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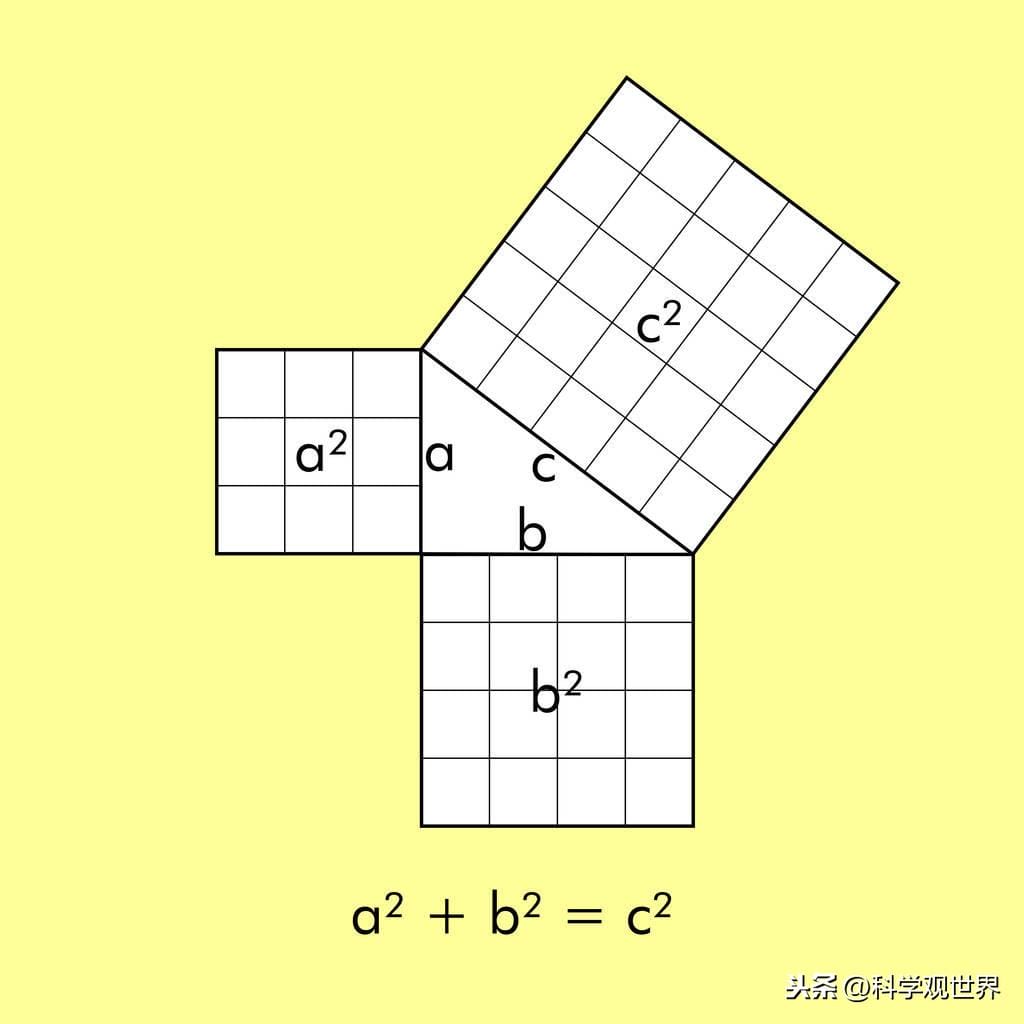
**IDX G9 MATH S+ STUDY GUIDE ISSUE 5**

**By Aiden Zhan and Julie Zhu**

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13. ***8-1 The Pythagorean Theorem and Its Converse***

**1-New Theorem**

**·Th 8-1(Pythagorean Theorem) In a right triangle, the sum of the squares of the lengths of the legs is equal to the square of the length of the hypotenuse. Just a²+b²=c²。**

**·Th 8-2(Converse of the Pythagorean Theorem) If the square of the length of**

**one side of a triangle is equal to the sum of the squares of the lengths of the other**

**two sides, just a²+b²=c², then the triangle is a right triangle.**

**·Th 8-3 If the square of the length of one side of triangle is greater than the**

**sum of the squares of the lengths of the other two sides, just a²+b²<c²,then the**

**triangle is a obtuse triangle.**

**·Th 8-4 If the square of the length of one side of a triangle is smaller than the sum of the squares of the length of the other two sides, just a²+b²>c², then the triangle is acute triangle.**

**2-New terms**

**·*Pythagorean triple***

**Pythagorean triple is a set of nonzero three numbers a,b,c that satisfy a²+b²=c².**

**Examples of Pythagorean triple:**

1. **a=3 ,b=4 ,c=5**
2. **a=5 ,b=12 ,c=13**
3. **a=8 ,b=15, c=17**
4. **a=7 ,b=24, c=25**
5. **a=9 ,b=40, c=41**
6. **a=11 ,b=60, c=61**
7. **a=12 ,b=35, c=37**
8. **a=13 ,b=84, c=85**

**(better to memorize)**

1. ***8-2 Special Right Triangles***
2. **New Theorem**

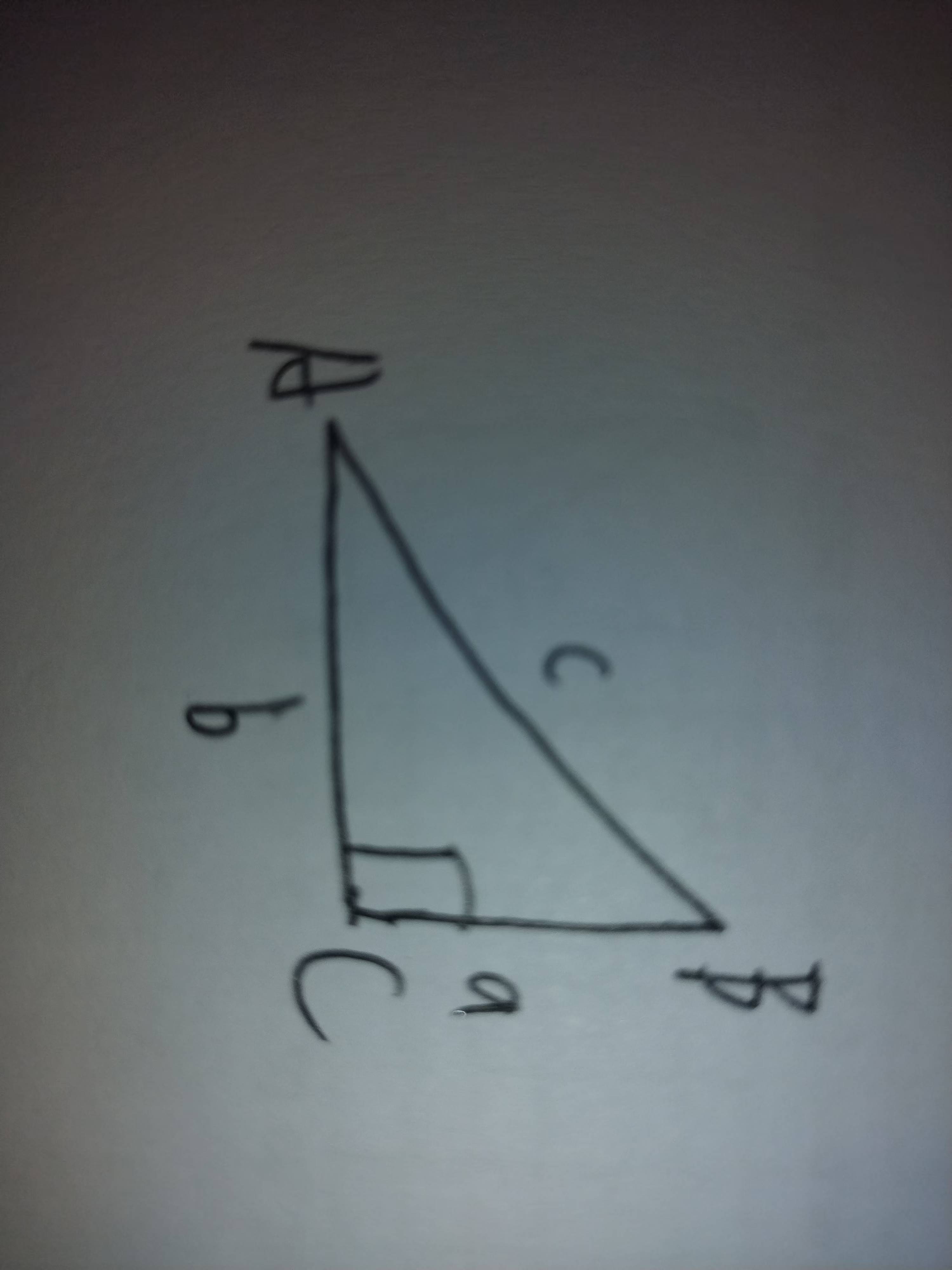
**·Th 8-5 (45°-45°-90°Triangle Th) In a 45°-45°-90°triangle, both legs are congruent and the length of the hypotenuse is times the length of a leg. Just 3 sides are in ratio 1:1:.**

**·Th 8-6 (30°-60°-90° Triangle Th) In a 30°-60°-90°triangle, the length of the**

**hypotenuse is twice the length of the shorter leg. The length of longer leg is times the length of the shorter leg. Just 3 sides are in ratio 1:2:**

1. ***8-3 The Tangent Ratio***
2. **New terms**

**·*Adjacent leg***

****Adjacent legs refer to the two sides of a right triangle that are connected to the right angle. Just a and b on the right picture.**

**·*Opposite leg***

**Opposite legs refers to the side of the triangle that is across from a given acute angle. Just a is the opposite leg of angle A on the right picture.**

**·*Tangent ratio***

**Tangent ratio is defined as the ratio of the length of the opposite side to the length of the adjacent side relative to a given acute angle in a right triangle. For example, the tangent ratio of the angle A in the right picture is equals to ratio of a to b. BUT, it depends on the measure of the angle rather than the size of the sides.**

**Plus, with the tangent ratio of one angle, we can find the length of its opposite side by tangent ratio\*hypotenuse and find the length of its adjacent side by hypotenuse/tangent ratio. Just a=tan(m∠a)\*c, b=in the right picture.**

1. **New symbols**

**·*tan***

***tan* is defined as the symbol to find tangent ratio of one angle by the measure of that angle. For example, *tan*(30°)=0.577**

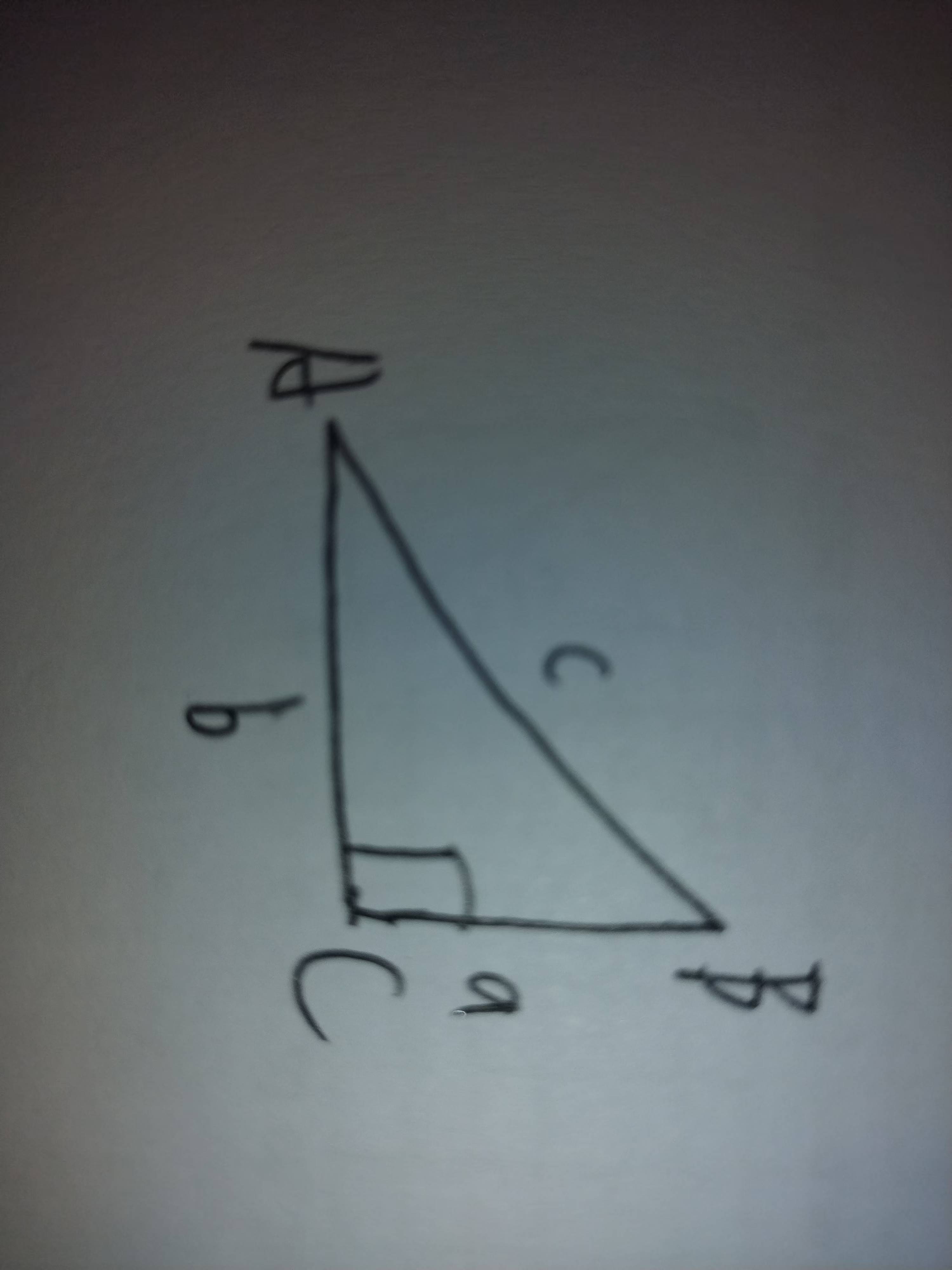
**·**

**is defined as the symbol to find the measure of one angle by tangent ratio of that angle which is also the converse version of *tan*. For example, 0.577)=30°**

**Plus, for that *tan* and are the converse version of each other, noting will happen to the value if you *tan* it and then it. For example, (tan(30°))=30°**

1. ***8-4 Sine and Cosine Ratios***
2. **New terms**

**·*Sine ratio***

**** Sine ratio is defined as the ratio of the length of the opposite side to the length of the hypotenuse relative to a given acute angle in a right triangle. For example, the sine**

**ratio of the angle A in the right picture is equals to ratio of a to c.**

**·*Cosine ratio***

**Cosine ratio is defined as the ratio of the length of the adjacent side to the length of the hypotenuse relative to a given acute angle in a right triangle. For example, the sine**

**ratio of the angle A in the right picture is equals to ratio of b to c.**

1. **New symbols**

**·*sin***

***sin* is defined as the symbol to find sine ratio of one angle by the measure of that angle. For example, *sin*(30°)=0.5**

**·*cos***

***cos* is defined as the symbol to find cosine ratio of one angle by the measure of that angle. For example, *cos*(30°)=0.866**

**·**

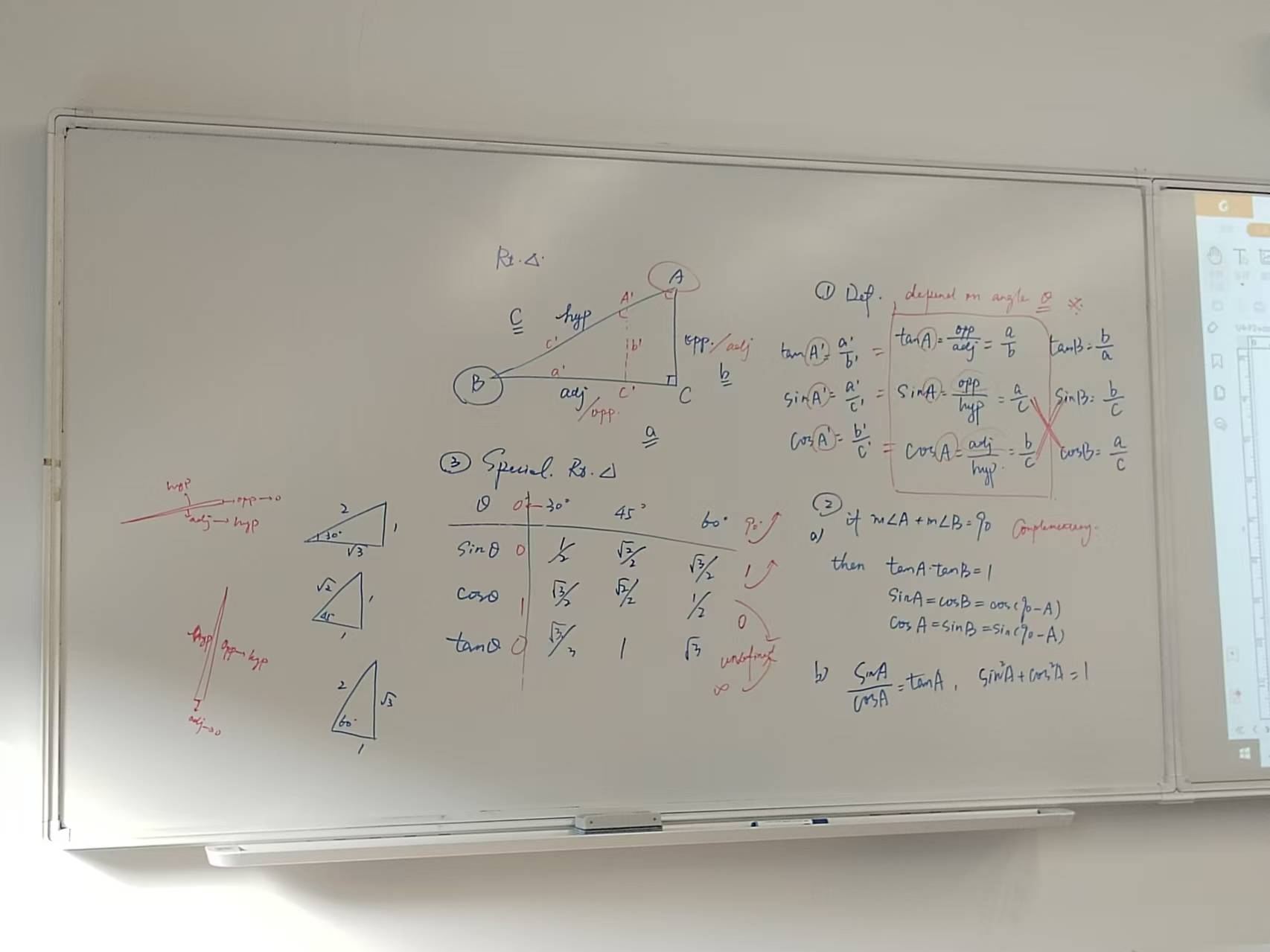
**is defined as the symbol to find the measure of one angle by sine ratio of that angle which is also the converse version of *sin*. For example, 0.5)=30°**

**·**

**is defined as the symbol to find the measure of one angle by cosine ratio of that angle which is also the converse version of *cos*. For example, 0.866)=30°**

1. **Others**

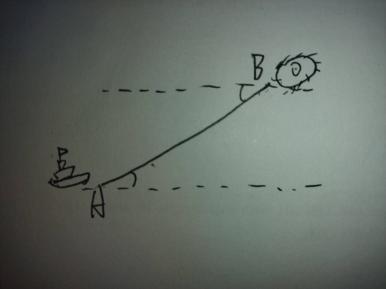
**The others which is mentioned in that chapter are included in this picture.**

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1. ***8-5 Angles of Elevation and Depression***
2. **New terms**

**·Angle of Elevation**

**The angle of elevation is the angle above the horizontal when looking up at an object.**

**Just the angle A on the right picture.**

**·Angle of Depression**

**The angle of depression is the angle below the horizontal when looking down at an object. Just the angle B on the right picture.**

1. **Solving right triangle**

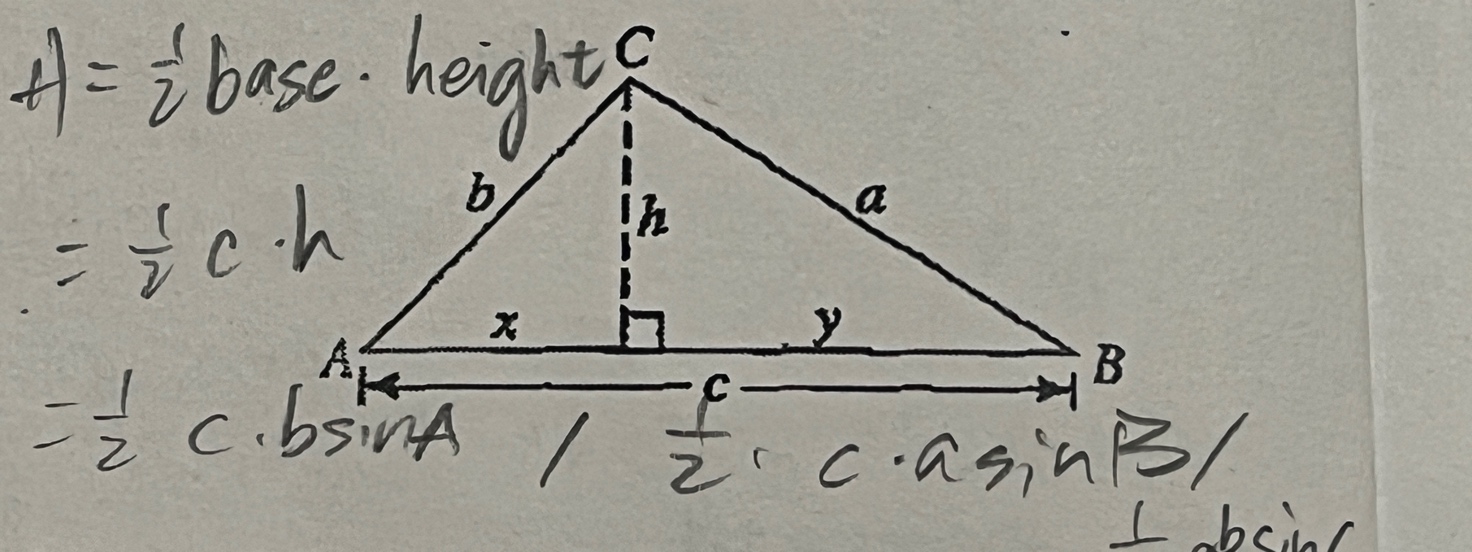
**sinX/1=opposite/hypotenuse**

**cosX/1=adjacent/hypotenuse**

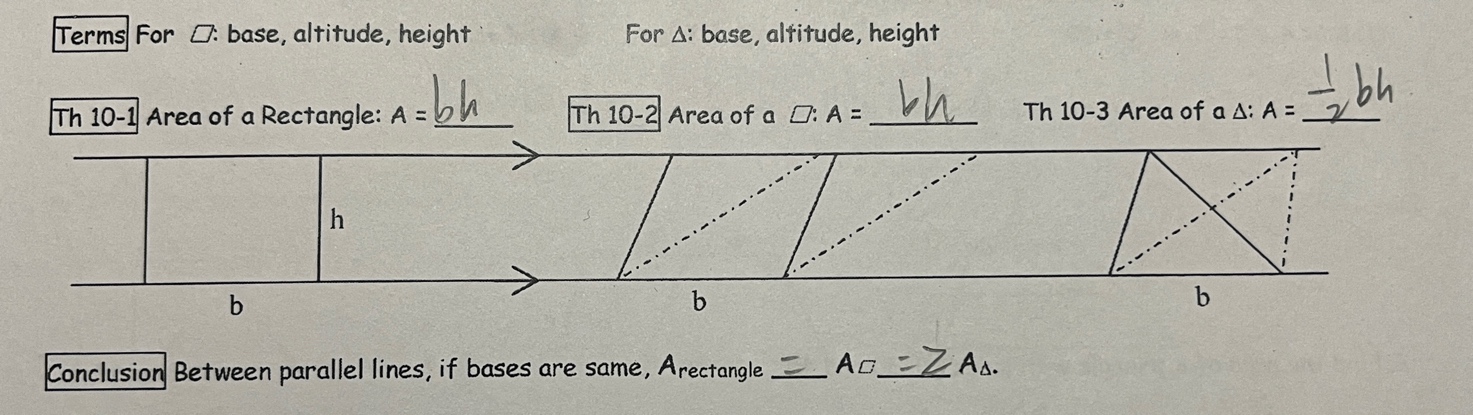
**tanX/1 = sinX/cosX = opposite/adjacent**

**H(eight)=bsinA=asinB**

**A(rea) of triangle=1/2base height=1/2 ab sinC=1/2 ac sinB= 1/2 bc sinA**

****

1. **Areas of parallelograms and triangles**

****

**A(rea) of a rectangle = B(ase) H(eight)**

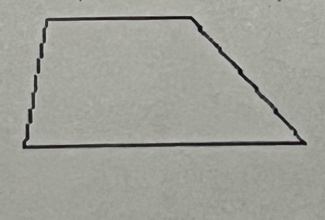
**Heron’s formula: S(ide): 1/2 (a+b+c)**

## A(era): √(s-a) (s-b) (s-c)

## (根号)

1. **Areas of trapezoids, rhombuses, and kites**

**Areas of trapezoids: 1/2 (base1+base2) height**

****

**Areas of rhombuses, and kites: 1/2 base1 base2**

****

1. **Areas of regular polygons**

Area of a regular n-gon: n(1/2 side apothem)=1/2ap

Area: √3/4

**A:(1/2 sinX)n**

**A: 1/2 n sinX**

**(x= 360/n)**