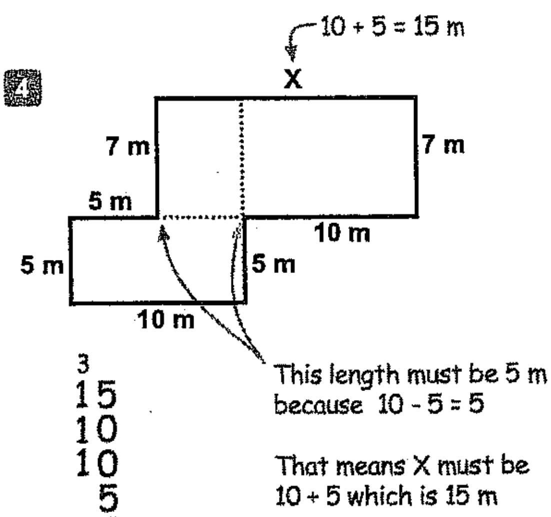
19 + 11 + 13 + 7 + 8 + 6 = **64 m**

3



12 + 5 + 5 + 4 + 4 + 4 + 2 + 2 = **38 m**

4

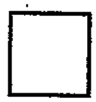


15 + 10 + 10 + 5 + 5 + 5 + 7 + 7 = **64 m**

Area

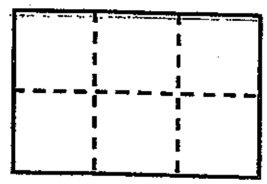
Area is a measure of surface. A larger surface has a larger area. For example, the total floor area of a house is larger than the area of any one of its rooms. The symbol for area is A.

To measure area, you can use an **area unit** in the shape of a square.

For example, you can use this square  as your area unit.

The surface area of a figure can be measured by the number of square area units that fit inside the figure. One way to find the area is to divide a figure into square area units and then count the units that fit inside the figure.

EXAMPLE What is the area of the rectangle at the right?



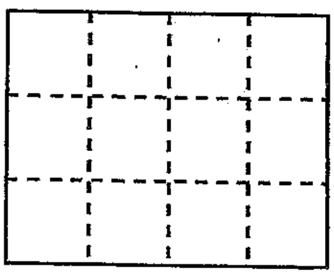
STEP 1 Divide the rectangle into square area units.

STEP 2 To find the area of the rectangle, count the number of area units that fit inside the rectangle.

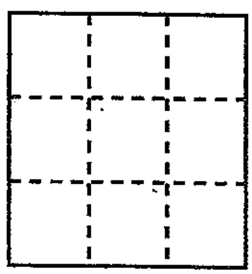
ANSWER: A = 6 area units

What is the area of each figure below? Each figure has been divided into square area units.

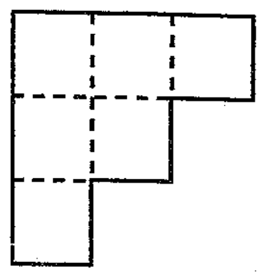
1. A = ______ area units



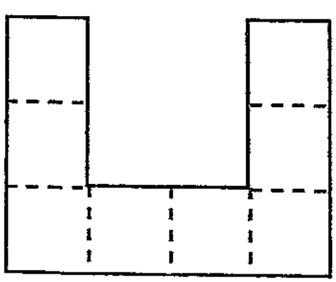
2. A = ______ area units



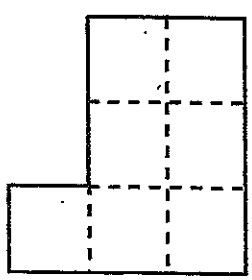
3. A = ______ area units



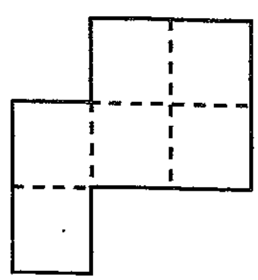
4. A = ______ area units



5. A = ______ area units



6. A = ______ area units



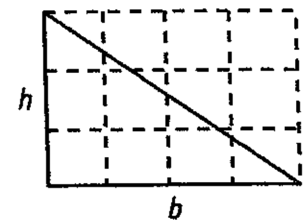
1. 12
2. 9
3. 6
4. 8
5. 7
6. 6

AREA

The area of a **triangle** is given by the formula

$$A = \frac{1}{2}bh$$

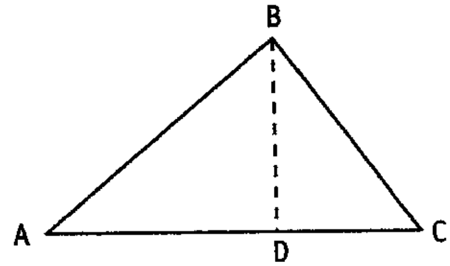
where b stands for base and h stands for height.



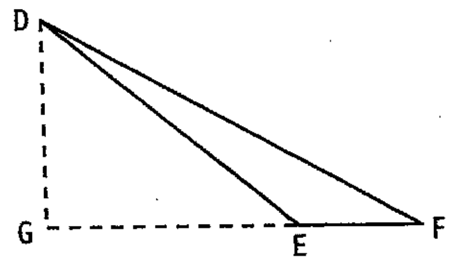
Note: 1. When working with triangles, it is common to talk of **base** and **height** instead of *length* and *width*.
2. As the drawing above shows, the area of a triangle is equal to $\frac{1}{2}$ the area of a rectangle with length b and width h.

The area formula is also used to find the area of triangles that do not contain a right angle.

The area of ΔABC is equal to $\frac{1}{2}$ times the base (AC) times the height (BD). Notice that the height BD is not one of the sides of ΔABC. The height BD is drawn in to show the distance between the vertex point B and the base AC.



The area of ΔDEF is equal to $\frac{1}{2}$ times the base (EF) times the height (DG). Since the vertex point D does not lie directly over the base EF, extend the base EF to point G. The height is then the line DG.



Note: In each case above, the height that appears in the formula is a line **perpendicular** to the base or to its extension. Perpendicular lines meet at right angles.

EXAMPLE 1 What is the area of the triangle at the right?

STEP 1 Identify the base (b) and the height (h).

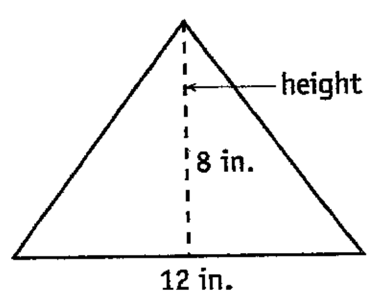
$b = 12$ in. and $h = 8$ in.

STEP 2 Substitute 12 for b and 8 for h in the area formula.

$$A = \frac{1}{2}bh$$

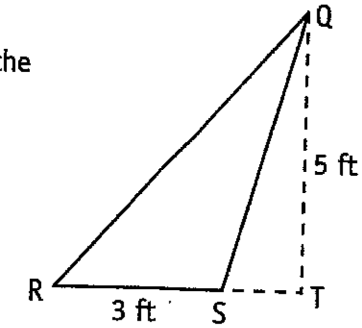
$$A = \frac{1}{2} \times 12 \times 8$$

$$A = \mathbf{48}$$



ANSWER: The area is 48 square inches.

EXAMPLE 2 What is the area of $\triangle QRS$?



STEP 1 Identify the base (b) and the height (h). Side RS is the base and the dotted line QT is the height.

$$b = 3 \text{ ft and } h = 5 \text{ ft}$$

STEP 2 Substitute 3 for b and 5 for h in the area formula.

$$A = \frac{1}{2}bh$$

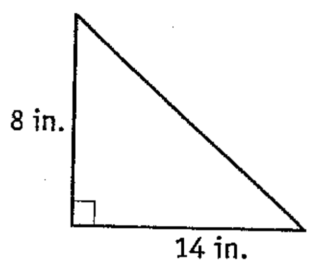
$$A = \frac{1}{2} \times 3 \times 5$$

$$= \frac{15}{2} = 7\frac{1}{2}$$

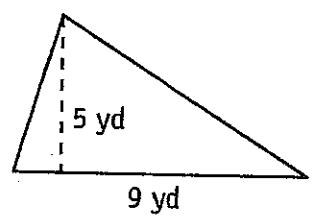
ANSWER: The area is $7\frac{1}{2}$ square feet.

Use the formula $A = \frac{1}{2}bh$ to find the area of each triangle.

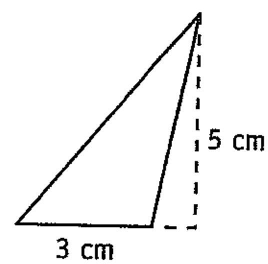
1. $A =$ ____________



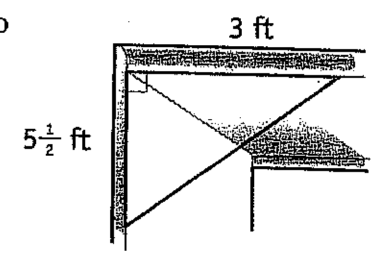
2. $A =$ ____________



3. $A =$ ____________

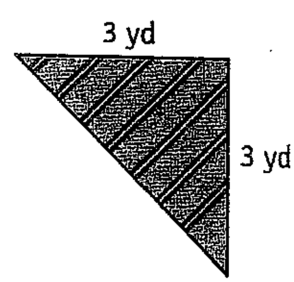


4. A corner of a counter top is shaped like a right triangle. The two sides forming the right angle have lengths of 3 feet and $5\frac{1}{2}$ feet. What is the surface area of this corner?



5. Jim cut a piece of plywood into the shape of a triangle. To the nearest square foot, find the area of the plywood if the base measures 8 feet and the height measures $6\frac{1}{4}$ feet.

6. A seamstress has a piece of cloth left over that is in the shape of an isosceles right triangle. How many square yards of cloth are in the piece if each of the two equal sides measures 3 yards? (**Hint:** The equal sides meet at a right angle.)



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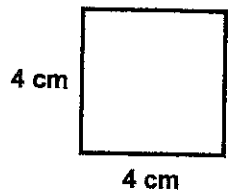
Finding the Area: Mixed Practice

AREA 3

Instructions: Find the area of each shape using the formulas you learned in the video.

1



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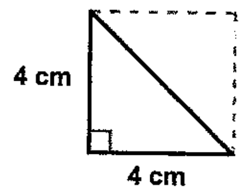

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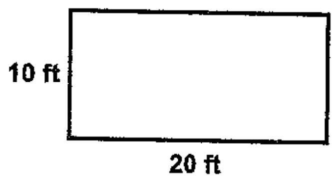

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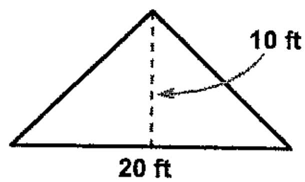

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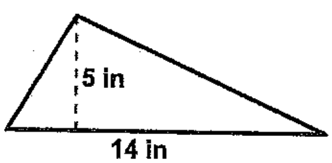

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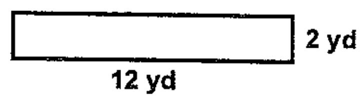

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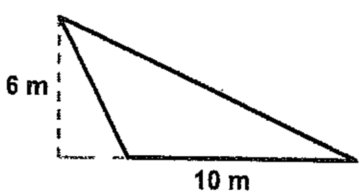
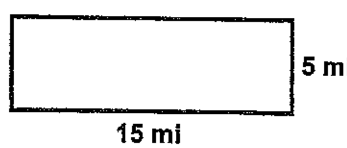


8



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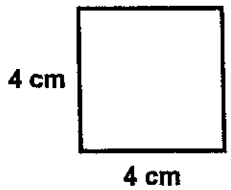
Finding the Area: Mixed Practice

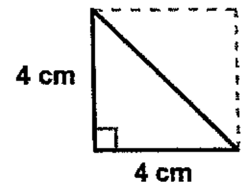
Instructions: Find the area of each shape using the formulas you learned in the video.

1



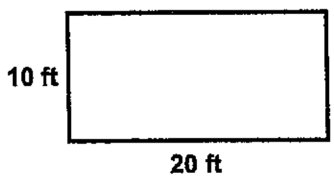
$A = 4 \times 4 =$ **$16\ cm^2$**

2



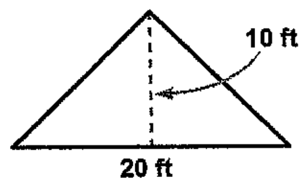
$A = \frac{1}{2}(4 \times 4) = \frac{16}{2} =$ **$8\ cm^2$**

3



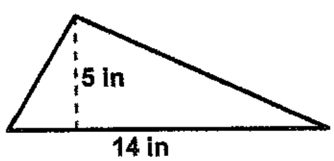
$A = 20 \times 10 =$ **$200\ ft^2$**

4



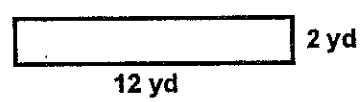
$A = \frac{1}{2}(20 \times 10) = \frac{200}{2} =$ **$100\ ft^2$**

5



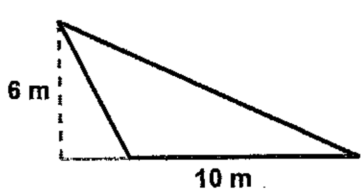
$A = \frac{1}{2}(14 \times 5) = \frac{70}{2} =$ **$35\ in^2$**

6



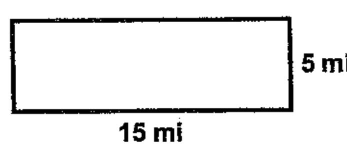
$A = 2 \times 12 =$ **$24\ yd^2$**

7



$A = \frac{1}{2}(10 \times 6) = \frac{60}{2}$ **$= 30\ m^2$**

8



$A = 15 \times 5 =$ **$75\ mi^2$**

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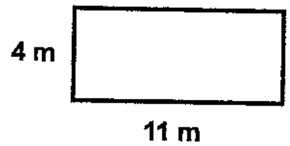
Finding Area and Perimeter

Instructions: Now that you know how to find both the perimeter and area, find both quantities for each of the following shapes. Don't forget to include the units in your answers!

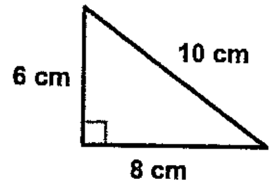
1



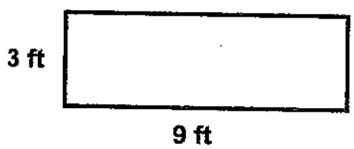
$P = 4 + 11 + 4 + 11 = 30\text{ m}$

$A = 4 \times 11 = 44\text{ m}^2$

2



3



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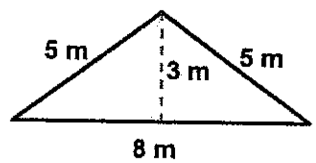

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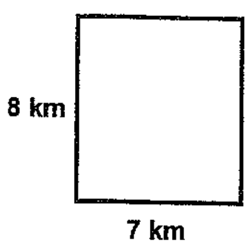

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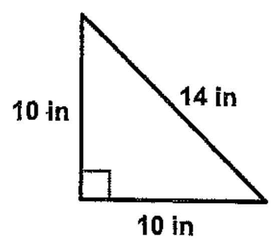

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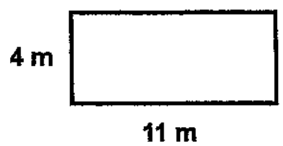
Finding Area and Perimeter

Instructions: Now that you know how to find both the perimeter and area, find both quantities for each of the following shapes. Don't forget to include the units in your answers!

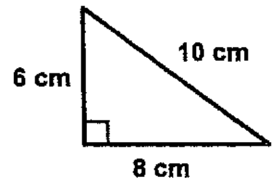
1



$P = 4 + 11 + 4 + 11 = 30\ m$

$A = 4 \times 11 = 44\ m^2$

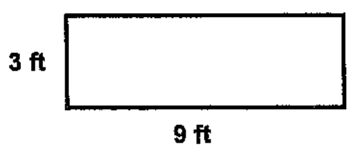
2



$P = 6 + 8 + 10 = 24\ cm$

$A = \frac{1}{2}(8 \times 6) = \frac{48}{2} = 24\ cm^2$

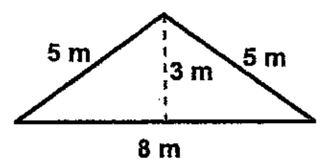
3



$P = 3 + 9 + 3 + 9 = 24\ ft$

$A = 3 \times 9 = 27\ ft^2$

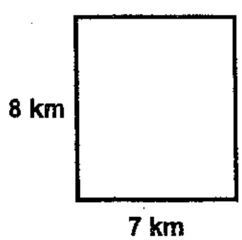
4



$P = 5 + 5 + 8 = 18\ m$

$A = \frac{1}{2}(8 \times 3) = \frac{24}{2} = 12\ m^2$

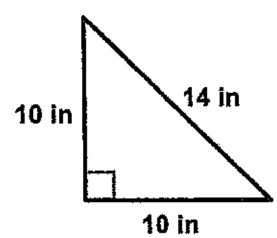
5



$P = 7 + 8 + 7 + 8 = 30\ km$

$A = 7 \times 8 = 56\ km^2$

6



$P = 10 + 10 + 14 = 34\ in$

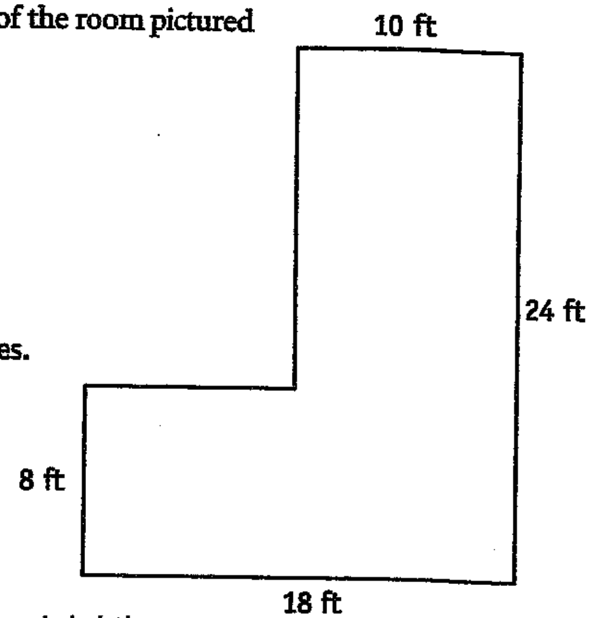
$A = \frac{1}{2}(10 \times 10) = \frac{100}{2} = 50\ in^2$

Solving Two-Step Area Problems: Part I

Many area problems involve figures that are a combination of common geometrical shapes. We call these problems **two-step area problems.**

To solve a two-step area problem, divide the figure into shapes you are familiar with and then solve for each shape separately.

For example, you may be asked to find the area of the room pictured to the right. To find this area, follow these steps.



STEP 1 Divide the room into two rectangles.

STEP 2 Find the unknown side of one rectangle.

STEP 3 Find the area of each rectangle.

STEP 4 Add the areas of the two rectangles. The example below will show you how to do this.

EXAMPLE What is the area of the room pictured at the right?

STEP 1 Divide the room into two rectangles. Label the rectangles I and II. Label the unmeasured long side of rectangle I as l for length. You need to know the value of l before you can find the area of rectangle I.

STEP 2 To find l subtract 8 from 24.

$l = 24 - 8$
$l = 16$

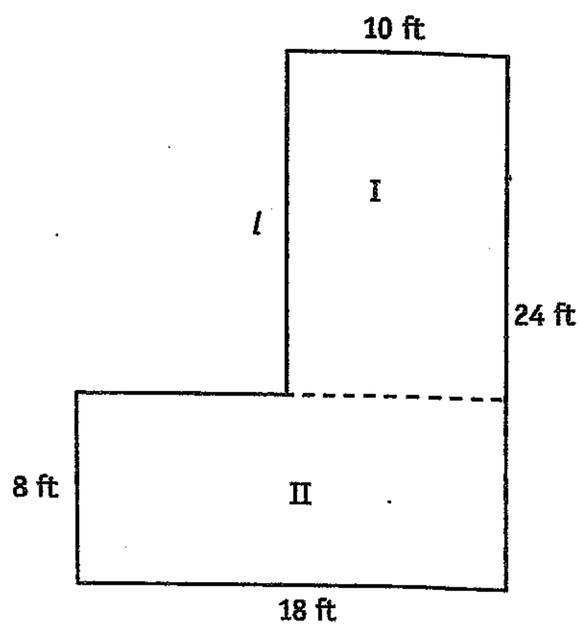
STEP 3 Find the area of rectangle I and the area of rectangle II.

Area of I $= lw = 16 \times 10$
$= 160$ sq ft

Area of II $= lw = 18 \times 8$
$= 144$ sq ft

STEP 4 Add the areas of rectangles I and II.

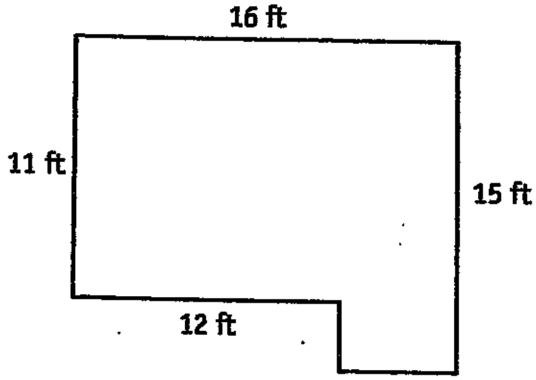
160 sq ft
+144 sq ft
304 sq ft



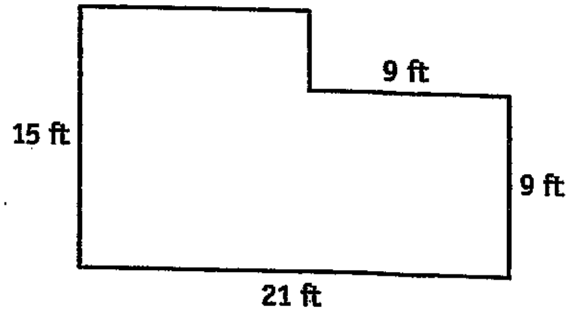
ANSWER: The area of the room is 304 sq ft.

What is the area of each room? You may use your calculator.

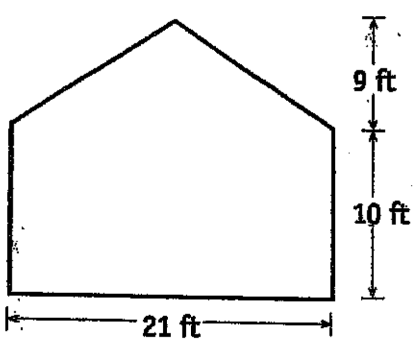
1. $A =$ ____________



2. $A =$ ____________

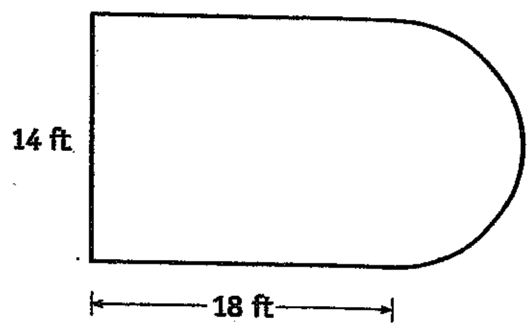


3. $A =$ ____________



(**Hint:** Problem 3 involves a rectangle and a triangle.)

4. $A =$ ____________



(**Hint:** Problem 4 involves a rectangle and half of a circle. Do you see a clue for the circle's diameter?)

Page 119

1. 192 sq ft
2. 261 sq ft
3. 304.5 sq ft
4. 329 sq ft

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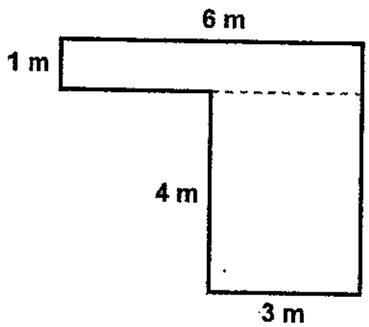
Finding the Area of Composite Shapes - Set 1

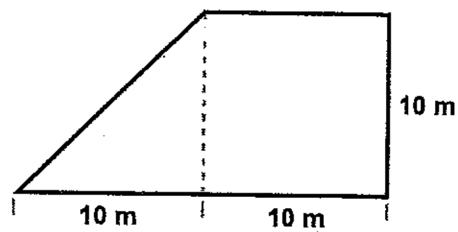
AREA 4

Instructions: Each of these shapes is some combination of quadrilaterals and/or triangles. Find the area of the shape by finding the area of each part that forms it and then adding them up.

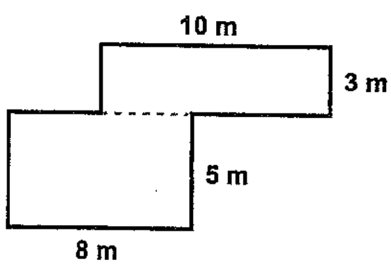
1



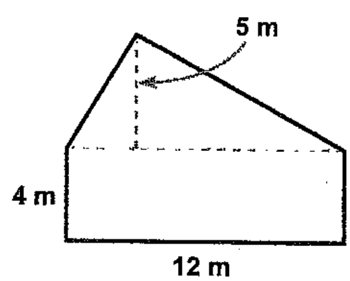
2



3



4



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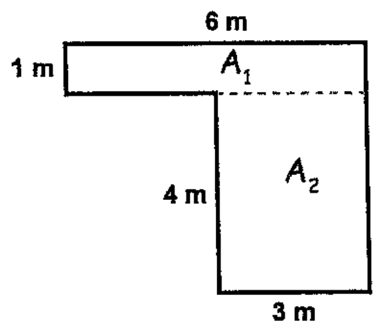
Name: ____________________

Date: ____________________

Finding the Area of Composite Shapes - Set 1

Instructions: Each of these shapes is some combination of quadrilaterals and/or triangles. Find the area of the shape by finding the area of each part that forms it and then adding them up.

1

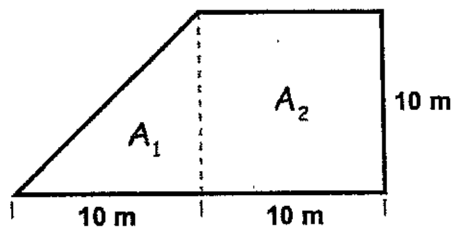


$A_1 = 1 \times 6 = 6\ m^2$

$A_2 = 4 \times 3 = 12\ m^2$

total: $12 + 6 = 18\ m^2$

2

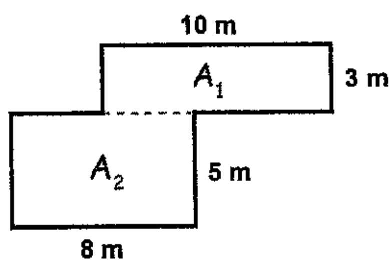


$A_1 = \frac{1}{2}(10 \times 10) = \frac{100}{2} = 50\ m^2$

$A_2 = 10 \times 10 = 100\ m^2$

total: $100 + 50 = 150\ m^2$

3

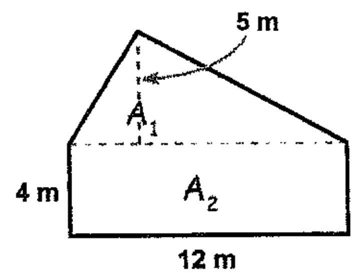


$A_1 = 3 \times 10 = 30\ m^2$

$A_2 = 5 \times 8 = 40\ m^2$

total: $30 + 40 = 70\ m^2$

4



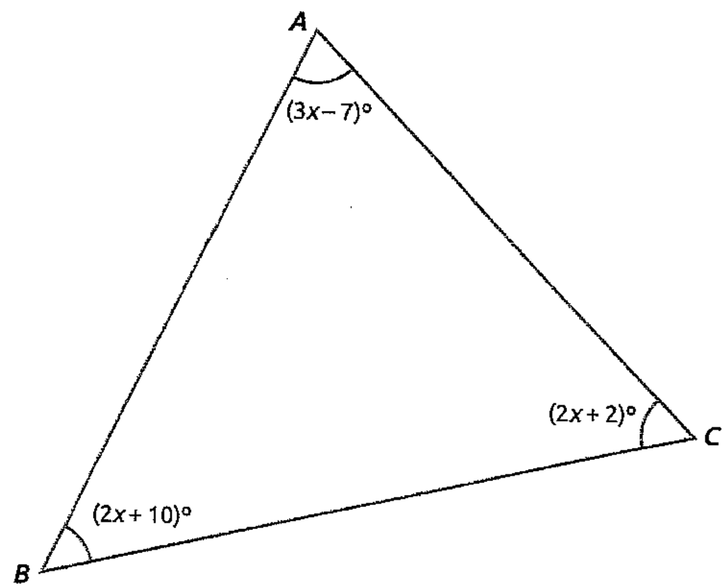
$A_1 = \frac{1}{2}(12 \times 5) = \frac{60}{2} = 30\ m^2$

$A_2 = 4 \times 12 = 48\ m^2$

total: $30 + 48 = 78\ m^2$

Lesson Practice

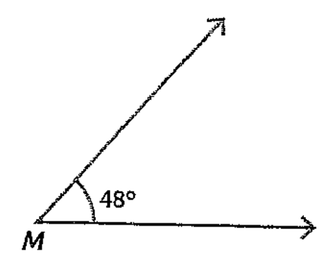
Questions 6 and 7 refer to the information below.



6. In ΔABC, what is the value of x?
   - **A** 10
   - **B** 25
   - **C** 52
   - **D** 60
   - **E** 68

7. In ΔABC, what is $m\angle A$?
   - **A** 10°
   - **B** 25°
   - **C** 52°
   - **D** 60°
   - **E** 68°

8. What is the measurement of the angle that is complementary to $\angle M$?



   - **A** 42°
   - **B** 48°
   - **C** 90°
   - **D** 132°
   - **E** 180°

9. $\angle X$ and $\angle Y$ are supplementary angles. If $m\angle X = (10n - 2)°$ and $m\angle Y = (2n + 2)°$, what is $m\angle X$?
   - **A** 15°
   - **B** 32°
   - **C** 90°
   - **D** 148°
   - **E** 180°

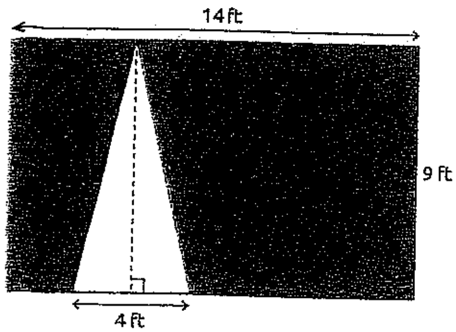
6. B. The sum of the three angles is $180°$. Set up the equation $(2x + 10) + (2x + 2) + (3x - 7) = 180$, and then solve for x.

7. E. Since $x = 25$, $m\angle A = 3(25) - 7 = 68°$.

8. A. Complementary angles add up to $90°$. $90° - 48° = 42°$.

9. D.

10. Which expression can be used to determine the area, in square feet, of the shaded region in the figure shown?



A $A = (14 \cdot 9) - (4 \cdot 9)$

B $A = (14 \cdot 9) - (\frac{1}{2} \cdot 4 \cdot 9)$

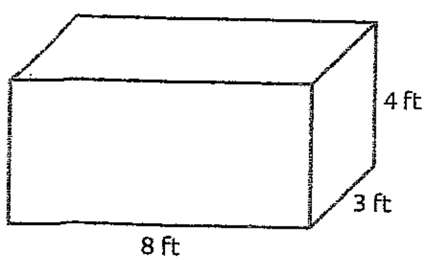
C $A = (14 \cdot 9) + (\frac{1}{2} \cdot 4 \cdot 9)$

D $A = (\frac{1}{2} \cdot 4 \cdot 9) - (14 \cdot 9)$

E $A = (\frac{1}{2} \cdot 4 \cdot 9) \cdot (14 \cdot 9)$

Questions 11 and 12 refer to the information below.

Isak is shipping the container shown.



11. In the container, Isak will pack as many smaller boxes as he can. The smaller boxes measure 3 feet by 2 feet by 2 feet. How many of the smaller boxes can he fit in the larger container?

A 4

B 8

C 12

D 96

E 108

12. Isak wants to wrap the large container with shipping paper to protect it and needs to know how much to buy. What is the surface area of the container?

A 48 ft^2

B 96 ft^2

C 112 ft^2

D 136 ft^2

E 4,224 ft^2

13. A carnival game involves throwing darts at a circular target that has a diameter of 6 inches. What is the area of the target? Use 3.14 for π.

A 18.84 in^2

B 28.26 in^2

C 37.68 in^2

D 113.04 in^2

E 452.16 in^2

See page 129 for answers and help.

10. B. Find the area of the rectangle and subtract from it the area of the triangle.

11. B. Divide the volume of the large container by the volume of a smaller box.

12. D.

13. B. Use the formula, $A = \pi r^2$, where the radius is 3 inches.

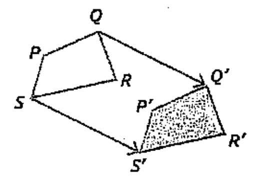
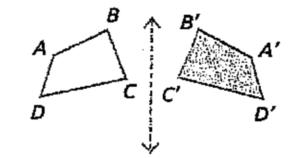
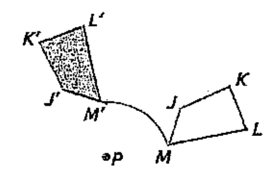
Understanding Similarity and Congruence

SKILLS TIP

Congruence transformation, the corresponding side lengths and angle measurements are consistent because the figure does not change size or shape.

Congruence

A **transformation** of a figure is a change in the position, size, or shape of the figure. The **preimage** is the figure before the transformation, and the **image** is the figure after the transformation. Some transformations are called congruence transformations because the figure does not change size or shape, only position. Congruence transformations include translations, reflections, and rotations. These transformations are summarized in the following table.

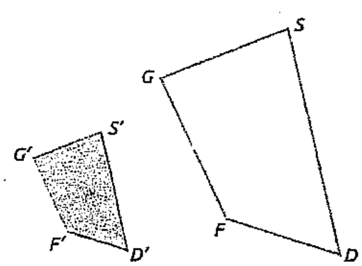
Translation	Reflection	Rotation
A slide – all points in a figure move the same direction and same distance.	A flip – a transformation across a line, called a line of reflection. Each point and its image are the same distance from the line of reflection.	A turn – a transformation about a point, *P*, which is the center of reflection. Each point and its image are the same distance from *P*.
		

Paco held up a message on a poster board that can be read by holding it up to a mirror. What transformation must occur in order to read the message? Explain your reasoning.

ANSWER: It is a reflection. The line of reflection is the mirror, and all points of the preimage and image are equal distances from the line of reflection, but the image is flipped over that line.

Similarity Transformation

A **dilation** is a transformation that changes the size but not the shape of the figure. The image and preimage are similar. The corresponding angles are still congruent, and the corresponding sides are proportional to each other. A dilation can be an enlargement or a reduction. The **scale factor** describes how much the preimage is enlarged or reduced.



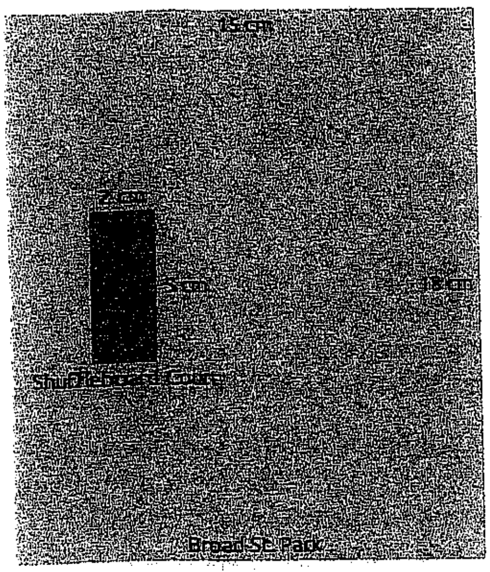
A scale factor is multiplied by each dimension of a preimage to find the dimensions of the dilated image. If a scale factor is greater than 1, then the dilation is an enlargement. If a scale factor is greater than 0 but less than 1, then the dilation is a reduction.

Rodney has a 4-inch by 6-inch photograph that he wants to enlarge to 6-inches by 9-inches. What is the scale factor he should use for the enlargement?

$$4 \times sf = 6$$
$$sf = \frac{3}{2}$$
$$6 \times sf = 9$$
$$sf = \frac{3}{2}$$

ANSWER: The scale factor is $\frac{3}{2}$ or 1.5.

The community park planning committee is drawing up plans for a new park. The following drawing lays out the plan for the park. If the actual dimensions of the shuffleboard court are 9 meters by 22.5 meters, what is the scale factor being used to create the drawing? What are the actual dimensions of the park?



9 meters = 900 centimeters

$$900 \times sf = 2$$
$$sf = \frac{2}{900} = \frac{1}{450}$$

22.5 meters = 2250 centimeters

$$2250 \times sf = 5$$
$$sf = \frac{5}{2250} = \frac{1}{450}$$

The scale factor is $\frac{1}{450}$.

So, to find the actual dimensions of the park, multiply by the scale factor of $\frac{450}{1}$.

$\frac{450}{1}$ x 18= 8100 cm, or 81 m

$\frac{450}{1}$ x 15= 6750 cm, or 67.5 m

ANSWER: The dimensions of the park are 67.5 meters by 81 meters.

SKILLS TIP

If coordinates are given that describe the vertices of a preimage, then the vertices of the dilated image can be found by multiplying each coordinate by the scale factor. For example, the table below shows the coordinates for the preimage points *A* and *B*. To determine *A'* and *B'*, each coordinate was multiplied by the scale factor 2.

Pre-Image	Image
A (1, 2)	*A'* (2, 4)
B (−3, −5)	*B'* (−6, −10)

Lesson Practice

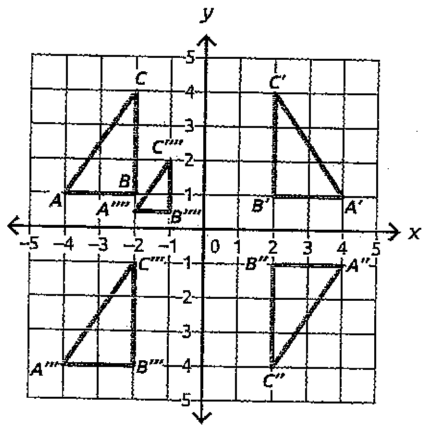
KEY POINT!

In determining the type of transformation, look at the orientation of the labeled vertices of the preimage and the image.

Complete the activities below to check your understanding of the lesson content.

Questions 1–4 refer to the information below.

The following diagram shows several



transformations of ΔABC.

1. Which triangle is not a congruence transformation of ΔABC?
   - **A** ΔABC
   - **B** $\Delta A'B'C'$
   - **C** $\Delta A''B''C''$
   - **D** $\Delta A'''B'''C'''$
   - **E** $\Delta A''''B''''C''''$

2. Which triangle is a rotation of ΔABC?
   - **A** ΔBAC
   - **B** $\Delta A'B'C'$
   - **C** $\Delta A''B''C''$
   - **D** $\Delta A'''B'''C'''$
   - **E** $\Delta A''''B''''C''''$

3. Which triangle is translation of ΔABC?
   - **A** ΔABC
   - **B** $\Delta A'B'C'$
   - **C** $\Delta A''B''C''$
   - **D** $\Delta A'''B'''C'''$
   - **E** $\Delta A''''B''''C''''$

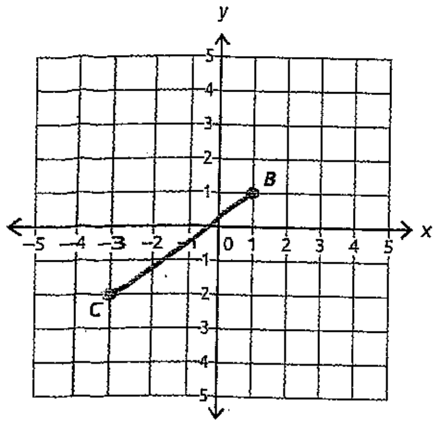
4. Which triangle is a reflection of ΔABC?
   - **A** ΔABC
   - **B** $\Delta A'B'C'$
   - **C** $\Delta A''B''C''$
   - **D** $\Delta A'''B'''C'''$
   - **E** $\Delta A''''B''''C''''$

5. Jasmina has a picture that she wants to enlarge to a poster that measures 24 inches by 32 inches. If her picture is 3 inches by 4 inches, what scale factor should Jasmine use to increase the picture to poster size?
   - **A** 2
   - **B** 4
   - **C** 5
   - **D** 8
   - **E** 10

6. Daphne is setting up chairs for a concert. She decides to move one chair directly forward 3 rows to add a seat in the front row. Which transformation did Daphne just perform with the chair?
   - **A** translation
   - **B** reflection
   - **C** rotation
   - **D** dilation
   - **E** reproduction

1. E. $\Delta A''''B''''C''''$ is a reduction dilation, which is a similarity transformation
2. C. $\Delta A''B''C''$ is a rotation of ΔABC around the origin.
3. D. $\Delta A'''B'''C'''$ is a translation of ΔABC. The original triangle is shifted 5 units down.
4. B. $\Delta A'B'C'$ is a reflection of ΔABC across the y-axis.
5. D.
6. A. The movement of the chair is like a translation. The chair changes position but not size or orientation.

Questions 7 and 8 refer to the information below.



7. If $\overline{BC}$ is dilated by a scale factor of 2, what is the coordinate of point B'?

   A $\left(\frac{1}{2}, \frac{1}{2}\right)$

   B $(2, 2)$

   C $(-2, -2)$

   D $(-6, -4)$

   E $\left(-\frac{3}{2}, -1\right)$

8. If the image of $\overline{B'C'}$ has coordinates of $B'(3, -2)$ and $C'(-1, -5)$, which of the following transformations could have occurred?

   A a dilation with scale factor 2

   B a rotation about the origin

   C a translation down 3 units and right 2 units

   D a reflection across the y-axis

   E a reflection across the x-axis

TEST STRATEGY

Read the problem carefully. Sometimes, it can be helpful to draw a diagram of what is happening if no diagram was provided.

See page 129 for answers and help.

7. B. Multiply the coordinates of the preimage by 2.

8. C.

Volume

Volume is a measure of the space *taken up* by a solid figure (or object). A large object has more volume than a small object. For example, the volume of a brick is greater than the volume of a marble.

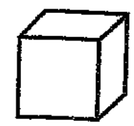
Volume can also refer to the space *enclosed* by the surface of a solid figure. For example, the volume of a room is the space enclosed by the floor, walls, and ceiling of the room.

Questions on volume may refer to either use of the word volume. In either case, the symbol for volume is V.

MEASURING VOLUME

To measure volume, you can use a **volume unit** in the shape of a cube.

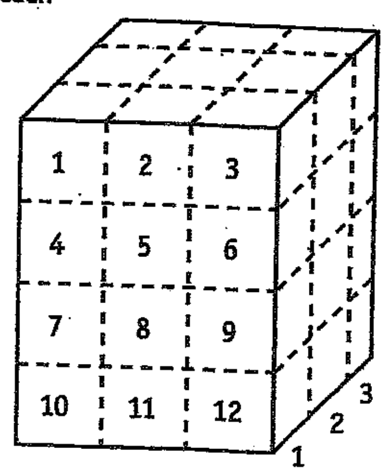
For example, you can use this cube as your volume unit. The volume of solid objects is measured in cubic units.



Volume can be found by first dividing an object into volume units and then counting these units.

EXAMPLE What is the volume of the rectangular solid at the right?

The rectangular solid is divided into volume units. To find the volume, count these units. Because you can't directly see each volume unit, follow these steps:



STEP 1 Count the number of volume units in one layer of the figure.
There are 12 volume units in the front layer.

Multiply the volume units in the length times the volume units in the height.

Area of surface $= 3 \times 4 = 12$

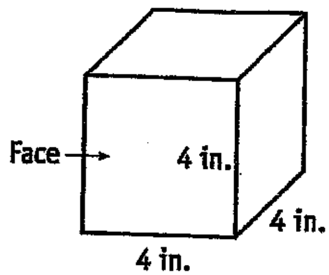
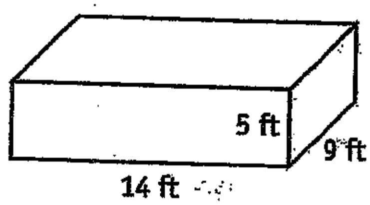
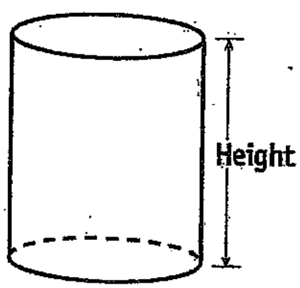
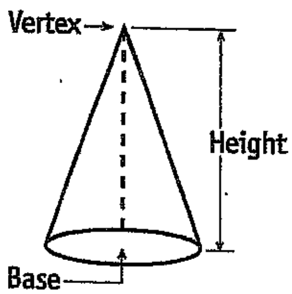
STEP 2 Multiply the number of volume units in the front layer (12) by the number of layers (3) in the figure.

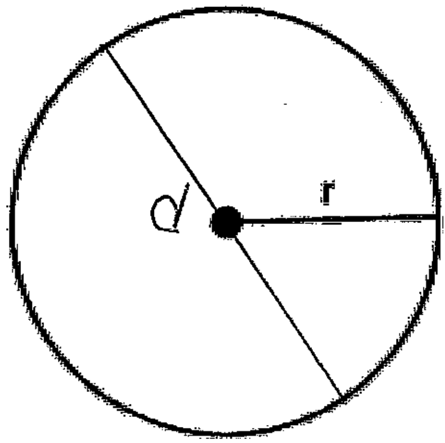
$12 \times 3 = $ **36**

ANSWER: $V = 36$ **volume units**

Recognizing Common Solid Figures

Solid figures take up space and have volume. Things you can see, touch, and hold are solid figures. There are four shapes of solid figures that occur so frequently that they are of special interest in the study of geometry. Below are listed the names and descriptions of these common solid figures.

Name	Example	Description
Cube		Each side of a **cube** has an equal length, and each pair of sides forms a right angle. Thus, each **face** (flat surface) of a cube is a square.
Rectangular Solid		Each face of a **rectangular solid** is either a rectangle or a square. At every corner, each pair of sides forms a right angle. A rectangular solid is also called a **rectangular prism.**
Cylinder		A **cylinder** has the shape of a common tin can. The top and bottom surfaces are circles that are parallel to each other. The distance between the top and bottom is called the **height** of the cylinder.
Cone		A **cone** has one circular surface called the **base.** The **vertex** of a cone is a point that lies directly above the center of the base. The distance between the vertex and the center of the base is called the **height** of the cone.



Area$= \pi r^2$

Circumference $= 2\pi r$

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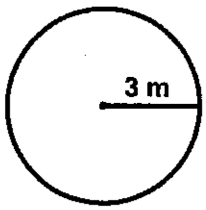
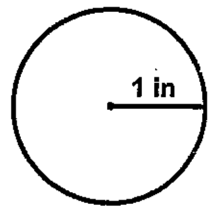
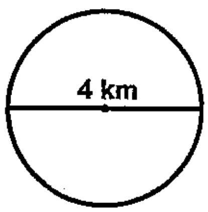
Calculating Circumference

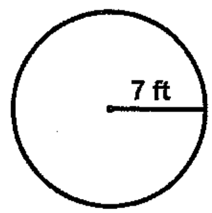
CCA 2

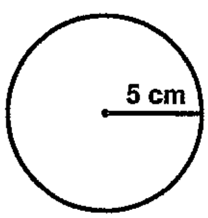
Instructions: Use the formula you learned in the video to calculate the circumference of each circle below. Use Pi = 3.14 and round your answers to two decimal places. You can use a calculator. *(Note: Sometimes the problem gives you the radius, but sometimes it gives you the diameter.)*

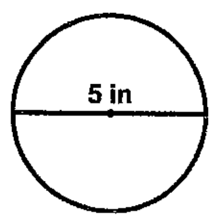
1


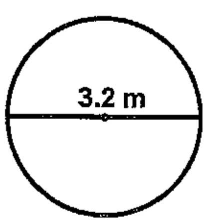
2


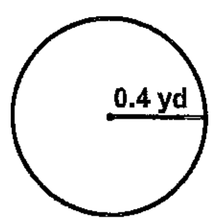
3


4


5


6


7


8


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Name:

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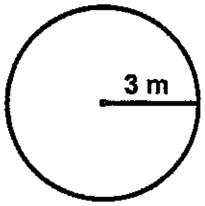
Calculating Circumference

CCA 2

Instructions: Use the formula you learned in the video to calculate the circumference of each circle below. Use Pi = 3.14 and round your answers to two decimal places. You can use a calculator. *(Note: Sometimes the problem gives you the radius, but sometimes it gives you the diameter.)*

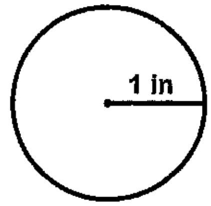
1



$C = 2\pi r$
$= 2 \times 3.14 \times 3$

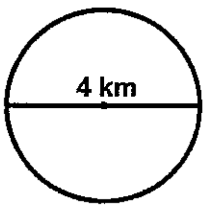
$C = 18.84$ m

2



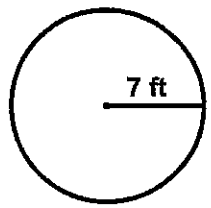
$C = 2\pi r$
$= 2 \times 3.14 \times 1$
$= 6.28$ in

3



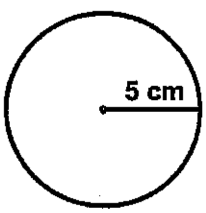
$C = 2\pi r$
$= 2 \times 3.14 \times 2$
$= 12.56$ Km

4



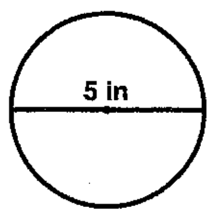
$C = 43.96$ ft

5



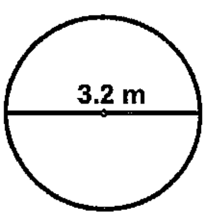
$C = 31.4$ cm

6



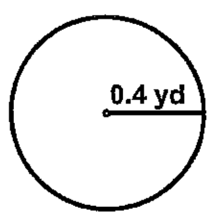
$C = 15.7$ in

7



$C = 10.05$ m

8



$C = 2.51$ yd.

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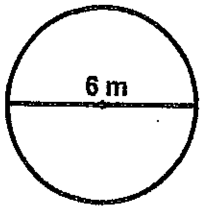
Calculating Area

CCA 3

Instructions: Use the formula you learned in the video to calculate the area of each circle below. Use Pi = 3.14 and round your answers to two decimal places. You can use a calculator.
(Note: Sometimes the problem gives you the radius, but sometimes it gives you the diameter.)

1

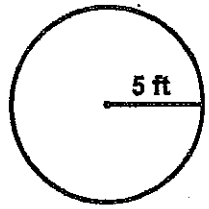


$A = \pi \times r^2$

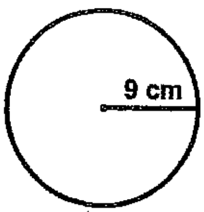
$A = 3.14 \times (3 \times 3)$

$A = 28.26\ m^2$

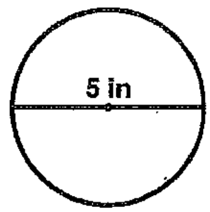
2



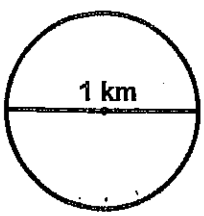
3



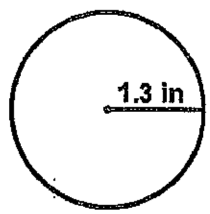
4



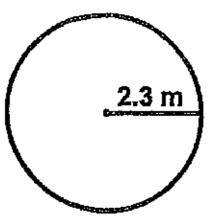
5



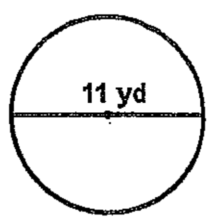
6



7



8



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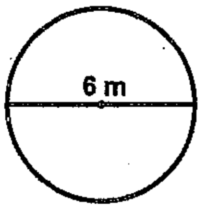
Calculating Area

CCA 3

Instructions: Use the formula you learned in the video to calculate the area of each circle below. Use Pi = 3.14 and round your answers to two decimal places. You can use a calculator.
(Note: Sometimes the problem gives you the radius, but sometimes it gives you the diameter.)

1



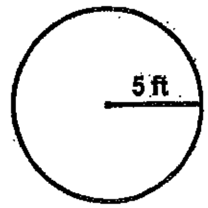
$A = \pi \times r^2$

$A = 3.14 \times (3 \times 3)$

$A = 28.26\ m^2$

$r = \frac{6}{2} = 3\ m$

2

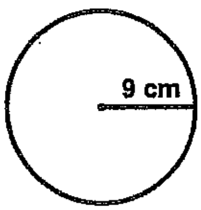


$A = \pi \times r^2$

$A = 3.14 \times (5 \times 5)$

$A = 78.5\ ft^2$

3

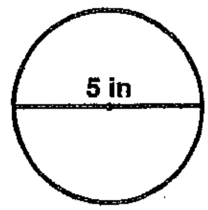


$A = \pi \times r^2$

$A = 3.14 \times (9 \times 9)$

$A = 254.34\ cm^2$

4



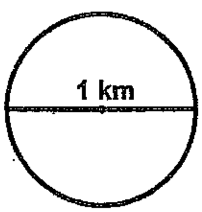
$A = \pi \times r^2$

$A = 3.14 \times (2.5)^2$

$A = 19.63\ in^2$

$r = \frac{5}{2} = 2.5\ in$

5



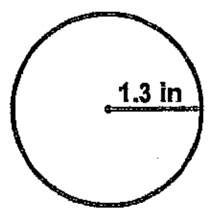
$A = \pi \times r^2$

$A = 3.14 \times (0.5)^2$

$A = 0.79\ km^2$

$r = \frac{1}{2} = 0.5\ km$

6

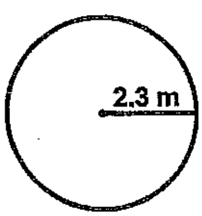


$A = \pi \times r^2$

$A = 3.14 \times (1.3)^2$

$A = 5.31\ in^2$

7

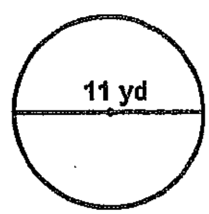


$A = \pi \times r^2$

$A = 3.14 \times (2.3)^2$

$A = 16.61\ m^2$

8



$A = \pi \times r^2$

$A = 3.14 \times (5.5)^2$

$A = 94.99\ yd^2$

$r = \frac{11}{2} = 5.5\ yd$

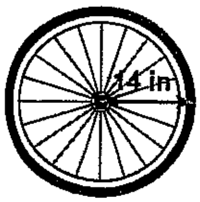
Name: ____________________

Date: ____________________

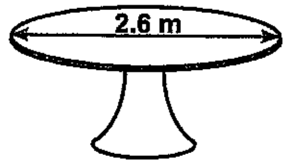
Circumference and Area - Word Problems

Instructions: For the following problems, use Pi = 3.14. You may use a calculator. If necessary, round your answers to two decimal places.

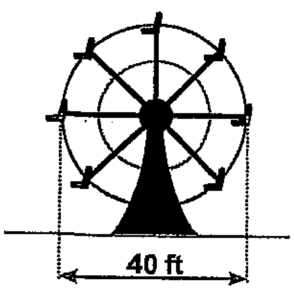
1. A bicycle tire has a radius of 14 inches. What is the circumference of the tire?



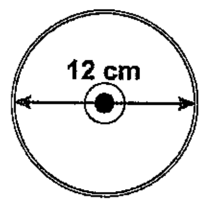
2. A round table top has a diameter of 2.6 meters. What is its surface area?



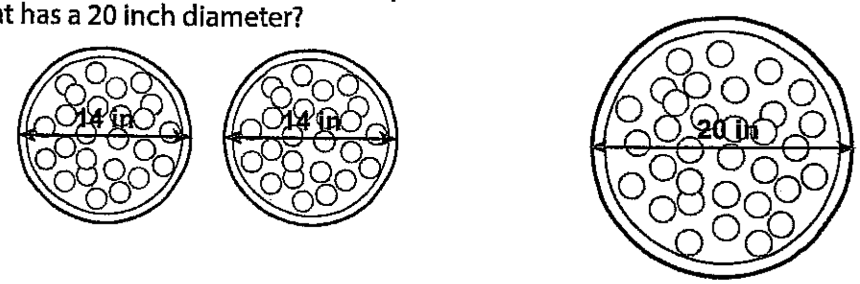
3. A Ferris-Wheel at an amusement park has a diameter of 40 feet. How far would you travel in one revolution? (In other words, find the circumference.)



4. A DVD disc has a diameter of 12 centimeters. What is the surface area of one side of the disc?



5. Which has the greatest surface area: two pizzas that have 14 inch diameters or one pizza that has a 20 inch diameter?



math Antics®
Worksheets

Name:

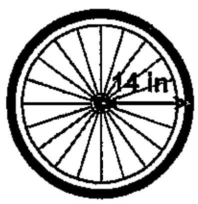
Date:

Circumference and Area - Word Problems

CCA 5

Instructions: For the following problems, use Pi = 3.14. You may use a calculator. If necessary, round your answers to two decimal places.

1. A bicycle tire has a radius of 14 inches. What is the circumference of the tire?



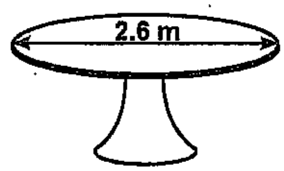
$C = 2\pi r$

$C = 2 \times 3.14 \times 14$

$C = 87.92$ in

d = 14 x 2 = 28 in

2. A round table top has a diameter of 2.6 meters. What is its surface area?



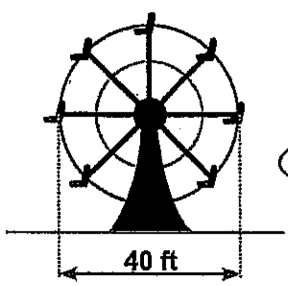
$A = \pi \times r^2$

$A = 3.14 \times (1.3)^2$

$A = 5.31\ m^2$

$r = \frac{2.6}{2} = 1.3$ m

3. A Ferris-Wheel at an amusement park has a diameter of 40 feet. How far would you travel in one revolution? (In other words, find the circumference.)

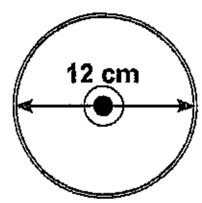


$C = 2\pi r$

$C = 2 \times 3.14 \times 20$

$C = 125.6$ ft

4. A DVD disc has a diameter of 12 centimeters. What is the surface area of one side of the disc?



$A = \pi \times r^2$

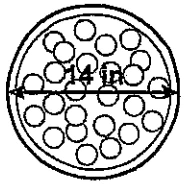
$A = 3.14 \times (6 \times 6)$

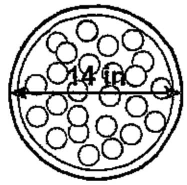
$A = 113.04\ cm^2$

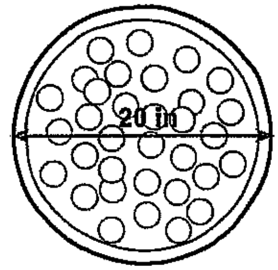
$r = \frac{12}{2} = 6$ cm

5. Which has the greatest surface area: two pizzas that have 14 inch diameters or one pizza that has a 20 inch diameter?

$r = \frac{14}{2} = 7$ in







$r = \frac{20}{2} = 10$ in

$A = \pi \times r^2$

$A = 3.14 \times (7 \times 7)$

$A = 153.86\ in^2$

$2 \times A = 307.72\ in^2$

$A = \pi \times r^2$

$A = 3.14 \times (10 \times 10)$

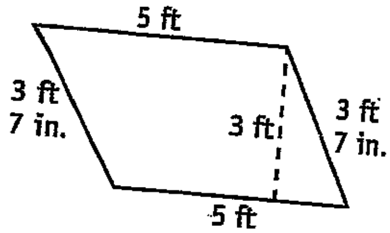
$A = 314\ in^2$

The 20 inch diameter pizza has a little more surface area than the two 14 inch diameter pizzas combined.

Solve the problems below. Round your answers to the nearest tenth. Use your calculator if you find it helpful.

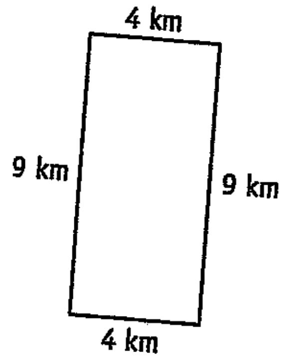
1. $P=$ ______

$A=$ ______



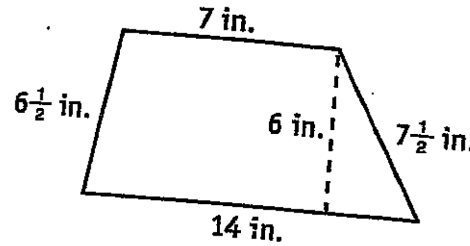
2. $P=$ ______

$A=$ ______



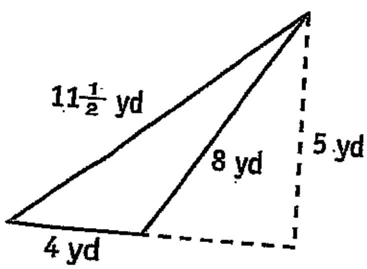
3. $P=$ ______

$A=$ ______



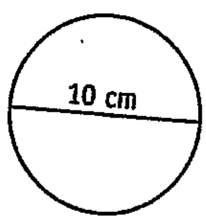
4. $P=$ ______

$A=$ ______



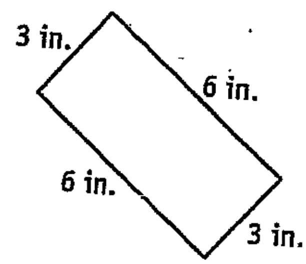
5. $C=$ ______

$A=$ ______



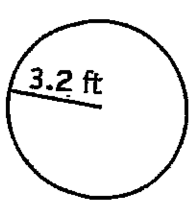
6. $P=$ ______

$A=$ ______



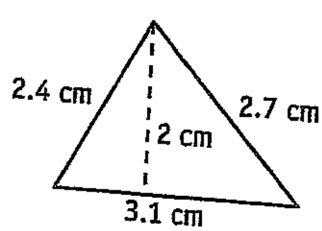
7. $C=$ ______

$A=$ ______



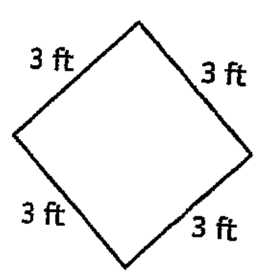
8. $P=$ ______

$A=$ ______



9. $P=$ ______

$A=$ ______



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1. 17 ft 2 in., 15 sq ft
2. 26 km, 36 km^2
3. 35 in., 63 sq in.
4. $23\frac{1}{2}$ yd, 10 sq yd
5. $31\frac{3}{7}$ cm or 31.4 cm, $78\frac{4}{7}$ cm^2 or 78.5 cm^2
6. 18 in., 18 sq in.
7. 20.1 ft, 32.2 sq ft
8. 8.2 cm, 3.1 cm^2
9. 12 ft, 9 sq ft

In the following problems, decide what shape you are working with and whether you are looking for perimeter or area. Then solve the problem. Round your answers to the nearest tenth. You may use your calculator.

10. Luis made a round oak table that he wants to cover with glass. How many square feet of glass are needed if the distance across the center of the table is 4 feet?

11. A swimming pool cover measures 5 meters long by 3 meters wide. At $5.25 per square meter, what is the cost of the cover?

12. After jogging 8 laps around a square field, Anne was curious about how far she had run. What was the total distance she had run if each side of the field measures 105 yards 2 feet?

13. In a carnival ride, the ponies walk in a circle with a 14-foot radius. How far does a child ride if the pony makes ten trips around before the child gets off?

14. The wall of Joan's living room measures 17 feet long and 8 feet high. To buy paint for the room, she needs to know the size of each wall. How many square feet is the living room wall she measured?

15. A rainbird sprinkler sends out water in a circular pattern. If the water reaches out a distance of 3.5 meters from the sprinkler, estimate how many square meters of lawn the sprinkler can water.

16. Central Park has three sides with lengths of 345 yards 2 feet, 464 yards 1 foot, and 500 yards. How far is it around this park?

17. At the base of Hyde Park is a circular water tower. If the diameter of this tower is 49 feet, what is the distance around it?

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10. $12\frac{4}{7}$ sq ft or 12.6 sq ft
11. $78.75
12. 3,381 yd 1 ft or almost 2 mi
13. 880 ft or 879.2 ft
14. 136 sq ft
15. about 48 to 50 m^2
16. 1,310 yd
17. 154 ft or 153.9 ft

18. Marie owns a piece of property with four equal sides. What is the area of this property if each side measures 21 meters?

19. To increase the size of his house, Jim decided to enclose his garage. How many square feet can Jim add to the house if the garage measures 24 feet long by 25 feet wide?

20. Compute how much fence will it take to enclose a triangular garden space which has sides of 12 yards 2 feet, 14 yards 1 foot, and 13 yards 2 feet.

21. Estimate how much surface a wading pool has if the diameter of the circular pool measures 42 feet?

22. The roof on Meg's house consists of two rectangular sides. Each side is 45 feet long and 20 feet wide. What is the total area of roof on Meg's house?

23. Refer to the drawing below. Which of the following fractions results when the area of triangle ABC is divided by the area of the square?

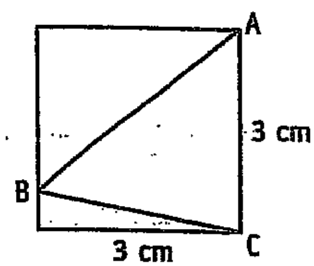
a. $\frac{2}{3}$

b. $\frac{1}{4}$

c. $\frac{1}{3}$

d. $\frac{1}{2}$

e. $\frac{3}{4}$



24. Refer to the drawing below. Choose the whole number that is closest to the result of dividing the area of the square by the area of the circle.

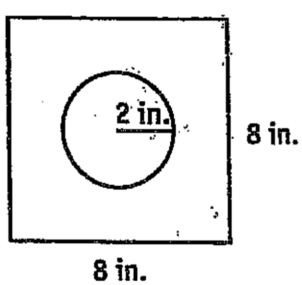
a. 4

b. 5

c. 6

d. 7

e. 8



25. George's backyard is in the shape of a trapezoid. What is the distance around the yard if the sides measure 14 m 50 cm, 12 m 80 cm, 15 m 75 cm, and 21 m 25 cm?

18. 441 m^2
19. 600 sq ft
20. 40 yd 2 ft
21. about 1,200 to 1,323 sq ft
22. 1,800 sq ft
23. d. $\frac{1}{2}$
24. b. 5
25. 64 m 30 cm