Chapter 5.6/5.7 – Inequalities in triangles. Pg 2-3

Chapter 6: Polygons and Quadrilaterals: Pg 4-8, Also detailed notes on page 16!!!
- 6.1: polygon angle sum theorem
- 6.2: Properties of parallelograms
- 6.3: Proving that a quadrilateral is a parallelogram.
- 6.4: Properties of Rhombuses, Rectangles, and squares.
- 6.5: Conditions for Rhombuses, Rectangles and squares.
- 6.6: Trapezoids and Kites.
- 6.8: Polygons in the coordinate plane.
- 6.9: proofs with coordinate geometry?

Chapter 7: Similarity: Pg 9-15
- 7.1: Ratios and Proportions
- 7.2: Similar polygons.
- 7.3: Proving Triangles Similar.
- 7.4: Similarity in right triangles
- 7.5: Proportions in triangles.

Chapter 8: Right triangles and Trig. Pg 17-19
- 8.1: Pythagorean theorem
- 8.2: Special right triangles
- 8.3: Trigonometry.
- 8.4: Angles of elevation and depression.
- 8.5: law of sines.
- 8.6: Law of cosines.

Chapter 10: Area Pg 20-22
- 10.1: Areas of parallelogram and triangles.
- 10.2: Area of trapezoids and rhombuses and Kites.
- 10.3: Area of regular polygons.
- 10.5 Trig and area.
- 10.6 Circles and Arcs.
- 10.7. Area of circles and sectors
- 10.8: Geometric Probability.

Chapter 12: Pg 24-27
- 12.1: Tangent Lines
- 12.2: Chords and Arcs
- 12.3: Inscribed Angles
- 12.4: Angle Measures and Segment lengths.
- 12.5 Circles in the coordinate plane.

Chapter 11: Basic surface area and volume of solids. Pg 29-32 Also, notes on pg 23
5.6/5.7:

Quick Review

For any triangle,

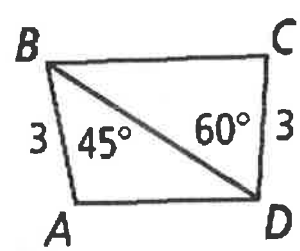
- the measure of an exterior angle is greater than the measure of each of its remote interior angles
- if two sides are not congruent, then the larger angle lies opposite the longer side
- if two angles are not congruent, then the longer side lies opposite the larger angle
- the sum of any two side lengths is greater than the third

The **Hinge Theorem** states that if two sides of one triangle are congruent to two sides of another triangle, and the included angles are not congruent, then the longer third side is opposite the larger included angle.

Example

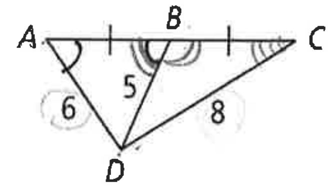
Which is greater, BC or AD?

$\overline{BA} \cong \overline{CD}$ and $\overline{BD} \cong \overline{DB}$, so $\triangle ABD$ and $\triangle CDB$ have two pairs of congruent corresponding sides. Since $60 > 45$, you know $BC > AD$ by the Hinge Theorem.



Sec.. 5.6-5.7 Quiz:

Use the figure at the right. Complete each statement with <, > or =.



1. $m\angle BAD$ $<$ $m\angle ABD$

2. $m\angle CBD$ $>$ $m\angle BCD$

3. $m\angle ABD$ $<$ $m\angle CBD$

4. In ΔLMO, $m\angle L = 40$ and $m\angle M = 60$. List the angles and sides in order from smallest to largest.

$\angle O = 180 - (40+60) = 80°$

$\angle L < \angle M < \angle O$

$\overline{MO} < \overline{LO} < \overline{LM}$

5. The lengths of two sides of a triangle are 8 ft and 10 ft. Write an inequality to show the possible values for x, the length of the third side.

if x is smaller side then...

$x + 8 > 10$

$x > 2$ → $\boxed{2 < x < 18}$ ←

if x is Largest side:

$8 + 10 > x$

$18 < x$

6. Is it possible for a triangle to have sides with the given lengths? Explain.

a. 5 in., 10 in., 15 in.

$5 + 10 = 15$

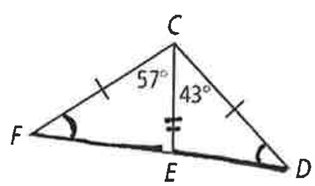
No →

b. 8 cm, 4 cm, 10 cm

$8 + 4 > 10$

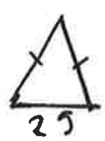
yes → 2 smallest sides are greater than 3rd side

7. Which is greater, *DE* or *EF*? Explain.



FE is greater given the hinge theorem

8. The base of an isosceles triangle has a length of 25. What can you say about the lengths of the legs?



9. List the angles of ΔABC from smallest to largest. $AB = 3$, $BC = 4$, $CA = 5$

$\angle C < \angle A < \angle B$

10. List the sides of ΔABC from shortest to longest. $m\angle A = 30$, $m\angle B = 60$, $m\angle C = 90$

$\overline{CB} < \overline{AC} < \overline{AB}$

Chapter 6:

Quadrilaterals

Parallelograms

1. Both prs op. sides are ∥
2. " " " angles are ≅
3. opposite ∠s are ≅
4. consecutive ∠s are supplementary

Rhombus

1. 4 = side lengths
2. diagonals are ⊥
3. diagonals bisect ∠s

Rectangle

1. 4 ≅ ∠s (90°)
2. Diagonals are ≅

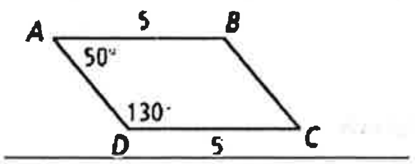
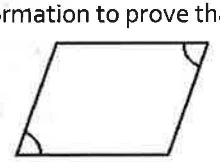
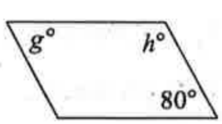
Square

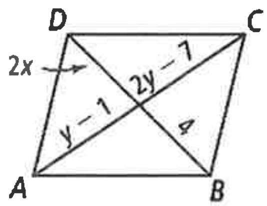
1. 4 ≅ sides
2. 4 ≅ angles
3. ⊥ diagonals
4. diagonals bisects all ∠s
5. ≅ diagonals

Polygons

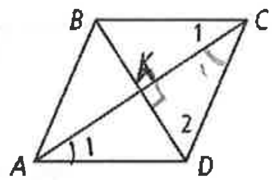
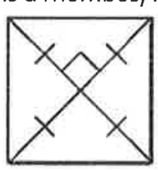
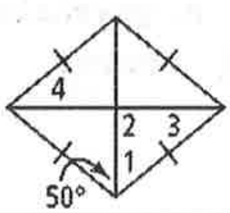
This is the name for a polygon with 7 congruent sides.	heptagon
This type of polygon is defined as a polygon where at least on of its internal angles is greater than 180 degrees.	concave
This is the sum of the exterior angles in the shape below. sum of 	Exterior ∠s are Always = 360° no matter the polygon
This polygon has interior angles that sum up to 720.	$(n-2)\cdot 180 = 720$ $n-2 = 4$ $\boxed{n=6}$ hexagon
This regular polygon has a single exterior angle measure of 40 degrees	$\frac{360}{n} = 40$ $n = \frac{360}{40} = \boxed{9}$ $\boxed{\text{nonagon}}$

Parallelograms

You can prove that a quadrilateral is a parallelogram by 1. Proving both pairs of opposite sides are parallel 2. Proving both pairs of opposite sides are congruent 3. Proving both pairs opposite angles are congruent. 4. Proving an angle is supplementary to both of its consecutive angles. 5. Proving diagonals bisect each other. **And by this method ????????**	1 pr of opposite sides are both parallel And congruent 
Explain whether or not there is enough information to prove that that quadrilateral is a parallelogram: 	Yes b/c of Consecutive ∠ theorem converse $\overline{AB} \parallel DC$. ∴ $\overline{AB} \parallel \overline{DC}$ and $\overline{AB} \cong \overline{DC}$ so 1 pr of opposite sides are ∥ & ≅ so its a parallelogram
Explain whether or not there is enough information to prove that that quadrilateral is a parallelogram: 	no - not enough
These are the values of the variables in the given parallelogram. 	$\angle h = 180 - 80 = 100°$ $\angle g \cong \angle 80° \rightarrow \angle g = 80°$

These variable values ensure that ABCD must be a parallelogram. 	$y-1=2y-7$ $-y+7 \quad -y+7$ $6=y$ 2) $2x=4/2$ $x=2$

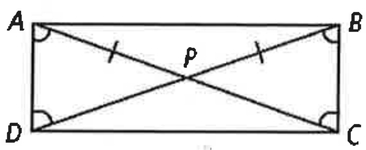
Special Parallelograms

▱ *ABCD* is a rhombus. What is the relationship between ∠1 and ∠2? Explain. 	Since diagonals are ⊥ and bisect ∠s we know that $\angle 1 + \angle 2 = 90$ ∠1 & ∠2 are complementary
DAILY DOUBLE: These three conditions are the ways to prove a parallelogram is a rhombus	1) Prove all side ≅ 2) prove diagonals ⊥ 3) prove a diagonal is an angle bisector of op. ∠s
Explain whether or not you can conclude that the parallelogram below is a rhombus, rectangle or square. 	it's a square b/c it diagonals are ≅ (Rectangle) and diagonals are ⊥ (Rhombus)
Bob the builder wants to ensure his door frame is rectangular. Explain how he can do so, using only his measuring tape.	① make sure opposite sides are ≅ ② make sure diagonals are ≅
Name the special parallelgoram and find the missing angle values. 	Rhombus $\angle 1 = 50°$ $\angle 2 = 90°$ $\angle 3 = 90-50=40°$ $\angle 4 \cong \angle 3 = 40°$

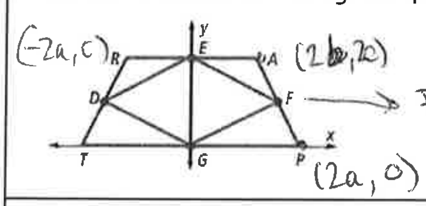
Quadrilaterals

	These quadrilaterals that have congruent diagonals	Rectangles, squares & isosceles trapazoids

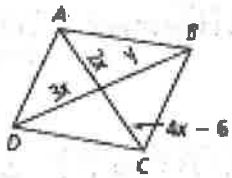
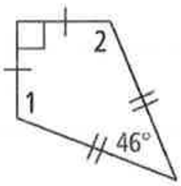
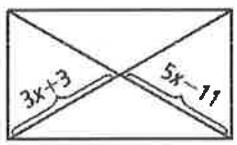
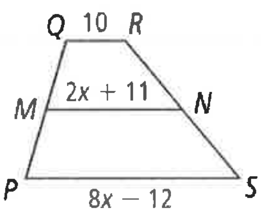
These quadrilaterals have perpendicular diagonals	Rhombus, Rectangle kite.

These are the ways the diagonals of a rectangle are similar and different to those of an isosceles trapezoid	Similar - diagonals are ≅ different: trapazoid diagonals Do not bisect eachother
Wh~~at do you call a destroyed angle?~~	
Explain how you know that *ABCD* is a rectangle.  	1) $\overline{AP} = \overline{DP}$ & $\overline{BP} = CP$

Coordinate Geometry

What are two ways (Include which formula you would use) you can prove a quadrilateral is a parallelogram in the coordinate plane.	① prove opposite sides are ∥ using slope ② prove opposite sides ≅ using distance Formula
John proves a quadrilateral is a rectangle by proving that the diagonals of the quadrilateral are congruent. Explain why this proof is incomplete.	b/c isosceles trapazoids also have ≅ diagonals.
Name a way to prove a parallelogram is a rhombus (include formula names).	① prove that it has 4 ≅ sides using distance Formula
Sam proves that one pair of opposite sides of a quadrilateral are congruent. What has he proven? Why?	nothing.
This is the coordinate of point F. (F is the midpoint of AP) if Trapezoid TRAP has a bottom base length of 4a, top base length of 4b and EG=2c.  F is the midpt of $\overline{AB}$ So ? ? - ?	$F = \left(\frac{2b+2a}{2}, \frac{2c+0}{2}\right)$ $F = (a+b, c)$

Sides and Angles

These are the values of x and y that make ABCD a parallelogram  	$2x = 4x - 6$ $6 = 2x$ $3 = x$ $3x = y$ $3(3) = y$ $9 = y$
These are the values of the missing angles in the given quadrilateral below  	$360 - 90 - 46 =$ $360 - 136 = 224$ $224 \div 2 = 112°$ $\boxed{\angle 1 \cong \angle 2 = 112°}$
This is the value of x that makes the parallelogram a rectangle.  	$3x + 3 = 5x - 11$ $-3x + 11 \quad -3x + 11$ $14 = 2x$ $\boxed{7 = x}$
This is the length of MN  $\overline{MN} = (2)(6) + 11$ $12 + 11$ $\overline{MN} = 33$	$\frac{1}{2}(10 + 8x - 12) = 2x + 11$ $-1 + 4x = 2x + 11$ $+1 \quad -2x \quad -2x \quad +1$ $2x = 12$ $x = 6$

Chapter 7:

1 Similarity
You can set up and solve proportions using corresponding sides of similar polygons.

2 Reasoning and Proof
Two triangles are similar if certain relationships exist between two or three pairs of corresponding parts.

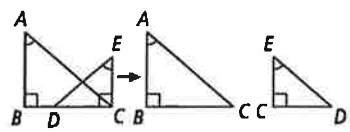
3 Visualization
Sketch and label triangles separately in the same orientation to see how the vertices correspond.

Ratios and Proportions (Lesson 7-1)
The Cross Products Property states that if $\frac{a}{b} = \frac{c}{d}$, then $ad = bc$.

Similar Polygons (Lesson 7-2)
Corresponding angles of similar polygons are congruent, and corresponding sides of similar polygons are proportional.

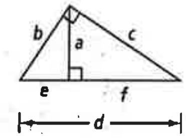
Proving Triangles Similar (Lesson 7-3)
Angle-Angle Similarity (AA ~) Postulate
Side-Angle-Side Similarity (SAS ~) Theorem
Side-Side-Side Similarity (SSS ~) Theorem

Seeing Similar Triangles (Lessons 7-3 and 7-4)



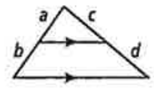
$\triangle ABC \sim \triangle ECD$

Proportions in Triangles (Lessons 7-4 and 7-5)
Geometric Means in Right Triangles



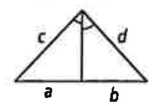
$\frac{e}{a} = \frac{a}{f}$ $\quad \frac{d}{b} = \frac{b}{e}$ $\quad \frac{d}{c} = \frac{c}{f}$

Side-Splitter Theorem



$\frac{a}{b} = \frac{c}{d}$

Triangle-Angle-Bisector Theorem



$\frac{a}{b} = \frac{c}{d}$

Geometry: Chapter 7 Review:

1) Ratios : 7.1

A. **Students should know what a ratio is. (See 7.1 notes)**

B. **Students should know how to represent a ratio in 3 different ways.** (see 7.1 notes)

Ex: length of car: 14 ft 10 in. Length of model car: 8 in. Write the ratio of the length of a car to the length of the model car.

$\frac{\text{car}}{\text{model car}} = \frac{14\text{ft } 10\text{in}}{8\text{in}} = \frac{14 \times 12 + 10}{8} = \frac{178}{8} = \frac{8\ldots}{4}$

C. **Students should understand extended ratios and know how to solve problems involving them.**

Ex: A band director needs to purchase new uniforms. The ratio of small to medium to large uniforms is 3 : 4 : 6.

a. If there are 260 total uniforms to purchase, how many will be small?

$3x + 4x + 6x = 266 \rightarrow 13x = 260$
$x = 20$

small: $3 \times 20 = 60$ uniforms

b. How many of these uniforms will be medium?

medium: $4 \times (20) = 80$ uniform

c. How many of these uniforms will be large?

large: $6 \times 20 = 120$ units

2) Proportions: 7.1

a

A. Students should understand what a proportion is. (see 7.1 notes)

B. Students should know how to find the cross products of a proportion to solve for an unknown value.

a. $\frac{3}{4} = \frac{x}{6}$

$3 \cdot 6 = 4x$

$\frac{}{4} \quad \frac{}{4}$

$\boxed{x = 4.5}$

b. $\frac{4}{5} = \frac{x-3}{9}$

$4 \cdot 9 = 5(x-3)$

$36 = 5x - 15 \rightarrow 51 = 5x$

$\boxed{10.2 = x}$

c. $\frac{12}{x} = \frac{4}{2x-5}$

$12(2x-5) = 4x$

$24x - 60 = 4x$

$-60 = 20x$

$\boxed{3 = x}$

C. Students should be able to identify the means and extremes of a proportion and see that the proportion can represented several ways based on the properties of proportions.

	Property	How to apply it
Properties of Proportions	(1) $\frac{a}{b} = \frac{c}{d}$ is equivalent to $\frac{b}{a} = \frac{d}{c}$.	Write the reciprocal of each ratio. $\frac{2}{3} = \frac{4}{6}$ becomes $\frac{3}{2} = \frac{6}{4}$.
	(2) $\frac{a}{b} = \frac{c}{d}$ is equivalent to $\frac{a}{c} = \frac{b}{d}$.	Switch the means. $\frac{2}{3} = \frac{4}{6}$ becomes $\frac{2}{4} = \frac{3}{6}$.
	(3) $\frac{a}{b} = \frac{c}{d}$ is equivalent to $\frac{a+b}{b} = \frac{c+d}{d}$.	In each ratio, add the denominator to the numerator. $\frac{2}{3} = \frac{4}{6}$ becomes $\frac{2+3}{3} = \frac{4+6}{6}$.

Ex. 1) a. Write a proportion that has means 4 and 15 and extremes 6 and 10.

not on Test

b. Write two more equivalent ratios to the one in part A.

D. Students should be able to solve application problems relating to proportions.

Ex. A meatloaf recipe uses 4 pounds of hamburger to feed 6 people. How many pounds of hamburger will be used to feed 15 people?

$\frac{4\text{ lb}}{6\text{ people}} = \frac{x}{15}$

$4 \cdot 15 = 6x$

$60 = 6x$

$x = 10$

3) Similarity

A. Students should know what similarity means (see 7.2 notes)

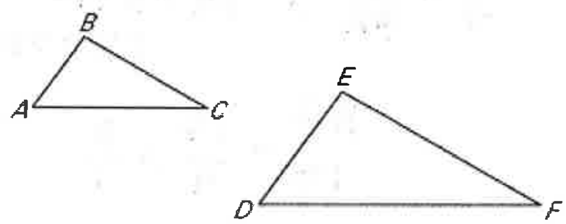
When 2 polygons are similar:

a. All of the corresponding angles are $\cong$

b. The ratio of the corresponding side-lengths are =

Ex 1: List all pairs of congruent angles for the figures. Then write the ratios of the corresponding sides in a statement of proportionality.

1. $\Delta ABC \sim \Delta DEF$



$\angle A \cong \angle D$

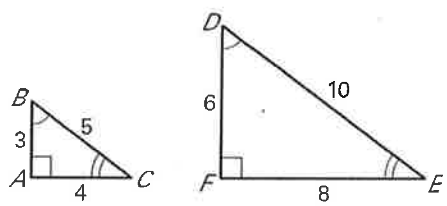
$\angle B \cong \angle E$

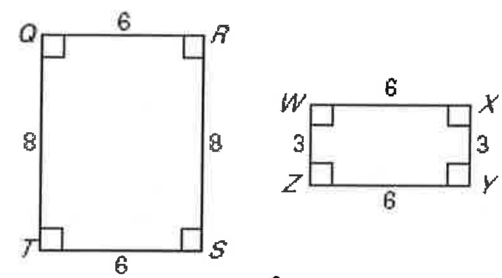
$\angle C \cong \angle F$

$\frac{AB}{DE} = \frac{BC}{EF} = \frac{AC}{DF}$

B. Students should be able to identify corresponding sides and angles and evaluate whether shapes are similar.
(To determine if two figures are similar, first confirm that all the angles are congruent. THEN set up the ratios of the sides of the one figure to the other and confirm all the ratios are proportional.)

EX:





$\frac{3}{6} = \frac{4}{8} = \frac{5}{10}$

$\frac{1}{2} = \frac{1}{2} = \frac{1}{2}$ ✓ Yes

$\Delta ABC \sim \Delta FDE$

$\frac{8}{6} = \frac{8}{6} \neq \frac{6}{3} = \frac{6}{3}$

$\frac{4}{3} = \frac{4}{3} \neq \frac{2}{1} = \frac{2}{1}$

Not ~

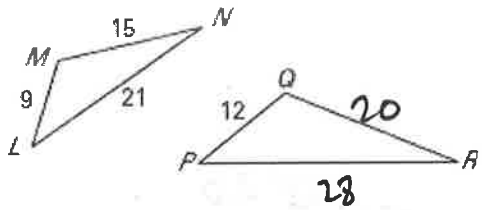
C. Students should know how to list congruent angles, equal side ratios, and write a similarity statement.

Ex: Write a similarity statement for the similar polygons in the above example.

D. Students should know what a scale factor is and be able to find it by comparing the side of one polygon to the corresponding sides of another
To find the scale factor of similar figures, find the ratio of 1 set of corresponding sides. Be sure the sides are corresponding!

Ex: Find the Scale Factor:

$\Delta LMN \sim \Delta PQR$



$\frac{LM}{PQ} = \frac{9}{12} = \frac{3}{4}$

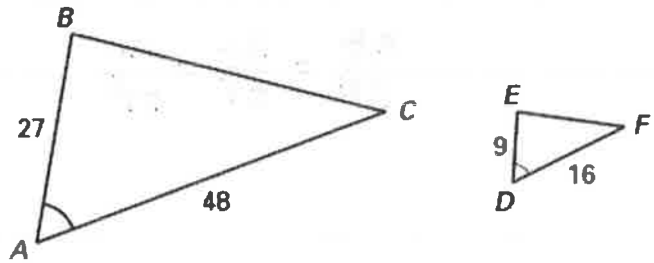
so $\frac{3}{4} = \frac{15}{QR} \rightarrow 60 = 3\,QR$

$QR = 20$

and $\frac{3}{4} = \frac{21}{PR} \Rightarrow 84 = 3\,PR$

$PR = 28$

$\Delta ABC \sim \Delta DEF$

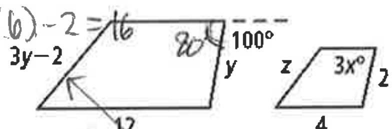


$\frac{AB}{DE} = \frac{27}{9} = \frac{3}{1}$

E. Students should be able to use a scale factors to find missing side length in similar polygons.

To find a missing side length, set up a proportion of corresponding sides, where one ratio of corresponding sides is the scale factor and the other is ratio is the one containing the ratio. Use cross-products to find the variable.

Ex: Find the value of the given variables in the similar polygons.



X: $\frac{3x}{3} = \frac{80}{3}$

$\boxed{x = \frac{80}{3}}$

$3(6) - 2 = 16$

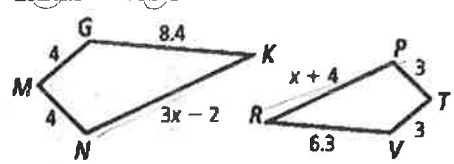
y: $\frac{12}{4} = \frac{y}{2} \Rightarrow 24 = 4y$

$\boxed{6 = y}$

z: $\frac{16}{z} = \frac{12}{4} = \frac{3}{1} = 3z = 16$

$z = 16/3$

GKNM ~ VRPT



$\frac{3x-2}{x+4} = \frac{4}{3} \Rightarrow 3(3x-2) = 4(x+4)$

$9x - 6 = 4x + 16$

$-4x + 6 \quad -4x + 6$

$5x = 22$

$x = 4.4$

F. Students should be able to solve application problems involving scale factor and similarity. (think back to the mural problem and the map problem from section 7.2)

Ex. Brian bought a 3-D scale model of a pool table for his desk. The length of the model is 5.6 inches long. The length of the actual pool table is 7 feet long, and the width is about 3.9 feet.

a. What is the width of the model? $\frac{5.6}{7} = \frac{x}{3.9} \rightarrow \frac{5.6 \cdot 3.9}{7} = \frac{7x}{7}$

$3.12 \text{ in} = x$

b. About how many times as wide as the model is the actual pool table?

$7 \cdot 12 = \frac{84 \text{ in}}{5.6 \text{ in}} = 15$ 15 times greater

or

$\frac{46.8 \text{ in}}{3.12} = 15$

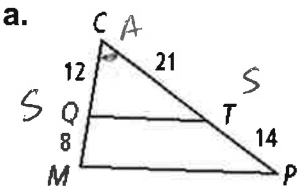
4) <u>Similarity Postulates</u>

A. Students should know the similarity postulates (AA~, SSS~, SAS~) and understand that when comparing sides, we are not comparing one side to its corresponding side, but instead, are comparing one ratio of sides to another.

B. Students should be able to determine if triangles are similar by these postulates.

Do the triangles have to be similar? If so, write a similarity statement and tell whether you would use AA ~, SAS ~ , or SSS ~.

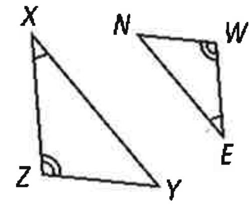
a.



$\frac{3}{5} \leftarrow \frac{12}{20} = \frac{21}{35} \rightarrow \frac{3}{5}$ Yes, SAS~

$\frac{3}{5} = \frac{3}{5}$ ✓ $\triangle MCP \sim \triangle QCT$

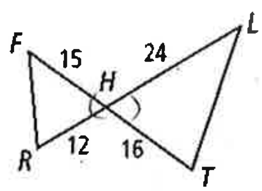
b.



Yes, AA~

$\triangle XYZ \sim \triangle ENW$

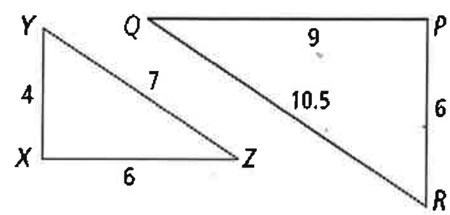
d.



No

$\frac{15}{16} \neq \frac{12}{24}$

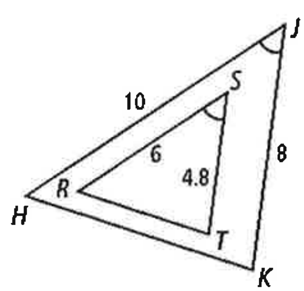
e.



$\frac{7}{10.5}$ $\frac{6}{9}$ $\frac{4}{6}$

$\frac{2}{3} = \frac{2}{3} = \frac{2}{3}$ ✓

Yes, SSS~ $\triangle XYZ \sim \triangle PRQ$



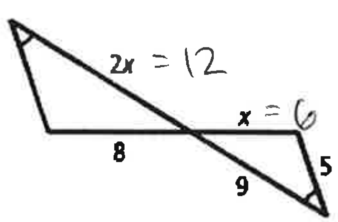
$\frac{10}{6} = \frac{8}{4.8}$

$\frac{5}{3} = \frac{5}{3}$ ✓

Yes, SAS~

$\triangle HJK \sim \triangle RST$

C. Students should be able to solve for missing sides and angles of similar triangles.

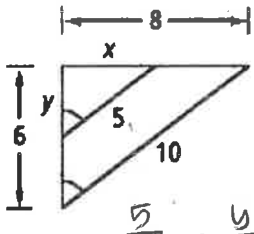


$\frac{x}{8} = \frac{9}{2x}$

$\frac{72}{2} = \frac{2x^2}{2}$

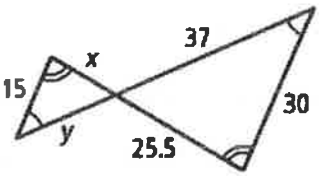
$\sqrt{36} = \sqrt{x^2}$

$6 = x$



$x = 4 \quad y = 3$

$\frac{5}{10} = \frac{y}{6} = \frac{x}{8}$

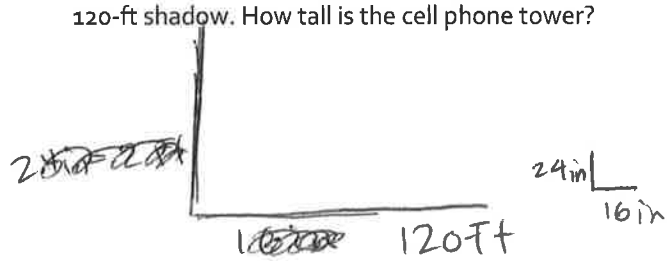


$\frac{15}{30} = \frac{x}{25.5} = \frac{y}{37}$

$x = 12.75 \quad y = 18.5$

D. Students should be able to solve application problems involving similar triangles.

Ex.: 2-ft vertical post casts a 16-in. shadow at the same time a nearby cell phone tower casts a 120-ft shadow. How tall is the cell phone tower?



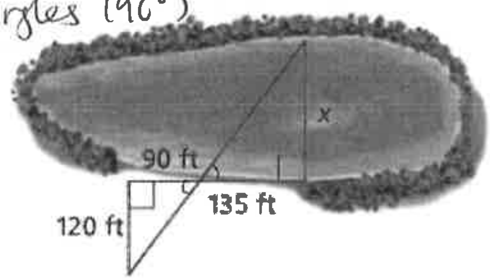
$\frac{24}{x} = \frac{16}{120}$

$\frac{\cancel{16}x}{\cancel{16}} = \frac{24 \cdot 120}{16}$

$x = 180\text{ft}$

Ex. **Explain why the triangles are similar, then find the distance across the lake.**

vertical ∠s are ≅ and they are right triangles (90°) So they're similar by AA~

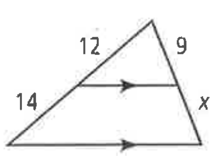


$\frac{90}{135} = \frac{120}{x} \rightarrow \frac{\cancel{90}x}{\cancel{90}} = \frac{120 \cdot 135}{90}$

$x = 180\text{ft}$

5) **Similarity relationships within triangles.**

A. Students should be able to use the side splitter theorem to set up proportions and find missing lengths.

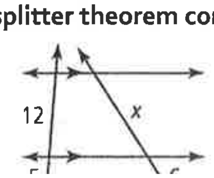


$\frac{12}{14} = \frac{9}{x} \rightarrow \frac{\cancel{12}x}{\cancel{12}} = \frac{9 \cdot 14}{12}$

$\boxed{x = 10.5}$

B. Students should be able to use the side-splitter theorem converse to determine if lines (or planes) are parallel.

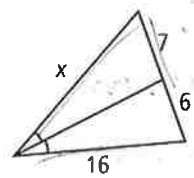
C. Students should be able to use the side-splitter theorem corollary to find missing lengths.



$\frac{5}{6} = \frac{12}{x}$

$5x = 72$

D. Students should be able to use the triangle angle bisector theorem to find different length.



$\frac{16}{6} = \frac{x}{7}$

$\frac{6x}{6} = \frac{16 \cdot 7}{6}$

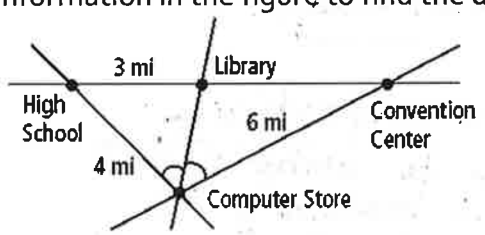
$x = 18\frac{2}{3}$

E. Students should know that the triangle angle bisector theorem is directly related to the side-splitter theorem.

An angle bisector of a triangle divides the opposite side of the triangle into segments 5 cm and 3 cm long. A second side of the triangle is 7.5 cm long. Find all possible lengths for the third side of the triangle

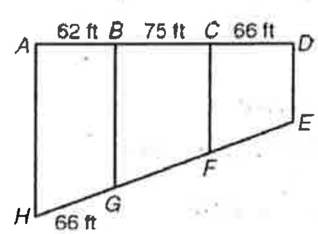
F. Students should be able to solve application problems relating to the above listed theorems.

Ex. The figure below shows the locations of a high school, a computer store, a library, and a convention center. The street along which the computer store and library are located bisects the obtuse angle formed by two of the other streets. Use the information in the figure to find the distance from the library to the convention center.



Ex.

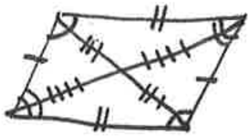
. The figure shows three lots in a housing development. If the boundary lines separating the lots are parallel, what is GF to the nearest tenth?



____

Quadrilateral: 4 sided polygon

Parallelogram

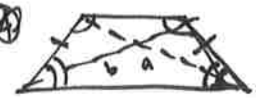


1. Both pr. opposite sides are ∥
   [Prove op. sides ∥ using slope (∥)]
2. Both pr opposite sides are ≅
   [prove op. sides ≅ using distance]
3. Consecutive angles are supplementary
   [prove 1 ∠ is supplementary to both of its consecutive ∠s]
4. opposite ∠s are ≅
   [prove opposite ∠s are ≅]
5. diagonals bisect eachother
   [prove diagonals bisect using Mdpt.]
6. [prove 1 pr of opposite sides are ∥ & ≅

Trapazoid

1. 2 bases
2. 2 Legs
3. Midsegment = a) ∥ to bases b) Length = $\frac{1}{2}(b_1+b_2)$

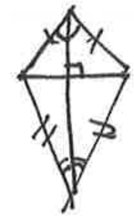
Isosceles Trapazoid

1. 2 ≅ Legs
2. 2 ≅ base ∠s (both pr. base ∠s are ≅)
3. diagonals are ≅
4. 

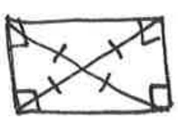
a=b

Kites

1. 2 prs of ≅ consecutive sides.
2. diagonals are perpendicular
3. Long diagonal bisects ∠s

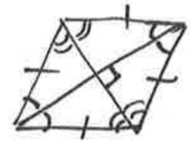


Rectangle



1. Has 4 ≅ angles
   prove right ∠s using slope (⊥)
2. Diagonals are congruent
   [prove diagonals are ≅ using distance]

Rhombus



1. Has 4 congruent sides
2. Diagonals are perpendicular
   [Prove diagonals ⊥ using slope]
3. Diagonals are ∠ bisectors
   [~~one di~~ prove 1 diagonal bisects ∠]

Square (must prove: 1 rectangle property AND 1 Rhombus property)

1. 4 right angles (Rec)
2. 4 ≅ sides (Rhom)
3. Congruent diagonals (Rec)
4. ⊥ diagonals (Rhom)
5. Diagonals are ∠ bisectors (Rec.)

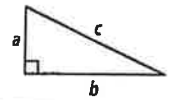
Chapter 8: Right triangles and Trig.

1 Measurement
Use the Pythagorean Theorem or trigonometric ratios to find a side length or angle measure of a right triangle. The Law of Sines and the Law of Cosines can be used to find missing side lengths and angle measures of any triangle.

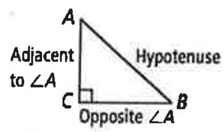
2 Similarity
A trigonometric ratio compares the lengths of two sides of a right triangle. The ratios remain constant within a group of similar right triangles.

The Pythagorean Theorem (Lesson 8-1)

$a^2 + b^2 = c^2$



Trigonometry (Lesson 8-3)

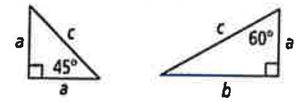


$\sin A = \dfrac{\text{opposite}}{\text{hypotenuse}}$

$\cos A = \dfrac{\text{adjacent}}{\text{hypotenuse}}$

$\tan A = \dfrac{\text{opposite}}{\text{adjacent}}$

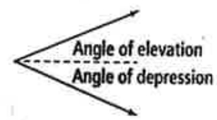
Special Triangles (Lesson 8-2)



$c = a\sqrt{2}$

$c = 2a$
$b = a\sqrt{3}$

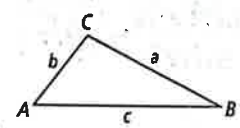
Angles of Elevation and Depression (Lesson 8-4)



Law of Sines and Law of Cosines (Lessons 8-5 and 8-6)

$\dfrac{\sin A}{a} = \dfrac{\sin B}{b} = \dfrac{\sin C}{c}$

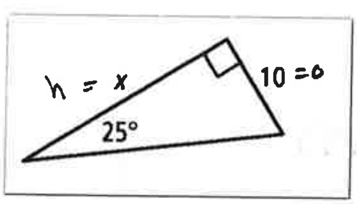
$a^2 = b^2 + c^2 - 2bc\cos A$
$b^2 = a^2 + c^2 - 2ac\cos B$
$c^2 = a^2 + b^2 - 2ab\cos C$



Chapter 8 Review:

SohCahToa

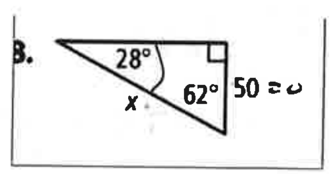
You must be able to solve for the missing angles and sides of a right triangle:



$\sin 25° = \dfrac{10}{h}$

$x = h = 10/\sin 25$

$\boxed{x \approx 23.7}$



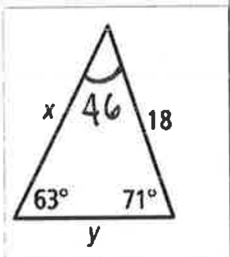
$\sin 28 = \dfrac{50}{x}$

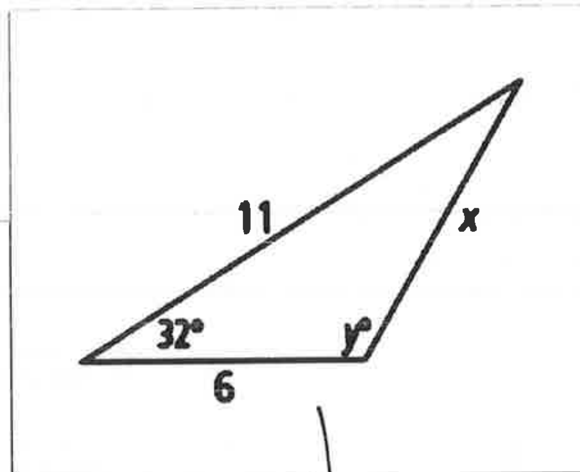
$x = 50/\sin 28 \approx \boxed{106.5}$

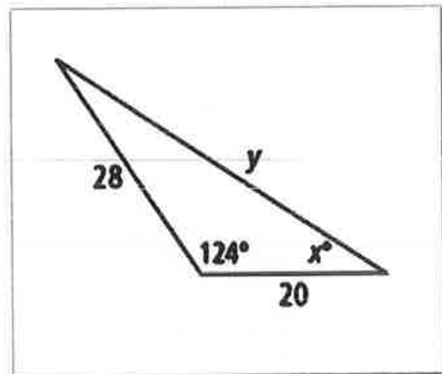
$$\frac{a^2-b^2-c^2}{-2bc} = \cos A$$

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

You must be able to solve for the missing angles and sides of a right triangle using the law of sines or the law of cosines (you must be able to figure out which one to use)







$$\frac{\sin 63}{18} = \frac{\sin 71}{x}$$

$$x = \frac{\sin 71° \cdot 18}{\sin 63} = \boxed{19.1} \quad x =$$

$$\frac{\sin 63}{18} = \frac{\sin 46}{y} \Rightarrow y = \frac{\sin 46 \cdot 18}{\sin 63} = \boxed{14.5} \quad y =$$

$$\sqrt{x^2} = \sqrt{6^2 + 11^2 - 2(6)(11)\cos 32} =$$

$$x \approx 6.7$$

$$\cos y = \frac{11^2 - 6^2 - 6.7^2}{-2(6)(6.7)} =$$

$$y = \cos^{-1}(-.498) \approx 119.9 \approx 120° = y$$

$$\sqrt{y^2} = \sqrt{28^2 + 20^2 - 2(20)(28)\cos 124}$$

$$y = \sqrt{1184 + 626}$$

$$y \approx 42.5$$

$$\frac{42.5}{\sin 124} = \frac{28}{\sin X}$$

$$X = \sin^{-1}\left(\frac{\sin 124 \cdot 28}{42.5}\right)$$

$$X \approx 33°$$

You must be able to solve application problems involving right and non-right triangles.

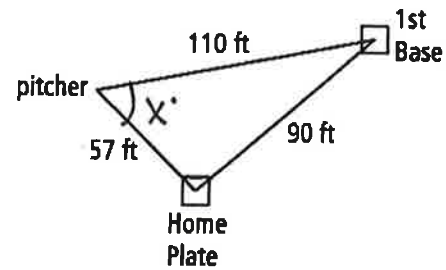
Aerial Television A blimp provides aerial television views of a football game. The television camera sights the stadium at a 7° angle of depression. The altitude of the blimp is 400 m. What is the line-of-sight distance from the television camera to the base of the stadium? Round to the nearest hundred meters.

0 = 400

$$\sin 7° = \frac{400}{x}$$

$$x = 400/(\sin 7) \approx 3{,}282.2 \approx \boxed{3{,}300\text{ m}}$$

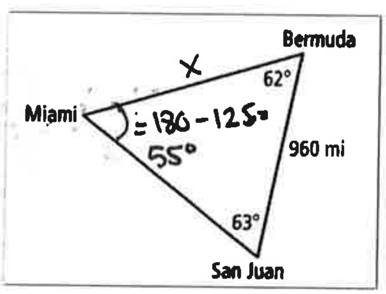
Baseball After fielding a ground ball, a pitcher is located 110 feet from first base and 57 feet from home plate as shown in the figure at the right. To the nearest tenth, what is the measure of the angle with its vertex at the pitcher?



$$\cos x = \frac{90^2 - 110^2 - 57^2}{-2(110)(57)}$$

$$x = \cos^{-1}(.57807) = \boxed{54.7^\circ}$$

Navigation The Bermuda Triangle is a historically famous region of the Atlantic Ocean. The vertices of the triangle are formed by Miami, FL; Bermuda; and San Juan, Puerto Rico. The approximate dimensions of the Bermuda Triangle are shown in the figure at the right. Explain how you would find the distance from Bermuda to Miami. What is this distance to the nearest mile?



$$\frac{\sin 55}{960} = \frac{\sin 63}{x}$$

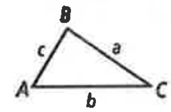
$$x = \frac{(\sin 63)(960)}{\sin 55} = \boxed{1{,}044 \text{ miles}}$$

1 Measurement
You can find the area of a polygon, or the circumference or area of a circle, by first determining which formula to use. Then you can substitute the needed measures into the formula.

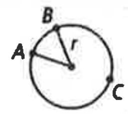
Areas of Polygons (Lessons 10-1, 10-2, and 10-3)

Parallelogram	$A = bh$
Triangle	$A = \frac{1}{2}bh$
Trapezoid	$A = \frac{1}{2}h(b_1 + b_2)$
Rhombus or kite	$A = \frac{1}{2}d_1d_2$
Regular polygon	$A = \frac{1}{2}ap$

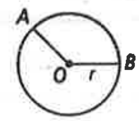
Area of a Triangle Given SAS (Lesson 10-5)
Area of $\triangle ABC = \frac{1}{2}bc(\sin A)$



Circles and Arcs (Lesson 10-6)
$C = \pi d$ or $C = 2\pi r$
$m\widehat{ABC} = m\widehat{AB} + m\widehat{BC}$
length of $\widehat{AB} = \frac{m\widehat{AB}}{360} \cdot 2\pi r$



Areas of Circles and Sectors (Lesson 10-7)
Area of $\odot O = \pi r^2$
Area of sector $AOB = \frac{m\widehat{AB}}{360} \cdot \pi r^2$



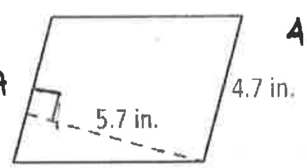
2 Similarity
The perimeters of similar polygons are proportional to the ratio of corresponding measures. The areas are proportional to the squares of corresponding measures.

Perimeter and Area (Lesson 10-4)
If the scale factor of two similar figures is $\frac{a}{b}$, then
(1) the ratio of their perimeters is $\frac{a}{b}$ and
(2) the ratio of their areas is $\frac{a^2}{b^2}$.

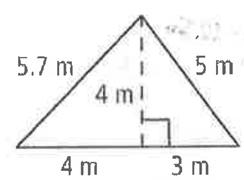
KEY TO FINDING AREA OF SHAPES IS:

1. PYTHAGOREAN THEOREM
2. 30-60-90 TRIANGLES
3. 45-45-90 TRIANGLES.

Students should know how to find the area of parallelograms and triangles.

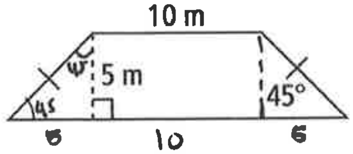


$4.7 \times 5.7 = \boxed{26.8 in^2}$



$\frac{7 \cdot 4}{2} = \boxed{14 m^2}$

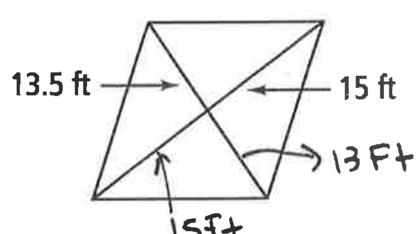
Students should know how to find the area of trapezoids, rhombuses and kites.



$b_1 = 10$
$b_2 = 20$
$h = 5$

$A = \frac{1}{2}(10+20)5$

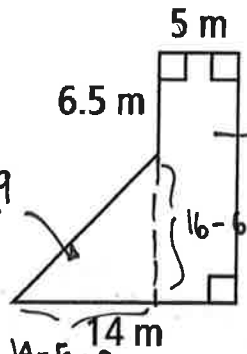
$15 \cdot 5 = \boxed{75 m^2}$



$d_1 = (13.5 \cdot 2)$ $d_2 = (15 \cdot 2)$

$A = \frac{1}{2} \cdot 27 \cdot 30 = \boxed{405 ft^2}$

Students should be able to find the area of compound shapes

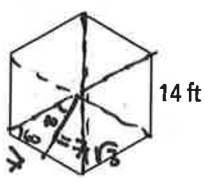


$\frac{9.5 \cdot 9}{2}$ $\quad$ $5 \times 16 = 80m^2$ $\quad$ $16 - 6.5 = 9.5$ $\quad$ $14 - 5 = 9$

$A = A_{\square} + A_{\triangle}$

$A = (5 \times 16) + \left(\frac{9.5 \cdot 9}{2}\right) = 80 + 42.75 =$ $\boxed{122.75\,m^2}$

Students should know how to find the area of any polygon using A= ½ ap



$7\sqrt{3}$

$A = \frac{1}{2} \cdot P \cdot a$ $\quad$ $a = 7\sqrt{3}$

$P = 14 \times 6$

$A = \frac{1}{2} \cdot 14 \cdot 6 \cdot 7\sqrt{3} = 42 \cdot 7\sqrt{3}$

$294\sqrt{3} \approx \boxed{509ft^2}$

Students should know the relationship between scale factor for length and scale factor for area.

Ex. A scale factor of 2/5 in terms of length, turns into $2^2/5^2 = 4/25$ when we're talking about area.

Students should be able to find the area ratios of two similar shapes given the scale factor.

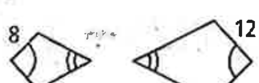
Ex. It will cost Monica \$225 to have carpet installed in a room that measures 14ft by 12ft. At this rate, how much would it cost to have carpet installed in a similarly shaped family room with the larger dimension 35 feet?

Length ratio $\frac{14}{35} = \frac{2}{5}$ $\quad$ Area Ratio: $\left(\frac{2}{5}\right)^2 = \frac{4}{25}$ $\quad$ Set up proportion $\frac{4}{25} = \frac{255}{x} \rightarrow$ $x = \frac{255 \cdot 25}{4} =$

$\boxed{\$1593.75}$

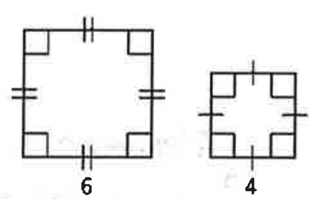
For each pair of similar figures, find the ratio of the area of the first figure to the second.

22.



$\frac{8}{12} = \frac{2}{3}$ $\quad$ $\left(\frac{2}{3}\right)^2 = \boxed{\frac{4}{9}}$

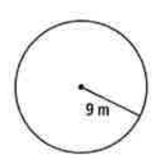
23.



$\frac{6}{4} = \frac{3}{2}$ $\quad$ $\left(\frac{3}{2}\right)^2 = \boxed{\frac{9}{4}}$

Students should know how to find the area and circumference of circles.

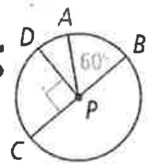
Ex. Find the area and circumference of the given circle.



$A = \pi (9)^2 = \boxed{81\pi}$ $\quad$ $C = \pi \cdot d = 2\pi r = 9 \cdot 2 \cdot \pi = \boxed{18\pi}$

Students should be able to find the measure and length of an arc.

Find each measure.



35. $m\angle APD = 90°$ **36.** $m\widehat{AC} = 180-60 = 120°$

37. $m\widehat{ABD}$ **38.** $m\angle CPA$

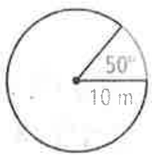
$360-30=330°$ $180-60 = 120°$

Find the length of each arc shown in red. Leave your answer in terms of π.

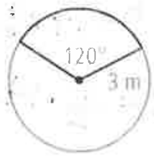
39.

40.

41.



42.



$360-120°$

39. $\frac{110}{360}(\pi \cdot 8) = \frac{11}{36}(8\pi) = \boxed{\frac{22}{9}\pi}$ in

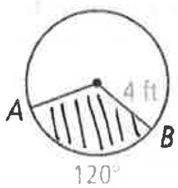
40. $\frac{60}{360}(6\pi) = \frac{1}{6}\cdot 6\pi = \boxed{\pi}$ m

41. $\frac{50}{360}(20\pi) = \frac{5}{36}\cdot 20\pi = \boxed{\frac{25}{9}\pi}$ m

42. $\frac{240}{360}(6\pi) = \frac{2}{3}\cdot 6\pi = \boxed{4\pi}$ m

Students should be able to find the area of a sector and section

Find the area of the sector.

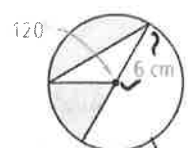


$\frac{120}{360}(\pi 4^2)$

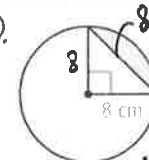
$\frac{1}{3}(16\pi) \approx \boxed{16.76 ft^3}$

Find the area of each shaded region. Round your answer to the nearest tenth.

45.



46.



$8\sqrt{2}$

$A = \frac{1}{4}(\pi \cdot 8^2)$ -

$8 \cdot 8/2$

$16\pi - \frac{64}{2} \approx$ 18.3 cm

47. A circle has a radius of 20 cm. What is the area of the smaller segment of the circle formed by a 60° arc? Round to the nearest tenth.

$r = 20$

$\frac{60}{360}(\pi(20)^2) \rightarrow \frac{1}{6}\cdot 400\pi =$

$209.4\ cm^2$

(45) $A_{sector} - A_{\Delta}$: $A_{sector} = \frac{1}{2}(\pi 6^2)$

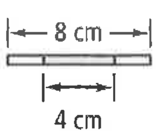
$A_{\Delta} =$ 6, 120°, $6\sqrt{3}$; 6, 60°, 3, $3\sqrt{3}$ $= \frac{1}{2}6\sqrt{3}\cdot 3$

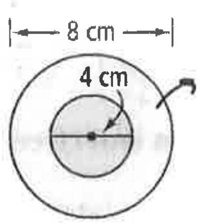
$A = \frac{1}{2}\pi(6^2) - \frac{1}{2}\cdot 18\sqrt{3} =$

$18\pi - 9\sqrt{3} \approx \boxed{41.0\ cm^2}$

Students should know how to find geometric probability.

Probability Fly A lands on the edge of the ruler at a random point. Fly B lands on the surface of the target at a random point. Which fly is more likely to land in a yellow region? Explain.





$8-4=4$

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

$P(yellow) = \frac{1}{2}$ or $\boxed{50\%}$

$P(yellow) =$

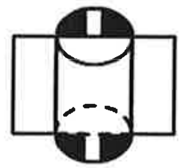
$\pi(4^2) - \pi(2^2)$

$16\pi - 4\pi = 12\pi$

$\frac{12\pi}{16\pi} = \frac{12}{16} = \frac{3}{4}$ or $\boxed{75\%}$

1 Visualization
You can determine the intersection of a solid and a plane by visualizing how the plane slices the solid to form a two-dimensional cross section.

Space Figures and Cross Sections (Lesson 11-1)
This vertical plane intersects the cylinder in a rectangular cross section.



B = base area.
P = perimeter
h = height
ℓ = slant length.
r = radius

2 Measurement
You can find the surface area or volume of a solid by first choosing a formula to use and then substituting the needed dimensions into the formula.

Surface Areas and Volumes of Prisms, Cylinders, Pyramids, and Cones (Lessons 11-2 through 11-5)

	Surface Area (S.A.)	Volume (V)
Prism	$ph + 2B$	Bh
Cylinder	$2\pi rh + 2B$	Bh
Pyramid	$\frac{1}{2}p\ell + B$	$\frac{1}{3}Bh$
Cone	$\pi r\ell + B$	$\frac{1}{3}Bh$

Surface Areas and Volumes of Spheres (Lesson 11-6)
S.A. $= 4\pi r^2$
$V = \frac{4}{3}\pi r^3$

3 Similarity
The surface areas of similar solids are proportional to the squares of their corresponding dimensions. The volumes are proportional to the cubes of their corresponding dimensions.

Areas and Volumes of Similar Solids (Lesson 11-7)
If the scale factor of two similar solids is $a : b$, then
- the ratio of their areas is $a^2 : b^2$
- the ratio of their volumes is $a^3 : b^3$

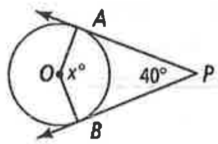
12-1 Tangent Lines

Quick Review

A **tangent** to a circle is a line that intersects the circle at exactly one point. The radius to that point is perpendicular to the tangent. From any point outside a circle, you can draw two segments tangent to a circle. Those segments are congruent.

Example

$\overrightarrow{PA}$ and $\overrightarrow{PB}$ are tangents. Find x.



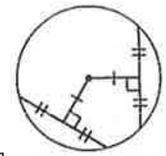
The radii are perpendicular to the tangents. Add the angle measures of the quadrilateral:

$$x + 90 + 90 + 40 = 360$$
$$x + 220 = 360$$
$$x = 140$$

12-2 Chords and Arcs

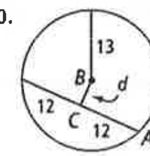
Quick Review

A **chord** is a segment whose endpoints are on a circle. Congruent chords are equidistant from the center. A diameter that bisects a chord that is not a diameter is perpendicular to the chord. The perpendicular bisector of a chord contains the center of the circle.



Example

What is the value of d?



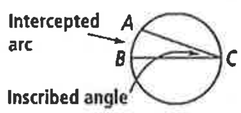
Since the chord is bisected, $m\angle ACB = 90$. The radius is 13 units. So an auxiliary segment from A to B is 13 units. Use the Pythagorean Theorem.

$$d^2 + 12^2 = 13^2$$
$$d^2 = 25$$
$$d = 5$$

12-3 Inscribed Angles

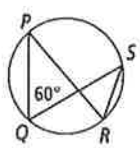
Quick Review

An **inscribed angle** has its vertex on a circle and its sides are chords. An **intercepted arc** has its endpoints on the sides of an inscribed angle, and its other points in the interior of the angle. The measure of an inscribed angle is half the measure of its intercepted arc.



Example

What is $m\widehat{PS}$? What is $m\angle R$?



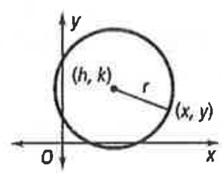
The $m\angle Q = 60$ is half of $m\widehat{PS}$, so $m\widehat{PS} = 120$. $\angle R$ intercepts the same arc as $\angle Q$, so $m\angle R = 60$.

12-5 Circles in the Coordinate Plane

Quick Review

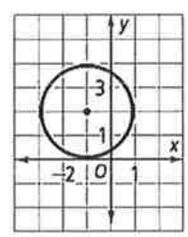
The **standard form of an equation of a circle** with center (h, k) and radius r is

$(x - h)^2 + (y - k)^2 = r^2$.



Example

Write the standard equation of the circle shown.



The center is $(-1, 2)$. The radius is 2.

The equation of the circle is

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

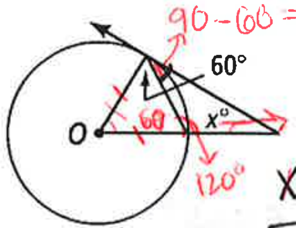
or

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

Chapter 12:

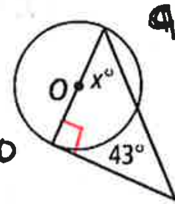
Students should be able to find missing angles and lengths (Pythagorean theorem-don't forget $(a+b)^2= a^2+ 2ab+ b^2$) based on tangent lines.

$90-60=30°$

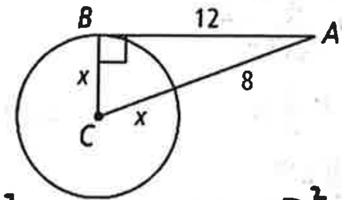


$X=180-120-30$

$\boxed{X = 30°}$



$90-43=$
$47°$



$X^2+12^2=(8+x)^2$

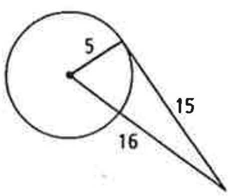
$\cancel{x^2}+12^2=64+16x+\cancel{x^2}$

$144-64=16x$

$\frac{80}{16}=\frac{16x}{16}$

$\boxed{x=5}$

Students should know how to confirm that a line is a tangent line (using Pythagorean theorem to see if it makes a right triangle)



Is one the sides of the triangle a tangent line?

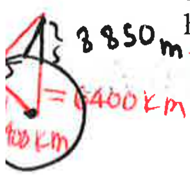
check using pythagorean theorem:

$5^2+15^2=16^2 \rightarrow 25+225 \neq 256$

$a^2+b^2 \neq c^2$ so NOT a tangent line.

Students should be able to find distances of tall objects to the horizon. (Think mt. Everest and Canada's CN tower problem from 12.1).

The peak of Mt. Everest is about 8850 m above sea level. About how many kilometers is it from the peak of Mt. Everest to the horizon if the Earth's radius is about 6400 km? Draw a diagram to help you solve the problem.



$= 8.85 km$

$a^2+b^2=c^2 \longrightarrow$

~~$(6400)^2+x^2=(6400+8.85)^2$~~

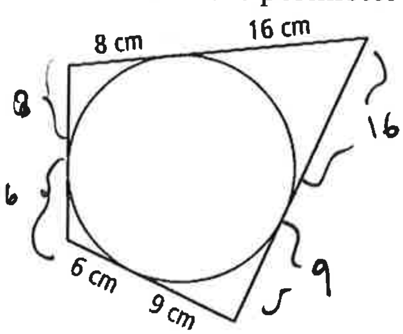
$x^2+6400^2=(6400+8.85)^2$

$X=\sqrt{6408.85^2-6400^2}$

$\approx \boxed{336.7 \text{ km}}$

Students should know how to find the perimeter of shapes given that they are tangent lines.

Find the perimeter of the shape below.



$(8+16)+(16+9)+(6+9)+(6+8)=\boxed{78cm}$

Students should know how to find missing lengths and angles based on chord theorems.

5

Algebra Find the value of x in $\odot O$.

$15^2 - 9^2 = (\frac{1}{2}x)^2$

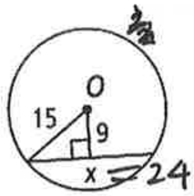
$\sqrt{15^2 - 9^2} = \sqrt{(\frac{1}{2}x)^2}$

$\sqrt{144} = \frac{1}{2}x$

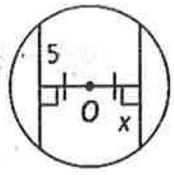
$2 \cdot 12 = \frac{1}{2}x \cdot 2$

$\boxed{X = 24}$

5.

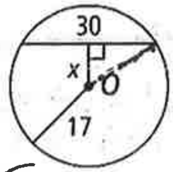


6.



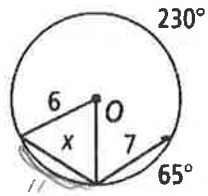
$\boxed{X = 5}$

7.



$\sqrt{17^2 - 15^2} = \sqrt{x^2} \rightarrow \boxed{X = 8}$

8.



$360 - 230 - 65 = 65°$

$65° \rightarrow$ therefore $\boxed{X = 7}$

Students should know how to find missing angles and arc measures based on the properties of inscribed and central angles.

Find the value of each variable. Lines that appear to be tangent are tangent, and the dot represents the center.

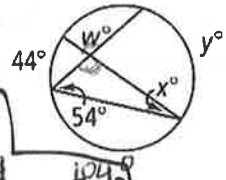
1

$x = \frac{1}{2}(44) = 22°$

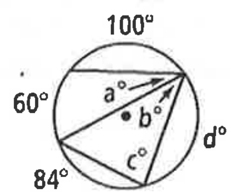
$y = 2(54) = 108°$

$w = 180 - 22 - \cancel{108}\ 54 = \cancel{50}\ 104°$

9.



10.



10 $a = \frac{1}{2}(60) = 30°$

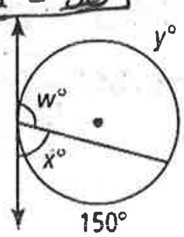
$b = \frac{1}{2}(84) = 42°$

$c = \frac{1}{2}(100 + 60) = 80°$

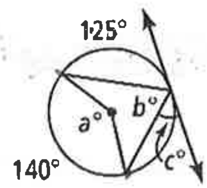
$d = 360 - (100 + 60 + 84) = 116°$

1c vertical ∠s

11.



12.



11. $X = \frac{1}{2}(150) = 75°$

$Y = 360 - 150 = 210°$

$w = \frac{1}{2}(210) = 105°$

12 $a = 140°$

$b = \frac{1}{2}(140°) = 70°$

$c = \frac{1}{2}(360 - 140 - 125) = 47.5°$

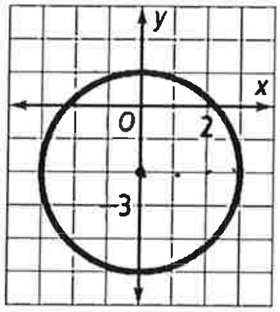
Students should know the standard form of an equation of a circle and find the equation by given points.

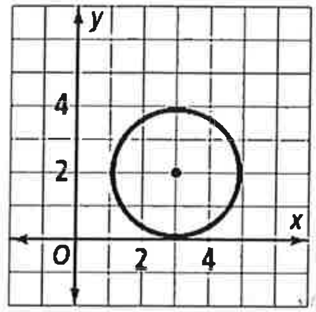
Write the standard equation of each circle below.

$r = 3$

center $= (0, -2)$

$\boxed{9 = x^2 + (y+2)^2}$

22. 

23. 

$r = 2$

cntr: $(3, 2)$

$\boxed{(x-3)^2 + (y-2)^2 = 4}$

24. What is the standard equation of the circle with radius 5 and center $(-3, -4)$?

$(x+3)^2 + (y+4)^2 = 25$

25. What is the standard equation of the circle with center (1, 4) that passes through $(-2, 4)$?

1) Find r^2

$r^2 = (-2-1)^2 + (4-4)^2 = 9$

$\boxed{9 = (x-1)^2 + (y-4)^2}$

26. What are the center and radius of the circle with equation $(x - 7)^2 + (y + 5)^2 = 36$?

radius $= \sqrt{36} = 6$ center $(7, -5)$

What is the equation of a circle with diameter AB where A(3,0) and B(7,0).

1) Find cntr. Mdpt. Formula: $\left(\frac{3+7}{2}, \frac{0+0}{2}\right) = (5, 0)$

2) Find r^2 (use either A or B for (x, y))

$r^2 = (7-5)^2 + (0-0)^2 = 4$

$\boxed{4 = (x-5)^2 + y^2}$

~~Quadrilateral~~

~~① 4 sided polygon~~

~~Parallelogram [Prove by..]~~

~~① opposites sides ≅ (both pr.)~~

~~• [opp. sides are = in length]~~

~~② Consecutive angles are supplementary~~

~~• [Prove 1 ∠ is supplementary to both consecutive ∠s]~~

~~③ opposite ∠s are ≅ (both pr)~~

~~• [Prove both pr of opposite ∠s are ≅]~~

~~④ diagonals bisect eachother~~

~~• [prove diagonals bisect]~~

~~⑤ • [prove 1 pr of opposite sides are ≅ & ∥]~~

What is the surface area of a prism whose bases each have area 16 m^2 and whose lateral surface area is 64 m^2? $LA = 64\,m^2 \quad B = 16\,m^2$

$SA = L \cdot A + 2B \Rightarrow S.A = 64 + 2(16) = 64 + 32 = \boxed{96\,m^2}$

A cylindrical container with radius 12 cm and height 7 cm is covered in paper. What is the area of the paper? Round to the nearest whole number.

(A) 528 cm^2 (B) 835 cm^2 (C) 1055 cm^2 (D) 1432 cm^2

$S.A_{\text{cylinder}} = 2\pi r h + 2 \cdot \pi r^2 \Rightarrow 2\pi \cdot 12 \cdot 7 + 2\pi(12^2)$

$168\pi + 288\pi =$

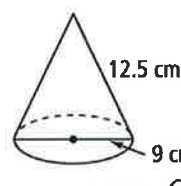
$456\pi = \boxed{1432\ cm^2}$

. What is the surface area of the cone, to the nearest whole number?

(F) 221 cm^2 (H) 304 cm^2

(G) 240 cm^2 (I) 620 cm^2

11 m



$r = 9/2 = 4.5$

$\ell = 12.5$

$S.A = \pi r \ell + B = \pi r \ell + \pi r^2 \rightarrow \pi(4.5)(12.5) + \pi(4.5)^2$

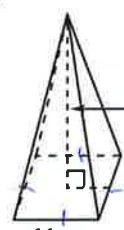
$76.5(\pi) = 240.3 \approx$

$\boxed{240\,cm^2}$

. What is the lateral area of the square pyramid, to the nearest whole number?

(A) 165 m^2 (C) 330 m^2

(B) 176 m^2 (D) 351 m^2

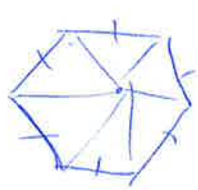


$L.A = \frac{1}{2}(P)\ell$

$P = 11 \times 4 = 44$

$\ell = 15$

$\rightarrow \frac{1}{2} \cdot 44 \cdot 15 = \boxed{330\,m^2}$



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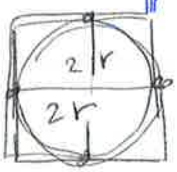
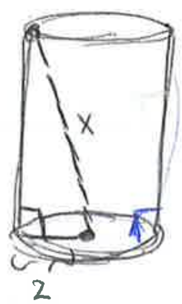
A sphere of radius r inside a cube touches each one of the six sides of the cube. What is the volume of the cube, in terms of r?



$V = b \cdot h \cdot w$

$V = 2r \cdot 2r \cdot 2r = (2r)^3 = 8r^3$

The height of a right circular cylinder is 5 and the diameter of its base is 4. What is the distance from the center of one base to a point on the circumference of the other base?

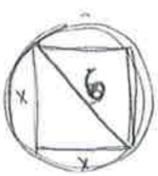


$x^2 = 5^2 + 2^2$

$x = \sqrt{25+4}$

$x = \sqrt{29} \approx 5.4$

What is the maximum possible volume of a cube, in cubic inches, that could be inscribed inside a sphere with a radius of 3 inches?



$x^2 + y^2 = 36$

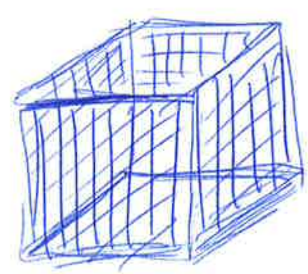
$2x^2 = 36$

$x = \sqrt{18}$

$(\sqrt{18})^3 \approx$

$\approx (4.24264)^3 \approx 76.4 \text{ in}^3$

. What is the lateral surface area of a cube with side length 9 cm?



$L.A = P \times h$

$P = 4 \times 9$

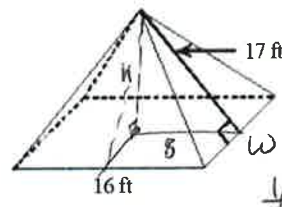
$h = 9$

$L.A = 4 \times 9 \times 9 = 81 \times 4 = 324 \text{ cm}^2$

$h^2 + 8^2 = 17^2$

$h = \sqrt{289 - 64} = \sqrt{225} = 15$

. Find the volume of the pyramid shown.



Not drawn to scale

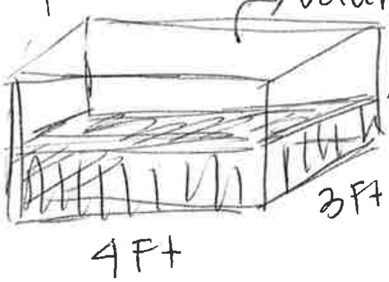
Volume $= \frac{1}{3} B \cdot h$

$\frac{1}{3}(16)^2 \cdot 15 = \boxed{1280\ ft^3}$

The interior dimensions of a rectangular fish tank are 4 feet long, 3 feet wide, and 2 feet high. The water level in the tank is 1 foot high. All of the water in this tank is poured into an empty second tank. If the interior dimensions of the second tank are 3 feet long, 2 feet wide, and 4 feet high, what is the height of the water in the second tank?

1st tank

volume of water $= 4 \times 3 \times 1 = 12\ ft^3$

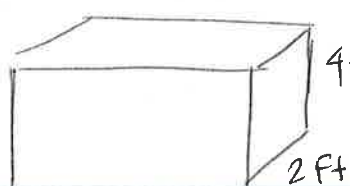


2nd Tank $= 3ft \times 2ft \times h = 12$

$6 \times h = 12$

$h = 2$

height of water = 2ft



What is the maximum number of rectangular blocks measuring 3 inches by 2 inches by 1 inch that can be packed into a cube-shaped box whose interior measures 6 inches on an edge?

Box $= 6^3 = 216 in^3$

Block $= 3 \times 2 \times 1 = 6 in^3$

$216/6 =$ 36 blocks

7. If each edge of cube M with a unit length of 3 is increased by 50%, creating a second cube B, then what is the volume of cube B?

$$(4.5)^3 = 91.125 \text{ units}^3$$

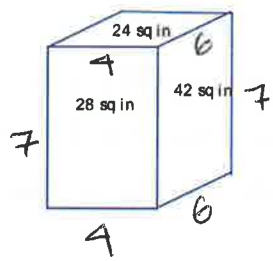
18. How many boxes whose length is 3 inches, width is 2 inches, and height is 1 inch can fit into a box with dimensions length is 300 inches, width is 200 inches, and height is 100 inches.

A) 100,000 B) 10,000 C) 1,000 D) 1,000,000

$$\frac{300 \times 200 \times 100}{3 \times 2 \times 1} = (100)^3 = 1{,}000{,}000$$

17. The surface areas of the rectangular prism shown are given. If the lengths of the edges are integers, what is the volume in cubic inches?

A) 94
B) 168
C) 188
D) 1,152
E) 1,176



Volume = $L \times w \times h$

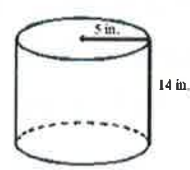
$4 \times 6 \times 7 = 168 \text{ in}^2$

. If each edge of a cube is doubled, the volume is multiplied by:

$V_1 = x^3$ $V_2 = (2x)^3 = 8x^3$

if each edge is doubled - then volume is 8 times greater

. Find the exact value of the volume of the cylinder shown.



Not drawn to scale

~~Cylinder = $2\pi r h + 2B$~~

~~$2\pi \cdot 5 \cdot 14 + 2(\pi \cdot 5^2)$~~

~~$140\pi + 50\pi$~~

~~$\boxed{190\pi}$~~

Cylinder = $B \cdot h$

$\pi(5^2) \cdot h$

$\pi \cdot 25 \cdot 14 = 350\pi = 1099.55 \approx 1100 \text{ in}^3$

~~$\pi(5)^2 14$~~

~~$25 \cdot 14 = 350 \cdot 3.14 = 1099.5 \approx 1100 \text{ in}^3$~~

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