Geometric Terminology

Across

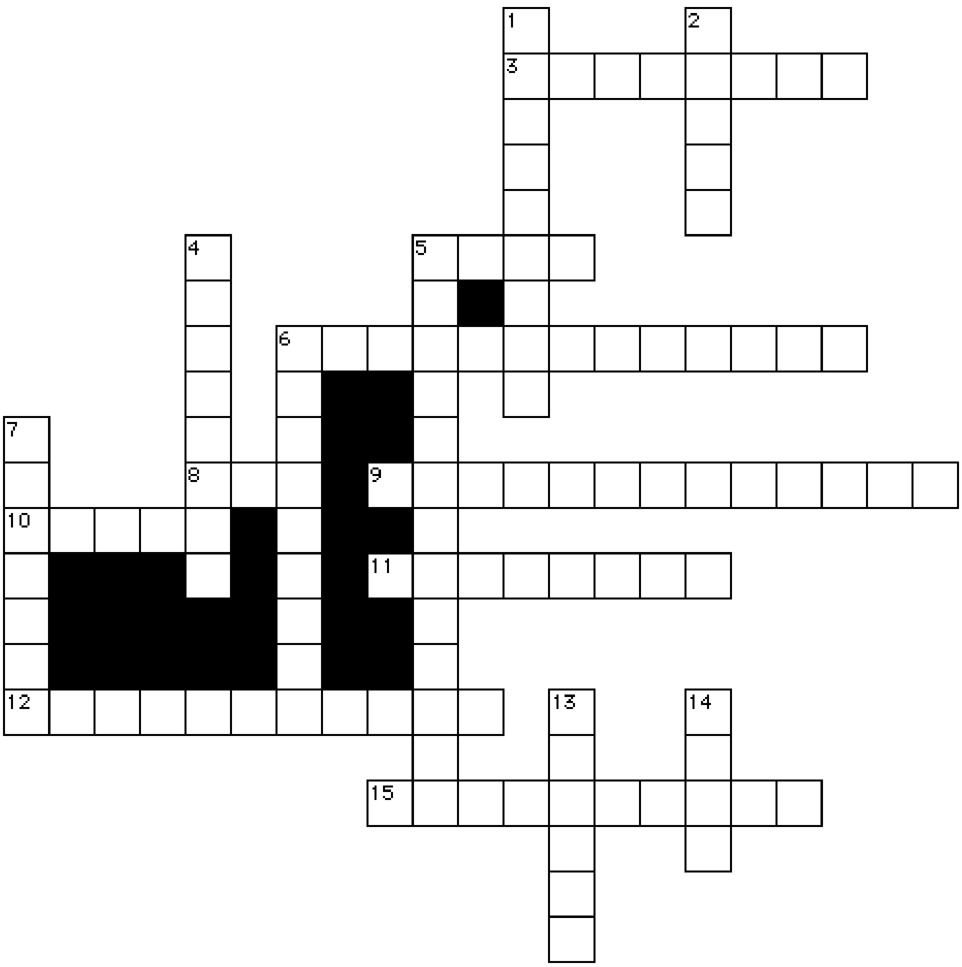
3. An angle measuring 180°.
5. Non–coplanar, non–intersecting lines.
6. Two angles that add to 90°.
8. In a right triangle, one of the shorter sides.
9. Lines that form right angles.
10. An angle measuring less than 90°.
11. Congruent angles formed by intersecting lines.
12. A polygon with all sides equal.
15. Longest side of a right triangle.

Down

1. Triangle with at least two congruent sides.
2. An angle measuring 90°.
4. Coplanar lines that never intersect.
5. Two angles that add to 180°.
6. Equal.
7. Triangle with no equal sides.
13. An angle measuring more than 90°.
14. Number of sides in a quadrilateral.

Word List

leg
skew
acute
obtuse
scalene
isosceles
equilateral
hypotenuse
perpendicular
complementary
supplementary
congruent
parallel
straight
vertical
right
four



Angles of a Triangle

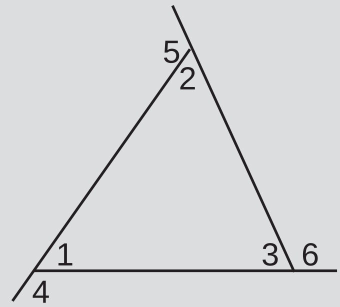
→The three angles in a triangle add to 180°: (∠1 + ∠2 + ∠3 = 180°).

If each side is extended in one direction, exterior angles are formed: (∠4, ∠5, and ∠6).

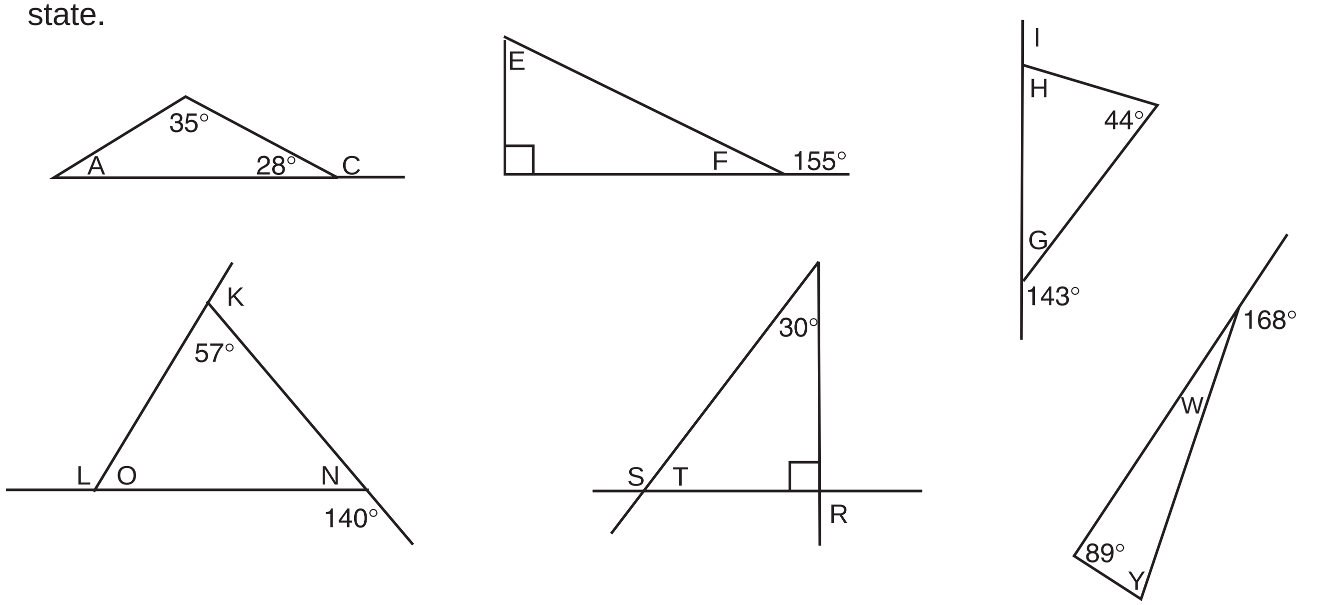
→An interior angle and its adjacent exterior angle are supplements: (∠1 + ∠4 = 180°).

→The measure of an exterior angle is equal to the sum of its remote interior angles: (∠2 + ∠3 = ∠4).

→All three exterior angles add to 360°: (∠4 + ∠5 + ∠6 = 360°).



Place the letter in the blank above its measure to reveal an interesting fact about our 49th state.



___ ___ ___   ___ ___   ___ ___ ___ ___ ___ ___ ___   ___ ___
60° 99° 65°   152° 83°   117° 120° 60° 97° 81° 40° 65°   83° 25°

___ ___ ___ ___ ___ ___   ___ ___   ___ ___ ___ ___ ___ ___
117° 97° 117° 120° 123° 117°   81° 120°   97° 83° 40° 37° 65° 90°

___ ___ ___ ___   ___ ___ ___   ___ ___ ___ ___ ___ ___
60° 99° 117° 40°   60° 99° 65°   65° 40° 60° 81° 90° 65°

___ ___ ___ ___ ___ ___ ___ ___ ___   ___ ___   ___ ___ ___
152° 83° 117° 120° 60° 97° 81° 40° 65°   83° 25°   60° 99° 65°

___ ___ ___ ___ ___   ___ ___ ___ ___ ___ – ___ ___ ___ ___ ___
97° 83° 12° 65° 90°   25° 83° 90° 60° 79° – 65° 81° 37° 99° 60°

___ ___ ___ ___ ___ ___.
120° 60° 117° 60° 65° 120°

Using Algebra with Complements and Supplements

Remember:

x = the angle

$90° - x$ = its complement

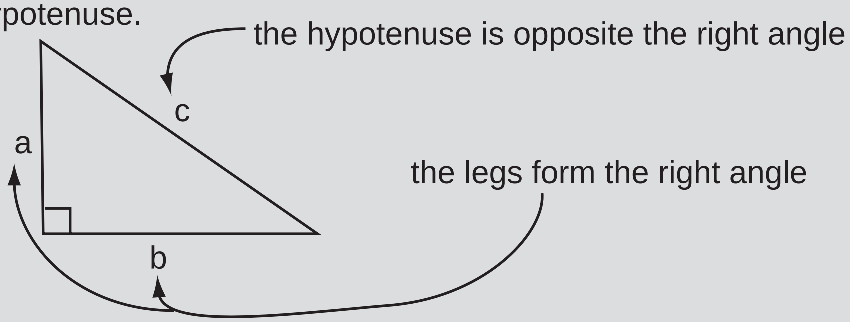
$180° - x$ = its supplement

Set up an equation for each problem, then solve for x. Use your answer for x to find the angle measures for the problem.

1. The complement of an angle is five times the measure of the angle itself. Find the angle and its complement.
2. The supplement of an angle is 30° less than twice the measure of the angle itself. Find the angle and its supplement.
3. The supplement of an angle is twice as large as the angle itself. Find the angle and its supplement.
4. The complement of an angle is 6° less than twice the measure of the angle itself. Find the angle and its complement.
5. Three times the measure of the supplement of an angle is equal to eight times the measure of its complement. Find the angle, its complement, and its supplement.
6. Two angles are congruent and complementary. Find their measures.
7. Two angles are congruent and supplementary. Find their measures.
8. The complement of an angle is twice as large as the angle itself. Find the angle and its complement.
9. The complement of an angle is 10° less than the angle itself. Find the angle and its complement.
10. The supplement of an angle is 20° more than three times the angle itself. Find the angle and its supplement.

The Pythagorean Theorem

In a right triangle, the sum of the squares of the legs is equal to the square of the hypotenuse.



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

Solve for the missing side. Use the decoder to find out what the numbers 3, 6, 10, and 15 have in common.

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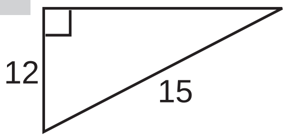

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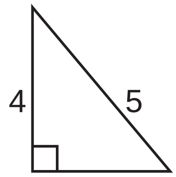

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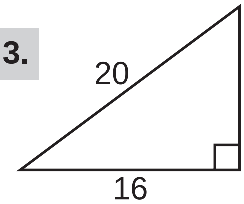

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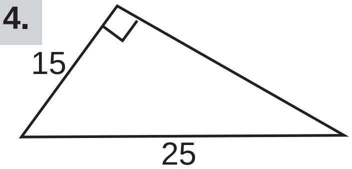

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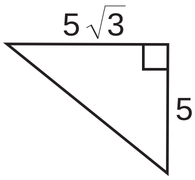

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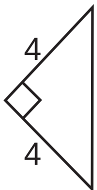

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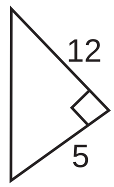

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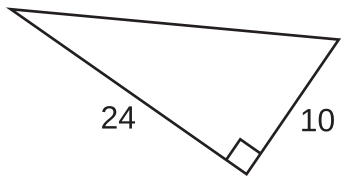

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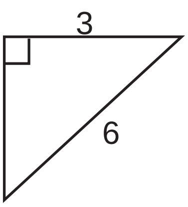

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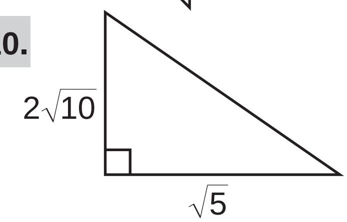

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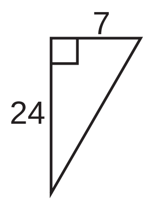

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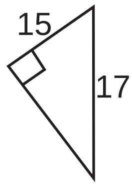

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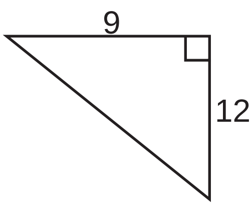

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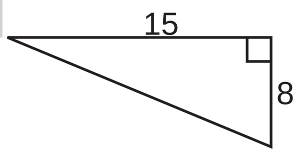


A	B	E	G	H	I	L	M	N	R	S	T	U	Y
3	$4\sqrt{2}$	$3\sqrt{3}$	8	9	10	12	13	15	17	20	$3\sqrt{5}$	25	26

____ ____ ____ ____   ____ ____ ____   ____ ____ ____
10 1 9 8   2 14 9   2 3 3

____ ____ ____ ____ ____ ____ ____ ____ ____ ____
10 14 5 2 13 12 11 3 2 14

____ ____ ____ ____ ____ ____ ____ .
13 11 7 6 9 14 4

Congruent Triangles

Three methods of proving triangles congruent:

Side–Side–Side (SSS)

3 sides of one triangle are congruent to 3 sides of another triangle.

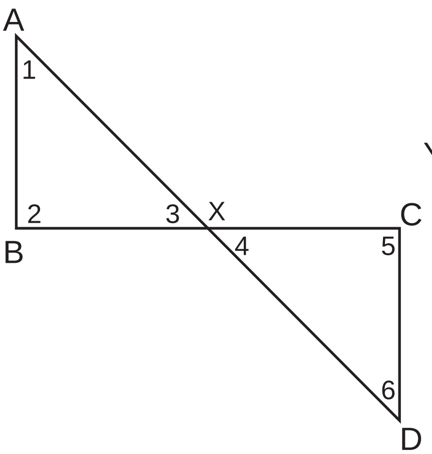
Side–Angle–Side (SAS)

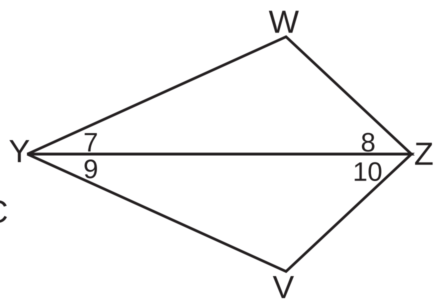
2 sides and the included angle of one triangle are congruent to 2 sides and the included angle of another triangle.

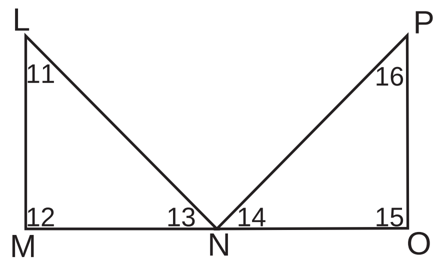
Angle–Side–Angle (ASA)

2 angles and the included side of one triangle are congruent to 2 angles and the included side of another triangle.

Use the diagrams and the information given to determine which of the above methods will prove the triangles congruent. Circle the letters beneath the correct method in the chart to reveal the mathematician who developed the symbol for congruence (≅).







1. X is the midpoint of $\overline{AD}$ and $\overline{BC}$
2. $\overline{AB} \perp \overline{BC}$; $\overline{DC} \perp \overline{BC}$; BX = XC
3. $\overline{AB} \parallel \overline{CD}$; AB = CD
4. YW = YV; WZ = VZ
5. $\angle 7 = \angle 9$; $\angle 8 = \angle 10$
6. WZ = VZ; $\overline{YZ}$ bisects $\angle WZV$
7. $\overline{AD}$ and $\overline{BC}$ bisect each other
8. N is the midpoint of $\overline{MO}$; LM = PO; LN = PN
9. $\overline{LM}$ and $\overline{PO}$ are $\perp$ to $\overline{MO}$; $\angle 11 = \angle 16$; LM = PO
10. N is the midpoint of $\overline{MO}$; $\angle 12 = \angle 15$; $\angle 13 = \angle 14$
11. LM = PO; MN = NO; LN = PN
12. $\overline{ZY}$ bisects $\angle WYV$; WY = YV
13. $\angle 1 = \angle 6$; X is the midpoint of $\overline{AD}$
14. N is the midpoint of $\overline{MO}$; LN = PN; $\angle 13 = \angle 14$
15. $\overline{YZ}$ bisects $\angle WYV$ and $\angle WZV$
16. ΔWYZ and ΔVYZ are equilateral

	SSS	SAS	ASA
1.	A	G	R
2.	C	H	O
3.	I	M	T
4.	T	E	D
5.	E	S	F
6.	T	R	H
7.	A	I	L
8.	E	Z	P
9.	L	M	D
10.	B	P	L
11.	E	A	S
12.	C	I	A
13.	L	O	B
14.	Q	N	P
15.	R	M	I
16.	Z	O	S

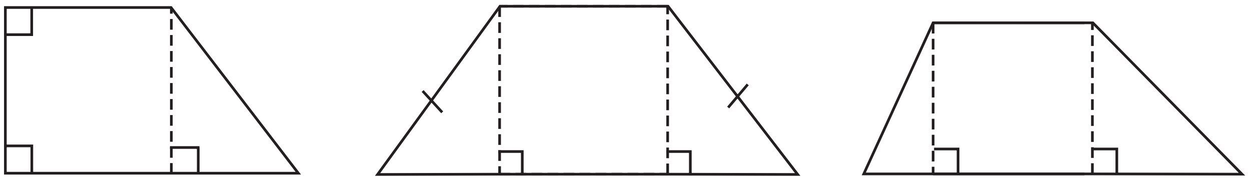
____ ____ ____ ____ ____ ____ ____ ____ ____

____ ____ ____ ____ ____ ____ ____

Trapezoids

All trapezoids have exactly one pair of parallel sides (called bases).
An isosceles trapezoid has congruent legs, base angles, and diagonals.
A right trapezoid has two right angles.

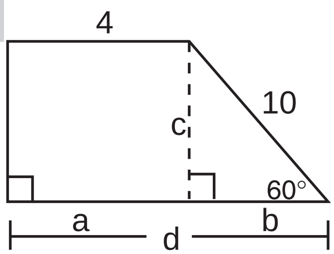
Any trapezoid can be divided into a rectangle and triangle(s) by drawing altitudes between the bases. This will aid in finding measures of segments and angles.



right trapezoid   isosceles trapezoid   general trapezoid

Use the properties of trapezoids, rectangles, and right triangles to find the missing measures. Shade the answers below to find which U.S. state has borders that closely resemble a right trapezoid.

1.



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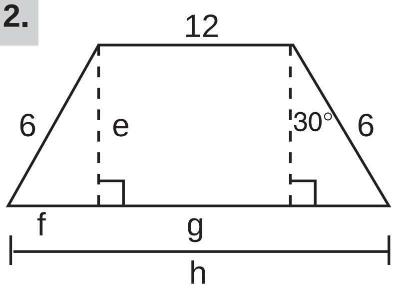

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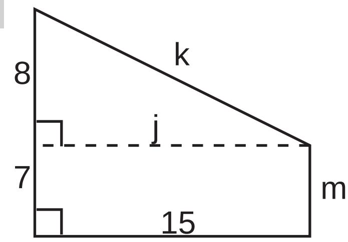

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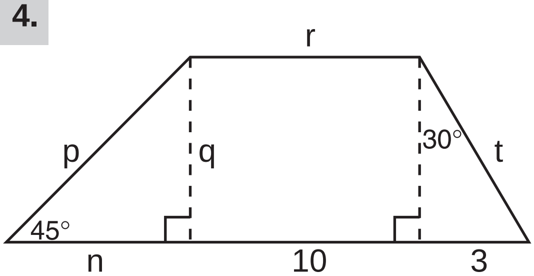
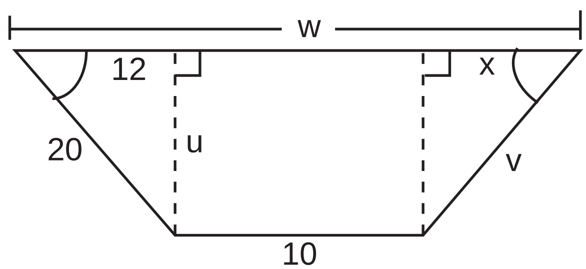
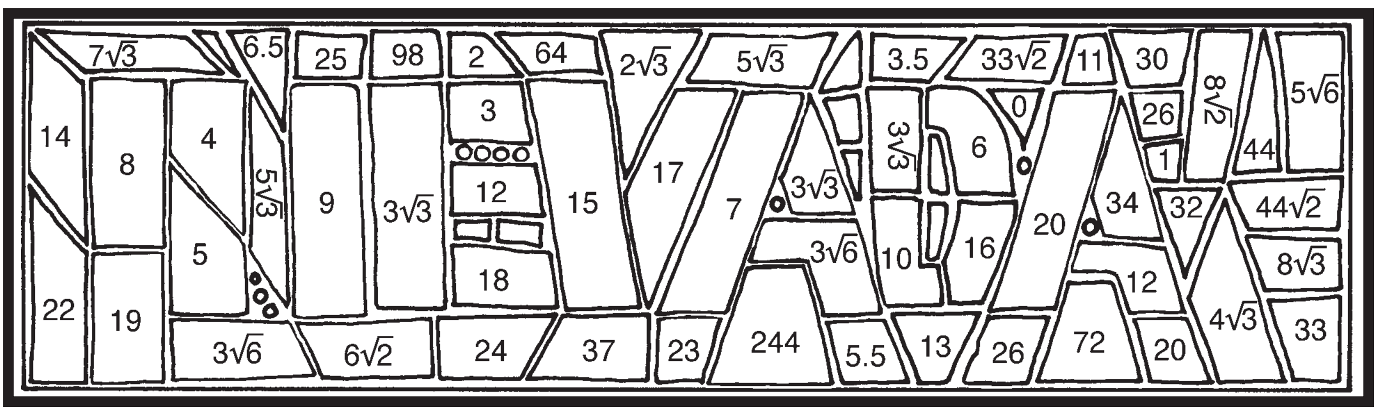


5.





Volume of Regular Right Pyramids and Cones

To find the volume of either of these solids, use this formula:

$$\text{Volume} = \frac{1}{3}\,(\text{Area of base})\,(\text{altitude of the solid})$$

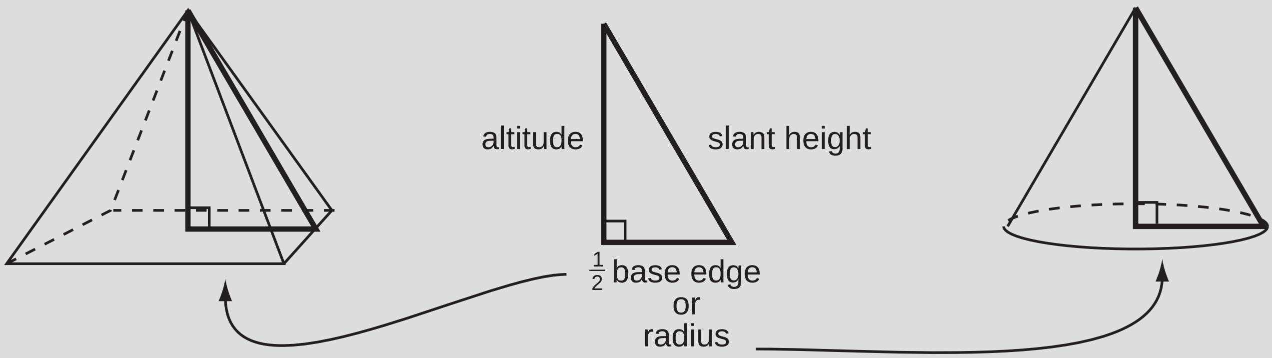
<u>Pyramids</u>

The base is a regular polygon; the altitude is the distance from the center of the base to the vertex (tip) of the pyramid.

<u>Cones</u>

The base is a circle; the altitude is the distance from the center of the circle to the vertex (tip) of the cone.

Notice the right triangle formed in each of these solids. Use this triangle and the Pythagorean theorem to solve for needed measures when they are not given.



Find the volume of the solids described below. Use the decoder to reveal the name of the first woman to appear on a U.S. postage stamp.

1. Regular square pyramid with base edge 8 cm and altitude 12 cm.
2. Cone with radius 6 cm and altitude 8 cm.
3. Regular square pyramid with base edge 5 m and altitude 3 m.
4. Cone with radius 10 m and altitude 9 m.
5. Regular square pyramid with base edge 3 in. and altitude 5 in.
6. Cone with diameter 16 in. and altitude 6 in.
7. Regular square pyramid with base edge 12 cm and slant height 10 cm.
8. Cone with radius 15 mm and slant height 30 mm.
9. Regular square pyramid with altitude 20 mm and slant height 25 mm.
10. Cone with altitude 10 ft. and slant height 26 ft.
11. Regular <u>triangular</u> pyramid with base edge 8 cm and altitude 12 cm.

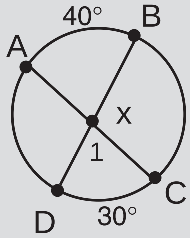
1920π ft^3	300π m^3	15 in.^{3}	6000 mm^3	$1125\pi\sqrt{3}$ mm^3	128π in.^{3}	$64\sqrt{3}$ cm^3	384 cm^3	25 m^3	256 cm^3	96π cm^3
A	G	H	I	M	N	O	R	S	T	W

___ ___ ___ ___ ___ ___   ___ ___ ___ ___ ___ ___ ___ ___ ___ ___

8 10 7 1 5 10   2 10 3 5 9 6 4 1 11 6

Angles Formed by Chords, Secants, and Tangents

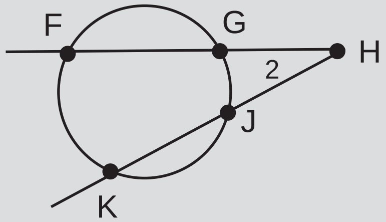
Angles formed by chords: Add two intercepted arcs and divide by two.

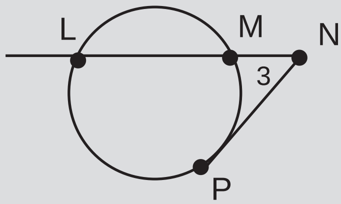


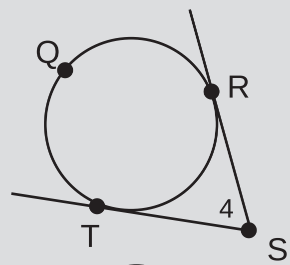
to find the measure of ∠1:

$$\frac{\overset{\frown}{AB} + \overset{\frown}{CD}}{2} = \frac{40 + 30}{2} = \frac{70}{2} = 35°$$

Angles formed by secants and tangents: Subtract smaller intercepted arc from larger intercepted arc and divide by two.







$\angle 2 = \frac{\overset{\frown}{FK} - \overset{\frown}{GJ}}{2}$ $\angle 3 = \frac{\overset{\frown}{LP} - \overset{\frown}{MP}}{2}$ $\angle 4 = \frac{\overset{\frown}{TQR} - \overset{\frown}{TR}}{2}$

Remember: angles INSIDE : ADD arcs and divide by 2
angles OUTSIDE : SUBTRACT arcs and divide by 2

Use the diagrams above and the information given to find the missing measures. Use the decoder to reveal the basketball player who scored 100 points in a game on March 2, 1962.

1. $\overset{\frown}{AB} = 60°$, $\overset{\frown}{DC} = 50°$, ∠1 = ________________°
2. $\overset{\frown}{AB} = 50°$, $\overset{\frown}{AD} = 160°$, $\overset{\frown}{BC} = 120°$, ∠1 = _____°
3. $\overset{\frown}{AD} = 50°$, $\overset{\frown}{DC} = 25°$, $\overset{\frown}{CB} = 140°$, ∠1 = ______°
4. $\overset{\frown}{FK} = 75°$, $\overset{\frown}{GJ} = 25°$, ∠2 = ________________°
5. $\overset{\frown}{FG} = 120°$, $\overset{\frown}{GJ} = 40°$, $\overset{\frown}{JK} = 100°$, ∠2 = ______°
6. $\overset{\frown}{FK} = 110°$, $\overset{\frown}{KJ} = 90°$, $\overset{\frown}{FG} = 120°$, ∠2 = ______°
7. $\overset{\frown}{LP} = 145°$, $\overset{\frown}{MP} = 45°$, ∠3 = ________°
8. $\overset{\frown}{LM} = 90°$, $\overset{\frown}{MP} = 90°$, ∠3 = _________°
9. $\overset{\frown}{LM} = 100°$, $\overset{\frown}{LP} = 210°$, ∠3 = _______°
10. $\overset{\frown}{QT} = 120°$, $\overset{\frown}{QR} = 130°$, ∠4 = _______°
11. $\overset{\frown}{QR} = 155°$, $\overset{\frown}{TR} = 115°$, ∠4 = _______°
12. $\overset{\frown}{QT} = 125°$, $\overset{\frown}{TR} = 85°$, ∠4 = ________°

A	B	C	E	H	I	L	M	N	R	T	W
30°	85°	80°	70°	55°	50°	35°	40°	65°	45°	95°	25°

____ ____ ____ ____   ____ ____ ____ ____ ____ ____ ____ ____ ____ ____ ____
4 7 6 12   9 1 5 2 3 10 8 6 5 7 11