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

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 ↔ Equiangular

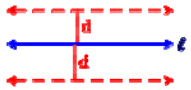
Exterior angle of a triangle equals the sum of the 2 non-adjacent interior angles.

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

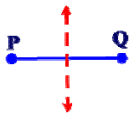
Locus Theorems:

Fixed distance from point.

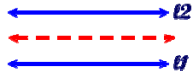
Fixed distance from a line.



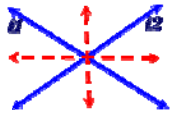
Equidistant from 2 points.



Equidistant 2 parallel lines.



Equidistant from 2 intersecting lines



Congruent Triangles

SSS
SAS
ASA
AAS
HL (right triangles only)

NO donkey theorem (SSA or ASS)

CPCTC (use after the triangles are congruent)

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) = $\frac{360}{n}$

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:

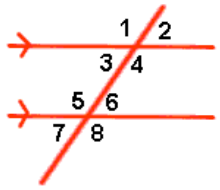
Altitude Rule:

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

Leg Rule:

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

Parallels: If lines are parallel …



Corresponding angles are equal.
$m\angle1=m\angle5$, $m\angle2=m\angle6$, $m\angle3=m\angle7$, $m\angle4=m\angle8$
Alternate Interior angles are equal.
$m\angle3=m\angle6$, $m\angle4=m\angle5$
Alternate Exterior angles are equal.
$m\angle1=m\angle8$, $m\angle2=m\angle7$
Same side interior angles are supp.
$m\angle3 + m\angle5=180$, $m\angle4 + m\angle6=180$

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)

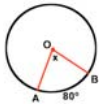
Secant-Secant Rule:
(whole secant)•(external part) = (whole secant)•(external part)

Secant-Tangent Rule:
(whole secant)•(external part) = (tangent)^2

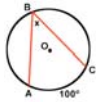
Hat Rule: Two tangents are equal.

Circle Angles:

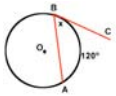
Central angle = arc



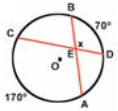
Inscribed angle = half arc



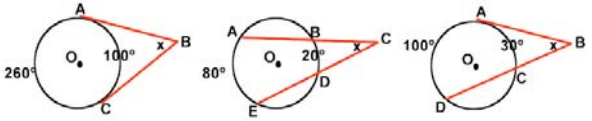
Angle by tangent/chord = half arc



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.