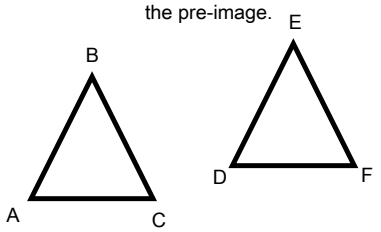
Level 1 - Transformations

Rigid Motions

Rigid motions preserve the size of the side lengths and angle measures. For this reason, the image is always **congruent** to the pre-image.



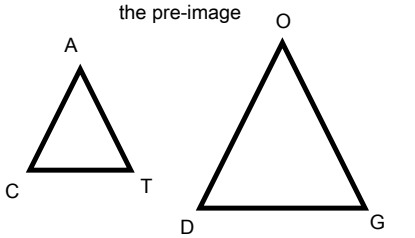
A translation along BE maps △ABC onto △DEF

Minimum rotation

$$\frac{360}{n}$$

Dilations

Dilations change the side length but preserves the angle measures. For this reason, the image is always **similar** to the pre-image



A dilation with a scale factor of 2 maps △CAT onto △DOG

Level 2 - Congruent Triangles

Proving Congruence

SSS

SAS

ASA

AAS

HL

NOTHING ELSE!

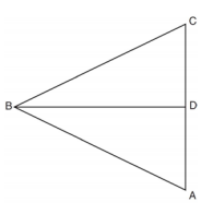
CPCTC

Corresponding Part of Congruent Triangles are Congruent

Use CPCTC

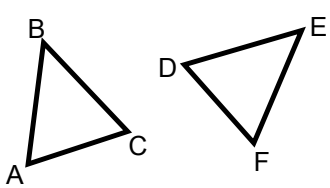
Given: $\triangle ABC$, $\overline{BD}$ bisects $\angle ABC$, $\overline{BD} \perp \overline{AC}$

Prove: $\overline{AB} \cong \overline{CB}$

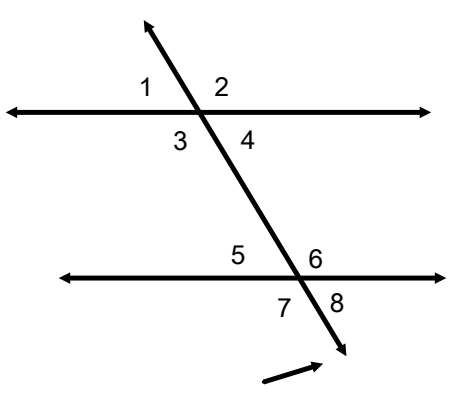


△ABC = △DEF

Order matters!



Level 3 - Parallel Lines



Transversal

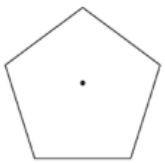
Alternate Interior Angles are Congruent

Alternate Exterior Angles are Congruent

Corresponding Angles are Congruent

Same-Side Interior Angles are ***Supplementary***

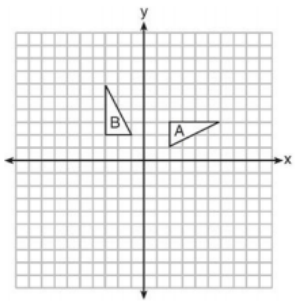
A regular pentagon is shown in the diagram below.



If the pentagon is rotated clockwise around its center, the minimum number of degrees it must be rotated to carry the pentagon onto itself is

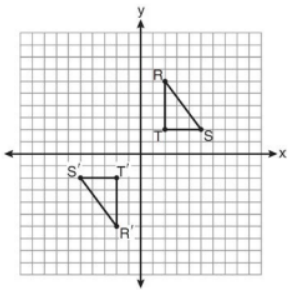
1) 54°
2) 72°
3) 108°
4) 360°

In the diagram below, which single transformation was used to map triangle A onto triangle B?



1) line reflection
2) rotation
3) dilation
4) translation

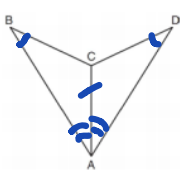
As shown on the graph below, $\triangle R'S'T'$ is the image of $\triangle RST$ under a single transformation.



Which transformation does this graph represent?

1) glide reflection
2) line reflection
3) rotation
4) translation

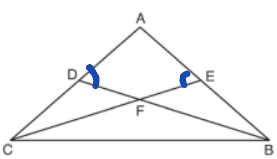
As shown in the diagram below, $\overline{AC}$ bisects $\angle BAD$ and $\angle B \cong \angle D$.



Which method could be used to prove $\triangle ABC \cong \triangle ADC$?

1) SSS
2) AAA
3) SAS
4) AAS

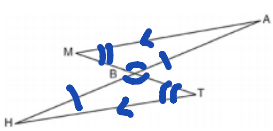
In $\triangle ABC$ shown below with $\overline{ADC}$, $\overline{AEB}$, $\overline{CFE}$, and $\overline{BFD}$, $\triangle ACE \cong \triangle ABD$.



Which statement must be true?

1) $\angle ACF \cong \angle BCF$
2) $\angle DAE \cong \angle DFE$
3) $\angle BCD \cong \angle ABD$
4) $\angle AEF \cong \angle ADF$

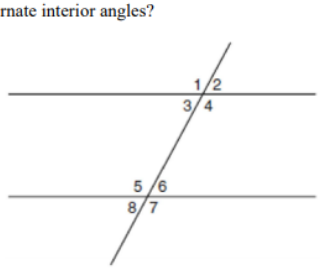
Given: $\overline{MT}$ and $\overline{HA}$ intersect at B, $\overline{MA} \parallel \overline{HT}$, and $\overline{MT}$ bisects $\overline{HA}$.



Prove: $\overline{MA} \cong \overline{HT}$

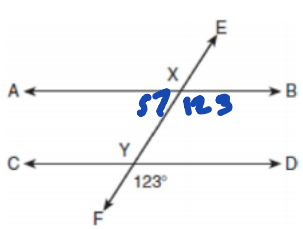
S	R
(1) " "	(1) given
(2) CM ≅ CT	(2) Alt. int. ∠'s ≅ when lines ∥
(3) ∠MBA ≅ ∠HBT	(3) vert. ∠'s ≅
(4) AB ≅ BA	(4) A line bisector divides a line in 2 ≅ parts
(5) ΔMBA ≅ ΔHBT	(5) AAS ≅
(6) MA ≅ HT	(6) CPCTC

In the accompanying figure, what is one pair of alternate interior angles?



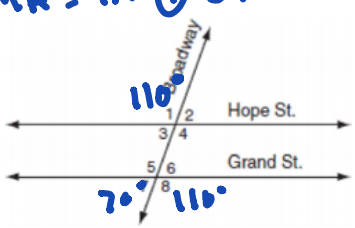
1) $\angle 1$ and $\angle 2$
2) $\angle 4$ and $\angle 5$
3) $\angle 4$ and $\angle 6$
4) $\angle 6$ and $\angle 8$

In the accompanying diagram, parallel lines $\overline{AB}$ and $\overline{CD}$ are intersected by transversal $\overline{EF}$ at points X and Y, and $m\angle FYD = 123$. Find $m\angle AXY$.



$\angle AXY = 57°$

The accompanying diagram shows two parallel roads, Hope Street and Grand Street, crossed by a transversal road, Broadway.



If $m\angle 1 = 110$, what is the measure of $m\angle 7$?

1) 40°
2) 70°
3) 110°
4) 180°

Level 4 - Similarity

Facts about similar triangles:

1) Corresponding angles are congruent

2) Corresponding sides have the same ratio

Three ways to prove similarity

AA

SSS ← Must show corresponding sides have the same ratio!

SAS

Facts about dilations

1) After dilation, image is parallel to the pre - image (will have same slope)

2) Angle measures stay the same after dilation

3) Dilations produce similar figures

4) Scale factor: $\frac{\text{Distance from image to center of dilation}}{\text{Distance from pre-image to center of dilation}}$

Level 5 - Parallelograms

Properties of Parallelograms

1) Opposite sides are congruent

2) Opposite sides are parallel

3) Opposite angles are congruent

4) Adjacent angles are supplementary

5) Diagonals bisect each other

Special Properties of a Rectangle

1) All angles are 90

2) Diagonals are congruent

Special Properties of a Rhombus

1) Diagonals bisect vertex angles

2) Diagonals are perpendicular

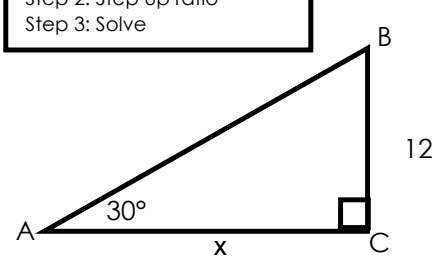
3) All sides are congruent

SQUARES HAVE ALL THE PROPERTIES!

Level 6 - Trigonometry

Steps To Find Missing Side or Angle

Step 1: Identify Trig Function
Step 2: Step up ratio
Step 3: Solve



Trig Function ↘ Angle Measure ↙ Side Ratio ↙

_____ ( ) = _____

YOU MUST REMEMBER

SOHCAHTOA

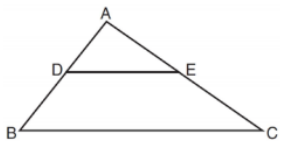
YOU MUST REMEMBER

SinA = CosB
if A + B = 90

Which is *not* a property of all similar triangles?

1) The corresponding angles are congruent.
2) The corresponding sides are congruent.
3) The perimeters are in the same ratio as the corresponding sides.
4) The altitudes are in the same ratio as the corresponding sides.

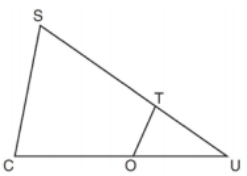
4 In the diagram below, $\triangle ABC \sim \triangle ADE$.



Which measurements are justified by this similarity?

1) $AD = 3$, $AB = 6$, $AE = 4$, and $AC = 12$
2) $AD = 5$, $AB = 8$, $AE = 7$, and $AC = 10$
3) $AD = 3$, $AB = 9$, $AE = 5$, and $AC = 10$
4) $AD = 2$, $AB = 6$, $AE = 5$, and $AC = 15$

In $\triangle SCU$ shown below, points T and O are on $\overline{SU}$ and $\overline{CU}$, respectively. Segment OT is drawn so that $\angle C \cong \angle OTU$.



If $TU = 4$, $OU = 5$, and $OC = 7$, what is the length of $\overline{ST}$?

1) 5.6
2) 8.75
3) 11
4) 15

A parallelogram must be a rectangle when its

1) diagonals are perpendicular
2) diagonals are congruent
3) opposite sides are parallel
4) opposite sides are congruent

If $ABCD$ is a parallelogram, which statement would prove that $ABCD$ is a rhombus?

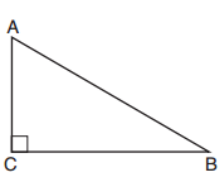
1) $\angle ABC \cong \angle CDA$
2) $\overline{AC} \cong \overline{BD}$
3) $\overline{AC} \perp \overline{BD}$
4) $\overline{AB} \perp \overline{CD}$

In the diagram below, $MATH$ is a rhombus with diagonals $\overline{AH}$ and $\overline{MT}$.

If $m\angle HAM = 12$, what is $m\angle AMT$?

1) 12 2) 78 3) 84 4) 156

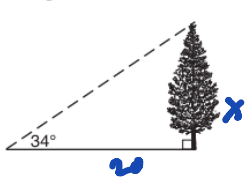
In scalene triangle ABC shown in the diagram below, $m\angle C = 90°$.



Which equation is always true?

(1) $\sin A = \sin B$
(2) $\cos A = \cos B$
(3) $\cos A = \sin C$
(4) $\sin A = \cos B$

As shown in the diagram below, the angle of elevation from a point on the ground to the top of the tree is 34°.



$\tan 34 = \frac{x}{20}$

If the point is 20 feet from the base of the tree, what is the height of the tree, to the *nearest tenth of a foot*?

(1) 29.7
(2) 16.6
(3) 13.5
(4) 11.2

Level 7 and 8 - Coordinate Geometry

Parallel Slopes

Are always the same

$m_1 = 3$ $m_2 = 3$

Perpendicular Slopes

Are always negative reciprocals

$m_1 = 3$ $m_2 = -\frac{1}{3}$

Dilations of Lines

If the center of dilation is on the line - the equation of the line doesn't change!

If the center of dilation is on the origin, just multiply the y-intercept by the scale factor. Slope stays the same!

Partitioning Line Segments

$$x_1 + \frac{r_1}{r_1 + r_2}(x_2 - x_1)$$

$$y_1 + \frac{r_1}{r_1 + r_2}(y_2 - y_1)$$

Level 9 - Circles

Area of a sector

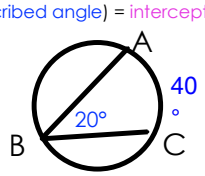
$$Area = \frac{\theta}{360} \times \pi r^2$$

Length of a sector

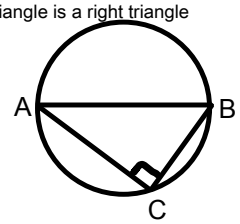
$$l = \frac{\theta}{360} 2\pi r$$

Inscribed Angle Theorem

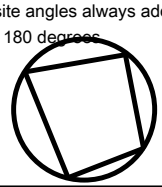
2 (inscribed angle) = intercepted arc



If a triangle is inscribed in a circle and the **hypotenuse is the diameter** of the circle, than the triangle is a right triangle



If a quadrilateral is inscribed in a circle, then the opposite angles always add up to 180 degrees



Chord-Chord

$$\text{Angle} = \frac{\text{Arc1} + \text{Arc2}}{2}$$

Secant-Secant

$$\text{Angle} = \frac{\text{Big Arc} - \text{Small Arc}}{2}$$

Level 10 - Volume

Circle	$A = \pi r^2$
Circle	$C = \pi d$ or $C = 2\pi r$
General Prisms	$V = Bh$
Cylinder	$V = \pi r^2 h$
Sphere	$V = \frac{4}{3}\pi r^3$
Cone	$V = \frac{1}{3}\pi r^2 h$
Pyramid	$V = \frac{1}{3}Bh$

Formula To Find Weight

W = V x D

V = Volume

D = Density

Population Density

$$\text{Density} = \frac{\text{Population}}{\text{Area}}$$

Formula To Find Cost

C = W x U

W = Weight

U = Unit Price

Rotating Figures

Rotate Triangle - Cone

Rotate Rectangle - Cylinder

Rotate Circle - Sphere

What are the coordinates of the point on the directed line segment from $K(-5,-4)$ to $L(5,1)$ that partitions the segment into a ratio of 3 to 2?

1) $(-3,-3)$
2) $(-1,-2)$
3) $\left(0,-\frac{3}{2}\right)$
4) $(1,-1)$

The equation of line h is $2x+y=1$. Line m is the image of line h after a dilation of scale factor 4 with respect to the origin. What is the equation of the line m?

1) $y=-2x+1$
2) $y=-2x+4$
3) $y=2x+4$
4) $y=2x+1$

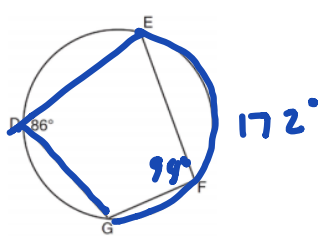
Which equation represents the line that is perpendicular to $2y=x+2$ and passes through the point $(4,3)$?

1) $y=\frac{1}{2}x-5$
2) $y=\frac{1}{2}x+1$
3) $y=-2x+11$
4) $y=-2x-5$

The equation of a circle is $x^2+y^2+6y=7$. What are the coordinates of the center and the length of the radius of the circle?

(1) center $(0,3)$ and radius 4
(2) center $(0,-3)$ and radius 4
(3) center $(0,3)$ and radius 16
(4) center $(0,-3)$ and radius 16

As shown in the diagram below, quadrilateral $DEFG$ is inscribed in a circle and $m\angle D = 86$.



172°

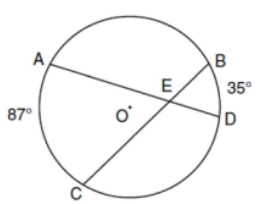
99

Determine and state $m\overset{\frown}{GFE}$. Determine and state $m\angle F$.

$m\overset{\frown}{GFE} = 172°$

$m\angle F = 99°$

In the diagram below of circle O, chords $\overline{AD}$ and $\overline{BC}$ intersect at E, $m\overset{\frown}{AC} = 87$, and $m\overset{\frown}{BD} = 35$.



What is the degree measure of $\angle CEA$?

1) 87
2) 61
3) 43.5
4) 26

A shipping container is in the shape of a right rectangular prism with a length of 12 feet, a width of 8.5 feet, and a height of 4 feet. The container is completely filled with contents that weigh, on average, 0.25 pound per cubic foot. What is the weight, in pounds, of the contents in the container?

(1) 1,632
(2) 408
(3) 102
(4) 92

$V = 12 \times 8.5 \cdot 4$

$V = 408 ft^3$

$W = 408 \times .25$

$W = 102 lbs$