Name Key Geometry Final Exam Review Study Guide

Unit 4: Quadrilaterals

Perimeter: add up all sides. You may need:

Pythagorean Theorem $a^2 + b^2 = c^2$ or

Distance Formula: $\sqrt{(x-x)^2 + (y-y)^2}$ to find the side lengths

Area of a rectangle or parallelogram: $A = bh$

Area of a triangle: $A = \frac{1}{2}bh$

Area of a trapezoid: $A = \frac{1}{2}(b_1 + b_2)$

Area of a kite or rhombus: $A = \frac{1}{2}d_1 \cdot d_2$

Quadrilateral	**Basic definition/minimum to be called this shape**	**Additional properties**
Parallelogram	A quadrilateral with opposite sides parallel (opposite sides will have the same slope)	opposite angles are congruent diagonals are bisected opposite sides are congruent
Rectangle	A quadrilateral with four right angles (sides will have opposite reciprocal slopes!)	Opposite sides area parallel and congruent Diagonals are congruent & bisected
Rhombus	A quadrilateral with four congruent sides	Opposite angles are congruent Opposite sides parallel Diagonals are perpendicular & bisected
Square	A quadrilateral with four right angles and four congruent sides	Diagonals are congruent Diagonals are bisected

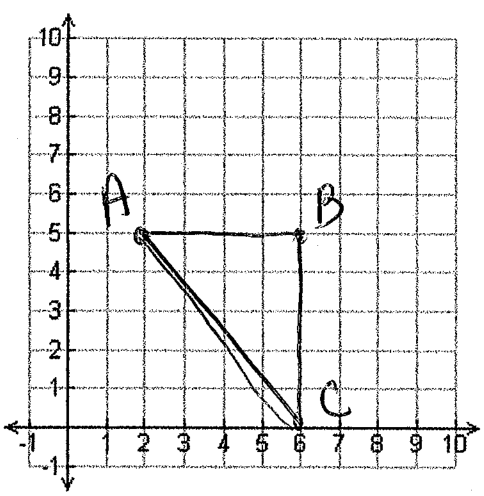
Practice

Name the shape based only on the information given:

1. I have four right angles rectangle
2. The slopes of my adjacent sides are $\frac{3}{4}$ and $-\frac{4}{3}$ rectangle
3. I have four congruent sides rhombus
4. The lengths of all four of my sides are 5 units rhombus.
5. My opposite sides are parallel parallelogram
6. I have four right angles and four congruent sides square

Find the area and the perimeter of each triangle:

7. A (2, 5) B (6, 5) C (6, 0)



$4^2+5^2=x^2$

$41=x^2$

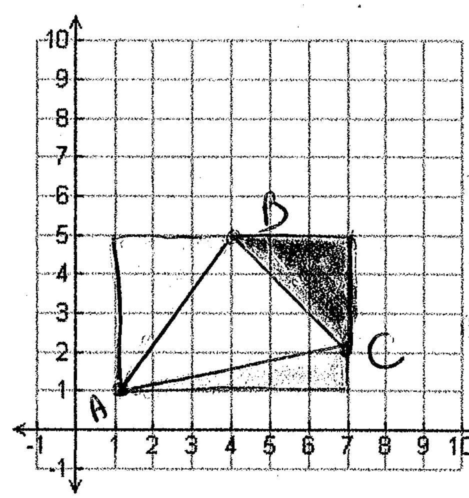
$6.4=x$

AB 4 BC 5 AC 6.4

P 15.4 A 10

$4+5+6.4$ $\frac{1}{2}(4)(5)$

8. A (1, 1) B (4, 5) C (7, 2)



Rectangle

$6(5)=30$

$\frac{1}{2}\cdot 3\cdot 4=6$

$\frac{1}{2}\cdot 3\cdot 3=4.5$

$\frac{1}{2}\cdot 1\cdot 6=3$

$6+4.5+3=13.5$

$30-13.5$

$=16.5$

AB 5 BC 4.2 AC 6.1

P $5+4.2+6.1$ 15.3 A 16.5

AB:

$3^2+4^2=x^2$

$25=x^2$

$5=x$

BC:

$3^2+3^2=x^2$

$18=x^2$

$4.2=x$

AC:

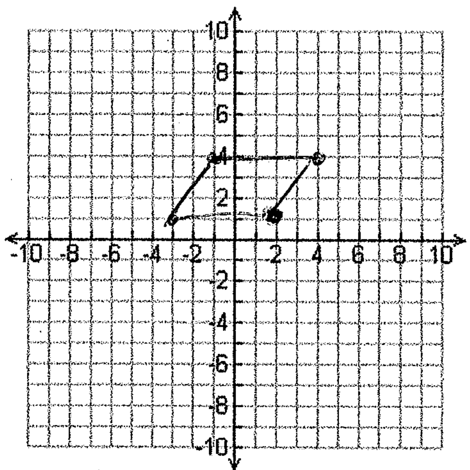
$1^2+6^2=x^2$

$37=x^2$

$6.1=x$

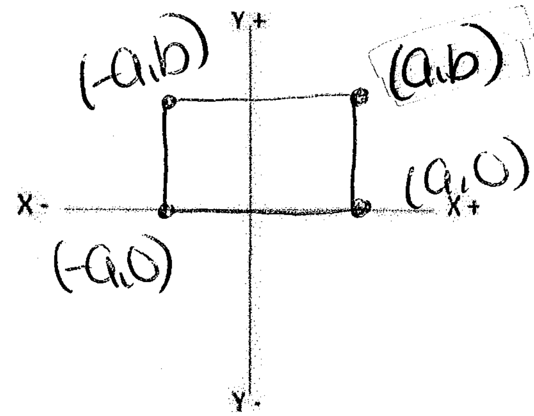
Find the missing coordinate of each quadrilateral:

9. parallelogram: (-3, 1) (-1, 4) (4, 4)



(2,1)

10. Rectangle (a, 0) (-a, 0) (-a, b)



(a,b)

11. Find the perimeter and the area of the parallelogram in #9

Top 5 Bottom 5 Left 3.6 Right 3.6

Perimeter 17.2 Area 5(3)=15

$3^2+2^2=x^2$

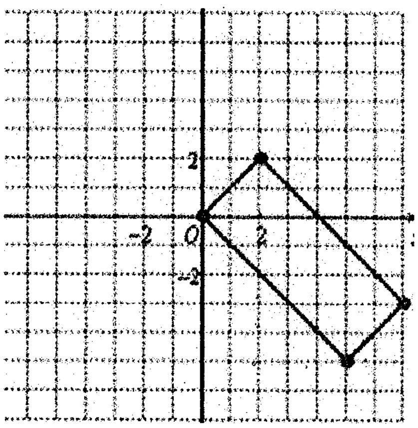
$\sqrt{13}=x$

$3.6=x$

$$\begin{array}{r} 5 \\ +5 \\ +3.6 \\ +3.6 \\ \hline 17.2 \end{array}$$

12. State the definition of a rectangle: a quadrilateral with 4 right angles

IS the quadrilateral is a rectangle:



$$m = \frac{rise}{run} = \frac{2}{2} = 1$$

$$m = -\frac{7}{5}$$

1 & $-\frac{7}{5}$ not opposite reciprocals

not a rectangle

13. You start a SohCahToa sign making business. You have signs that are 8.5 inches by 11 inches and 11 inches by 16 inches.

a. What is the area of each sign? $8.5(11) = 93.5\ in^2$ $\quad 11(16) = 176\ in^2$

b. how much bigger is the large sign? $176 - 93.5 = 82.5\ in^2$

c. ink costs $0.01 per square inch to print. How much does it cost to print the small sign? $93.5(.01) = \$0.94$

d. how much does it cost to print the large sign? $176(.01) = \$1.76$

e. how much more expensive is the large sign? $1.76 - .94 = \$.82$

Name Key Final Exam Study Guide: Unit 5

Soh Cah Toa

$\sin\theta = \frac{opposite}{hypotenuse}$ $\cos\theta = \frac{adjacent}{hypotenuse}$ $\tan\theta = \frac{opposite}{hypotenuse}$

Area of a triangle using trig: $\mathbf{A} = \frac{1}{2}\mathbf{bc(sinA)}$ b, c are sides of a triangle, A is the included angle

Law of sines: $\frac{sinA}{a} = \frac{sinB}{b} = \frac{sinC}{c}$ (a is side opposite to angle A)

Law of cosines:

$a^2 = b^2 + c^2 - 2bc(\cos A)$ this is the given angle

What to do if "a" is not the side you need:

these are always the given sides

$\cos A = \frac{b^2+c^2-a^2}{2bc}$

What to do if A is not the angle you need:

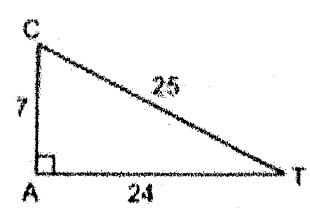
the letter/angle you want is always the subtracted one

Two investigations that we completed:

1. Angle C and angle T are complementary angles because they must sum to 90.

sin T = 7/25

cos C = 7/25



Therefore the sin of an angle = cos of its complement

2. cos 50° = sin 40°

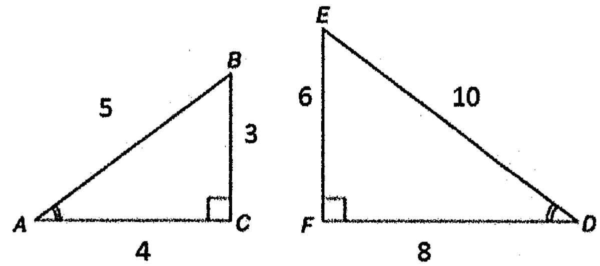
3. sin 20° = cos 70°

4. sin 75° = cos 15°

5. cos 32° = sin 58°

Similar triangles and trig ratios:

6. Triangle ABC is similar to triangle DEF



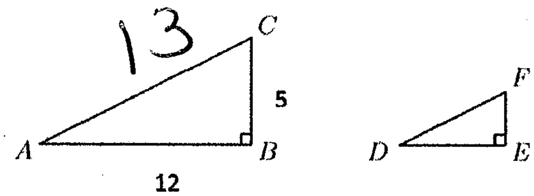
sin A $3/5$ sin D $6/10 = 3/5$

sin B $4/5$ sin E $8/10 = 4/5$

tan A $3/4$ tan D $6/8 = 3/4$

conclusion: similar triangle have the same trig ratios!

7. $\Delta ABC \sim \Delta DEF$



tan F $12/5$ (tanC)

sin F $12/13$ (SinC)

cos F $5/13$ (cosC)

$5^2 + 12^2 = X^2$

$169 = X^2$

$13 = X$

8. $\Delta ABC \sim \Delta DEF$

sin A = $\frac{9}{41}$ sin D = $9/41$

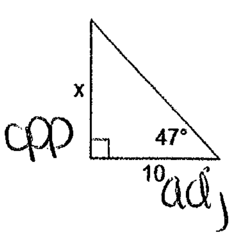
tan B = $\frac{40}{9}$ tan E = $40/9$

9 $\Delta ABC \sim \Delta DEF$

cos B = $\frac{3}{5}$ cos E = $3/5$

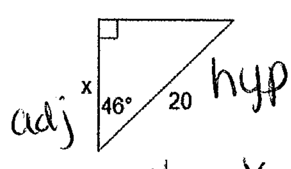
Use Soh Cah Toa to find the missing side lengths:

10.



$\tan 47 = \frac{X}{10}$ $\boxed{X = 10.7}$

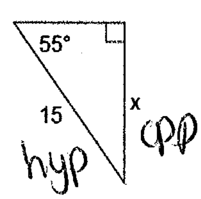
11.



$\cos 46 = \frac{X}{20}$

$\boxed{X = 13.9}$

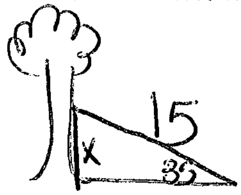
12.



$\sin 55 = \frac{X}{15}$

$\boxed{X = 12.3}$

13. A 15 foot ladder makes a 35 degree angle with the ground. How high can the ladder reach when it is leaning against a tree? (Hint: DRAW this!)



$\sin 35 = \frac{x}{15}$ $\boxed{x = 8.6}$

14. A triangle has sides of 6 inches and 4 inches, and its included angle is 38°. What is its area?

$\frac{1}{2}(6)(4)(\sin 38)$

$= \boxed{7.4 \text{ in}^2}$

15. Triangle ABC has the sides: a = 24, b = 20, c = 30. Use the law of cosines to find the measure of angle A.

$\cos A = \frac{20^2 + 30^2 - 24^2}{2(20)(30)} = \frac{724}{1200}$ $\cos^{-1}\left(\frac{724}{1200}\right) = 52.9 = \boxed{53°}$

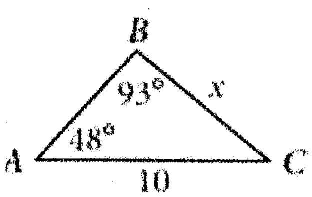
16. Triangle ABC has the sides: a = 24, b = 20, c = 30. Use the law of cosines to find the measure of angle B.

$\cos B = \frac{a^2 + c^2 - b^2}{2ac}$ $\cos B = \frac{24^2 + 30^2 - 20^2}{2(24)(30)} = \frac{1076}{1440}$ $\cos^{-1}\left(\frac{1076}{1440}\right)$

$= 41.6° = \boxed{42°}$

Use the law of sines to solve for x:

17.



$\frac{\sin 93}{10} = \frac{\sin 48}{x}$

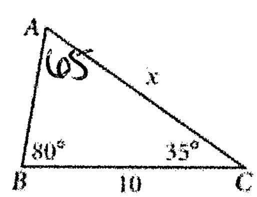
$x \cdot \sin 93 = 10 \cdot \sin 48$

$\div \sin 93 \quad \div \sin 93$

$\boxed{x = 7.4}$

18.

$80 + 35 = 115$
$180 - 115 = 65°$



$\frac{\sin 65}{10} = \frac{\sin 80}{x}$

$x \cdot \sin 65 = 10 \cdot \sin 80$

$\div \sin 65 \quad \div \sin 65$

$\boxed{x = 10.9}$

Name Key Geometry Final Exam Study Guide Unit 6: Circles

Circle: A circle is the set of all points in a plane that are a given distance, the radius, from a given point, the center.

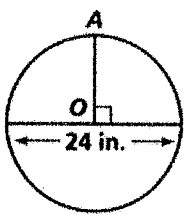
Diameter: twice the length of the radius

All circles are similar: take the formula $C = \pi d$, solve for π. $\pi = \frac{C}{d}$ for <u>every</u> circle. OR....take $C = 2\pi r$, and $\pi = \frac{C}{2r}$ for <u>every</u> circle.

Arc length: $\frac{arc\ measure}{360} \cdot 2\pi r$ **Sector Area:** $\frac{arc\ measure}{360} \cdot \pi r^2$

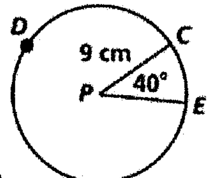
Find the length of each arc. Leave your answers in terms of π

1. $\overset{\frown}{AB}$



$\frac{90}{360} 2\pi 12 = \boxed{6\pi \text{ in}}$

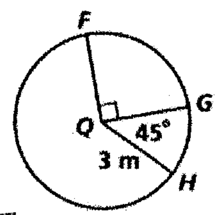
2. $\overset{\frown}{CDE}$ $360-40=320$



$\frac{320}{360} \cdot 2\pi 9$

$= \boxed{16\pi \text{ cm}}$

3. $\overset{\frown}{FH}$ $90+45=135$

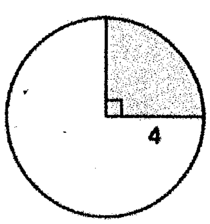


$\frac{135}{360} \cdot 2\pi 3$

$= \boxed{2.25\pi \text{ m}}$

Find the area of each shaded sector. Leave your answers in terms of π

4.

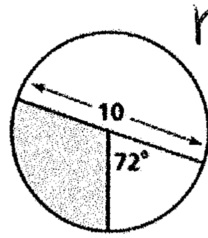


$\frac{90}{360} \cdot \pi 4^2$

$= \boxed{4\pi \text{ units}^2}$

5. $180-72=108$

$r=5$

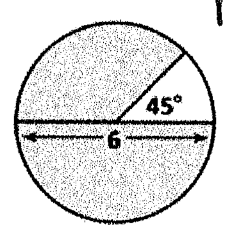


$\frac{108}{360} \cdot \pi 5^2$

$= \boxed{7.5\pi \text{ units}^2}$

6. $360-45=315$

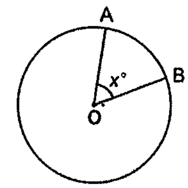
$r=3$



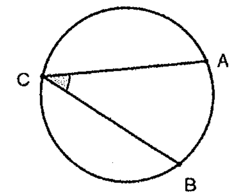
$\frac{315}{360} \cdot \pi 3^2$

$= \boxed{7.875\pi \text{ units}^2}$

Central Angle: vertex is in the <u>center</u> of the circle. Central angle = intercepted arc measure.



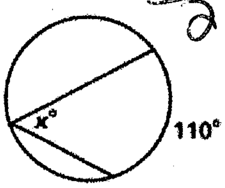
Inscribed Angle: vertex is on the circle. Inscribed angle = $\frac{1}{2}$ intercepted arc measure.



*If a quadrilateral is inscribed in a circle, then opposite angles are supplementary.

7.

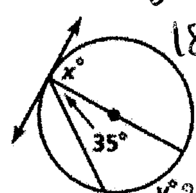
$\frac{110}{2} = 55$



x = 55°

8.

$\frac{180}{2} = 90$

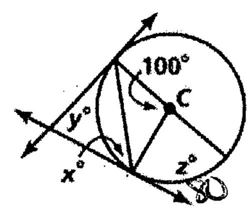


$35 \cdot 2 = 70$

x = 90°

y = 70°

9.



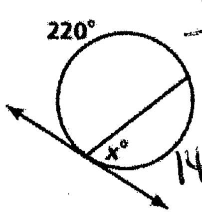
$180 - 100 = 80$

x = 50°

y (arc) = 100°

z = 80°

10.



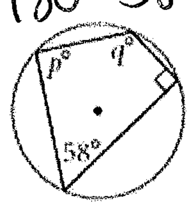
$360 - 220 = 140$

x = 70°

11.

$180 - 90 = 90$

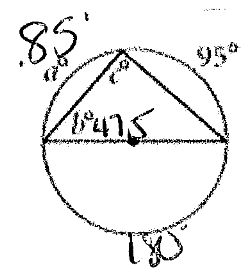
$180 - 58 = 122$



p = 90°

q = 122°

12.



$\frac{95}{2} = 47.5$

a = 85°

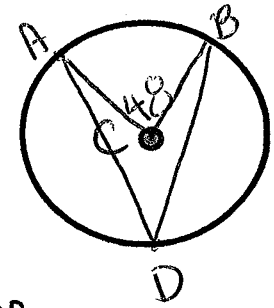
$180 - 95 = 85°$

b = 47.5°

c = 90°

$\frac{180}{2} = 90°$

13. To the right is circle C.



a. label the center C.

b. draw central angle ACB. Label its measure 48°

c. place point D on the circle (not in it!!!!) draw inscribed angle ADB.

d. What is the measure of arc AB? 48°

e. What is the measure of angle ADB? 48/2 = 24°

Standard form of a circle: $(x - h)^2 + (y - k)^2 = r^2$

Center = (h, k) radius = r

Identify the center and the radius:

14. $(x + 3)^2 + y^2 = 16$

Center (-3, 0)

Radius $\sqrt{16} = 4$

15. $(x - 9)^2 + (y + 5)^2 = 64$

center (9, -5)

radius $\sqrt{64} = 8$

16. $x^2 + y^2 = 3$

center (0, 0)

radius $\sqrt{3}$

Write the standard form equation for each circle:

17. center (-5, 8) radius = 16 $16^2 = 256$

$(x+5)^2 + (y-8)^2 = 256$

18. Center (2, -9) radius = $\sqrt{5}$ $\sqrt{5}^2 = 5$

$(x-2)^2 + (y+9)^2 = 5$

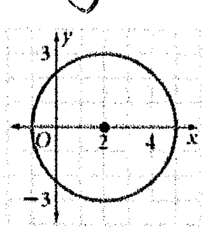
19. center (0, 0) radius = $2\sqrt{5}$ $(2\sqrt{5})^2 = 20$

$x^2 + y^2 = 20$

20. Center (-10, -8) radius = $3\sqrt{2}$ $(3\sqrt{2})^2 = 18$

$(x+10)^2 + (y+8)^2 = 18$

21.

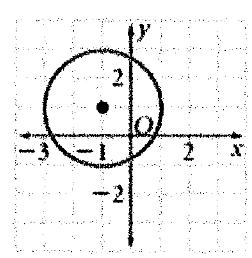


Center (2, 0)

r = 3

$(x-2)^2 + y^2 = 9$

22.



Center (-1, 1)

r = 2

$(x+1)^2 + (y-1)^2 = 4$

Calculate the radius and then write the standard form equation of the circle:

23. center (-2, 5) point (2, 3)

$(2--2)^2+(3-5)^2=r^2$

$20=r^2 \quad \sqrt{20}=r$

Radius $\underline{\sqrt{20}}$

Equation $\underline{(x+2)^2+(y-5)^2=20}$

24. Center (3, 5) point (2, 11)

$(2-3)^2+(11-5)^2=r^2$

$37=r^2 \quad \sqrt{37}=r$

radius $\underline{\sqrt{37}}$

Equation $\underline{(x-3)^2+(y-5)^2=37}$

Is the point inside the circle, on the circle, or outside the circle?

25. center (-3, 8) radius = 3 point: (0, 8)

$(0--3)^2+(8-8)^2=3^2$

$9=9$ equal $\rightarrow$ point is <u>on</u> circle

26. center (-3, 8) radius = 3 point: (-3, 4)

$(-3--3)^2+(4-8)^2=3^2$

$16=9 \longrightarrow 16>9$ point is <u>outside</u> of circle.

(distance between points is greater than the radius)

27. center (-3, 8) radius = 3 point: (-4, 6)

$(-4--3)^2+(6-8)^2=3^2$

$5=9 \longrightarrow 5<9$ point is <u>inside</u> circle

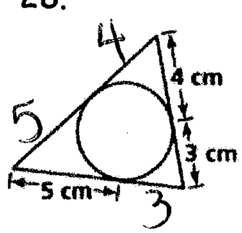
(distance between points is less than radius)

Tangent Lines: a line is tangent to a circle if it intersects the circle in exactly one point.

- The tangent line and the radius are perpendicular
- If two tangent lines meet at a point outside the circle, they are congruent.

Find the perimeter:

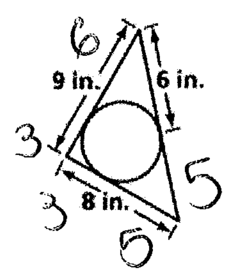
28.



$9+7+8$

$\boxed{24\text{cm}}$

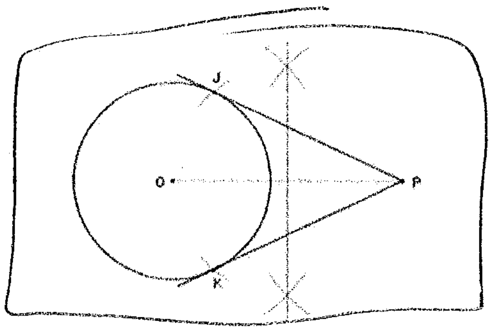
29.

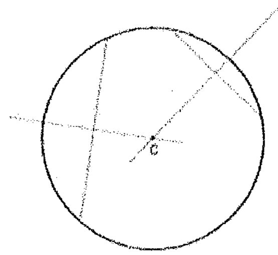


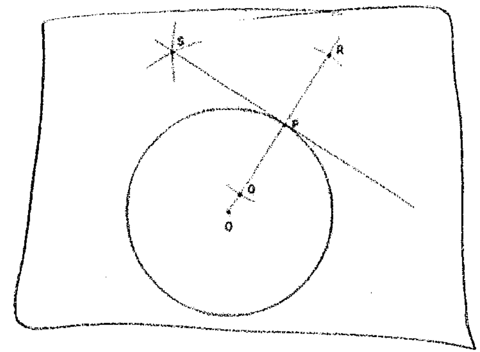
$9+8+11$

$\boxed{28\text{ in}}$

Tangent line constructions: circle the two figures which model constructiong a tangent line:







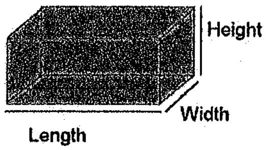
Steps for constructing a tangent line from a circle to a point outside the circle. Also visit mathopenref.com for more help.

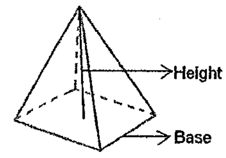
1. Draw circle O, draw point P outside O.
2. connect points P and O.
3. find the midpoint of this line by constructing the perpendicular bisector.
4. place compass on the midpoint, and set the width to point O.
5. with compass on midpoint draw two arcs that intersect the circle at two points. Call these points J and K.
6. Connect P and J, and P and K.

Steps for constructing a tangent line from a circle to a point on the circle.

1. Draw circle O, with point P on the circle
2. connect O and P, and extend the line beyond P.
3. place compass on P and make arcs on the left and right of P. Call the points Q and R.
4. widen compass. Compass on Q, make an arc above P.
5. compass on R, make an arc above P.
6. Call the intersection of the arcs S. Connect P and S.

Name Key Geometry Final Exam Study Guide Unit 7

<table>
<tr>
<td>

Rectangular prism</td>
<td>Rectangular Prism:
$V = Bh$
(B = Base area)
OR $V = lwh$</td>
<td rowspan="2">

Pyramid</td>
<td rowspan="2">Square or Rectangular Pyramid:
$V = \frac{1}{3}Bh$
(B = Base area)</td>
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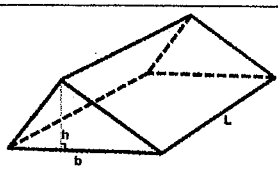
<td>
</td>
<td>Triangular Prism:
$V = Bh$
B = Base area, h = prism height
Base Area = $\frac{1}{2}bh$</td>
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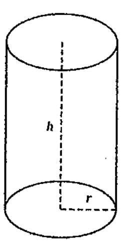
<td>
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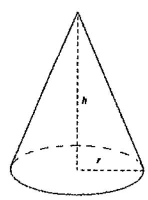
<td>Cylinder:
$V = \pi r^2 h$</td>
<td>
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<td>Cone:
$V = \frac{1}{3}\pi r^2 h$</td>
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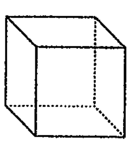
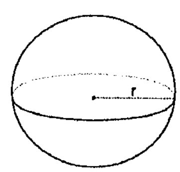
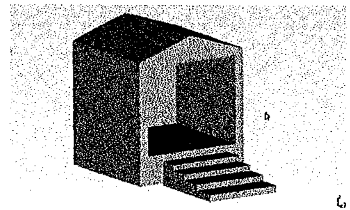
<tr>
<td></td>
<td>Cube:
$V = s^3$</td>
<td>
</td>
<td>Sphere:
$V = \frac{4}{3}\pi r^3$</td>
</tr>
</table>

1. Name the 3-D objects that create a kitchen table
   4 cylinders, 1 rectangular prism (or cylinder!)
2. Name the 3-D objects that create an ice cream cone with a scoop of ice cream.
   cone, sphere

3. name the 3-D objects in the picture:



cube, 5 rectangular prisms
rectangular pyramid

4. How are the volumes of a cone and a cylinder related?

cone is 1/3 of a cylinder or
cylinder is 3x a cone

5. How are the volumes of a prism and a pyramid related?

pyramid is 1/3 of a prism,
or a prism is 3x a pyramid

6. Find the volume of a sphere with a diameter of 14 inches $\frac{4}{3} \cdot \pi \cdot 7^3 = 1436.8 \text{ in}^3$

7. Joey was fighting with his little brother Peter. As a punishment, Joey's mother is making him fill Peter's rectangular kiddie pool (dimensions 40 inches by 30 inches by 15 inches) with a cylindrical cup that is 6 inches high with a radius of 2 inches. How many cups of water will Joey need to fill the pool?

Pool volume 18000 in^3 cup volume $\pi \cdot 2^2 \cdot 6 = 75.4 \text{ in}^3$

Number of cups needed 238 (238.7)

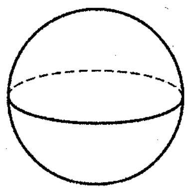
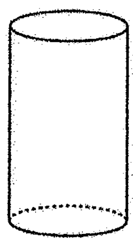
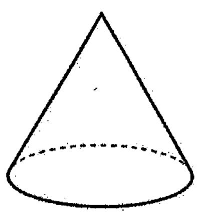
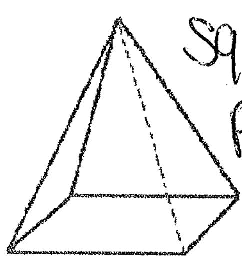
8. Find the volume of a cone that has a height of 16 inches and a diameter of 10 inches. Round your answer to the nearest tenth.

$$\frac{1}{3} \cdot \pi \cdot 5^2 \cdot 16 = 418.9 \text{ in}^3$$

9. A cylinder shaped can has a height of 10 inches and a diameter of 8 inches. What is the length of a side of a cube with the same volume?

$$V = \pi \cdot 4^2 \cdot 10 = 502.65$$
$$\sqrt[3]{502.65} = 7.95 = 8 \text{ in}$$

Describe the shape you see for each cross section cut:

Name the 3-D figure:	Cut vertically	Cut horizontally
 sphere	circle	circle
 cylinder	rectangle	circle
 cone	triangle	circle
 square pyramid	triangle	square