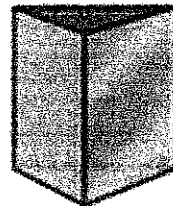
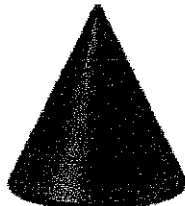
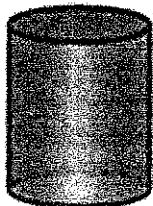
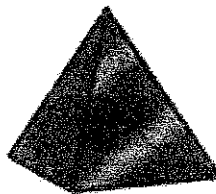
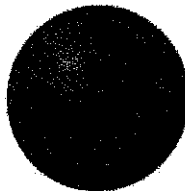
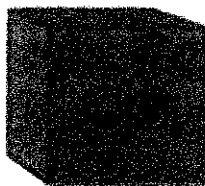


# Unit 3B: Segments in Circles and Volume

March				
Monday	Tuesday	Wednesday	Thursday	Friday
8 Segments and Chords	9 Tangents and Pythagorean	10 Delta Math	11 Secant and Tangent Lengths	12 Review/Quiz
15 Volume Cylinders, Cones, Spheres	16 Volume of Prisms and Pyramids and Cavalieri	17 Delta Math	18 Review	19 Test

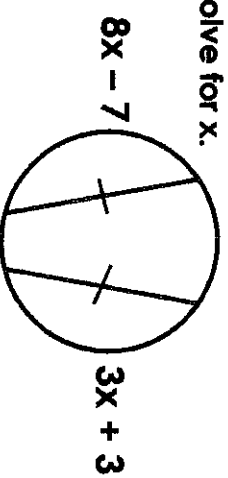




# Unit 3B: Segments in Circles

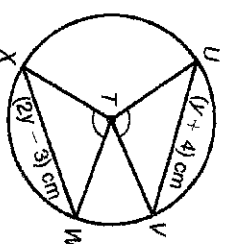
If two chords are congruent, then their corresponding arcs are congruent.

Solve for x.



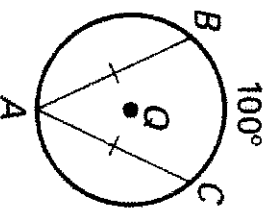
Example

Find WX.



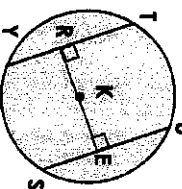
Example

Find  $m\widehat{AB}$



If two chords are congruent, then they are equidistant from the center.

In  $\odot K$ , K is the midpoint of RE. If  $TY = -3x + 56$  and  $US = 4x$ , find the length of  $\widehat{TY}$ .

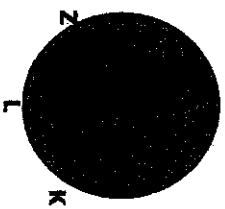


If a diameter is perpendicular to a chord, then it also bisects the chord.

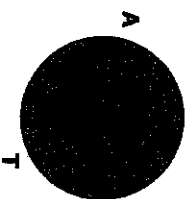
This results in congruent arcs too.

Sometimes, this creates a right triangle & you'll use Pythagorean Theorem.

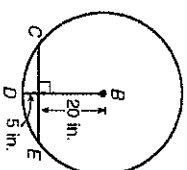
In  $\odot Q$ ,  $\widehat{KL} \cong \widehat{LZ}$ . If  $CK = 2x + 3$  and  $CZ = 4x$ , find  $x$ .



In  $\odot P$ , if  $PM \perp AT$ ,  $PT = 10$ , and  $PM = 8$ , find  $AT$ .

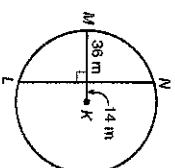


Example



Find CE

Example



Find NL

(Full Page Version is in packet!)

February 12, 2021

Find the measure of the given arc or chord.

1.  $m\widehat{BC}$



2.  $m\widehat{IJ}$



3.  $\widehat{RS}$



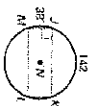
4.  $m\widehat{AC}$



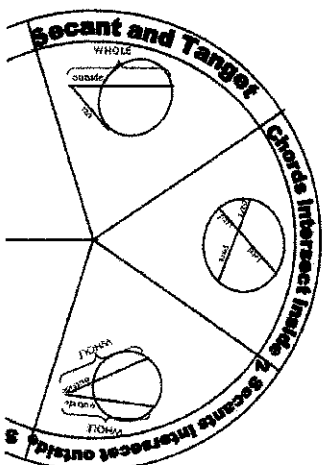
5.  $m\widehat{QR}$



6.  $m\widehat{KL}$

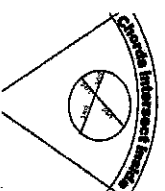
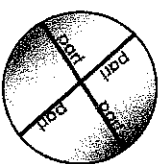


# Segment Lengths in Circles



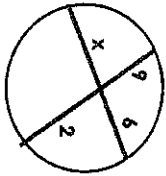
February 12, 2021

**Type 1:** Two chords intersect  
INSIDE the circle



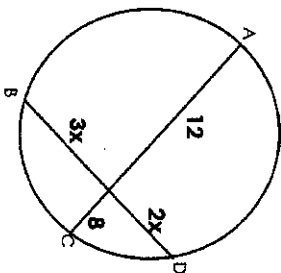
Go down the chord and multiply

Solve for  $x$ .



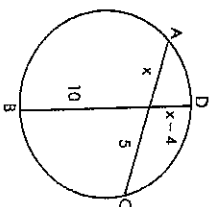
February 12, 2021

Find the length of DB.



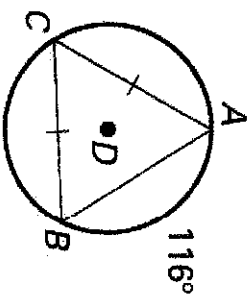
February 12, 2021

Find the length of AC and DB.

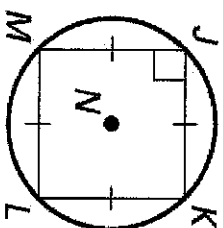


Find the measure of the given arc or chord.

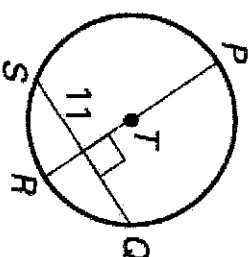
1.  $m\widehat{BC}$



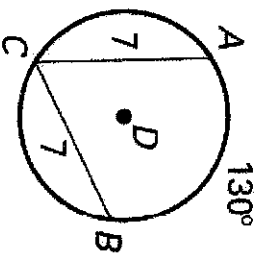
2.  $m\widehat{LM}$



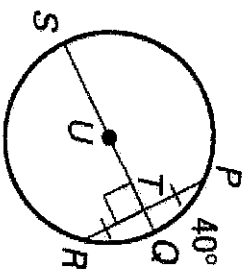
3.  $\overline{QS}$



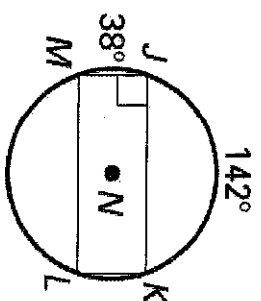
4.  $m\widehat{AC}$



5.  $m\widehat{PQR}$



6.  $m\widehat{KLM}$



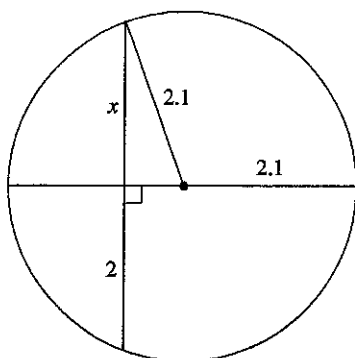


# Chords in Circles

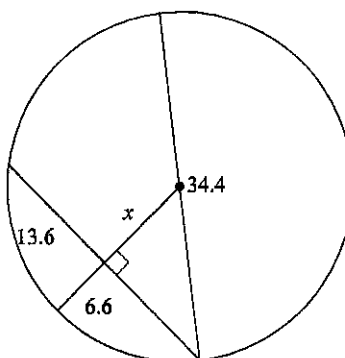
Date \_\_\_\_\_ Period \_\_\_\_\_

Find the length of the segment indicated. Round your answer to the nearest tenth if necessary.

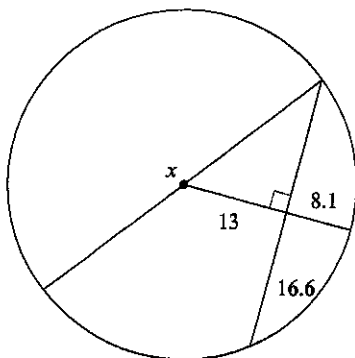
1)



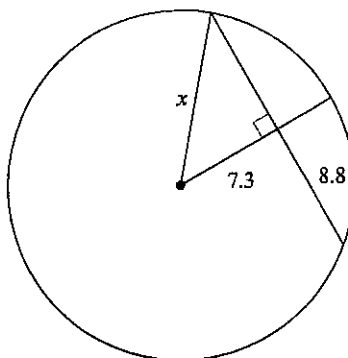
2)



3)

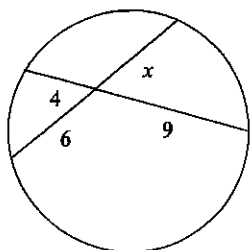


4)

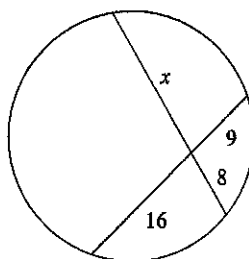


Solve for  $x$ . Assume that lines which appear tangent are tangent.

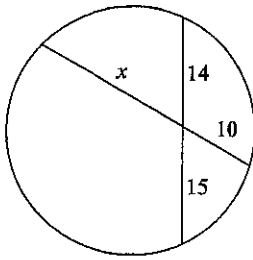
5)



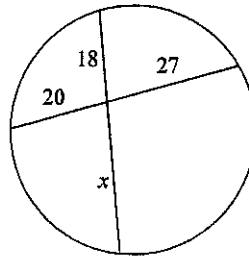
6)



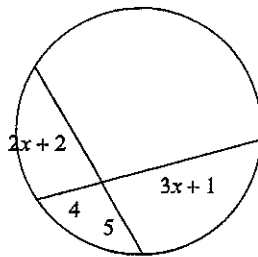
7)



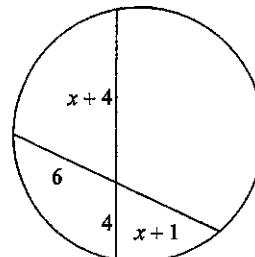
8)



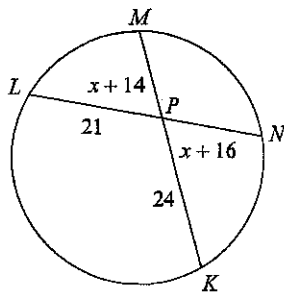
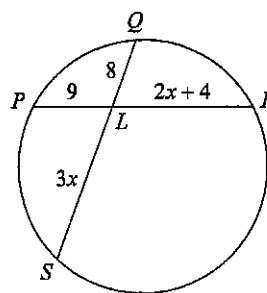
9)



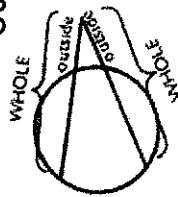
10)



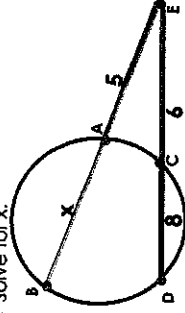
**Find the measure of the line segment indicated. Assume that lines which appear tangent are tangent.**

11) Find  $LN$ 12) Find  $QS$ 

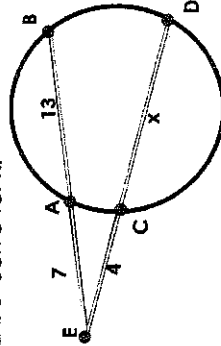
# **Type 2.** Two secants intersect OUTSIDE the circle



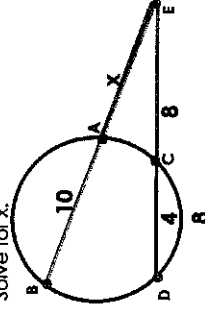
Ex: 4 Solve for  $x$ .



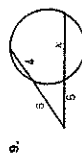
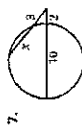
Ex: 3 Solve for  $x$ .



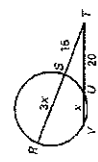
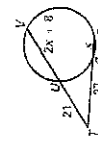
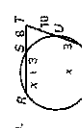
Ex: 5 Solve for  $x$ .



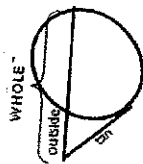
Find the value of  $x$ .



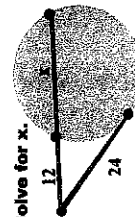
Find  $RT$  and  $TV$ .



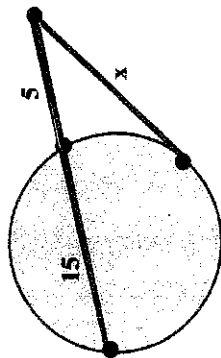
# Type 2 (with a twist): Secant and Tangent



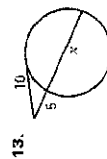
Ex: 5 Solve for  $x$ .



**Ex: 6**



Find the value of  $x$ .



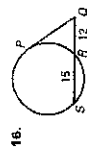
14.



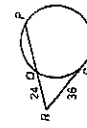
15.



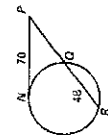
Find  $PQ$ .



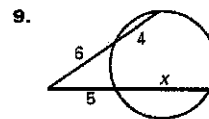
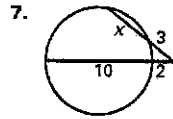
17.



18.

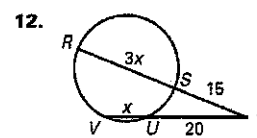
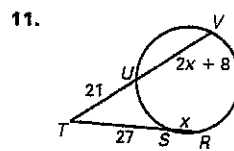
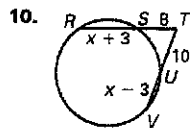


Find the value of  $x$ .



24

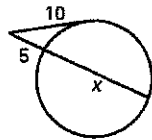
Find  $RT$  and  $TV$ .



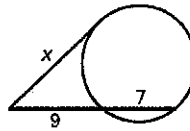
25

Find the value of  $x$ .

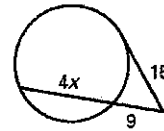
13.



14.



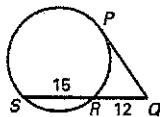
15.



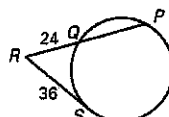
29

Find  $PQ$ .

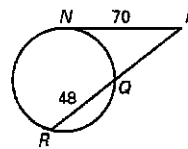
16.



17.



18.

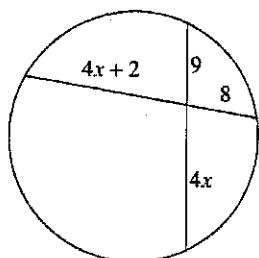


30

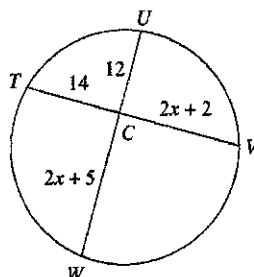
Name: \_\_\_\_\_ Date: \_\_\_\_\_

**Segment Lengths with Circles Homework**

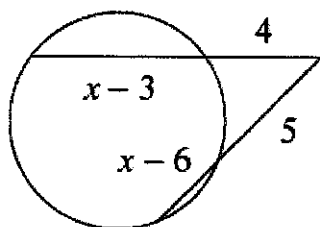
1.  $x =$  \_\_\_\_\_



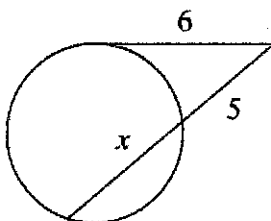
2.  $x =$  \_\_\_\_\_



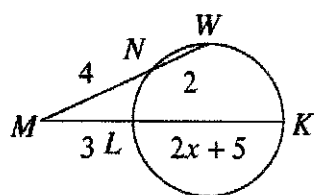
3.  $x =$  \_\_\_\_\_



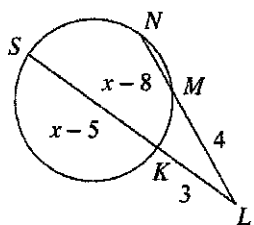
4.  $x =$  \_\_\_\_\_



5.  $x =$  \_\_\_\_\_

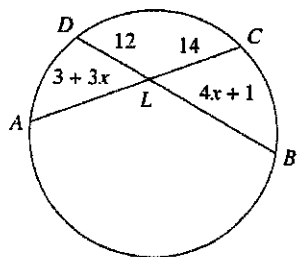


6.  $x =$  \_\_\_\_\_

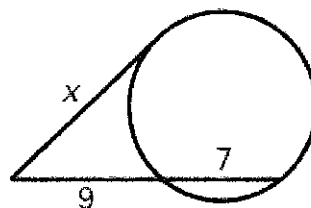




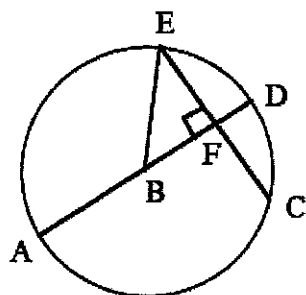
7.  $x =$  \_\_\_\_\_



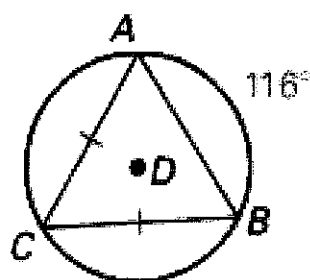
8.  $x =$  \_\_\_\_\_



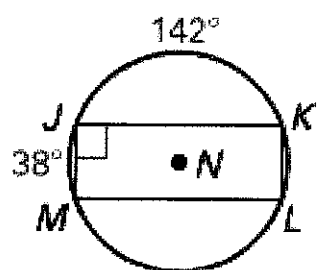
9.  $EC = 8, AB = 5, BF =$  \_\_\_\_\_



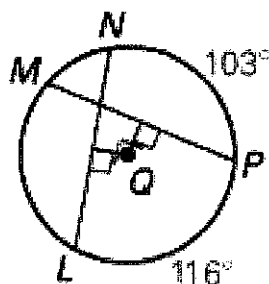
10.  $m\angle C =$  \_\_\_\_\_



11.  $m\angle KLM =$  \_\_\_\_\_



12.  $m\angle MN =$  \_\_\_\_\_

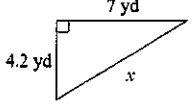


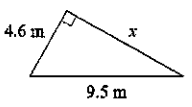
Welcome back.

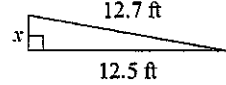
Warm up

Use Pythagorean Theorem to find the missing side.

Round to the nearest tenths.

1) 

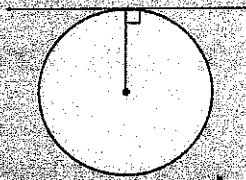
2) 

3) 

1

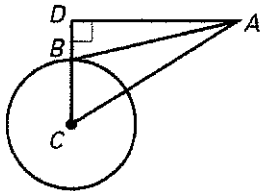
## TANGENTS

A line is tangent to the circle only if it is perpendicular to the radius drawn to the point of tangency



2

Is AD tangent or not tangent?

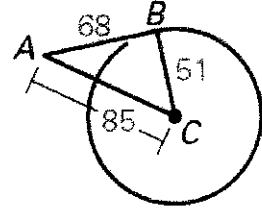


No, point D is not tangent to the circle.

3

Is AB tangent or not tangent?

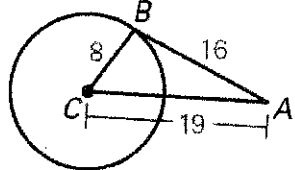
Use Pythagorean Theorem to find out.



4

Is AB tangent or not tangent?

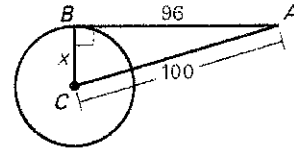
Use Pythagorean Theorem to find out.



5

Solve for x.

BC is a radius of Circle C  
AB is tangent to Circle C



6

**Solve for x.**

BC is a radius of Circle C  
AB is tangent to Circle C

7

**Solve for x.**

BC is a radius of Circle C  
AB is tangent to Circle C

8

**Solve for x.**

BC is a radius of Circle C  
AB is tangent to Circle C

9

**Solve for x.**

BC is a radius of Circle C  
AB is tangent to Circle C

10

**Party Hat Problems**  
(Tangent/Tangent)

11

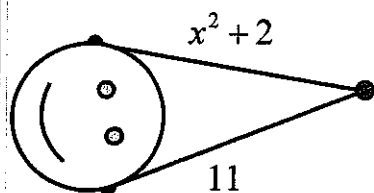
**$RS \cong TS$**

If two segments from the same exterior point are tangent to a circle, then they are congruent.

Party hat problems!

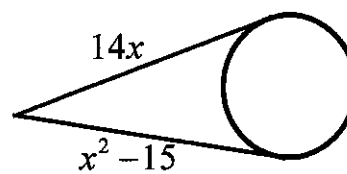
12

Solve for x



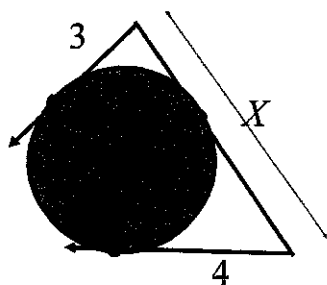
13

Solve for x



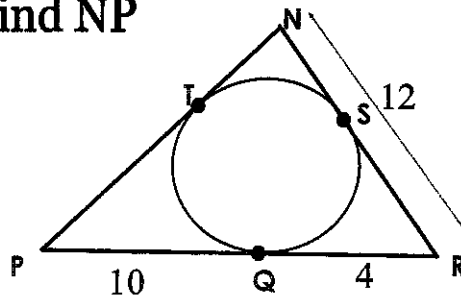
14

Solve for x



15

Find NP



16

# Homework



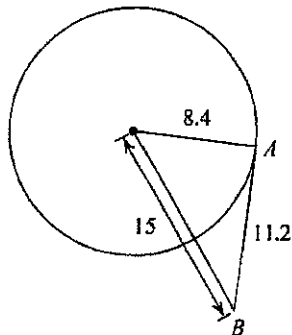
?

17

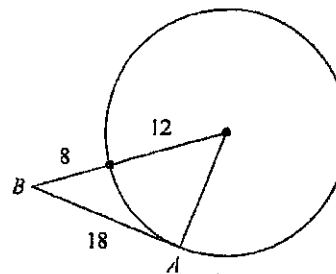
# Tangents & Party Hats

Determine if line AB is tangent to the circle.

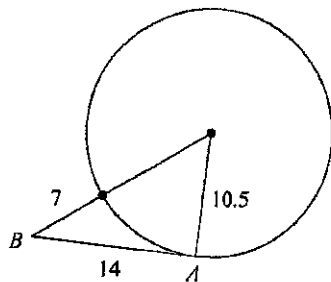
1)



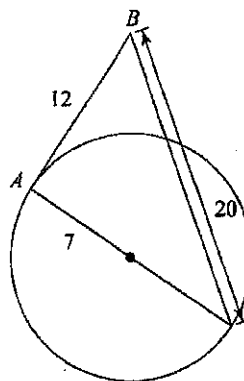
2)



3)

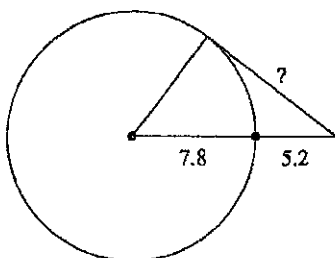


4)

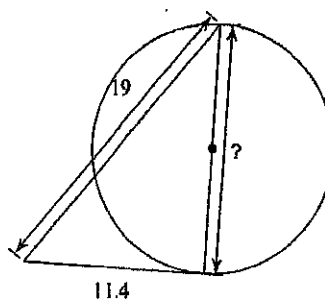


Find the segment length indicated. Assume that lines which appear to be tangent are tangent.

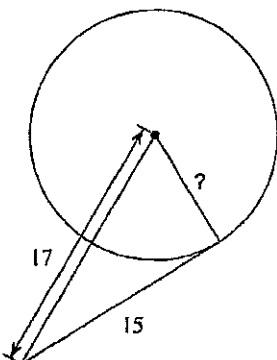
5)



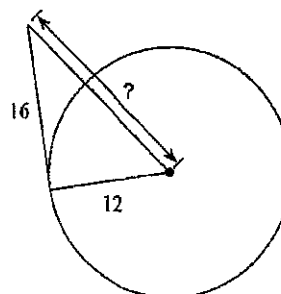
6)



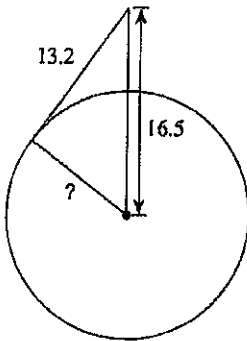
7)



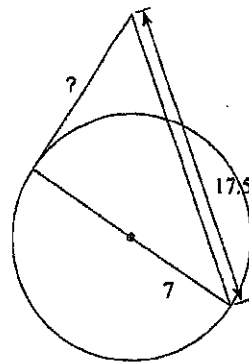
8)



9)

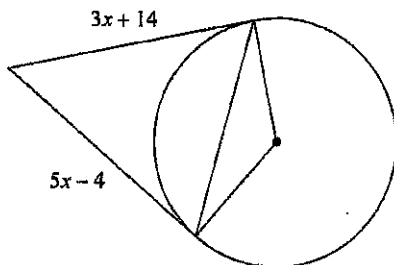


10)

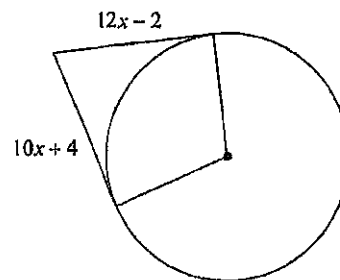


Solve for  $x$ . Assume that lines which appear to be tangent are tangent.

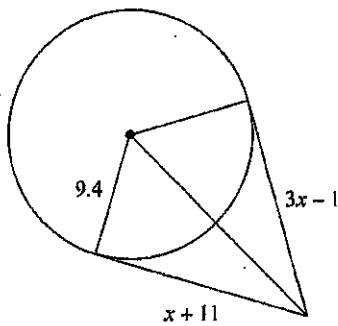
11)



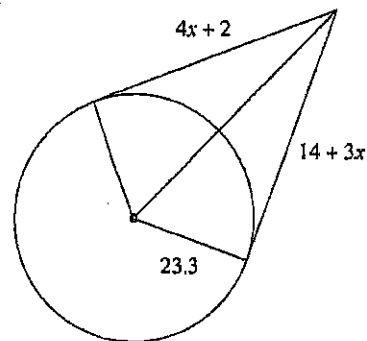
12)



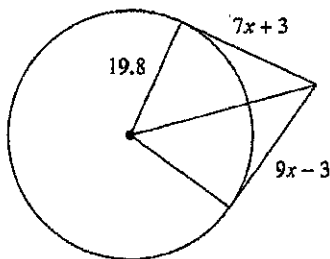
13)



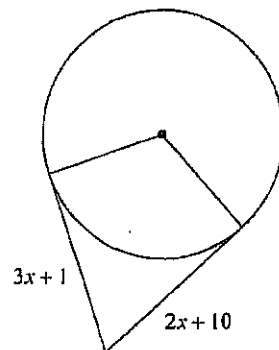
14)



15)

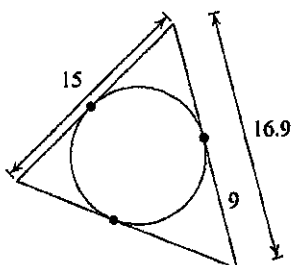


16)

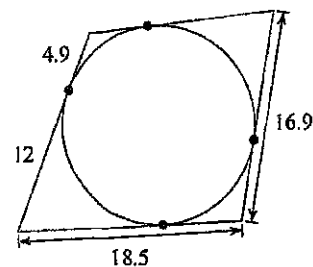


Find the perimeter of each polygon. Assume that lines which appear to be tangent are tangent.

17)



18)



# Volume of Cylinders

1

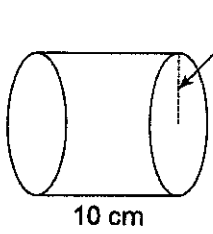
## Volume of Cylinders

$$V = Bh$$

*B stands for the area of the base  
and the base of a cylinder will  
ALWAYS BE A CIRCLE*

2

**1. Volume of a Cylinder**  
(round to the nearest tenths)



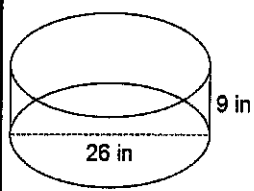
5 cm

10 cm

$$V = Bh$$

3

**2. Volume of a Cylinder**  
(round to the nearest tenths)

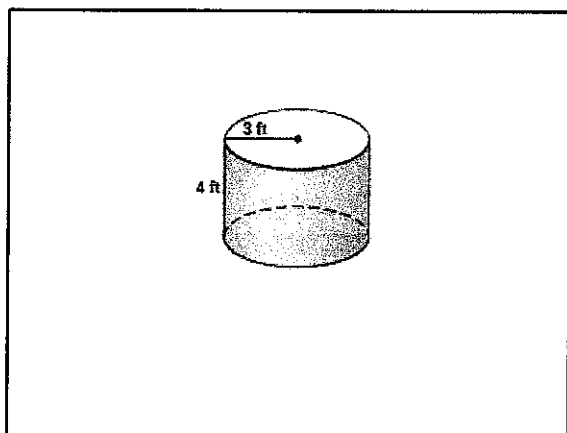


9 in

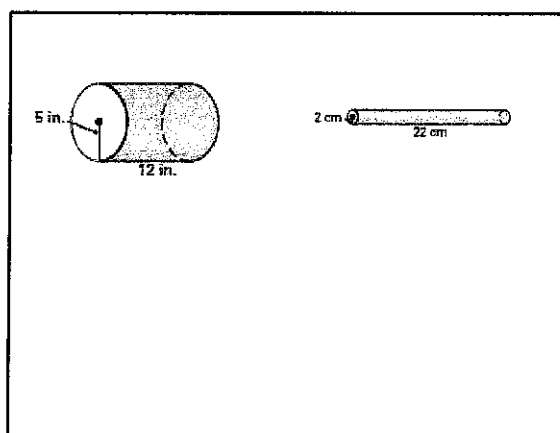
26 in

$$V = Bh$$

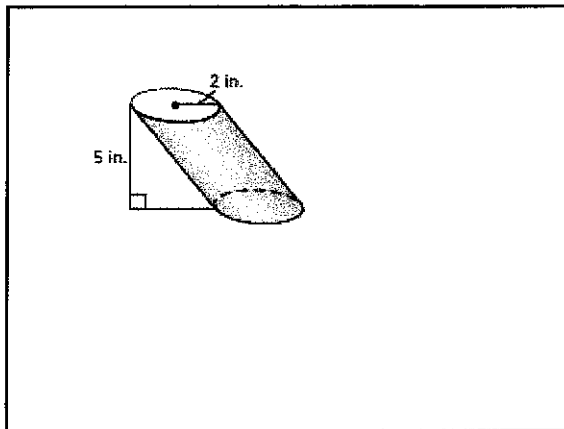
4



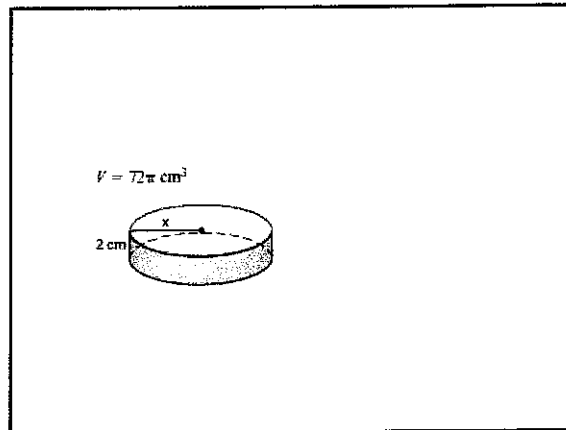
5



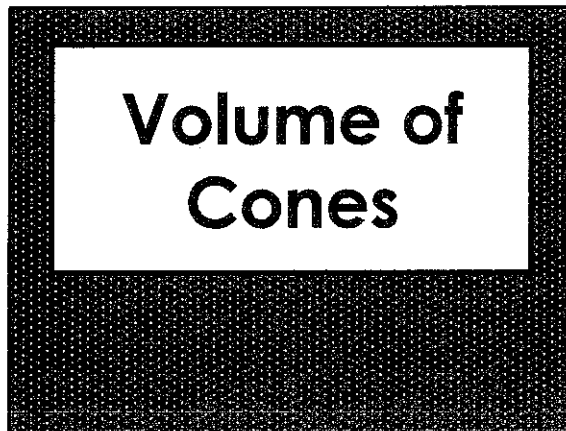
6



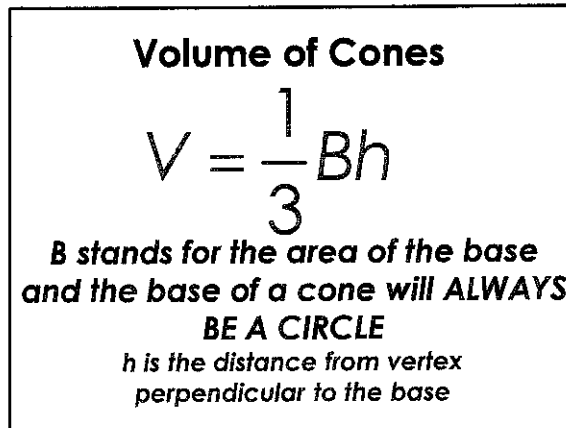
7



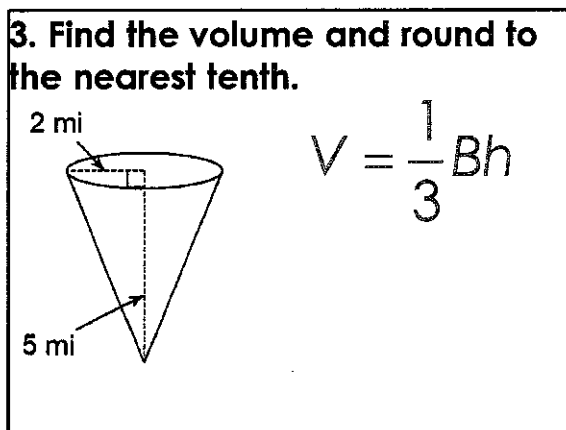
8



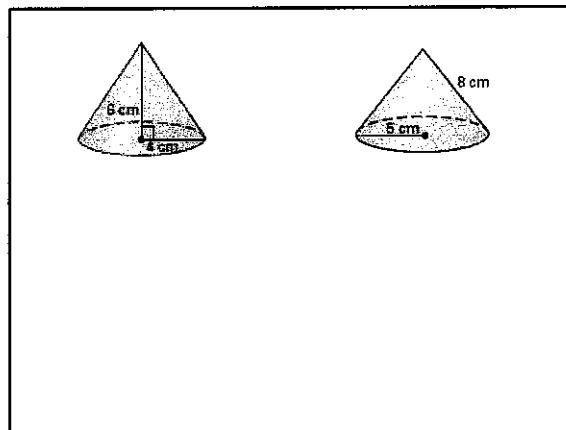
9



10

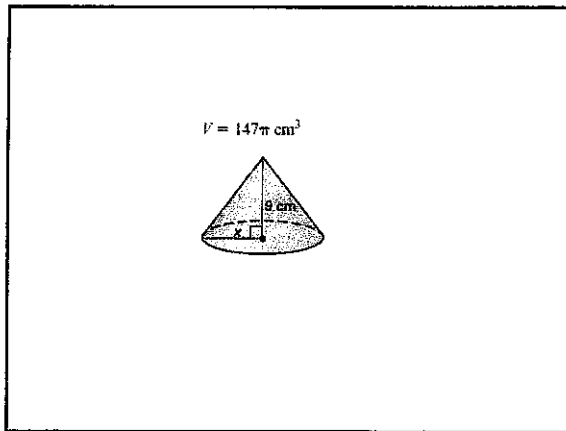


11

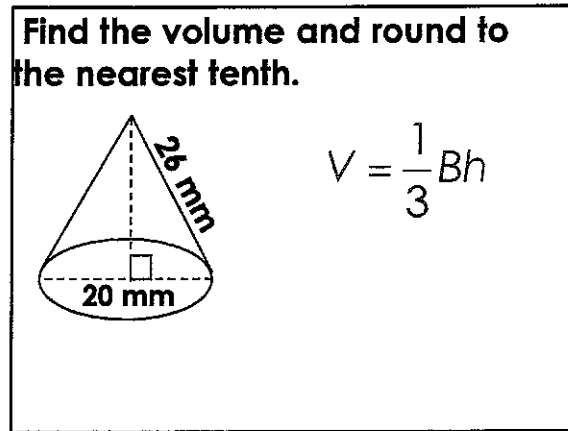


12





13



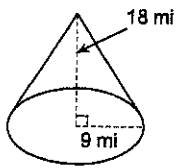
14

# Assignment

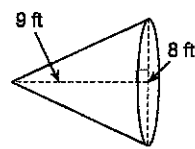
Date \_\_\_\_\_ Period \_\_\_\_\_

Find the volume of each figure. Round your answers to the nearest hundredth, if necessary.

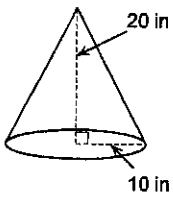
1)



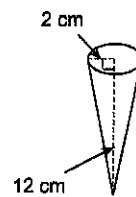
2)



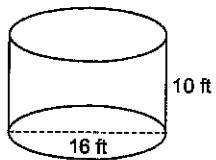
3)



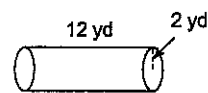
4)



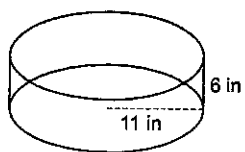
5)



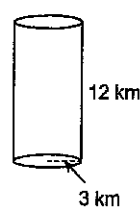
6)



7)



8)



$$V = Bh$$

**B = area of BASE**

*(use different formulas according to the shape of the base)*

**h = HEIGHT of the solid**

*(distance from base to base)*

1

## Area Formula's "B"

### Formulas

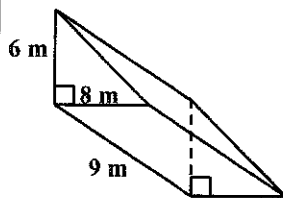
$$A_{\text{triangle}} = \frac{1}{2}bh \quad A_{\text{square/rectangle}} = bh$$

$$A_{\text{circle}} = \pi r^2 \quad A_{\text{trapezoid}} = \frac{1}{2}(b_1 + b_2)h$$

$$SA_{\text{sphere}} = 4\pi r^2 \quad V_{\text{sphere}} = \frac{4}{3}\pi r^3$$

2

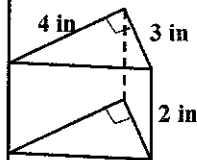
EX: Find the volume.



$$V = Bh$$

3

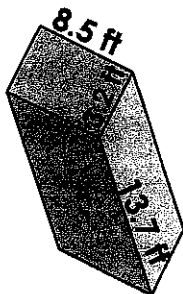
EX: Find the volume.



$$V = Bh$$

4

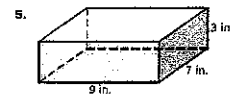
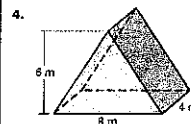
EX: Find the volume.



$$V = Bh$$

5

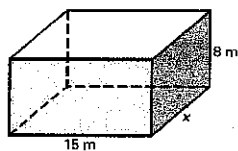
Find the Volumes



6

### Working Backwards

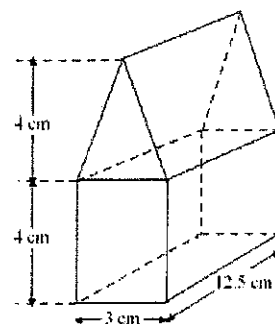
$$V = 1440 \text{ m}^3$$



7

EX: Find the volume.

$$V = Bh$$



8

## Volume of Pyramids

9

### Volume of Pyramids

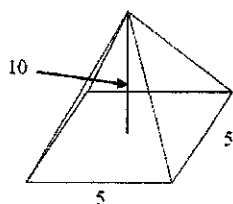
$$V = \frac{1}{3}Bh$$

*B stands for the area of the base*

10

Find the volume and round to the nearest tenth.

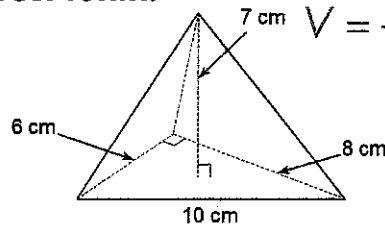
$$V = \frac{1}{3}Bh$$



11

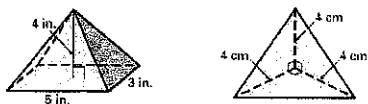
Find the volume and round to the nearest tenth.

$$V = \frac{1}{3}Bh$$



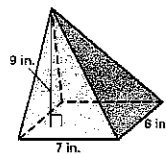
12

### Find the Volumes



13

### Find the Volume

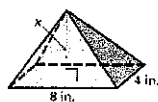


14

### Working Backwards

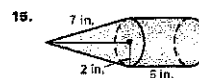
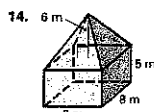
Find the value of  $x$ .

$$V = 64 \text{ in.}^3$$



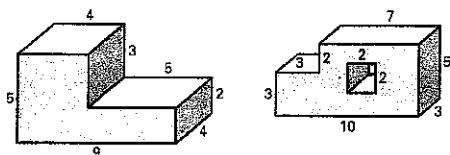
15

### Composite Solids



16

### Composite Solids



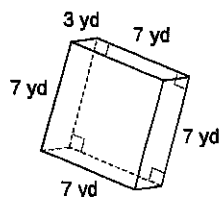
17

# Prisms and Pyramids Practice

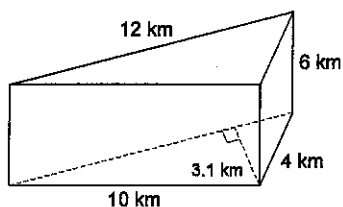
Date \_\_\_\_\_ Period \_\_\_\_\_

Find the volume of each figure. Round your answers to the nearest hundredth, if necessary.

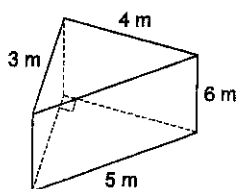
1)



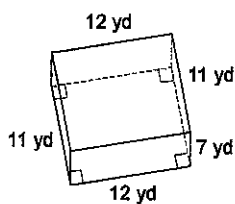
2)



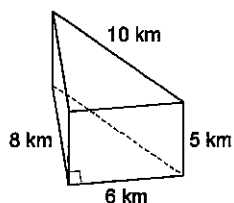
3)



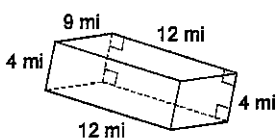
4)



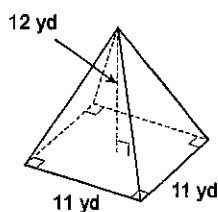
5)



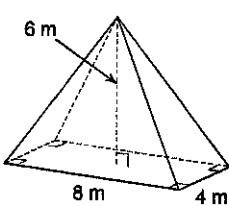
6)



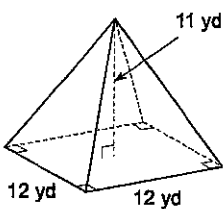
7)



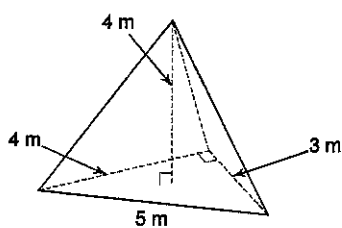
8)



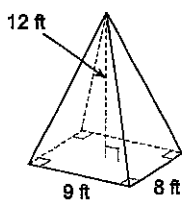
9)



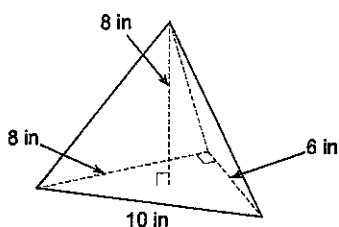
10)



11)



12)



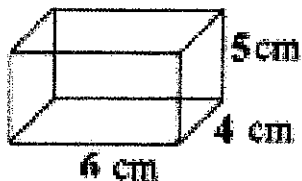
## Geometry

Find the volume of each figure

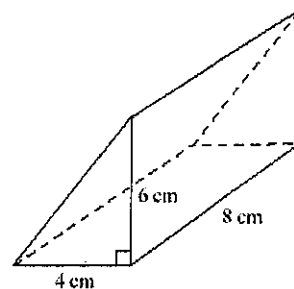
Name \_\_\_\_\_

Prisms: Round to the nearest tenth.

1.  $V =$  \_\_\_\_\_

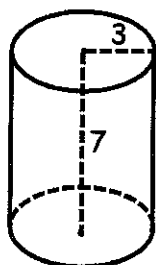


2.  $V =$  \_\_\_\_\_

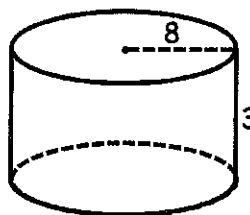


Cylinders:

3. Find the Exact volume.  $V =$  \_\_\_\_\_

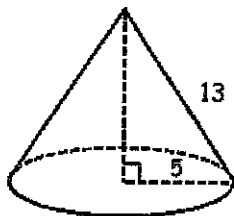


4. Round to the nearest tenth.  $V =$  \_\_\_\_\_

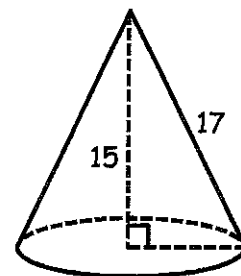


Cones:

5. Exact  $V =$  \_\_\_\_\_

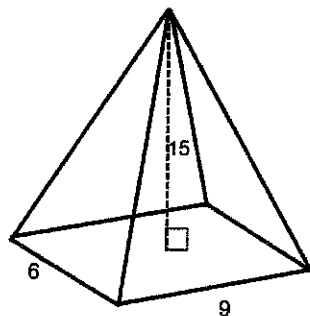


6. Nearest tenth  $V =$  \_\_\_\_\_

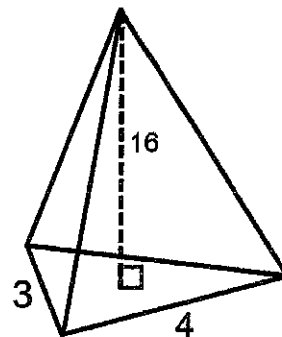


Pyramids: Round to the nearest 10th

7.  $V =$  \_\_\_\_\_



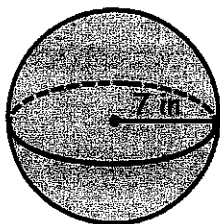
8.  $V =$  \_\_\_\_\_



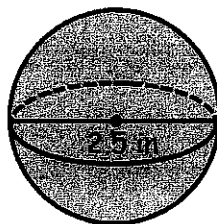
---

### Spheres

8. Exact  $V =$  \_\_\_\_\_



9. Nearest  $10^{\text{th}}$  \_\_\_\_\_



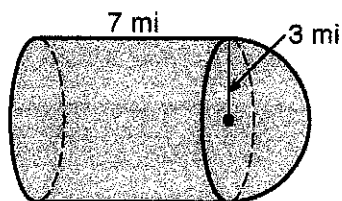
10. If you were to triple the radius of a sphere, how many times more volume would you end up with?

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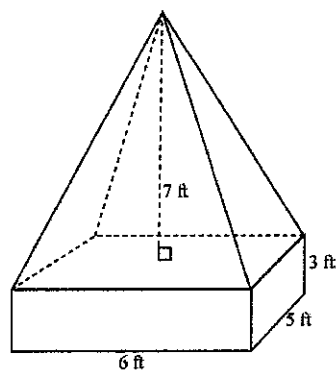
### Volume of Composite Figures:

If necessary, round to the nearest  $10^{\text{th}}$ .

11. \_\_\_\_\_



12. \_\_\_\_\_

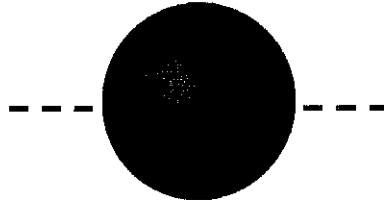




## Volume of Spheres Cavalieri's Principle

1

If you cut a sphere right down the middle you would create two congruent halves called HEMISPHERES.



You can think of the globe. The equator cuts the earth into the northern and southern hemisphere.



2

Look at the cross section formed when you cut a sphere in half.

What shape is it?

A circle!!! This is called the **GREAT CIRCLE** of the sphere.

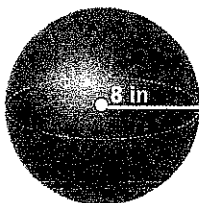
3

## Formula for Volume of a Sphere

$$V = \frac{4}{3} \pi r^3$$

4

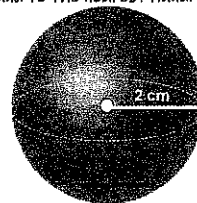
Find the Exact Volume:



5

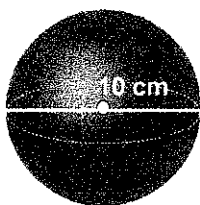
Find the volume

(round to the nearest hundredth):



6

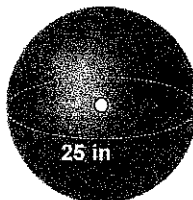
Find the Exact Volume



7

The circumference of a great circle of a sphere is 25 inches. Find the volume of the sphere. (Round to the nearest tenths.)

$$C = 2\pi r$$

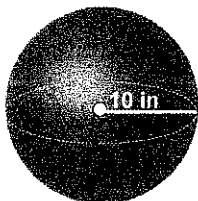
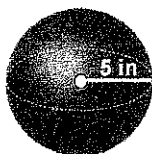


8

### Volume of a Sphere

A spherical balloon has an initial radius of 5 in. When more air is added, the radius becomes 10 in. Explain how the volume changes as the radius changes.

$$V = \frac{4}{3} \pi r^3$$



9

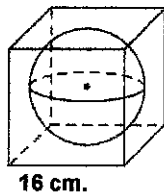
### Volume of a Sphere

A sphere has an initial volume of  $400 \text{ cm}^3$ . The sphere is made bigger by making the radius 4 times as big. What is the new volume of the sphere?

10

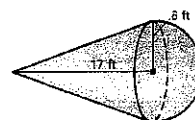
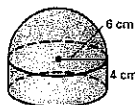
### Volume of a Sphere

A sphere is inscribed in a cube-shaped box as pictured below. To the nearest centimeter, what is the volume of the empty space in the box?



11

### Composites with HEMISPHERES



12

## Cavalieri's Principle

The volumes of two objects of the same height are equal if the areas of their corresponding cross sections are equal

13

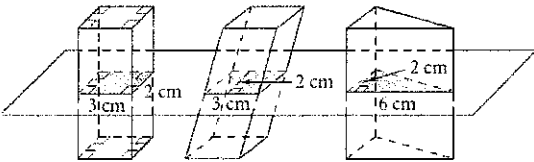
## Cavalieri's Principle Examples



These pieces maintain their **SAME** volume regardless of how they are moved.

14

## Cavalieri's Principle Examples



15

## Cavalieri's Principle Examples

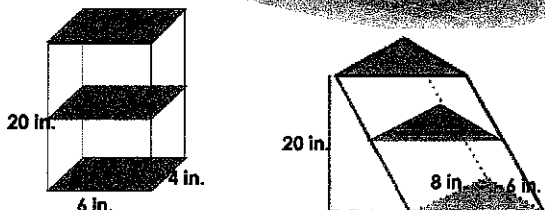
The same volume formula applies whether it's a right prism or an oblique prism.

$$V = Bh$$



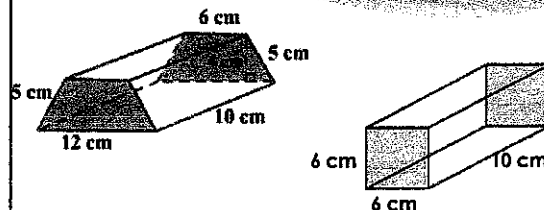
16

Example 1: Which solid has more volume? Use Cavalieri's Principle.



17

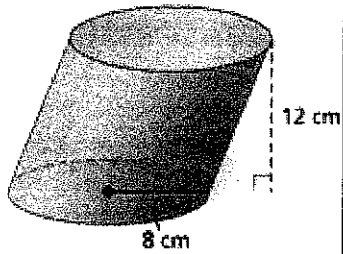
Example 2: Which solid has more volume? Use Cavalieri's Principle.



18

3. Find the volume to the nearest tenth.

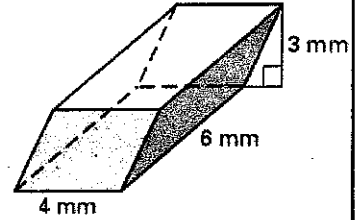
$$V = Bh$$



19

4. Find the volume to the nearest tenth.

$$V = Bh$$



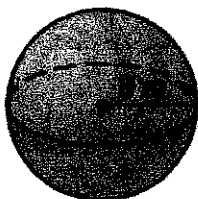
20

# Spheres Practice

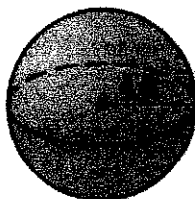
Name: \_\_\_\_\_

Find the volume of each Sphere. Your answers for 23-25 should be Exact. Your answers for 26-28 should be rounded to the nearest tenth.

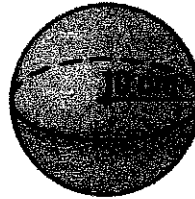
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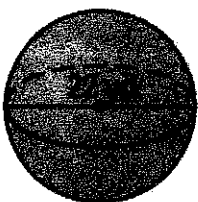
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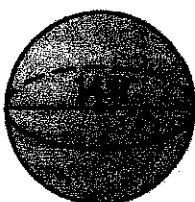
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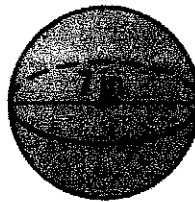
26.



27.



28.

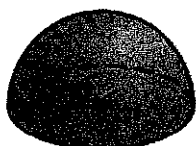


Find the volume of each hemisphere. For 37 and 38, round to the nearest 10<sup>th</sup>. For 39, your answer should be exact.

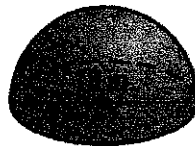
37.



38.

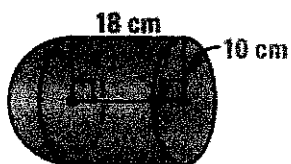


39.

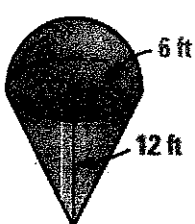


Find the volume of each solid, rounded to the nearest 10<sup>th</sup>. 42 has a hollow hemisphere on the top.

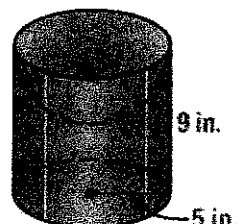
40.



41.



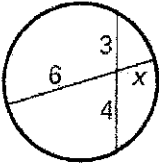
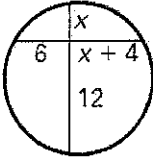
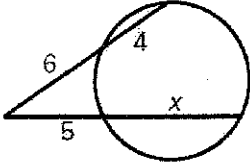
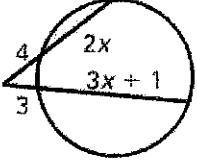
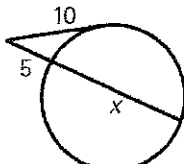
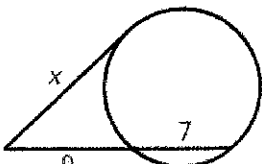
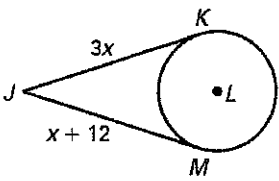
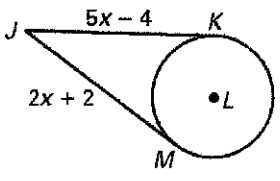
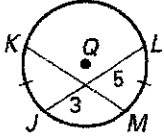
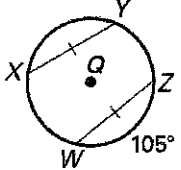
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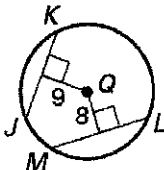
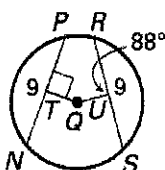
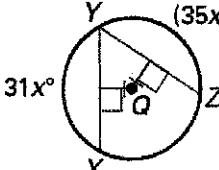
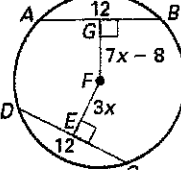
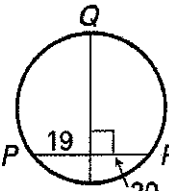
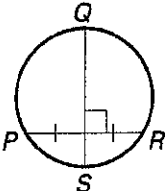
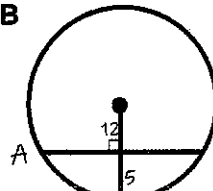
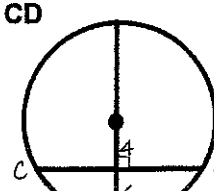
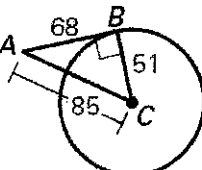
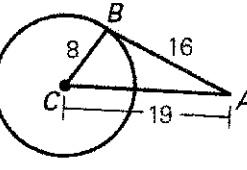
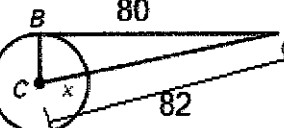
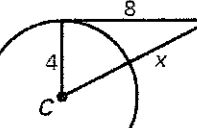


Name: \_\_\_\_\_

Date: \_\_\_\_\_

Use the following to review for you test. Work the Practice Problems on a separate sheet of paper.

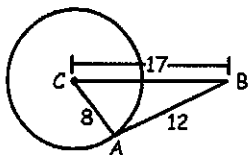
What you need to know & be able to do	Things to remember		
Find the measure of parts of a chord in a circle	part • part = part • part	<b>1. Find the value of <math>x</math></b> 	<b>2. Find the value of <math>x</math></b> 
Find the measure of segments when two secants intersect a circle.	outside • whole = outside • whole	<b>3. Find the value of <math>x</math></b> 	<b>4. Find the value of <math>x</math>.</b> 
Find the measure of segments when a secant and a tangent intersect a circle.	outside • whole = outside • whole	<b>5. Find the value of <math>x</math>.</b> 	<b>6. Find the value of <math>x</math>.</b> 
Use the properties of congruent tangents	Tangents coming from the same external point are congruent	<b>7. Find JK.</b> 	<b>8. Find JM.</b> 
Use the properties of congruent chords to find the measures of chords and arcs.	If two chords are congruent then their arcs are congruent	<b>9. Find the value of KM.</b> 	<b>10. Find the <math>m\widehat{YZ}</math> if <math>m\widehat{XW} = 95^\circ</math>.</b> 

<p>Determine if two chords are congruent</p>	<p>Two chords are congruent if they are equidistant from the center of the circle</p>	<p>11. Are <math>\overline{JK}</math> and <math>\overline{ML}</math> congruent?</p> 	<p>12. Are <math>\overline{TQ}</math> and <math>\overline{UQ}</math> congruent?</p> 
<p>Use the properties of congruent chords to find the measure of arcs and segments</p>	<p>Two chords are congruent if and only if they are equidistant from the center of the circle.</p>	<p>13. Find the measure of <math>\widehat{YX}</math>.</p> 	<p>14. Find the measure of <math>\widehat{GF}</math>.</p> 
<p>Determine if a chord is a diameter.</p>	<p>To be a diameter the chord must be a perpendicular bisector of another chord.</p>	<p>15. Is <math>\overline{QS}</math> a diameter? Why or why not?</p> 	<p>16. Is <math>\overline{QS}</math> a diameter? Why or why not?</p> 
<p>Use the properties of diameters and perpendicular chords.</p>	<p>Set up the problem so that you can use Pythagorean theorem.</p>	<p>17. Find AB</p> 	<p>18. Find CD</p> 
<p>Use properties of tangents to determine if the line is a tangent</p>	<p>You must satisfy the Pythagorean Theorem.</p>	<p>19. Is <math>\overline{AB}</math> a tangent? Why or why not?</p> 	<p>20. Is <math>\overline{AB}</math> a tangent? Why or why not?</p> 
<p>Use properties of tangents to find missing measures.</p>	<p>Pythagorean Theorem</p>	<p>21. Find the measure of x.</p> 	<p>22. Find the value of x.</p> 

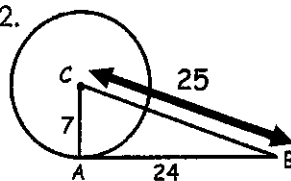
Name: \_\_\_\_\_ Date: \_\_\_\_\_

Is  $\overline{AB}$  tangent to  $\odot C$ ? Explain your reasoning. Show work!

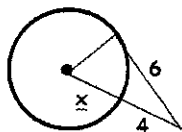
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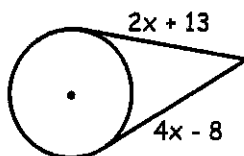
2.

For each  $\odot C$  find the value of  $x$ . Assume that segments that appear to be tangent are tangent.

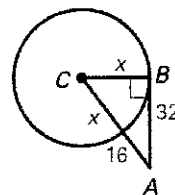
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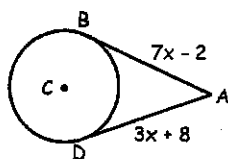
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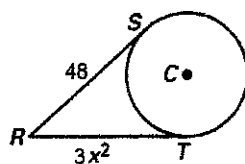
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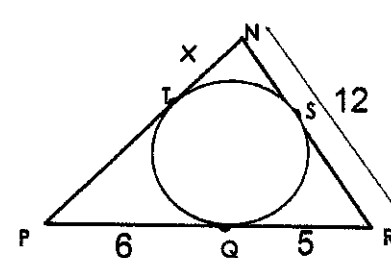
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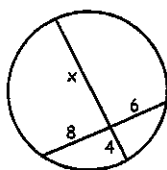
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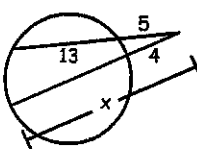
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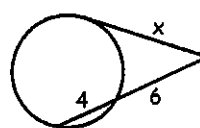
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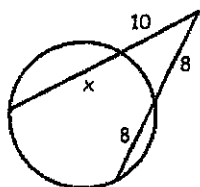
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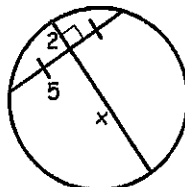
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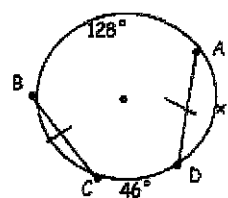
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13.

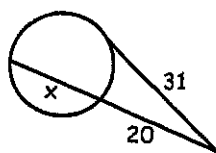


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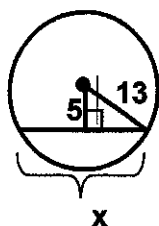




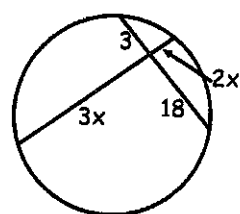
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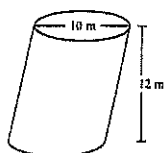


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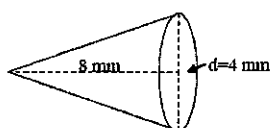


Find the volume of the following figures.

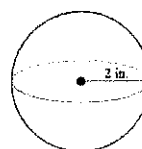
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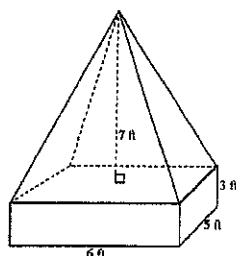
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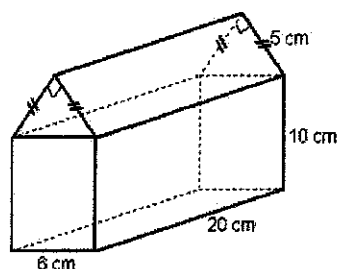
20.



21.



22.



23. A prism has a square base with a side of 3 cm. Its volume is  $90 \text{ cm}^3$ . A pyramid has the same square and same height as the prism. What is the volume of the pyramid?

24. Collin is going to change the oil in his Jeep. He has two funnels. **A** has a diameter of 6 inches and is 5 inches deep. **B** has a diameter of 5 inches but is 7 inches deep. He wants to use the funnel with the **greatest volume** to minimize the chance of spilling the oil. What are the volumes of the funnels? Which one should he use **A** or **B**?

25. A perfume manufacturer is offering a gift set for the holidays that contains a regular size bottle that is a rectangular prism with base dimensions of 8cm by 4cm, and a height of 9cm. It also contains a travel size cylindrical bottle with an interior diameter of 3cm and a height of 5cm. What volume of perfume does it need to fill 1,000 gift sets?