proof - lat. probare - to test, prove
demonstrate - proof + action, lat. de - entirely; monstrare - to point out
Geometry - measurement of the earth

TERMS LABELS
point - position on a plane // has 0 dimensions
line segment - connection between two endpoints // 1 dimensional
endpoints - the last points from each side of a line segment
ray - vertex + line and a direction
line - has no endpoints,
midpoint - the middle point in a segment

2 dimensional - plane

TRANSFORMATION

types
Rigid or isometric
preserve angle measure, lengths of segments, area of shapes

Translation - moving all points by the same amount in the same direction
When you translate something you simply move it around, you do not distort it in any way
Rotation - make things turn in a cycle around different center point
rotation do not distort shapes, they whirl them around; Every rotation is defined by two important parameters - the center of the rotation, the angle of the rotation
Angle - how much we rotate the plane about the center
Reflection - mirror image

Non rigid -
Proportional dilation - preserve angles but change the size of the shape,
Disproportional dilation - do not preserve angles and also changes the size of the shape
Distortion ? - lat. dis - apart, tort - twist

Functions example
Translation
$(x,y) \Rightarrow (x+3, y+5)$
Reflection
$(x,y) \Rightarrow (-x,y)$
Rotation
$(x,y) \Rightarrow (y,-x)$

ROTATION

make things turn in a cycle around different center point

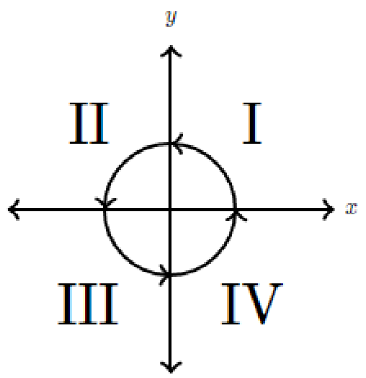
rotation do not distort shapes, they whirl them around

Clockwise and counterclockwise rotation

This is how we number quadrants of the coordinate plane

clockwise - describes negative angles

counterclockwise - describes positive angles



REFLECTION

A reflection moves a point perpendicularly across a line so that the image is the same distance from the line as pre-image

This means the line of reflection is the line that contains the midpoints

Line of reflection

To reflect a shape across diagonal line, for every point should be drawn a perpendicular, which is going to have the reciprocal slope of the initial line

To find the reflected image use the midpoint formula a+b/2

DILATION

Scale up or down

TRANSFORMATION PROPERTIES AND PROOFS

holograph - lat.whole + graph - draw

sum of triangle inner angles is 180

congruence - two objects that have the same size and shape but different coordinates (lat. con-together, gruere-to come together)

superimpose - to lay or to place something above of another thing

perimeter - (lat. peri - around + meter)

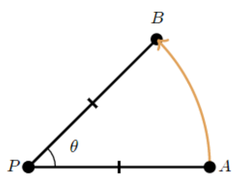
PRESERVED AND NOT PRESERVED PROPERTIES

Preserved
Angle measures
Area
Perimeter, circumference

Not preserved
coordinates

DILATION AND PROPERTIES
angles and segments len is preserved at all times when there is a proportional dilation or any rigid transformation

ROTATION PRECISE DEFINITION



A rotation by theta degrees about P, moves any point A counterclockwise to a point B where segments PA = PB and APB angle = theta

COUNTEREXAMPLE
A specific instance that disproves a general statement or rule

REFLECTIVE SYMMETRY OF 2D SHAPES

ROTATIONAL SYMMETRY
All angle points should map to the opposite points and the distance should be equal between this points and point in the centre for a shape to be symmetric after a rotation of 180

ISOSCELES TRIANGLE
Greek isos - equal; skelos - leg

equal legs triangle, that can be divided into two equal parts

ANGLES
Adjacent - share a common side
Vertical - do not share sides and are opposite, (vertex)

CONGRUENCE
Congruence - two figures are congruent if and only if there exists a series or rigid transformations which will map one onto another
Corresponding angles are equal, sides have equal length

The same shape and size
transversal - turned or directed across, lat. trans - across, versus - turned
perpendicular - two lines intersect at 90 degrees, lat. per - completely, thoroughly, pendere - to hang
distance - lat. dis - apart, stare - to stand(in other meanings state), the amount of space between two points
bisect(verb) - lat. bis - twice, sectus - cut, cutting something in two equal sections
Radius - lat. spoke/ray,

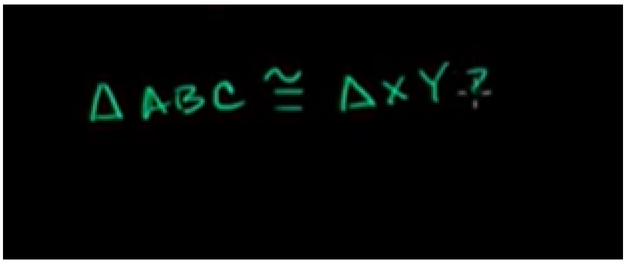
Justify - lat. just - right, facere - make, prove with arguments some statement or conclusion
Similar - have the same shape but not necessary the same size
TRIANGLE CONGRUENCE POSTULATES

SSS -> congruent
AAA -> only if SSS are congruent
SAS -> congruent
AAS -> imply congruency
SSA ->not congruent

Anchor - a fixed point that is used a reference for constructing or measuring another objects, for example (0,0) is an anchor used in cartesian coordinate system

Offset - a line that is constructed in parallel to another line but shifted, for example segment AB, A1B1 parallel to it it's going to be an offset

Equality - when quantities are the same
Congruent - same size and shape



Transversal - lying across lat. trans - across versus - to turn
Reflexive property - true between a thing and itself
Transitive property - two things that relate to a common middle thing also relate to each other
Symmetric property - if true between things is true in either order

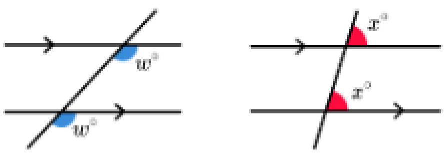
ANGLES OF TRIANGLE 180 degrees proof
Sum of square is 360, a square is two triangles so 360/2 = 180
Extension of angles

ISOSCELES TRIANGLE
Two sides are congruent

ALTERNATE INTERIOR ANGLES
The angels formed by parallel lines have equal alternate interior measures

CORRESPONDING ANGLES

Corresponding angles occur when a transversal line crosses two parallel lines. The pairs of angles formed on the same side of the transversal that are the same size.



TRIANGLES CONGRUENCE CRITERIA
Side-side-side
Side-angle-side
Angle-side-angle

Right triangle
Hypotenuse-leg

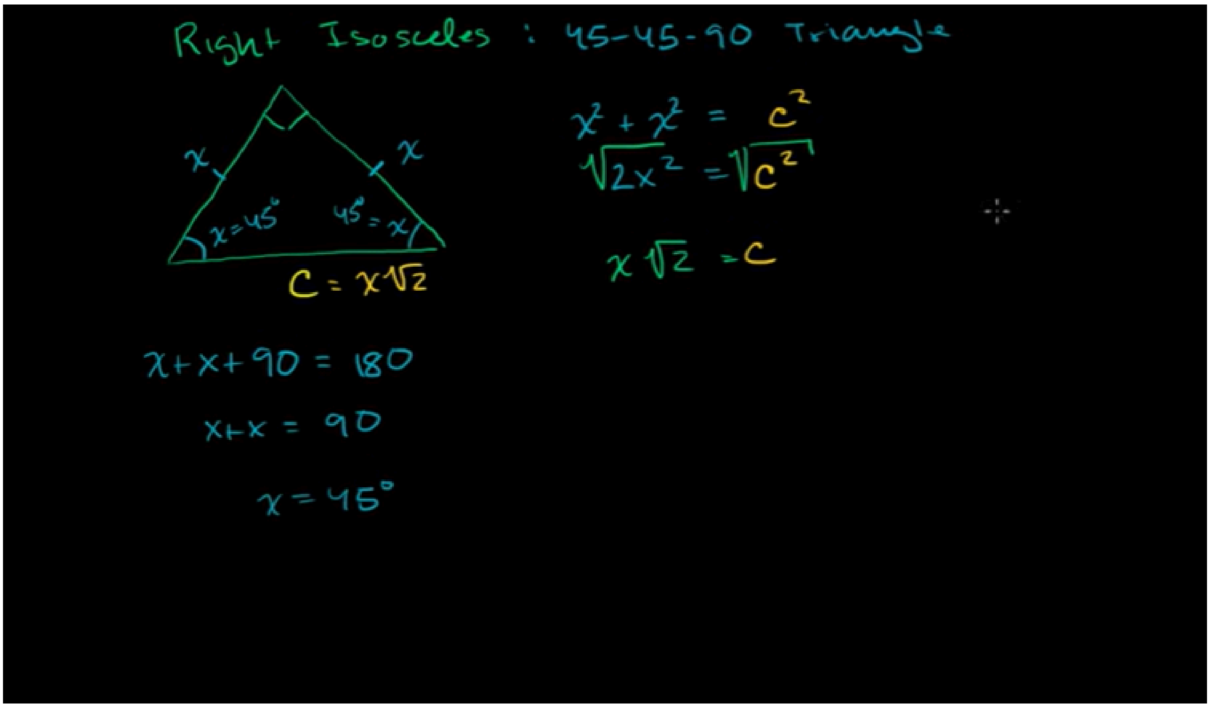
SIMILARITY
Two shapes having the same proportions
Corresponding angles are equal
Corresponding sides are proportional(their ratios are equal)

Similarity postulates

AA - angle angle
SSS - ratio between sides is going to be the same
SAS - ration between corresponding sides of two triangles and the angles between them are congruent

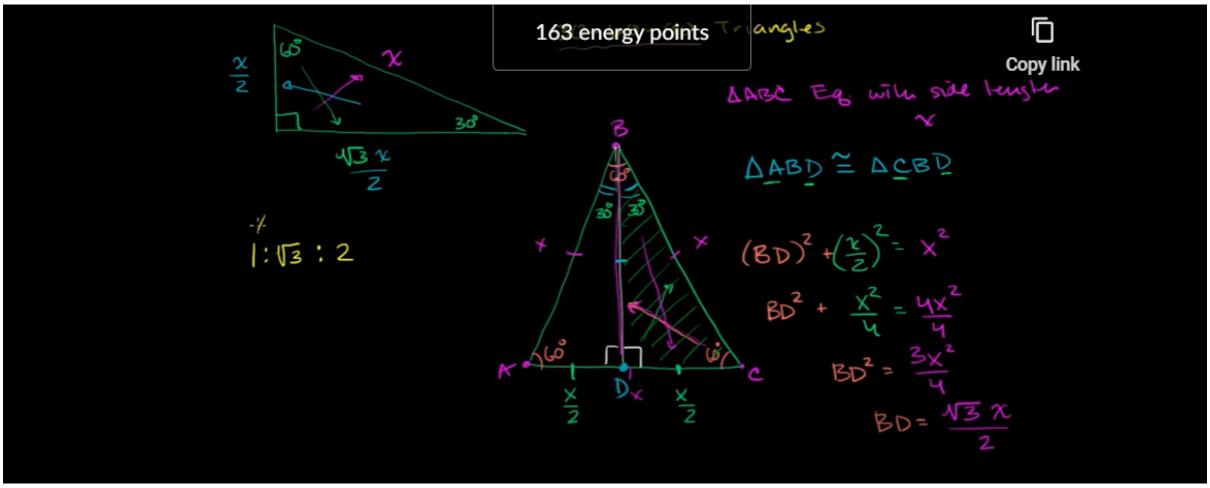
ANGLE BISECTOR
Tells that the ratios between other two sides of triangles are the same

RIGHT ISOSCELES TRIANGLE

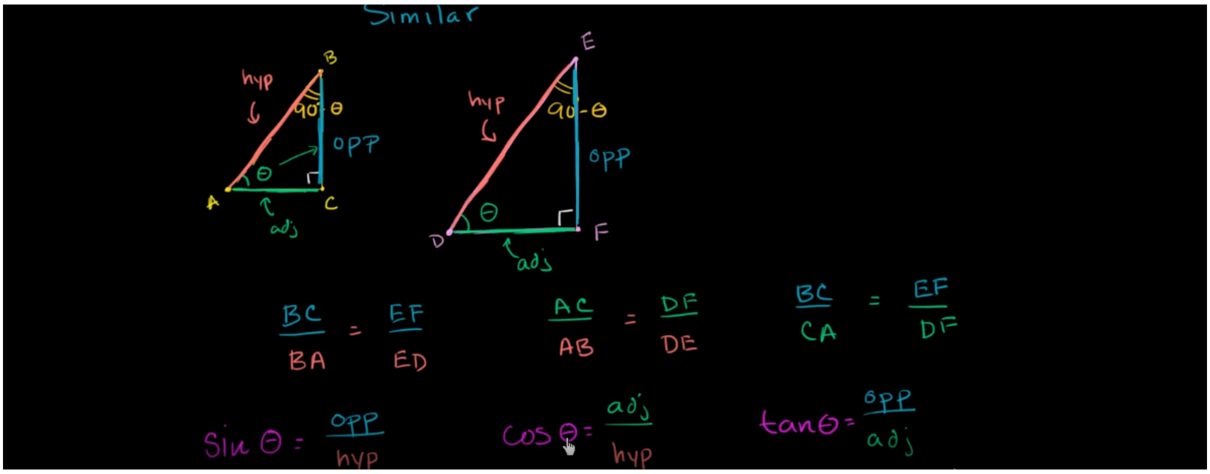


TRIGONOMETRY

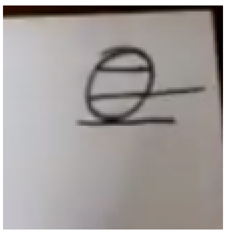
RIGHT TRIANGLES 30 60 90 PROOF



INTRODUCTION TO TRIGONOMETRIC RATIOS



theta - greek letter used for unknown angles
the six trig func are the ratios between three sides
sin - opposite/hypotenuse
cosine - adjacent/hypotenuse
tangent - opposite/adjacent
Mnemonic acronym - sohcahtoa


chord, secant, tangent

INVERSE TRIG FUNCTIONS

f(y)=x

Trigonometric functions input angles and output side ratios		Inverse trigonometric functions input side ratios and output angles
$\sin(\theta) = \dfrac{\text{opposite}}{\text{hypotenuse}}$	$\rightarrow$	$\sin^{-1}\left(\dfrac{\text{opposite}}{\text{hypotenuse}}\right) = \theta$
$\cos(\theta) = \dfrac{\text{adjacent}}{\text{hypotenuse}}$	$\rightarrow$	$\cos^{-1}\left(\dfrac{\text{adjacent}}{\text{hypotenuse}}\right) = \theta$
$\tan(\theta) = \dfrac{\text{opposite}}{\text{adjacent}}$	$\rightarrow$	$\tan^{-1}\left(\dfrac{\text{opposite}}{\text{adjacent}}\right) = \theta$

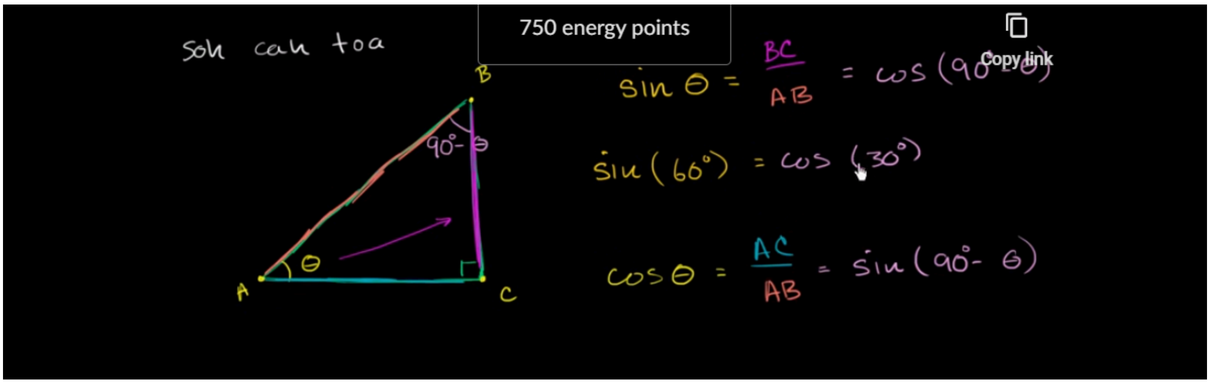
Misconception alert

sin^-1(x) is not the same as 1/sin(x), in other words -1 is not an exponent it simply means inverse function

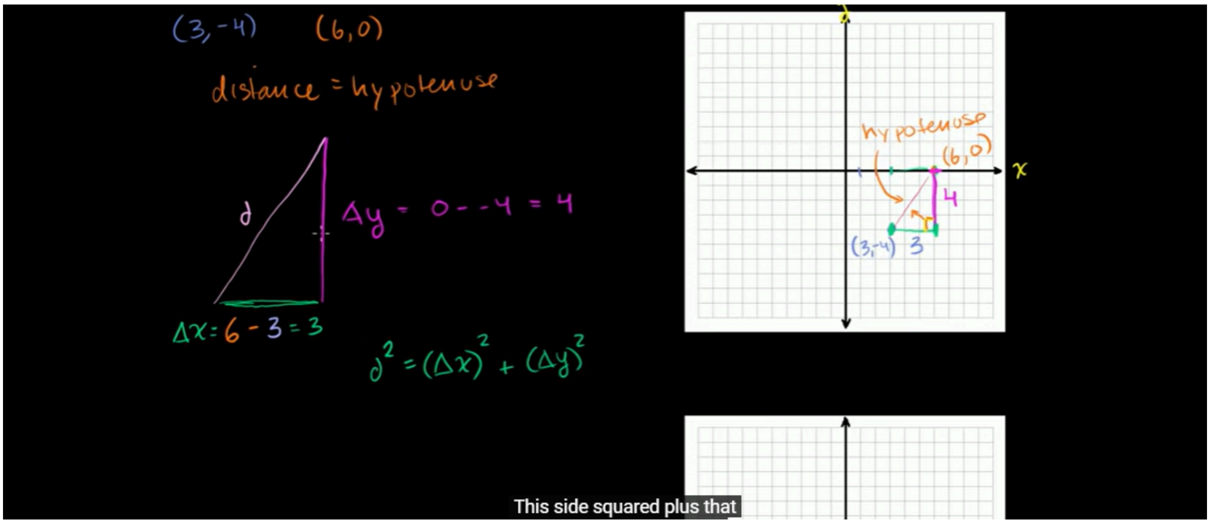
SINE COSINE OF COMPLEMENTARY ANGLES

From different perspectives some angles might be complementary

Sin theta = cos(90 - theta)



DISTANCE FORMULA



Delta - change in

Not worth memorizing, it’s just pythagorean theorem

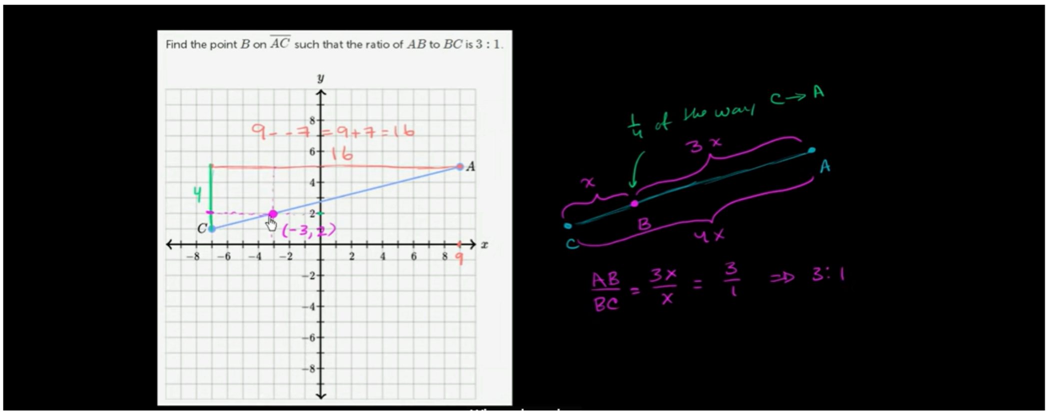
$$d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$$

MIDPOINT

The midpoint of the points (x_1, y_1) and (x_2, y_2) is given by the following formula:

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

DIVIDING LINE SEGMENT



Displacement - перемещение
Median - a line in a triangle joining a vertex and a midpoint on an opposite line

WEIGHTED AVERAGE
AC = 10 find point B that is AB ⅔ BC ⅓

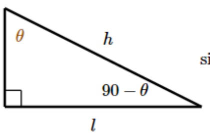
RECIPROCAL TRIG RATIOS

Their product is equal to 1
sohcahtoa -> sine, cosine, tangent,
shochatao -> cosecant, secant, cotangent,

	Verbal description	Mathematical relationship
cosecant	The *cosecant* is the *reciprocal of the sine*.	$\csc(A) = \dfrac{1}{\sin(A)}$
secant	The *secant* is the *reciprocal of the cosine*.	$\sec(A) = \dfrac{1}{\cos(A)}$
cotangent	The *cotangent* is the *reciprocal of the tangent*.	$\cot(A) = \dfrac{1}{\tan(A)}$

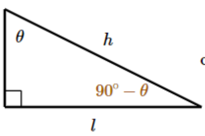
COMPLEMENTARY ANGLES

Acute angle - less than 90 degrees
For example sin cosine are complementary angles



$\sin(\theta) = \frac{l}{h}$

describes the exact same ratio as the cosine of the other acute angle?

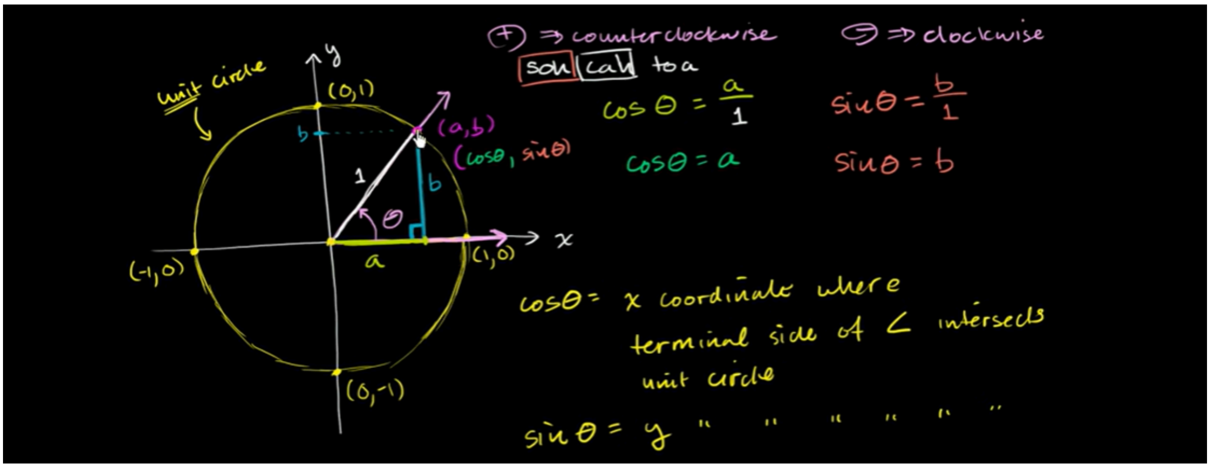


$\cos(90^\circ - \theta) = \frac{l}{h}$

Other cofunctions of complementary angles
Sum of the angles is 90 degrees or pi/2

Sine and cosine	$\sin(\theta) = \cos(90^\circ - \theta)$
	$\cos(\theta) = \sin(90^\circ - \theta)$
Tangent and cotangent	$\tan(\theta) = \cot(90^\circ - \theta)$
	$\cot(\theta) = \tan(90^\circ - \theta)$
Secant and cosecant	$\sec(\theta) = \csc(90^\circ - \theta)$
	$\csc(\theta) = \sec(90^\circ - \theta)$

UNIT CIRCLE



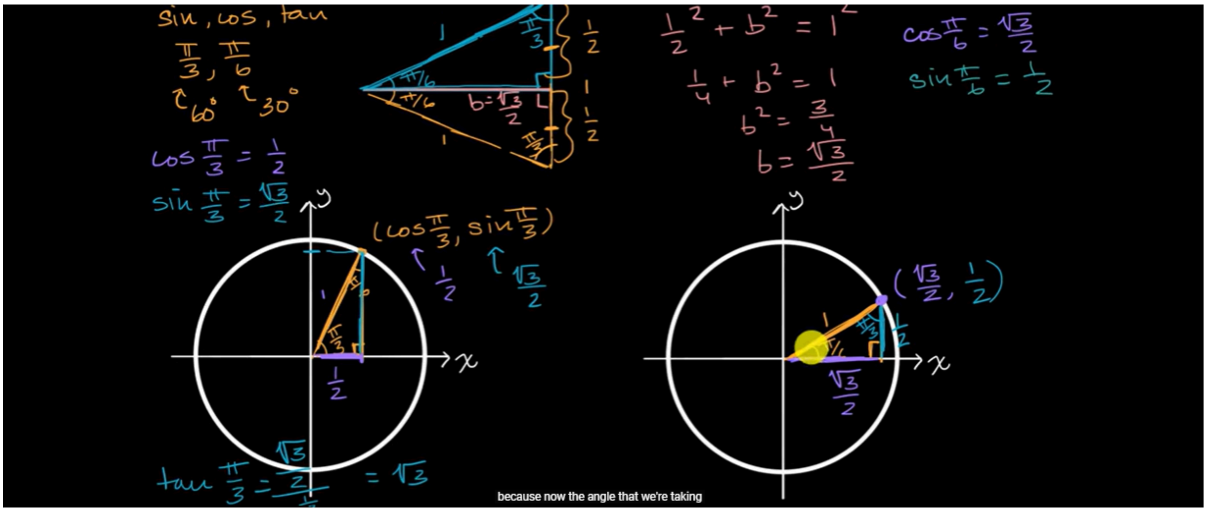
Unit circle - a circle with a radius of 1
Clockwise - negative
Counterclockwise - positive
Cos theta - a or x coordinate of intersection
Sin theta - b or y coordinate of intersection
Tan theta - sin/cos b/a y/x
Radian - one radius length around the circumference

PYTHAGORIAN IDENTITY

Relative to unit circle
Hypotenuse is always 1
sine of theta is opp/hyp or y/1 or just y
cosine of theta is adj/hyp or x/1 or just x
tangent of theta is opp/adj or just y/x - slope
Identity is cos^2+sin^2 =1

SPECIAL TRIG VALUES

60+30+90 triangle

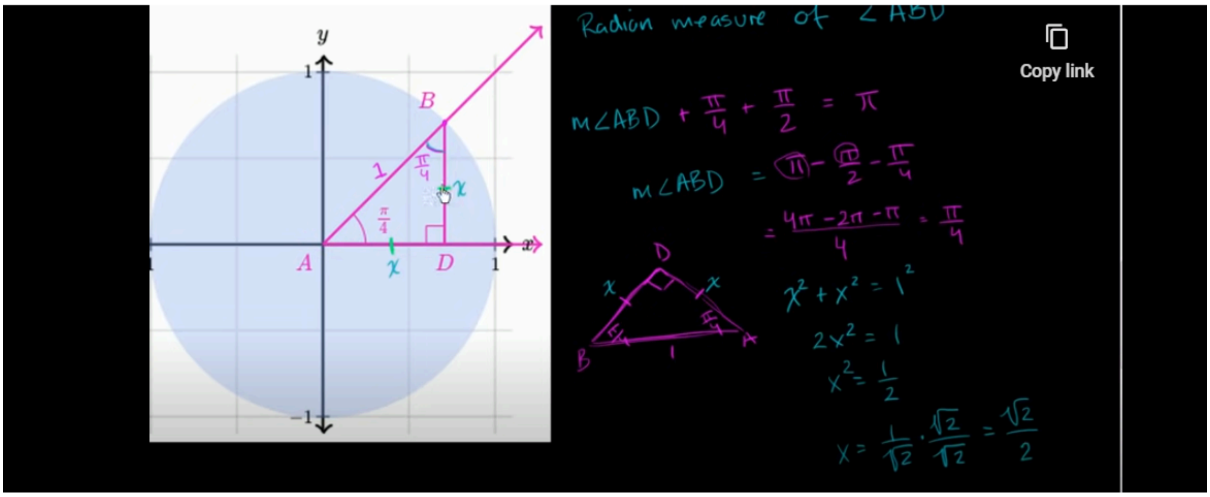


in the first unit circle I see x,y coordinates as trig functions
in the second unit circle I see, x,y coordinates as ratios

pi/3 radians = 60 degrees
pi/6 radians = 30 degrees
hypotenuse of 1
angles of
pi/3
pi/6
I don’t know the values of x and y yet
cos pi/3 is just x/1 or adj/hyp, if I know hyp I can find adj or x
sin pi/3 is just y/1 or opp/hyp, if I know hyp I can find opp or y
That’s why
Instead of writing (x,y) I just write (cos pi/3, sin pi/3) thru them I can find x,y
because cos pi/3 it’s the same as cos 60 degrees, it’s just a ratio, so
cos 60 degrees = x/1
sin 60 degrees = y/1

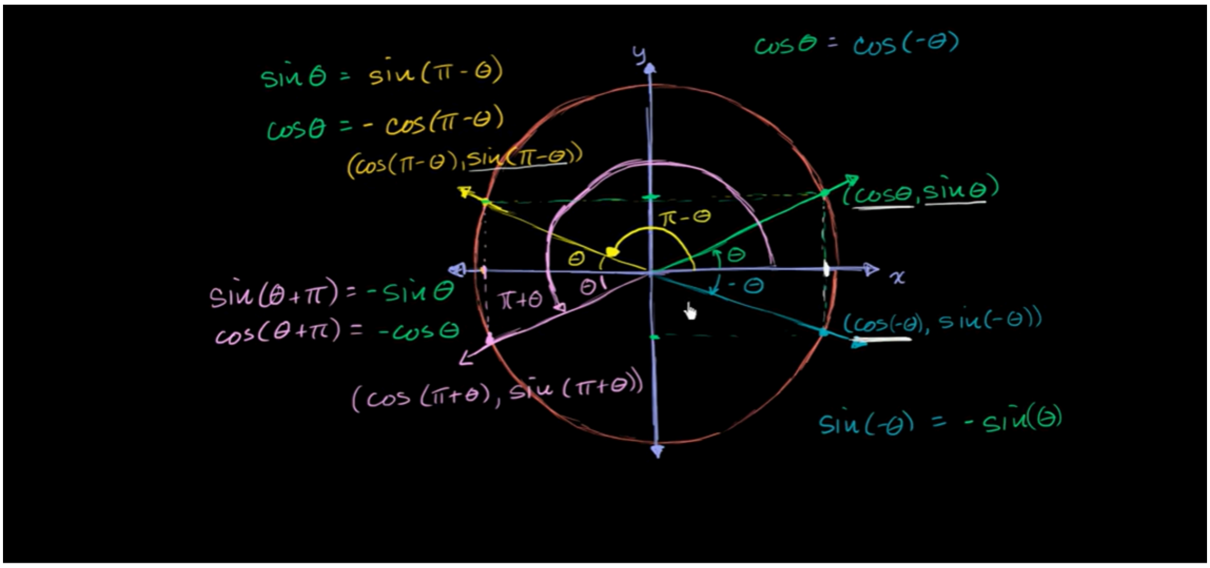
Another interesting fact is that pi/3 + pi/6 = pi/2 or 60+30 = 90, sin and cosine are complementary angles, so they complete to 90 degrees

45+45+90 triangle
pi/4 is 1/4pi or 45 degrees, so 1/4pi+1/4pi = 1/2pi or 90 degrees, other angle is 1/2pi as well

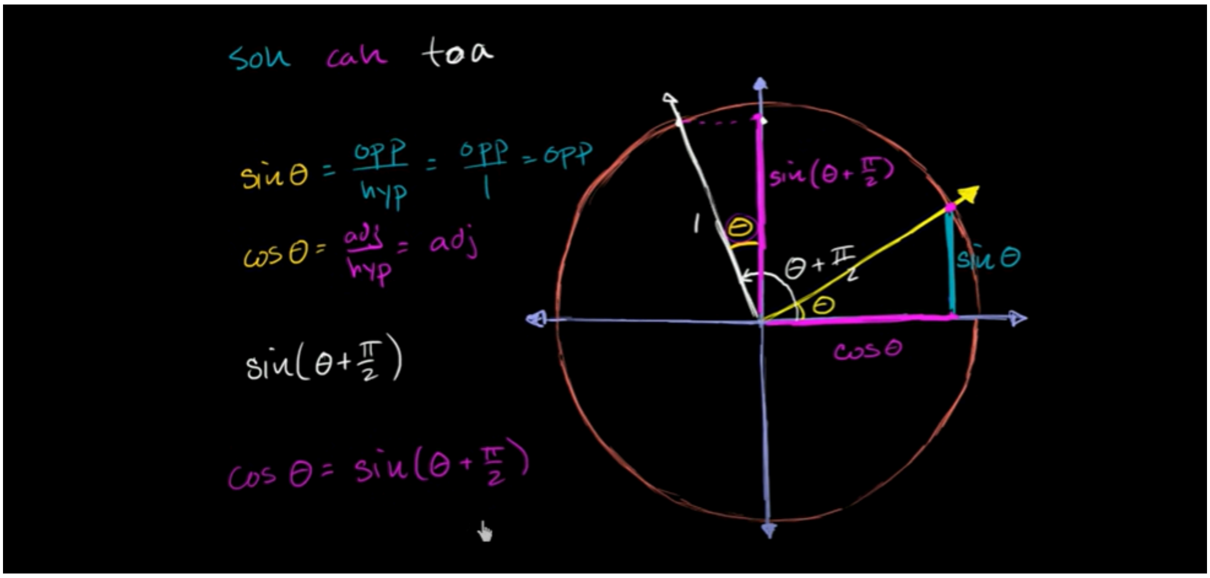


TRIG VALUES ON UNIT CIRCLE

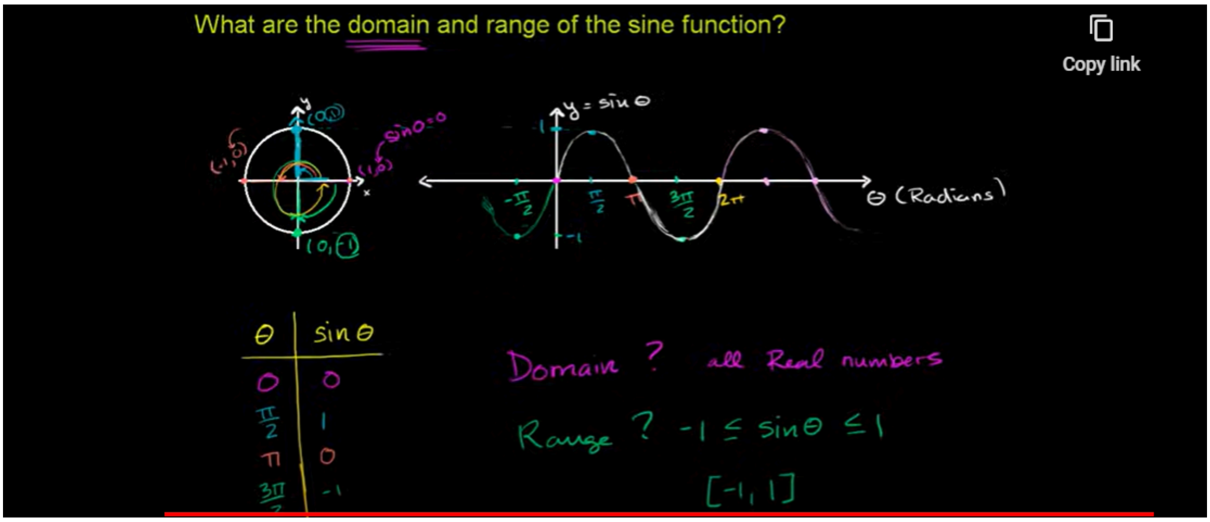
Sine cosine identities
symmetry and reflections on x,y axis of the unit circle



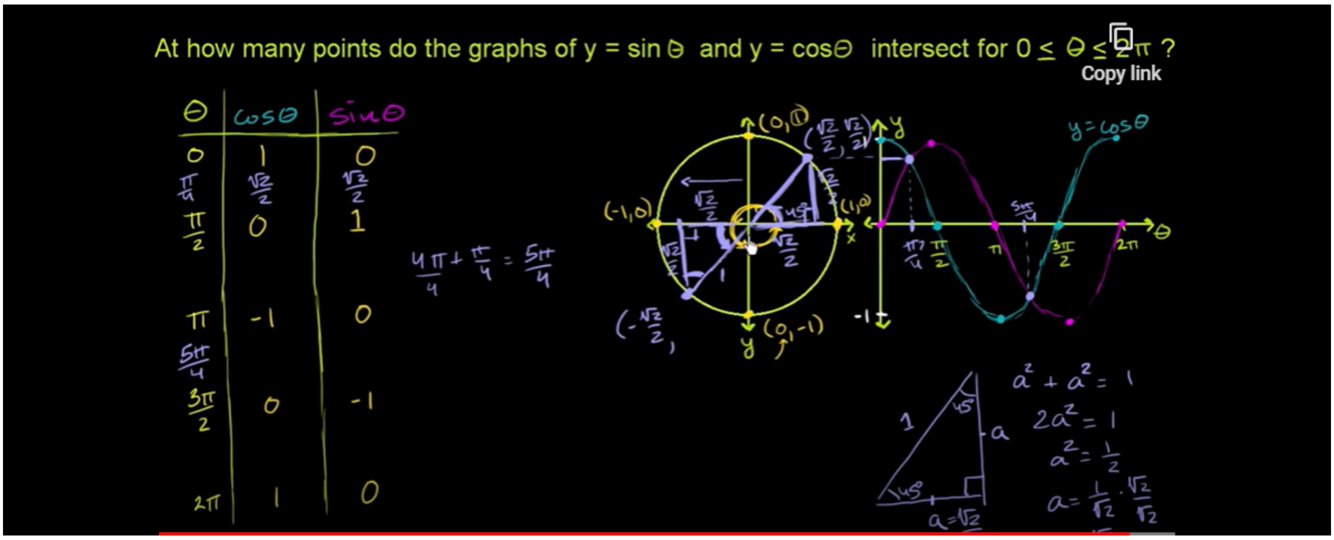
SINE COSINE PERIODICITY



GRAPH OF y=sin(theta)



Intersection points y=sin(theta) y=cos(theta)



GENERAL FORM OF TRIG FUNCTIONS

Example of trig cos function

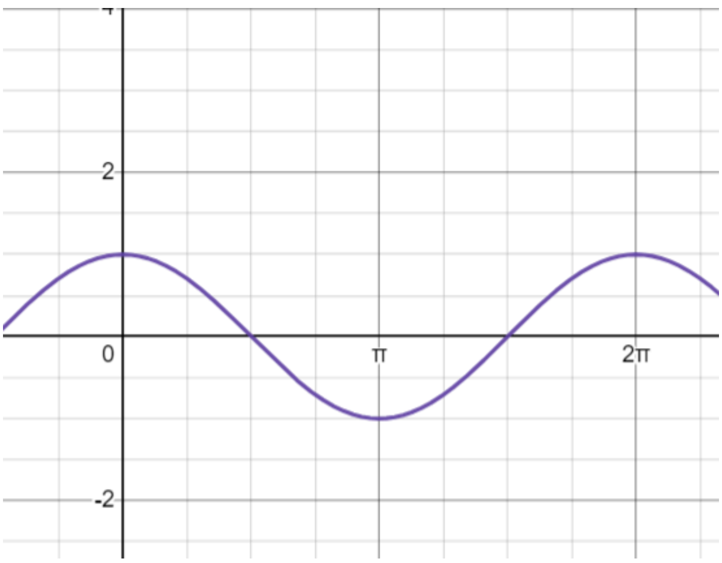
In a general cosine function $g(x) = A\cos(Bx + C) + D$, where:

- A is the amplitude,
- B is the frequency (number of cycles in 2π),
- C is the phase shift (horizontal shift),
- D is the vertical shift.

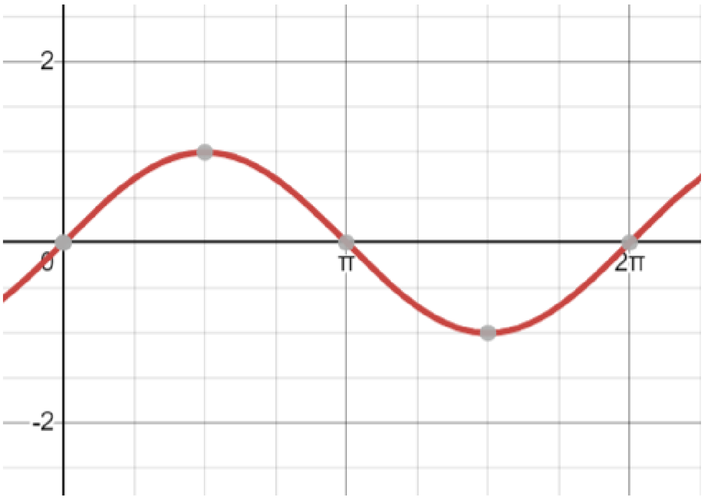
The midline of the cosine function is given by the equation $y = D$.

Amplitude - half of the difference between minimum and maximum
Frequency - how fast or how slow does function behave, 1/2x, it's going to grow ½ as fast, so period is going to be 2 as long, 1/6
Period - the length of one full cycle; usually is equal to 2pi, and the coefficient(frequency determinator) for this is 1, usually good to measure between two consecutive minimum or maximum points
Midpoint - число поделенное на два, 10 на 2 = 5, но формула 0 + n / 2 = m, где 0 это смещение, чтобы отрезок был всегда от нуля до крайнего числа, сохраняем его размер
Phase Shift - x displacement
Vertical Shift - y displacement
Distance between two consecutive minimum or maximum points is always ½ of a period
Distance between a midline and a maximum or minimum point is always ¼ of a period

cos(x)



sin(x)



HOW TO THINK ON TRIG FUNCTIONS

Think on 2pi as one 1

When you have a function with a period of 2pi and other function with a period of 6pi

6pi is now one 1

2pi/6pi - 2pi interval per one, so it's 1/3 of 2pi per 1

y = cos x
1 cycle till 2pi(frequency)

y = cos ⅓ x
⅓ of a cycle till 2pi(frequency)

y = cos 2pi x
6.28 cycles till 2pi(frequency)

Trigonometric values for 0:

$\sin(0) = 0$

$\cos(0) = 1$

Trigonometric values for $\frac{\pi}{6}$:

$\sin\left(\frac{\pi}{6}\right) = \frac{1}{2}$

$\cos\left(\frac{\pi}{6}\right) = \frac{\sqrt{3}}{2}$

Trigonometric values for $\frac{\pi}{4}$:

$\sin\left(\frac{\pi}{4}\right) = \frac{\sqrt{2}}{2}$

$\cos\left(\frac{\pi}{4}\right) = \frac{\sqrt{2}}{2}$

Trigonometric values for $\frac{\pi}{3}$:

$\sin\left(\frac{\pi}{3}\right) = \frac{\sqrt{3}}{2}$

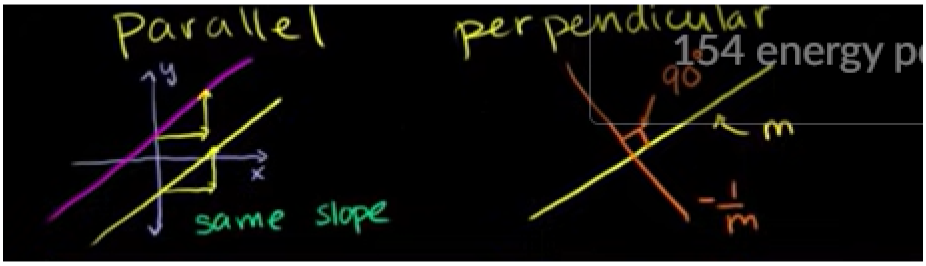
$\cos\left(\frac{\pi}{3}\right) = \frac{1}{2}$

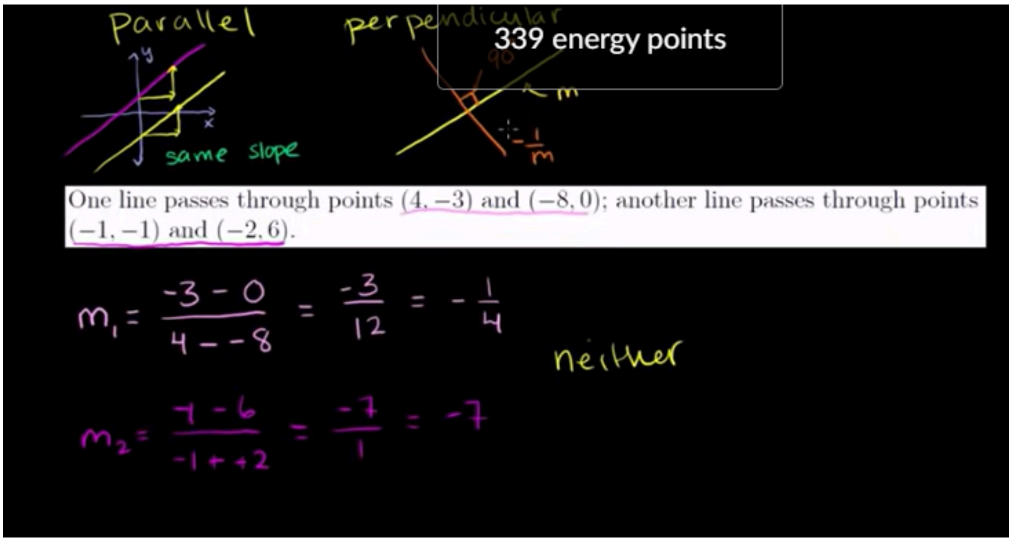
A CIRCLE

Circle - a set of points that are x units away from the center
Theorem of pythagoras

PARALLEL AND PERPENDICULAR LINES INTRO

Perpendicular lines - lines that intersect at a right angle(negative reciprocal of each other 2; -½)
Parallel lines - lines that have the same angle/slope but shifted so never intersect





CLASSIFY FIGURES WITH COORDINATES

Parallelogram - opposites sides are parallel and equal and diagonals bisect each other and form congruent triangles

Rectangle - parallelogram with all angles 90 degrees

All rectangles are parallelograms but not vice versa

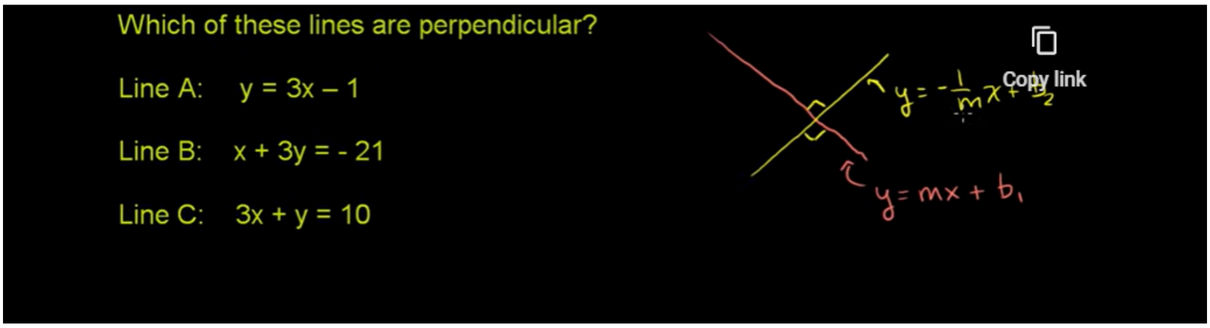
Trapezoid - parallel top and bottom sides

Rhombus - all sides are congruent to each other and diagonals bisect each other and form right angles

PARALLEL AND PERPENDICULAR LINES FROM EQUATIONS

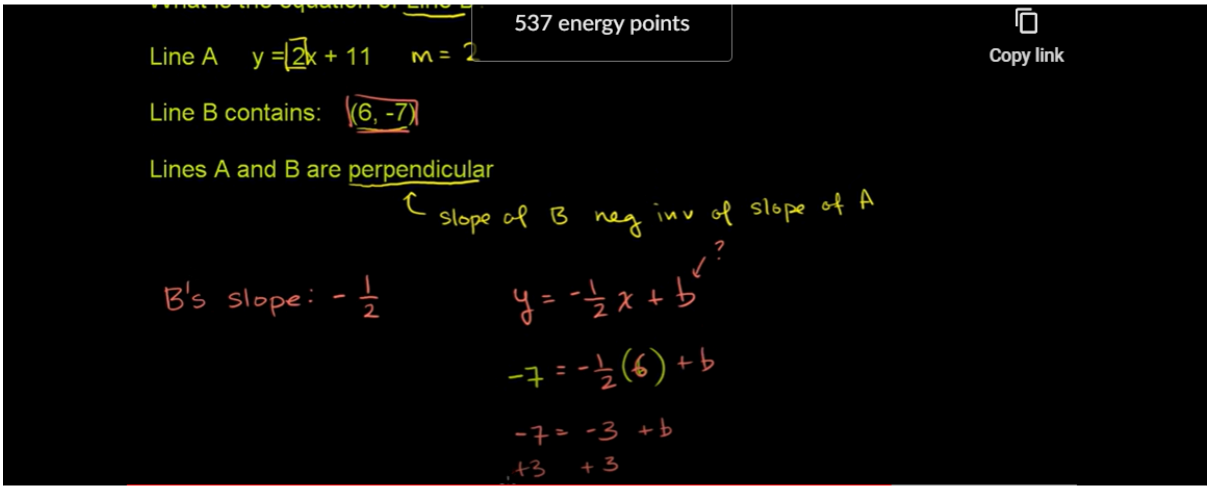
Perpendicular lines from equation

Google Classroom

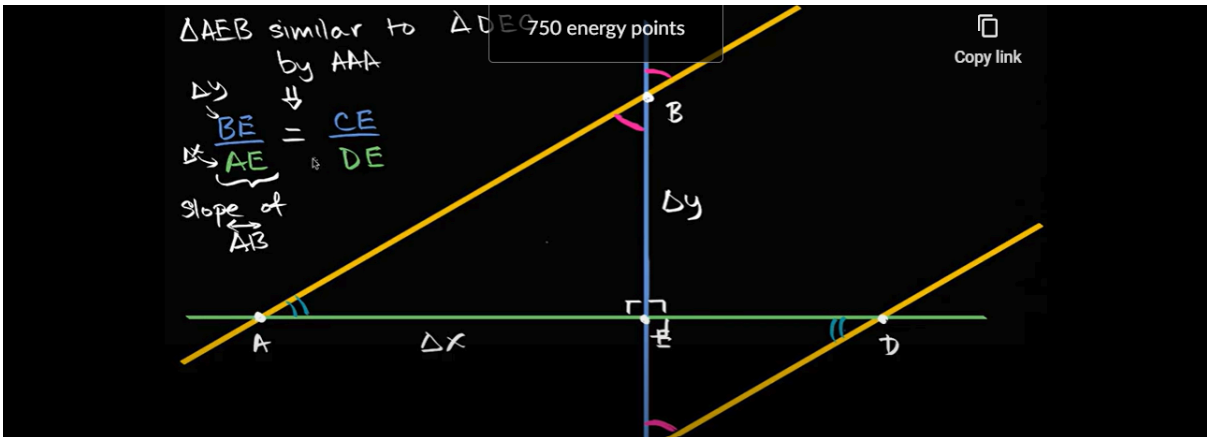


Any lines that have different slopes are intersecting
Line where delta y delta x are equal and y intercept are the same line
Negative reciprocal rise/run are perpendicular lines

LINES FROM EQUATIONS



SLOPE

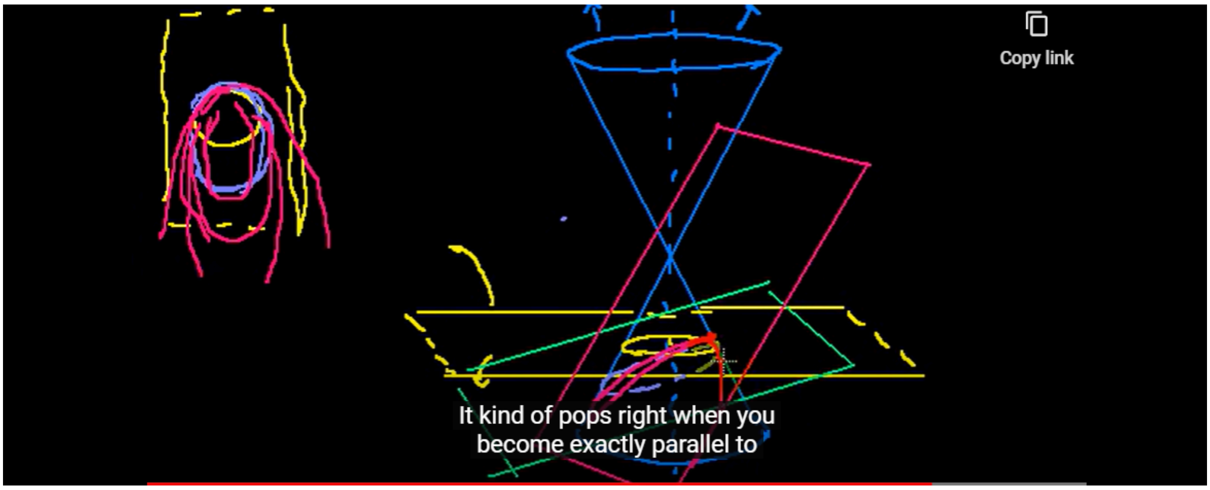


CONIC SECTIONS

Conic sections - shapes you get when you slice a cone at different angles

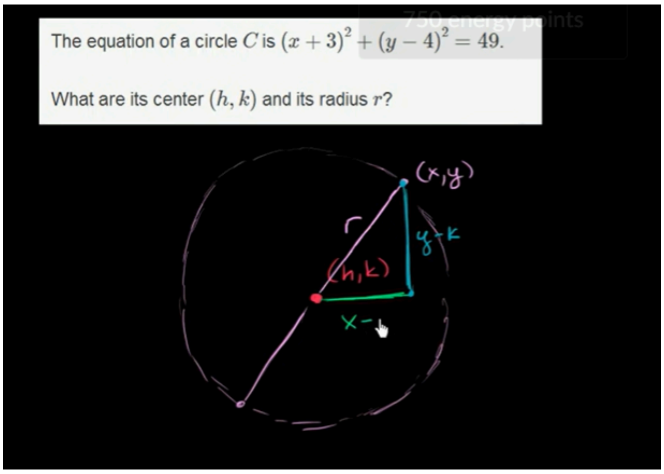
Circle - a special case of ellipse
Ellipse

Parabola
Hyperbola



FEATURES FROM A CIRCLE IN ITS STANDARD FORM
Circle - a collection of all points around a center point distanced by radius which is constant
Radius - a segment from circle center to circumference
Diameter - radius squared

(x-h)^2+(y-k)^2=c^2
(x,h) - circle center
c^2 - radius squared for formula to maintain equality
C = actual radius

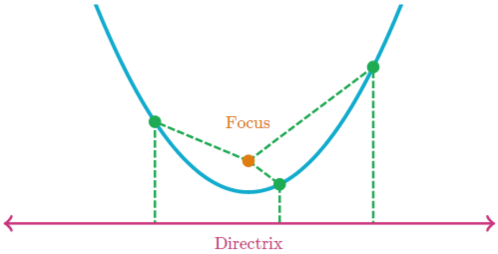


Write equation of a circle using points h,k,x,y
(x-k)^2+(y-h)^2=r^2 is basically pythagorean theorem with coordinates
key understanding
R = is radius itself
But we write R^2 to maintain the formula equality

Perfect square - is created anytime you multiple a value by itself

FOCUS AND DIRECTRIX OF A PARABOLA
Focus - a certain point above the vertex of a parabola
Directrix - a horizontal line below the parabola
Parabola - graph of quadratic function; locus of points that are equidistant from (given point)focus and directrix(given line)

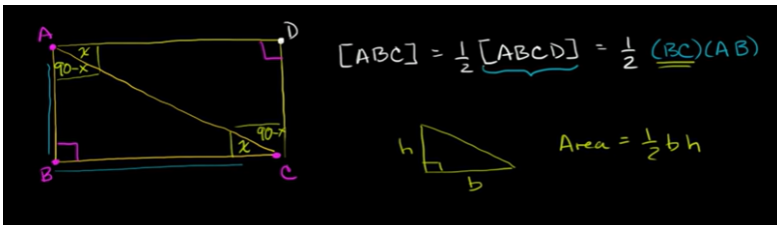
To find distance from from x,y to focus or from x,y to directrix just use distance formula



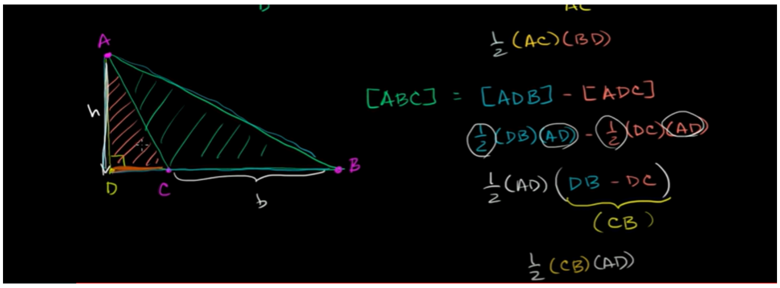
SQUARE + SQUARE ROOT
Square + square root is the same as taking absolute value

TRIANGLE AREA PROOF

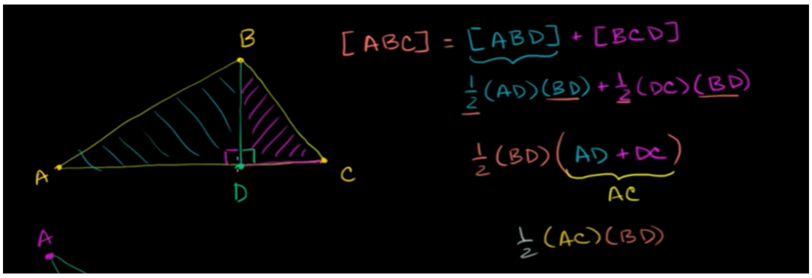
Right triangle



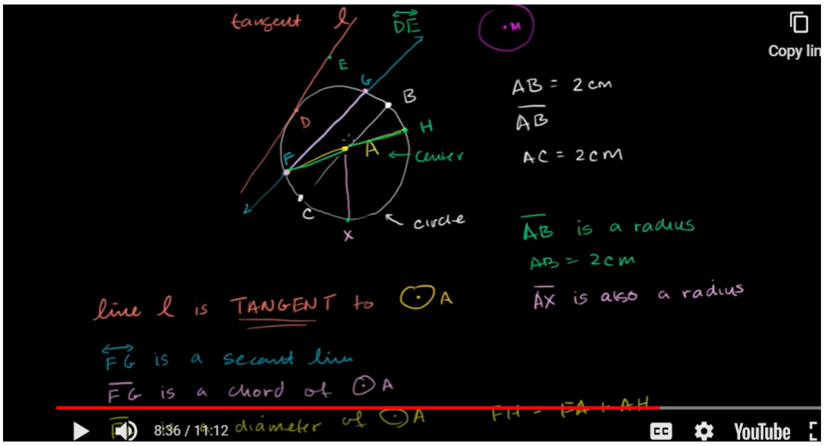
Obtuse triangle



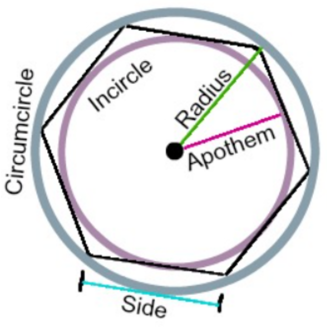
Arbitrary triangle



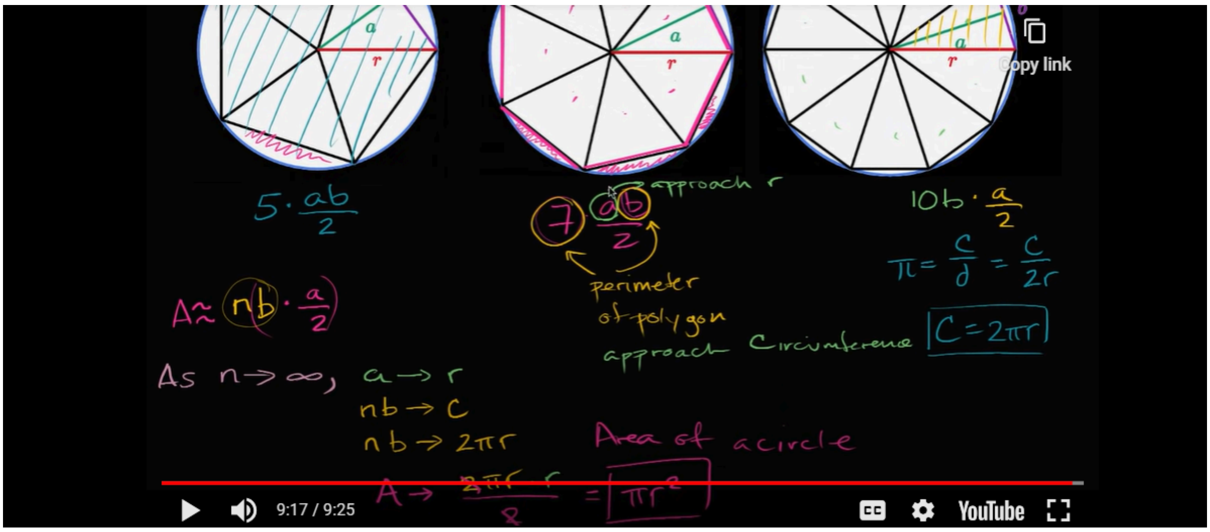
CIRCLE
Secant - a line that cuts a circle in two parts
Chord - a segment that connects two points in the circle
Diameter - a chord that goes thru the center of a circle
Tangent - a line that just touched a circle at a given point
Arc - segment of the length of a circle



Regular Polygon



AREA OF A CIRCLE INTUITION



WHAT IS PI

Circle circumference to diameter ratio

ARC MEASURE VS LENGTH

Arc measure - measured in degrees
Arc length - measured in units of length

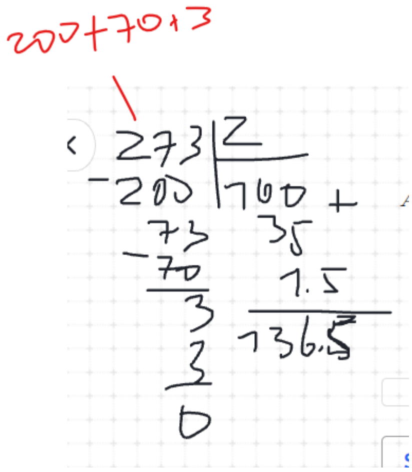
Circumference - 2 pi R
Diameter - 2 R

ARC LENGTH FROM SUBTENDED ANGLE

Part of circumference(length) = part of measure(degrees)
arc length/circumference = arc measure/360

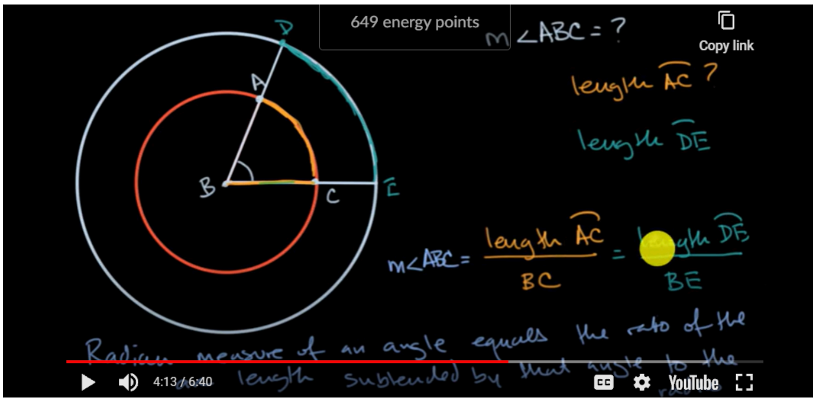
Obtuse - angle more than 90 less than 180

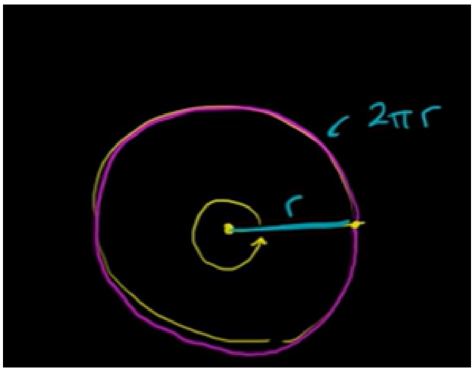
DIVIDING
Divide numbers by grouping them into units, from left to right, ex: hundreds, tens, ones,



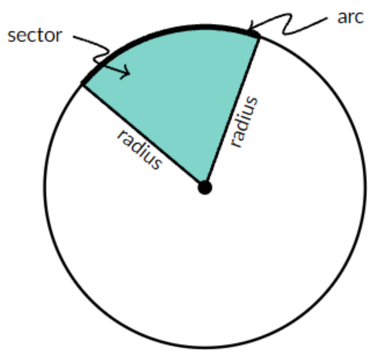
RADIANS

Radian - ratio of arc length / to the radius
When you divide arc length/ to the radius you actually want to know how many of the radii are in the arc in question;



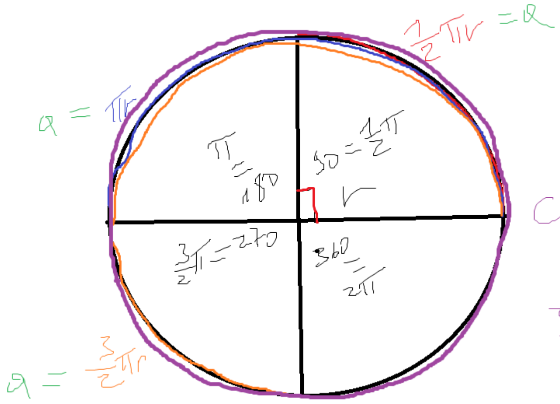


Dilation is not rigid even if it’s proportional
Sector is a portion of a circle between two radii



Subtindere - a delimita un arc de un cerc, geometric: a uni extremitatile unui arc
An arc is subtended by an angle - when two rays from angle vertex intersect the arc at two particular points

$\frac{aL}{C} = \frac{am}{360}$



$C = 2\pi r = 360$
length degrees

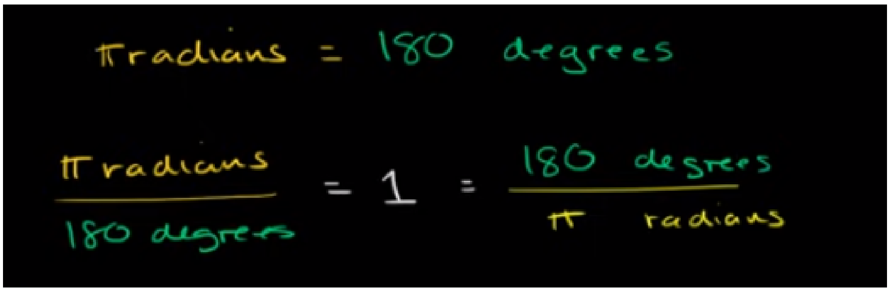
$\frac{360}{2} = \frac{2\pi}{2}$ Radians

$\frac{180}{\pi} = \frac{\pi}{\pi}$ radians

$\boxed{\frac{180}{\pi} = 1 \text{ Radian}}$

DEGREE RADIAN CONVERSIONS

2pi radians = 360 degrees
pi radians = 180 degrees
1 radian = 180 degrees/pi radian
1 degree = pi radians/180 degrees



ARC LENGTH FROM RADIANS and ARC LENGTH AS A FRACTION OF CIRCUMFERENCE

fraction
radians/circumference in terms of pi
radians to degrees and then degrees/360

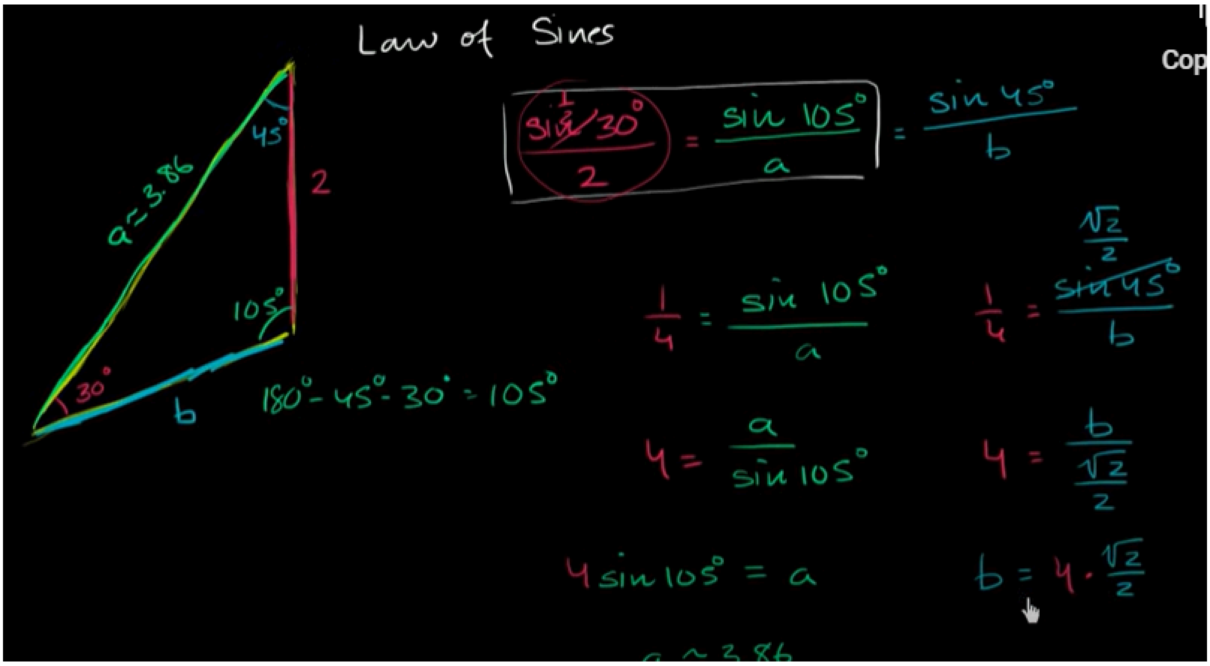
Len
Get the fraction multiply by circumference
If arc is 0.4 radians just divide it by 2pi to get the fraction and multiply by circumference to get the length

LAW OF SINES
Can be used to solve any triangles not just right triangles

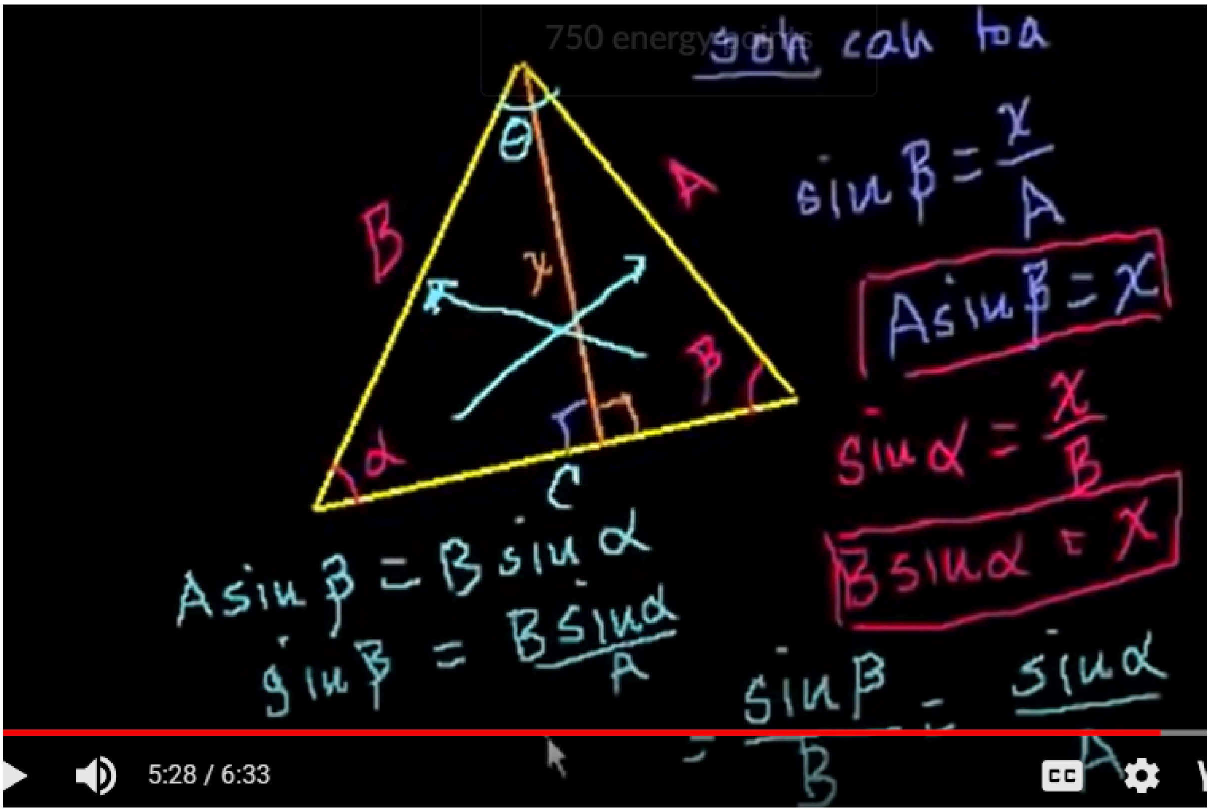
Sin of an angle over opposite is proportional to any other sin of an angle over opposite in almost any triangle

$$\frac{\text{length opposite } \angle 1}{\sin(m\angle 1)} = \frac{\text{length opposite } \angle 2}{\sin(m\angle 2)}$$

> $$\frac{\sin(m\angle 1)}{\text{length opposite } \angle 1} = \frac{\sin(m\angle 2)}{\text{length opposite } \angle 2}$$



PROOF OF LAW OF SINES

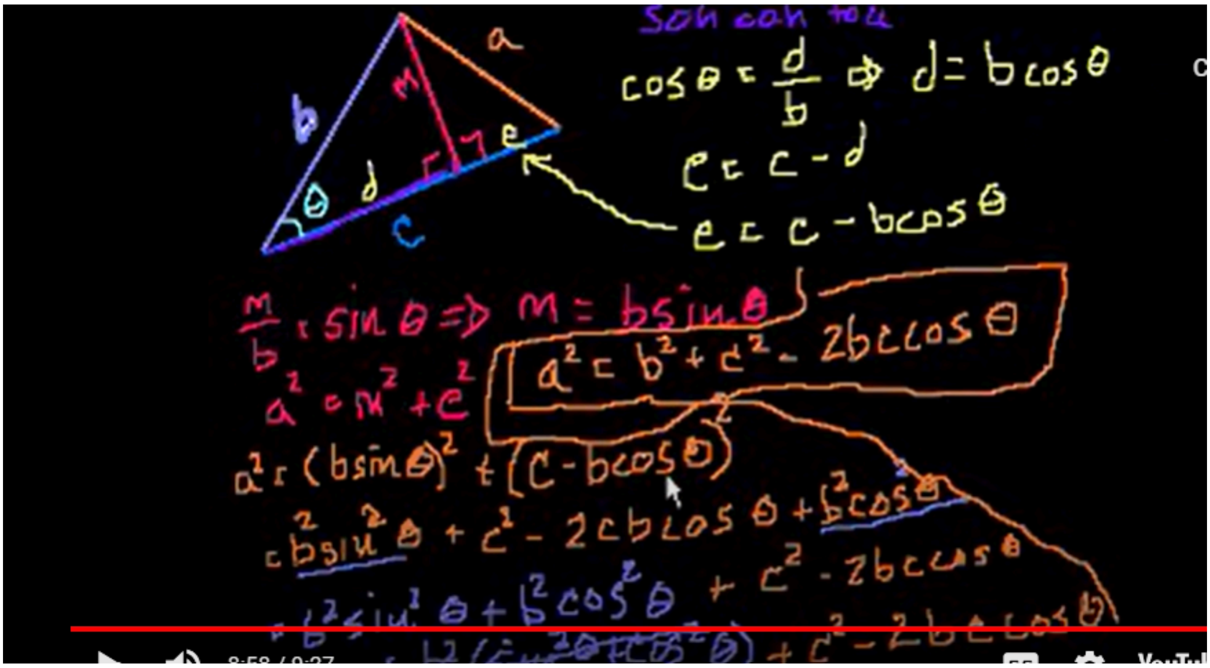


LAW OF COSINES

Square of a side is equal to sum of squares of other two sides minus twice the product of the other two sides and the cosine of the opposite length

$$c = \sqrt{a^2 + b^2 - 2\,a\,b\cos\gamma}$$

PROOF OF LAW OF COSINES

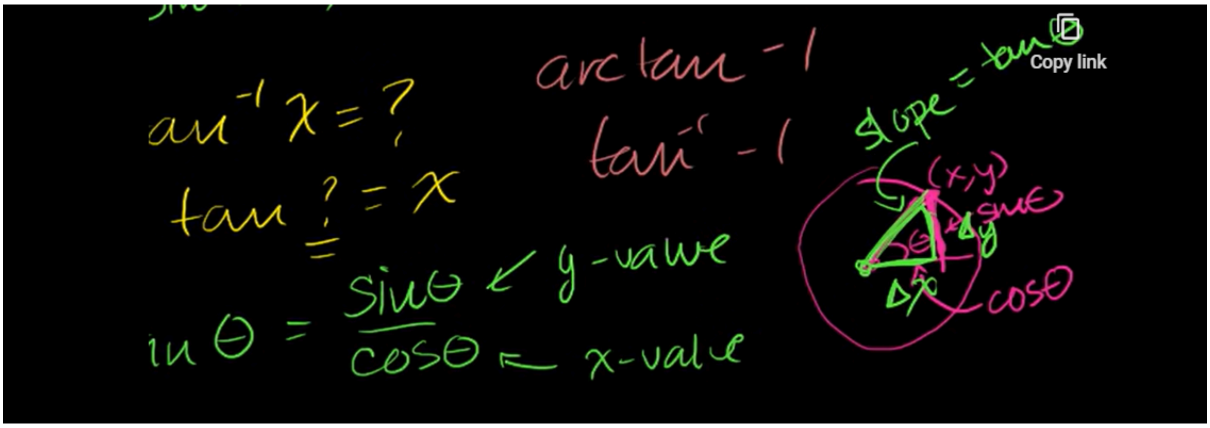


TRIGONOMETRIC EQUATIONS AND IDENTITIES

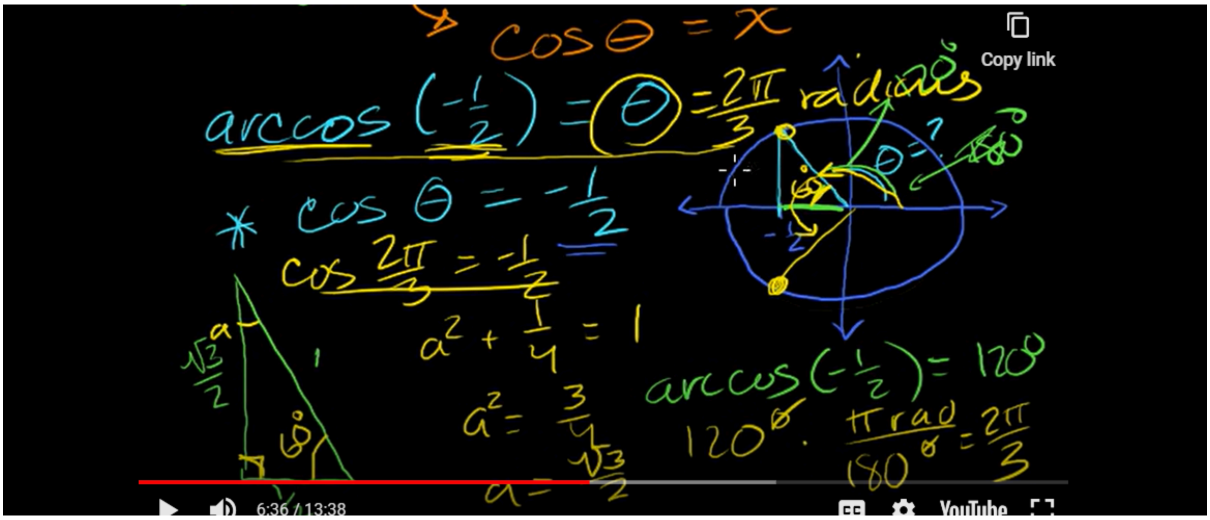
ARCSINE
Inverse sin func
Domain -1 <= x =< 1
Range -pi/2 <= theta =< pi/2

Sine function at its peak has only one solution x/2 because 1 is achieved only once and cannot be achieved twice.

ARCTANGENT
y/x
sin theta/cosine theta
slope
Domain -1 <= x =< 1
Range -pi/2 <= theta =< pi/2

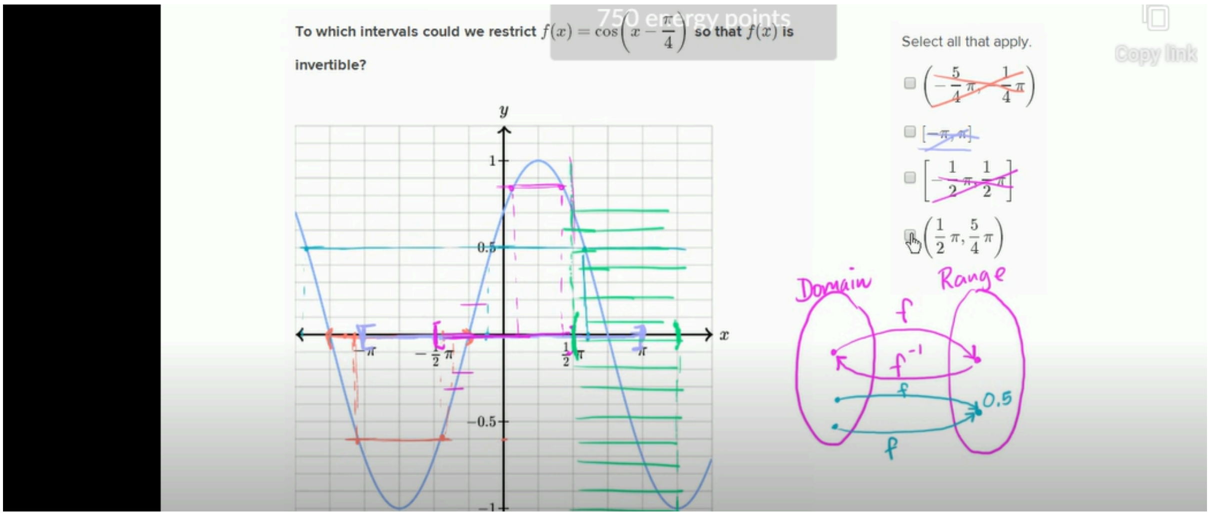


ARCCOSINE
Domain -1 <= x =< 1
Range 0 <= theta =< pi

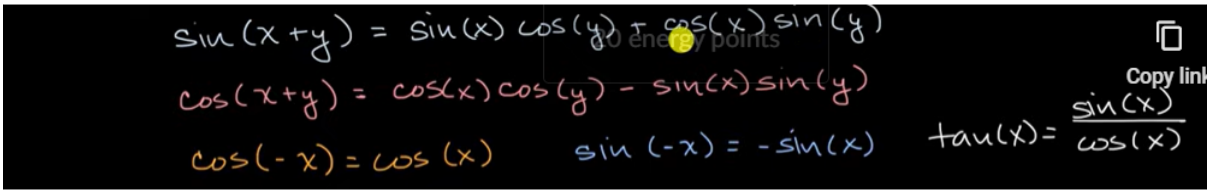


RESTRICTING DOMAINS TO MAKE THEM INVERTIBLE

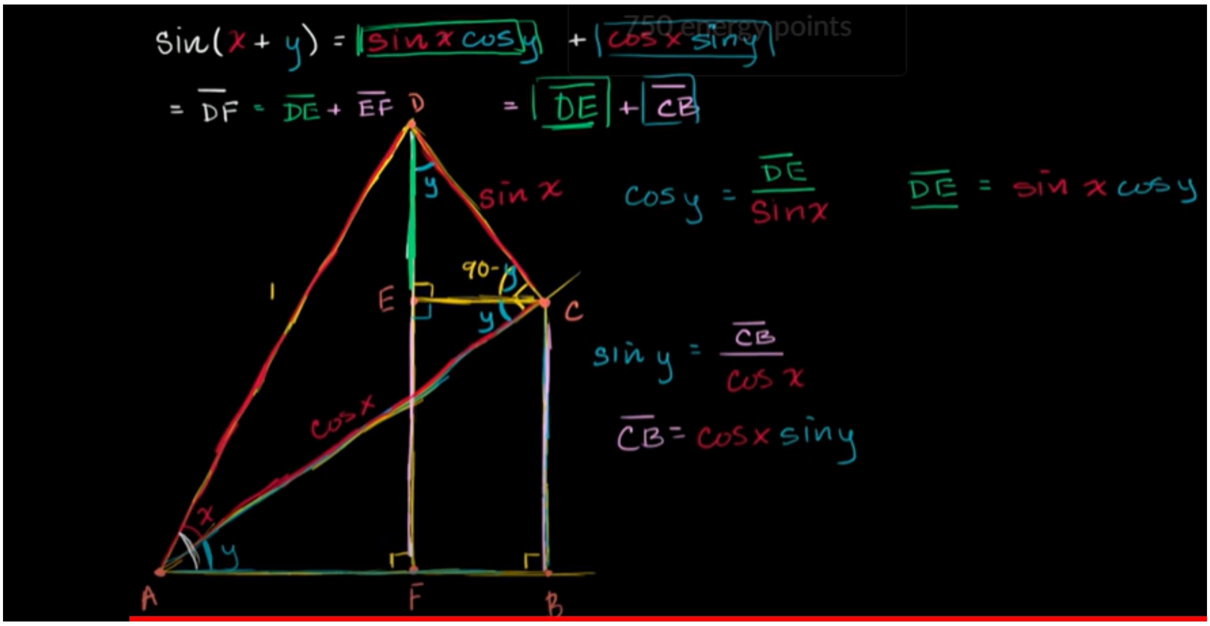
( ) - excluding
[ ] - including
s



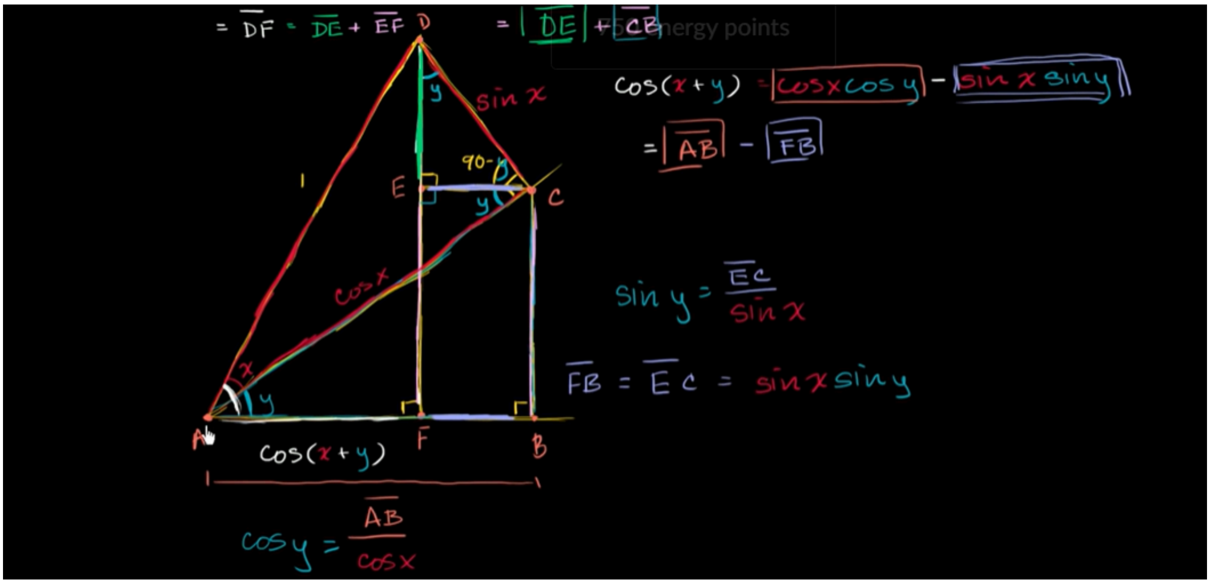
TRIG ADDITION IDENTITIES



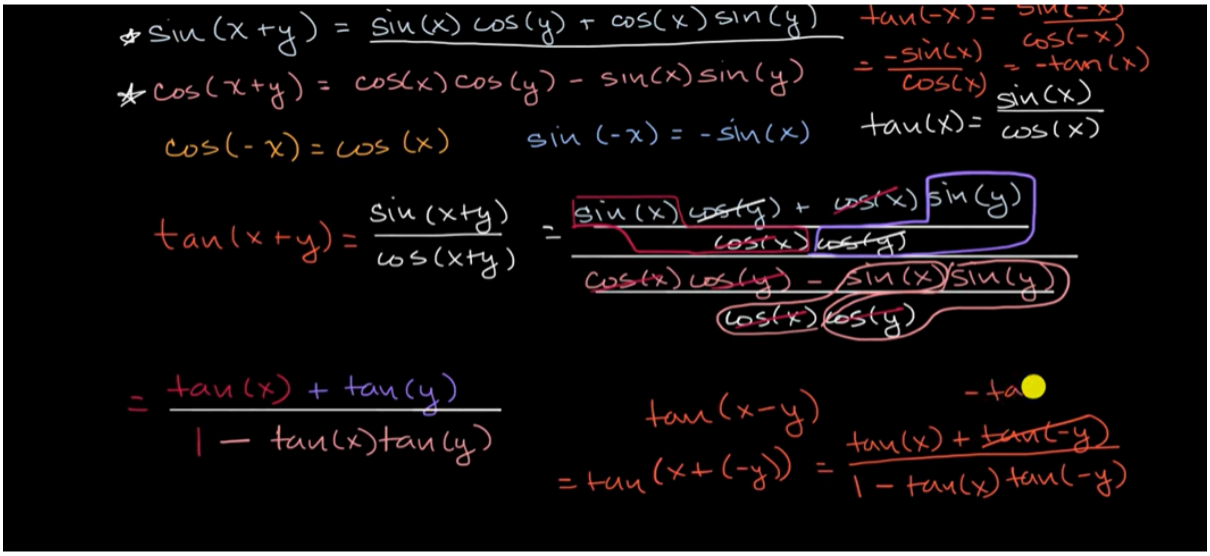
PROOF OF SINE ANGLE ADDITION



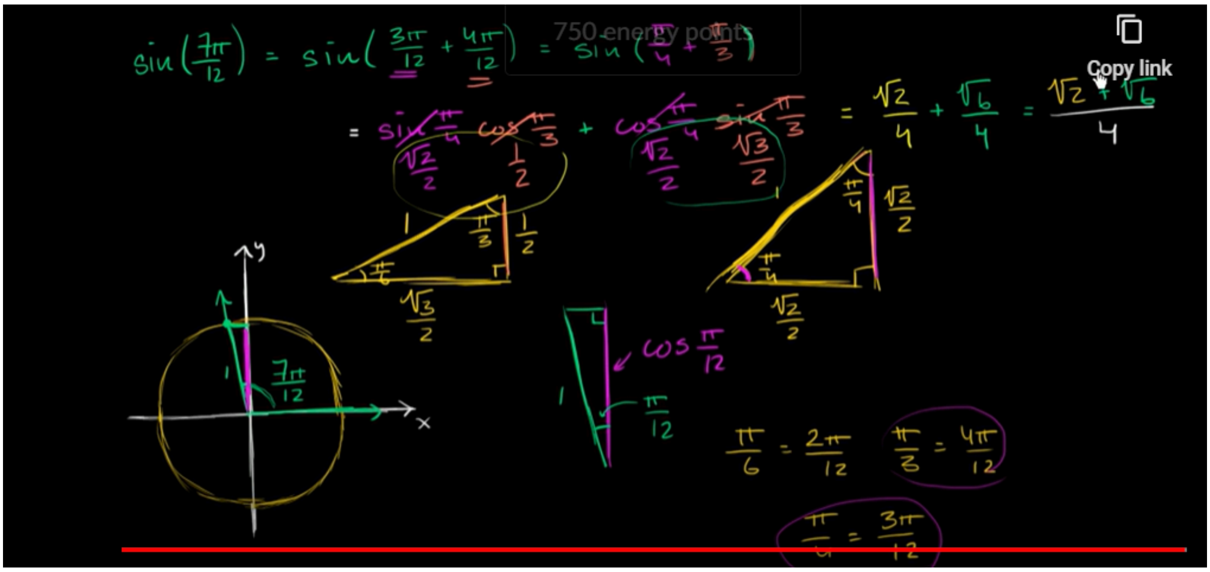
PROOF OF COSINE ANGLE ADDITION

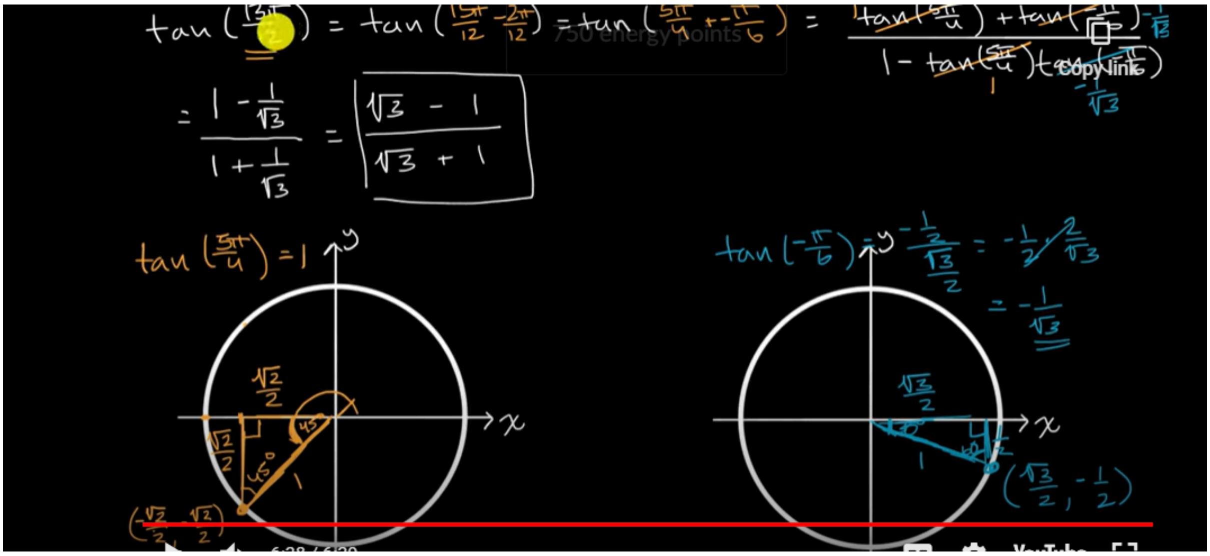


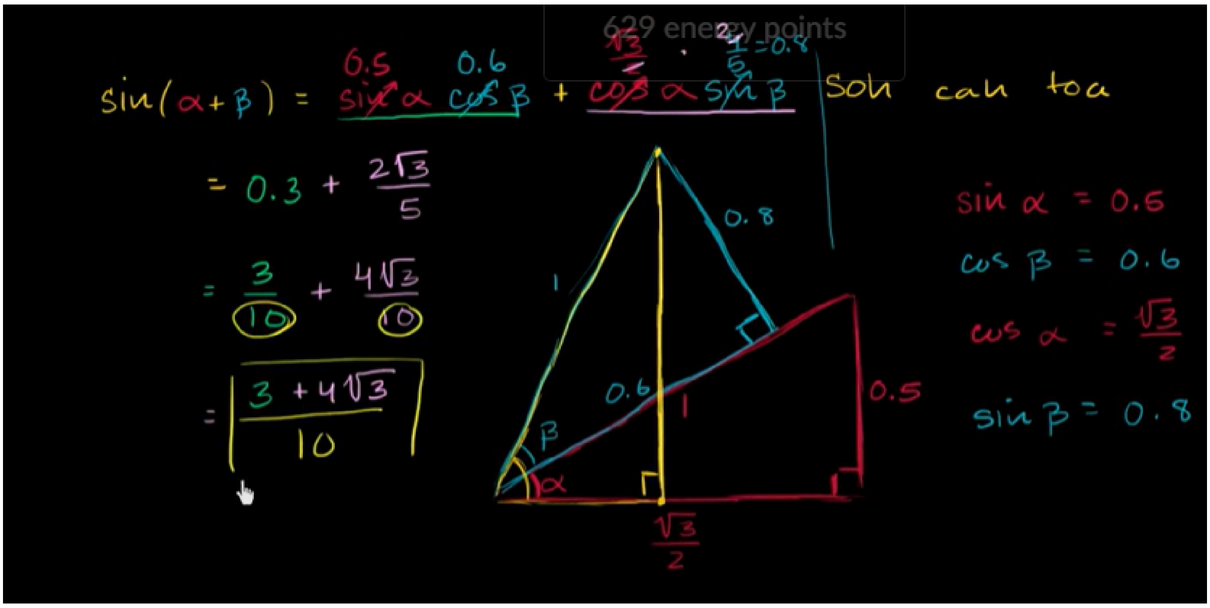
PROOF OF TANGENT ANGLE SUM IDENTITIES



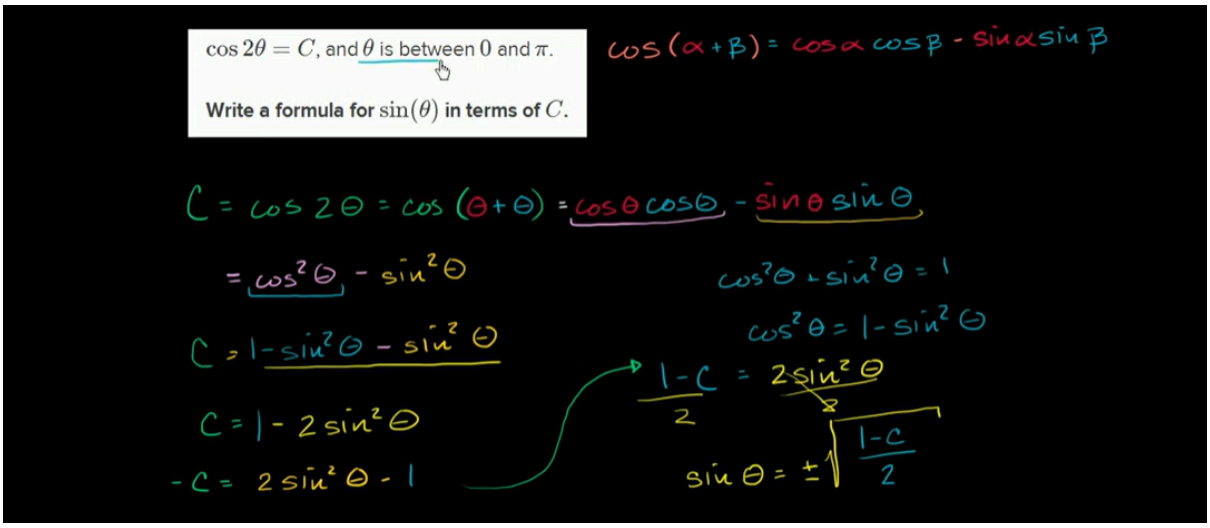
FINDING ANGLES USING TRIG ADDITION IDENTITIES

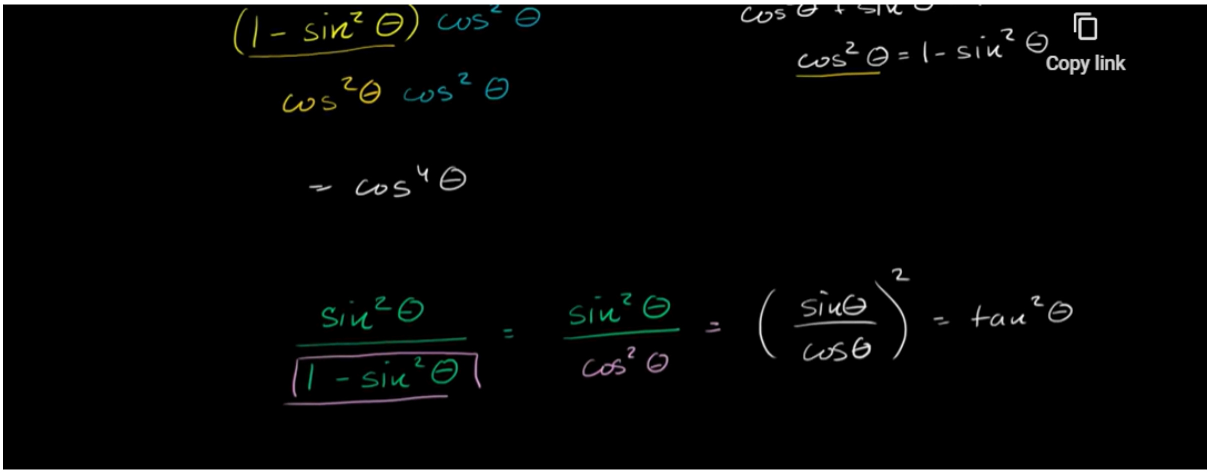






Manipulating trig expressions





TRIG IDENTITIES REFERENCE

RECIPROCAL RATIOS

Reciprocal and quotient identities

$\sec(\theta) = \frac{1}{\cos(\theta)}$
[Explain]

$\csc(\theta) = \frac{1}{\sin(\theta)}$
[Explain]

$\cot(\theta) = \frac{1}{\tan(\theta)}$
[Explain]

$\tan(\theta) = \frac{\sin(\theta)}{\cos(\theta)}$
[Explain]

$\cot(\theta) = \frac{\cos(\theta)}{\sin(\theta)}$
[Explain]

Ratio	Reciprocal
Sine ($\sin$)	Cosecant ($\csc$)
Cosine ($\cos$)	Secant ($\sec$)
Tangent ($\tan$)	Cotangent ($\cot$)

Pythagorean identities

$\sin^2(\theta) + \cos^2(\theta) = 1^2$
[Explain]

$\tan^2(\theta) + 1^2 = \sec^2(\theta)$
[Explain]

$\cot^2(\theta) + 1^2 = \csc^2(\theta)$
[Explain]

Angle sum and difference identities

$$\sin(\theta + \phi) = \sin\theta\cos\phi + \cos\theta\sin\phi$$

$$\sin(\theta - \phi) = \sin\theta\cos\phi - \cos\theta\sin\phi$$

$$\cos(\theta + \phi) = \cos\theta\cos\phi - \sin\theta\sin\phi$$

$$\cos(\theta - \phi) = \cos\theta\cos\phi + \sin\theta\sin\phi$$

$$\tan(\theta + \phi) = \frac{\tan\theta + \tan\phi}{1 - \tan\theta\tan\phi}$$

$$\tan(\theta - \phi) = \frac{\tan\theta - \tan\phi}{1 + \tan\theta\tan\phi}$$

Double angle identities

$$\sin(2\theta) = 2\sin\theta\cos\theta$$

[Explain]

$$\cos(2\theta) = 2\cos^2\theta - 1$$

[Explain]

$$\tan(2\theta) = \frac{2\tan\theta}{1 - \tan^2\theta}$$

[Explain]

Half angle identities

$$\sin\frac{\theta}{2}=\pm\sqrt{\frac{1-\cos\theta}{2}}$$

$$\cos\frac{\theta}{2}=\pm\sqrt{\frac{1+\cos\theta}{2}}$$

$$\tan\frac{\theta}{2}=\pm\sqrt{\frac{1-\cos\theta}{1+\cos\theta}}$$

$$=\frac{1-\cos\theta}{\sin\theta}$$

$$=\frac{\sin\theta}{1+\cos\theta}$$

[Explain]

Symmetry and periodicity identities

$\sin(-\theta)=-\sin(\theta)$
[Explain]

$\cos(-\theta)=+\cos(\theta)$
[Explain]

$\tan(-\theta)=-\tan(\theta)$
[Explain]

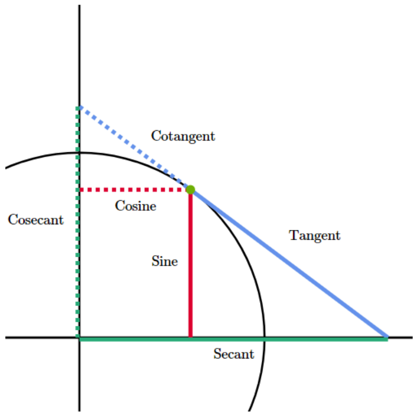
$\sin(\theta+2\pi)=\sin(\theta)$

$\cos(\theta+2\pi)=\cos(\theta)$

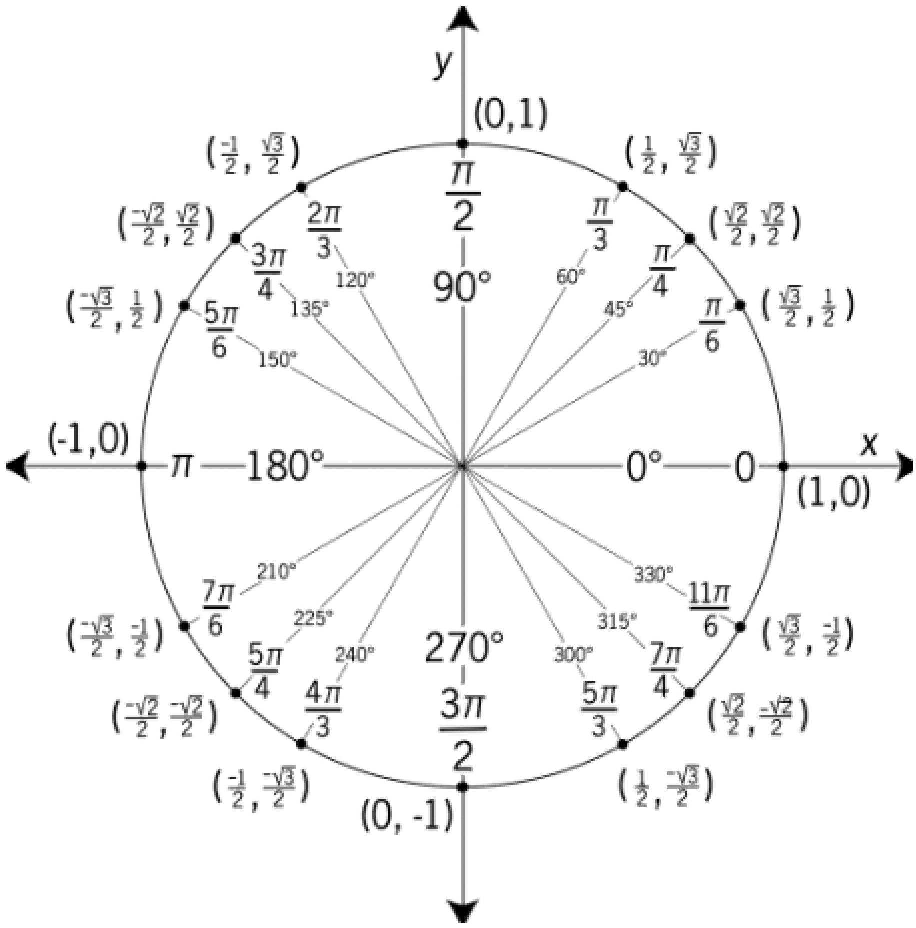
$\tan(\theta+\pi)=\tan(\theta)$

Appendix: All trig ratios in the unit circle

Use the movable point to see how the lengths of the ratios change according to the angle.

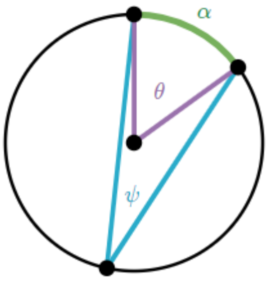


TRIG SPECIAL ANGLES UNIT CIRCLE



INSCRIBED ANGLES

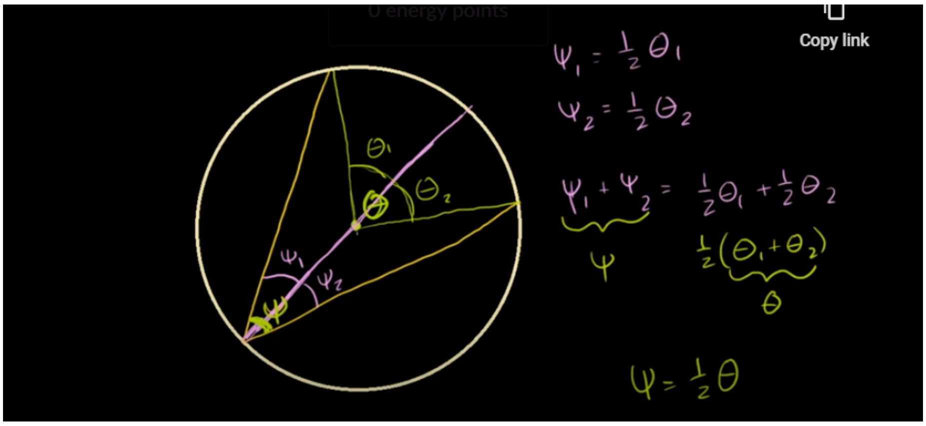
Inscribed - inscris, вписанный

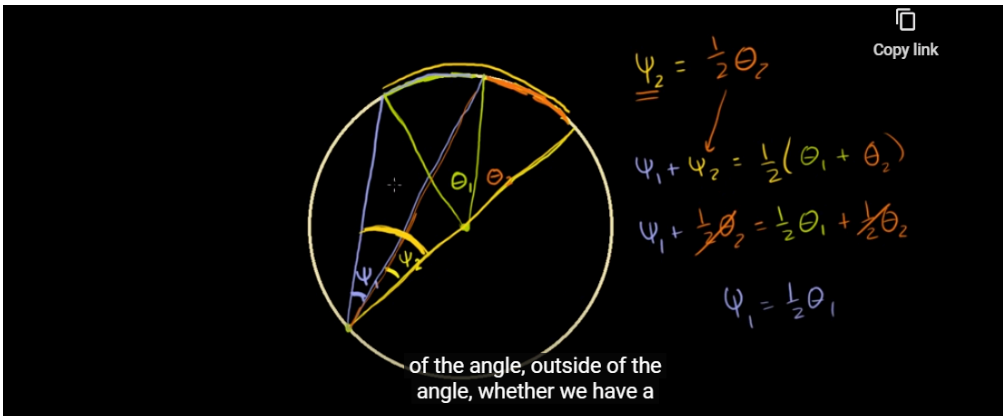


Central angle - when the vertex of the angle is the center of the circle
Inscribed angle - when the vertex of the angle is on the circumference
Intercepted arc - when the rays of central and inscribed angle intercept the circumference at two distinct points

Inscribed angle theorem - any central angle or intercepted angle is twice the measure of the corresponding arc

INSCRIBED ANGLE THEOREM PROOF





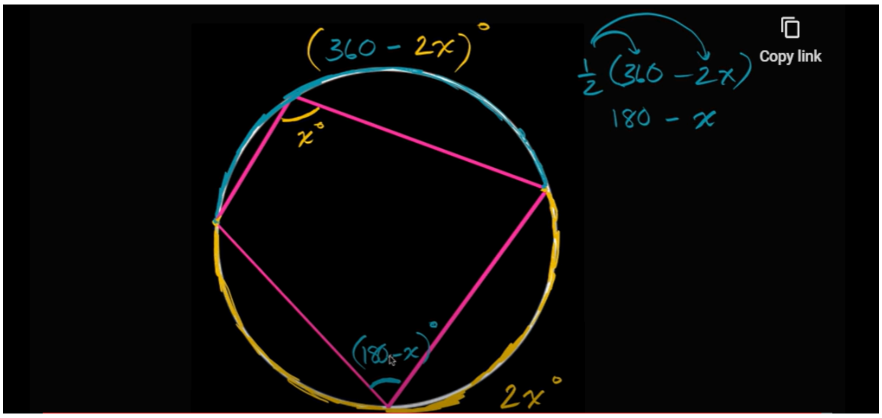
Effect - thoroughly do something ; temeinic

Product/ivity - serve to produce

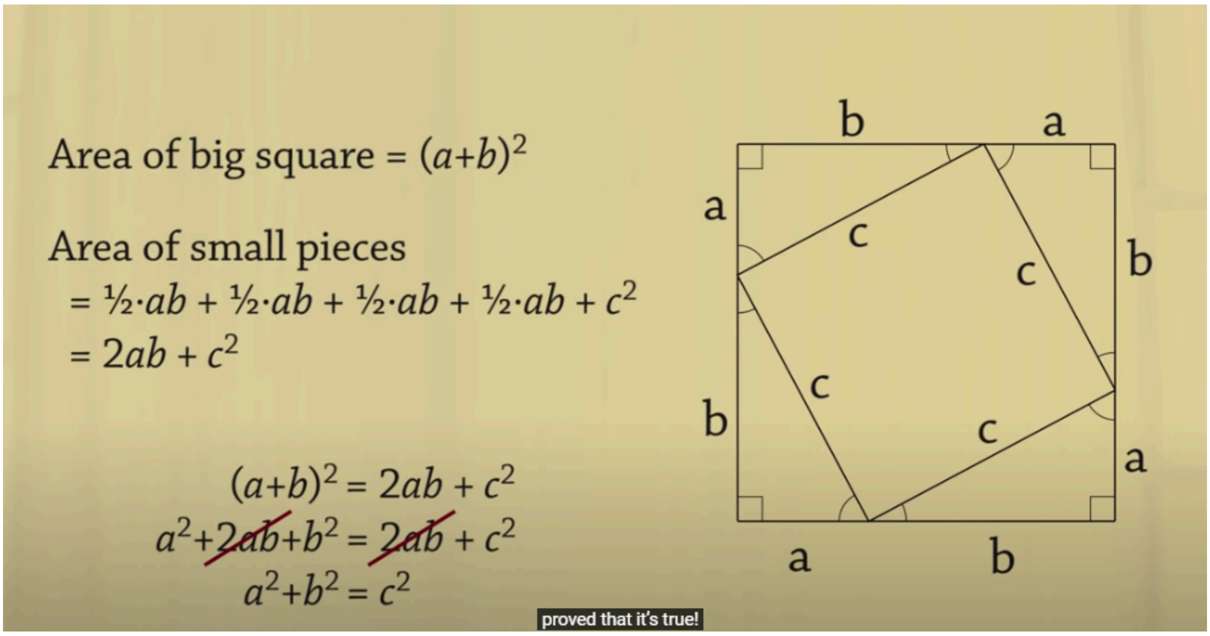
INSCRIBED SHAPES/ANGLE SUBTENDED BY DIAMETER
If an inscribed angle intercepts the diameter then it's measure is 90 degrees

HOW TO THINK
You always think relative to the problem from different perspectives

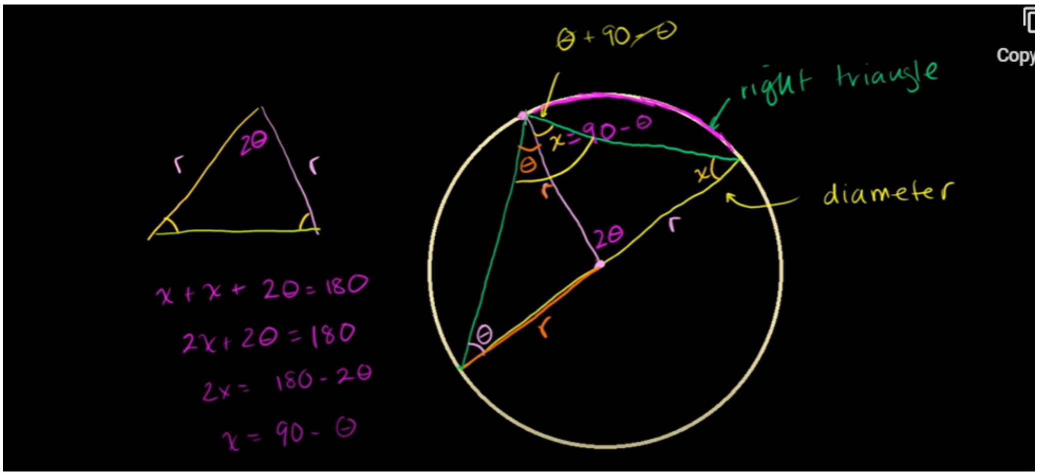
PROOF SUPPLEMENTARY ANGLES OF A INSCRIBED QUADRILATERAL SUM UP TO 180



PROOF OF PYTHAGOREAN THEORY

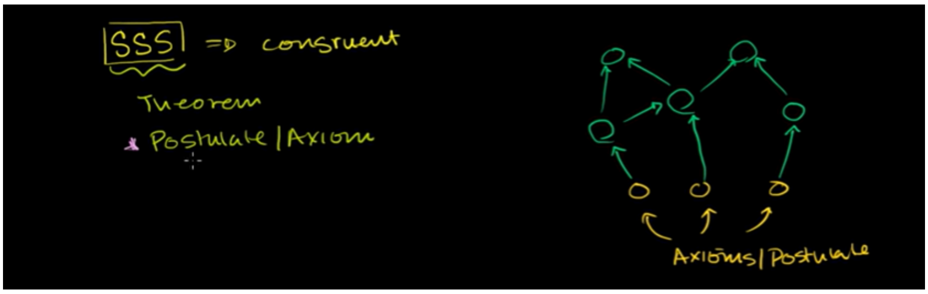


PROOF RIGHT TRIANGLES INSCRIBED IN CIRCLES(if one side is diameter)



AXIOM/POSTULATE/THEOREM

You use axioms and postulates that you assume to prove theorems



TANGENT LINES

A line is tangent if it is perpendicular to the radius so intersects the circumference only at one point

Any two segments tangent to a circle from a common endpoint are congruent

AREA VOLUME

Area - The amount of space enclosed in a 2D figure

Volume - The amount of space enclosed in a 3D figure

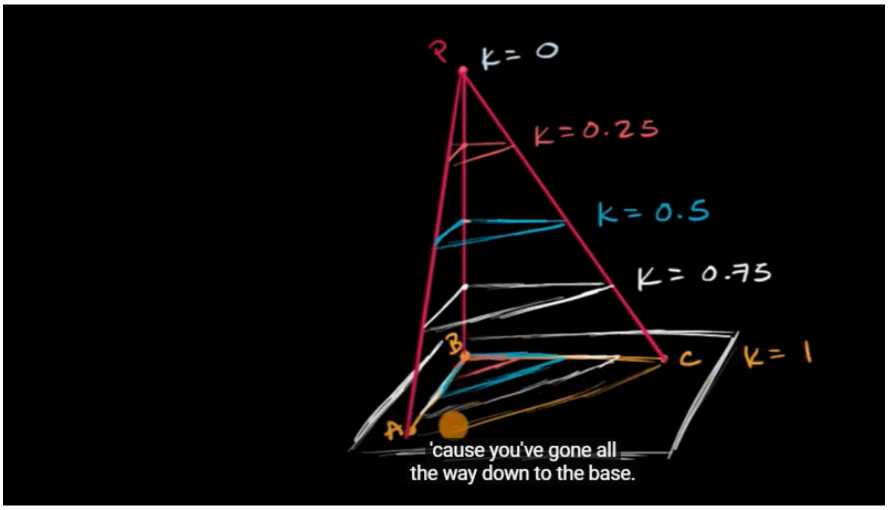
PROPORTIONAL RELATIONSHIP

Proportional relationship are two quantities where the ratio between two quantities is always the same

DENSITY

Proportional relationship that relates some quantity(such mass or number of people) to the volume or area of a region

DILATING IN 3D



CUTTING A RECTANGULAR PYRAMID

No matter where you cut vertically you will get either a trapezoid or a triangle if the cut is in the middle; horizontally it will be a square

SHAPE VS SOLID

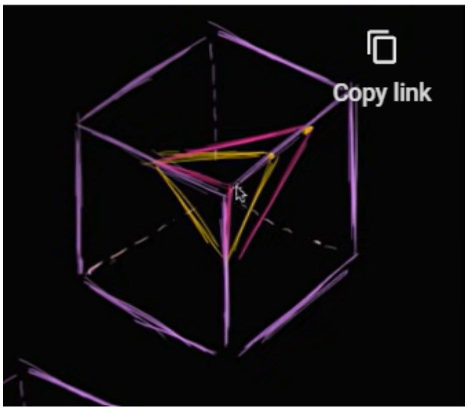
Shape - a 2 dimensional outline or a form of an object

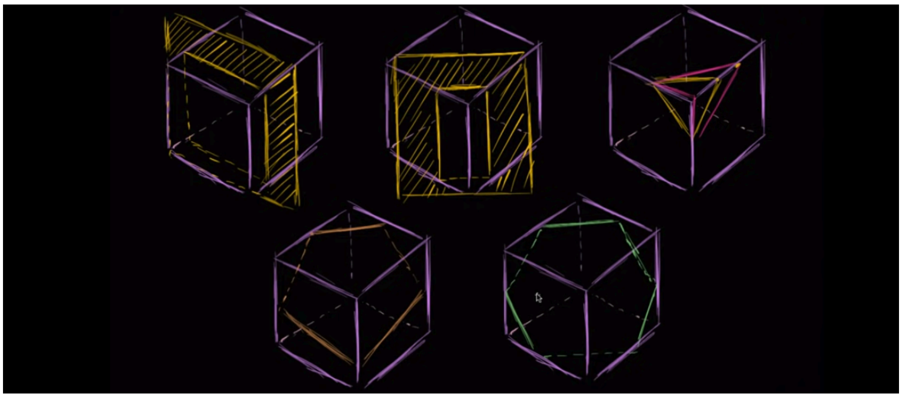
A form has shape, size, proportion, structure, texture, contour

Solid - a 3 dimensional object

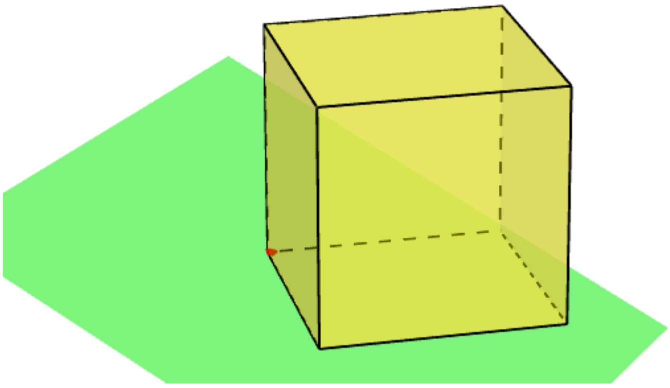
WAYS TO CROSS SECTION A CUBE

Cross section - an intersection of a solid body in 3d with a plane
right, equilateral, isosceles

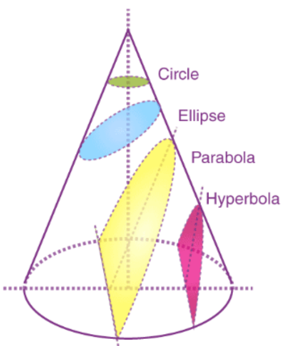




SLICING A CUBE DIAGONALLY TO ONE OF ITS FACES



CROSS SECTIONS OF A CONE



CAVALIERI’S PRINCIPLE 2D

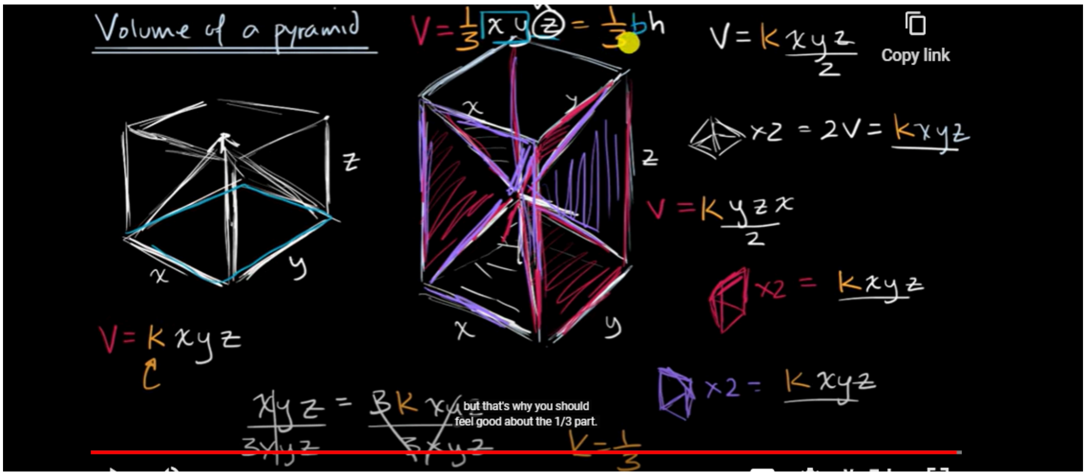
If two 2d figures have the same height and width at every point along height

CAVALIERI’S PRINCIPLE 3D

If two 3d figures have the same height and the same cross-sectional area at every point along height

VOLUME OF PYRAMIDS INTUITION

Where does the coefficient k come from ?
The volume of a pyramid should be v = kxyz, like volume of a cube, but pyramid is a part of the cube so has to be multiplied by some coefficient
V = ⅓ * base * height



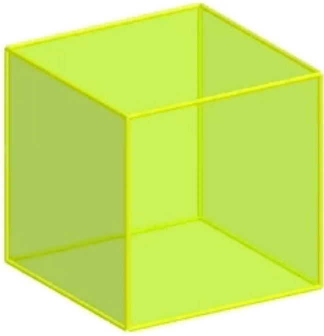
WHAT IS PYRAMID

A **pyramid** is the collection of all points (inclusive) between a polygon-shaped base and an apex that is in a different plane from the base.

or collection of all dilations between 0 and 1, apex being 0, base 1.

WHERE DOES THE ⅓ COME FROM ?

Suppose we start with a cube with a side length of 1 unit. We can slice that cube into congruent pyramids.



PRISM POLYHEDRON

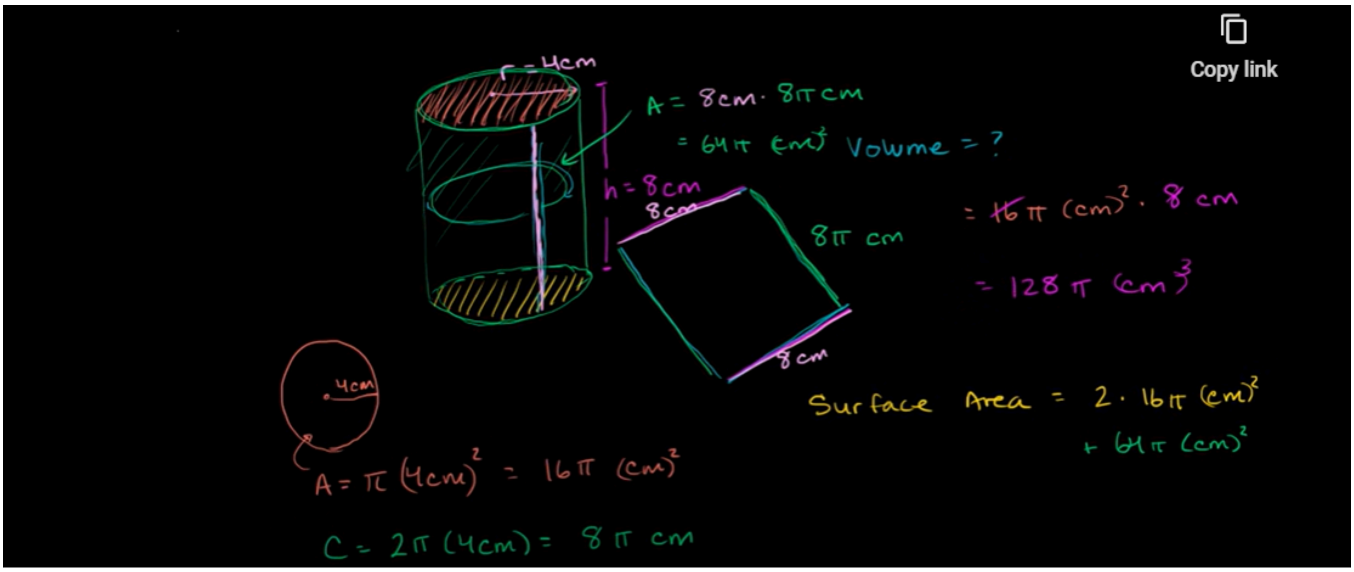
Polyhedron - many sides from greek
Polygon - many angles
Prims - is a three-dimensional geometric figure with two identical polygonal bases and rectangular or parallelogram-shaped faces connecting the corresponding sides of the bases.
Oblique - косой

VOLUME AND SURFACE AREA

The same as pyramid

CYLINDER VOLUME & SURFACE AREA

Surface - suprafata - поверхность - means all the area of a solid body



VOLUMES OVERVIEW

Prism like figures - base * height
Triangular prisms - ½ base * height
Cylinder - pi r^2 * height
Cone - 1/3 * pi r^2 * height
Pyramid - 1/3 * base * height
Sphere - 4/3 * pi r^3

DENSITY

Area density and Volume density
density= some quantity per unit area; quantity/unit area or volume area

Transversal, proofs, parallel lines (to repeat)