3-D Figures:

Prism: $V = Bh$

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

Cylinder: $V = \pi r^2 h$; $SA = 2\pi rh + 2\pi r^2$

Cone: $V = \frac{1}{3}\pi r^2 h$; $SA = s\pi r + \pi r^2$

Sphere: $V = \frac{4}{3}\pi r^3$; $SA = 4\pi r^2 = \pi d^2$

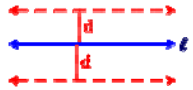
Regular Solids:

Tetrahedron – 4 faces
Cube – 6 faces
Octahedron – 8 faces
Dodecahedron – 12 faces
Icosahedron – 20 faces

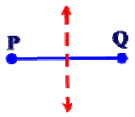
Locus Theorems:

Fixed distance from point.

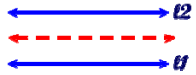
Fixed distance from a line.



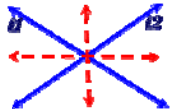
Equidistant from 2 points.



Equidistant 2 parallel lines.



Equidistant from 2 intersecting lines



Polygon Interior/Exterior Angles:

Sum of int. angles = $180(n-2)$

Each int. angle (regular) = $\frac{180(n-2)}{n}$

Sum of ext. angles = 360

Each ext. angle (regular) = $\frac{360}{n}$

Triangles:

By Sides:
Scalene – no congruent sides
Isosceles – 2 congruent sides
Equilateral – 3 congruent sides

By Angles:
Acute – all acute angles
Right – one right angle
Obtuse – one obtuse angle
Equiangular – 3 congruent angles(60º)
Equilateral $\leftrightarrow$ Equiangular

Exterior angle of a triangle equals the sum of the 2 non-adjacent interior angles.

Mid-segment of a triangle is parallel to the third side and half the length of the third side.

Congruent Triangles

SSS
SAS
ASA
AAS
HL (right triangles only)

NO donkey theorem
(SSA or ASS)

CPCTC (use after the triangles are congruent)

Related Conditionals:

Converse: switch if and then
Inverse: negate if and then
Contrapositive: inverse of the converse (contrapositive has the same truth value as the original statement)

Inequalities:

--Sum of the lengths of any two sides of a triangle is greater than the length of the third side.
--Longest side of a triangle is opposite the largest angle.
--Exterior angle of a triangle is greater than either of the two non-adjacent interior angles.

Pythagorean Theorem:

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

Converse: If the sides of a triangle satisfy $c^2 = a^2 + b^2$ then the triangle is a right triangle.

Similar Triangles:

AA
SSS for similarity
SAS for similarity
Corresponding sides of similar triangles are in proportion.

Mean Proportional in Right Triangle:

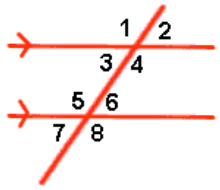
Altitude Rule:

$$\frac{\text{part hyp}}{\text{altitude}} = \frac{\text{altitude}}{\text{other part hyp}}$$

Leg Rule:

$$\frac{\text{hyp}}{\text{leg}} = \frac{\text{leg}}{\text{projection}}$$

Parallels: If lines are parallel …



Corresponding angles are equal.
$m\angle 1 = m\angle 5$, $m\angle 2 = m\angle 6$, $m\angle 3 = m\angle 7$, $m\angle 4 = m\angle 8$
Alternate Interior angles are equal.
$m\angle 3 = m\angle 6$, $m\angle 4 = m\angle 5$
Alternate Exterior angles are equal.
$m\angle 1 = m\angle 8$, $m\angle 2 = m\angle 7$
Same side interior angles are supp.
$m\angle 3 + m\angle 5 = 180$, $m\angle 4 + m\angle 6 = 180$

Quadrilaterals:

Parallelogram:
opp. sides parallel
opp sides =
opp angles =
consec. angles supp
diag bis each other
Rectangle: add 4 rt angles, diag. =
Rhombus: add 4 = sides, diag. perp, diag bisect angles.
Square: All from above.

Trapezoid:
Only one set parallel sides.

Median of trap is parallel to both bases and = ½ sum bases.
Isosceles Trap:
legs =
base angles =
diagonals =
opp angles supp

Transformations:

$r_{x-axis}(x,y) = (x,-y)$
$r_{y-axis}(x,y) = (-x,y)$
$r_{y=x}(x,y) = (y,x)$
$r_{y=-x}(x,y) = (-y,-x)$
$r_{origin}(x,y) = (-x,-y)$
$T_{a,b}(x,y) = (x+a, y+b)$
$D_k(x,y) = (kx,ky)$
$R_{90°}(x,y) = (-y,x)$
$R_{180°}(x,y) = (-x,-y)$
$R_{270°}(x,y) = (y,-x)$

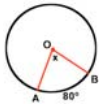
Glide reflection is composition of a reflection and a translation.

Isometry – keeps length.

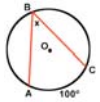
Orientation – label order

Circle Segments
In a circle, a radius perpendicular to a chord bisects the chord.
Intersecting Chords Rule:
(segment part)•(segment part) =
(segment part)•(segment part)
Secant-Secant Rule:
(whole secant)•(external part) =
(whole secant)•(external part)
Secant-Tangent Rule:
(whole secant)•(external part) = (tangent)^2
Hat Rule: Two tangents are equal.

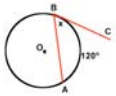
Circle Angles:
Central angle = arc



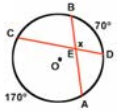
Inscribed angle = half arc



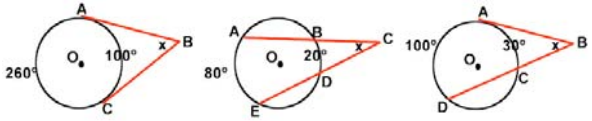
Angle by tangent/chord = half arc



Angle formed by 2 chords = half the sum of arcs



Angle formed by 2 tangents, or 2 secants, or a tangent/secant = half the difference of arcs



Slopes and Equations:

$$m = \frac{vertical\ change}{horizontal\ change} = \frac{y_2 - y_1}{x_2 - x_1}.$$

$y = mx + b$ slope-intercept

$y - y_1 = m(x - x_1)$ point-slope

Coordinate Geometry Formulas:
Distance Formula:

$$d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$$

Midpoint Formula:

$$(x, y) = \left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2}\right)$$

Circles:
Equation of circle center at origin:
$x^2 + y^2 = r^2$ where r is the radius.
Equation of circle not at origin:
$(x-h)^2 + (y-k)^2 = r^2$ where (h,k) is the center and r is the radius.