

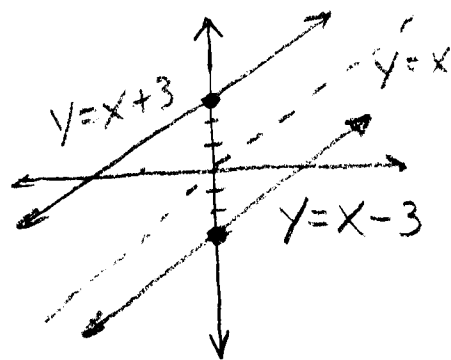
BE-Alg. 2 Monday 11-29-10

- ① DEFINE the inverse of a function.
- ② Is the inverse of a function always a function? If not, how can you tell if it is?
- ③ $y = f(x) = x + 3$ find $f^{-1}(x)$
Prove it is $f^{-1}(x)$

③ ans $\Rightarrow y = x + 3 = f(x)$

$$x = y + 3$$

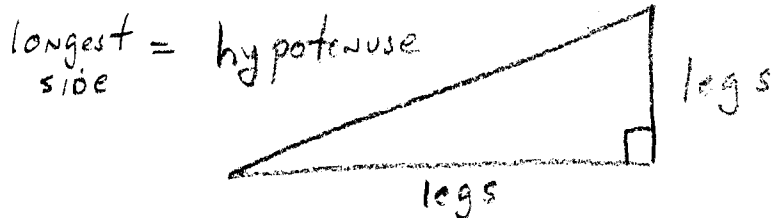
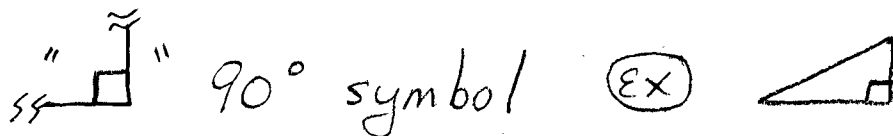
$$\boxed{x - 3 = y = f^{-1}(x)}$$



$$\left. \begin{array}{l} f(x) = x + 3 \\ f(x-3) = (x-3) + 3 \\ \quad = x \checkmark \\ (f \circ f^{-1})(x) = x \checkmark \end{array} \right\} \begin{array}{l} f^{-1}(x) = x - 3 \\ f^{-1}(x+3) = (x+3) - 3 \\ \quad = x \checkmark \\ (f^{-1} \circ f)(x) = x \checkmark \end{array}$$

Ch. 13-1 Right Triangle Trigonometry

Right Triangle Vocabulary AND Conventions & Properties

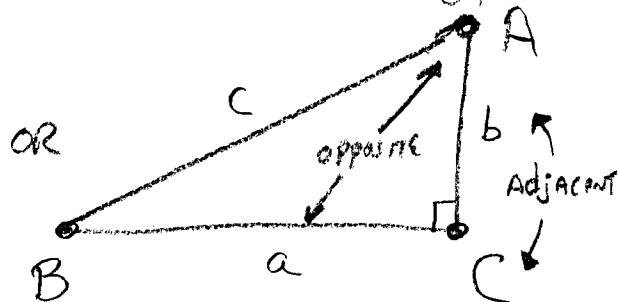
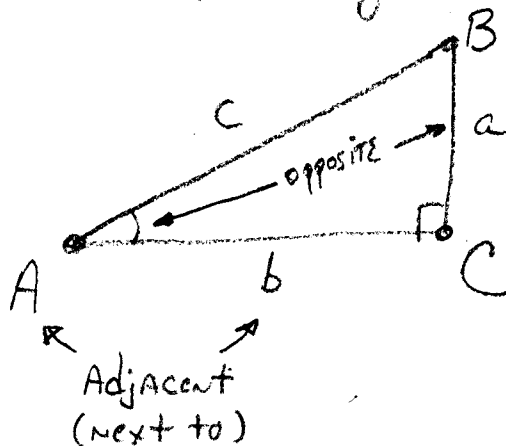


Every right triangle has ONE 90° angle (90°) and two acute ($< 90^\circ$) angles. The two acute angles Always add to 90° and together with the 90° angle = 180°

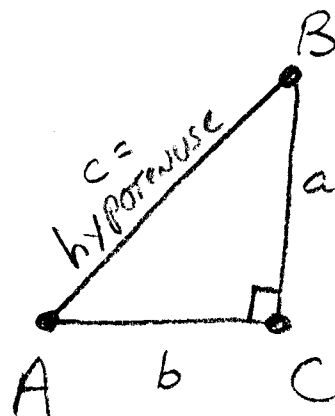
A, B, C = vertices or the angles (degrees)

a, b, c = sides (length)

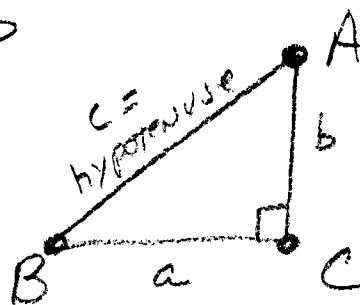
C = the 90° angle by convention $\therefore c$ = hypotenuse



- Adjacent and opposite are never used to describe the hypotenuse. The hypotenuse is called the... hypotenuse.

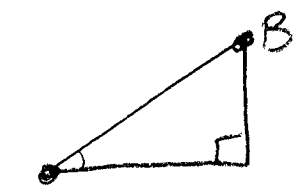


- $\angle A$ is always opposite side a (and adjacent to side b) (Angle A)
- $\angle B$ is always opposite side b (and adjacent to side a)



In any right triangle, once you know ONE acute angle - you know all 3 angles.

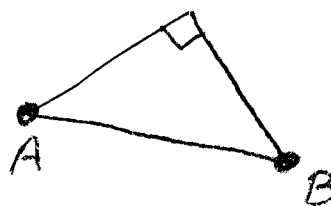
(EX) Name the missing $\angle$ value



$$\begin{aligned} A &= 40^\circ \\ B &= ? \\ C &= ? \end{aligned}$$

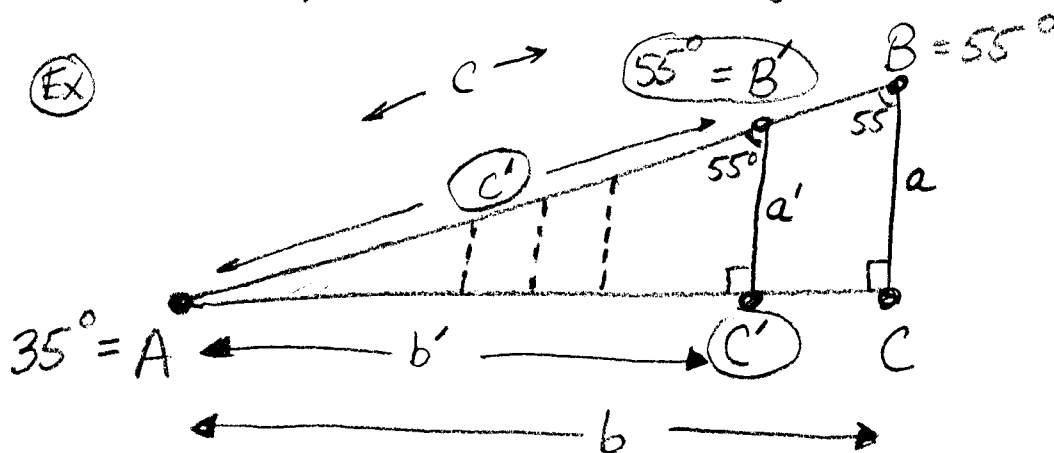


$$\begin{aligned} A &= 10^\circ \\ B &= ? \\ C &= ? \end{aligned}$$



$$\begin{aligned} A &= 45^\circ \\ B &= ? \\ C &= ? \end{aligned}$$

BECAUSE knowing the VALUE of 1 ACUTE angle "fixes" the VALUE of THE OTHER two angles, for ANY given ACUTE angle, say 35° , the RATIO of side lengths of ALL $35^\circ, 55^\circ, 90^\circ$ triangles ARE the SAME:



- INFINITE NUMBER OF $35^\circ-55^\circ-90^\circ$ triangles but the ratio of sides is always the same number

$$\text{For } A = 35^\circ, \quad \frac{a}{c} = \frac{a'}{c'} = \frac{\text{Any } a}{\text{Any } c} \approx .5736$$

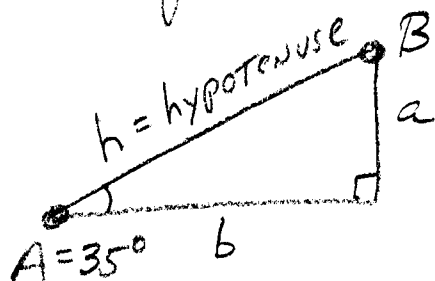
$$\frac{b}{c} = \frac{b'}{c'} = \frac{\text{any } b}{\text{any } c} \approx .8192$$

$$\frac{a}{b} = \frac{a'}{b'} = \frac{\text{any } a}{\text{any } b} \approx .7002$$

↑
 $\frac{\text{RISE}}{\text{RUN}}$ of A = SLOPE, slope of $45^\circ = 1$
 slope of $35^\circ = < 1$ but close

Since, for any PARTICULAR ACUTE angle in a right triangle the RATIO OF THE lengths of the sides are always the same, we NAME AND define them.

For THIS example:



$$\text{SINE} = \sin A = \sin 35^\circ = \frac{\text{opposite}}{\text{hypotenuse}} = \frac{o}{h} \approx .5736 \quad (\text{SOH})$$

$$\text{COSINE} = \cos A = \cos 35^\circ = \frac{\text{Adjacent}}{\text{hypotenuse}} = \frac{a}{h} \approx .8192 \quad (\text{CAH})$$

$$\text{tangent} = \tan A = \tan 35^\circ = \frac{\text{opposite}}{\text{adjacent}} = \frac{o}{a} \approx .7002 \quad (\text{TOA})$$

(Slope)

For any right triangle, where θ is an ACUTE $\angle$ θ = greek letter

$$\sin \theta = \frac{o}{h} \quad \cos \theta = \frac{a}{h} \quad \tan \theta = \frac{o}{a}$$

SOH	CAH	TOA
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FIND: $\sin, \cos, \tan 35^\circ$ from: table (handout)
calculator
(bring ACT calculator)

SOH CAH TOA

$$\sin = o/h$$

$$\cos = a/h$$

$$\tan = o/a = \text{rise/run}$$

$$\tan(0) = 0, \tan(90) = \text{undefined}, \tan(45) = 1$$

Table : Trigonometric Functions

Use for angles between 0 and 45 degrees.

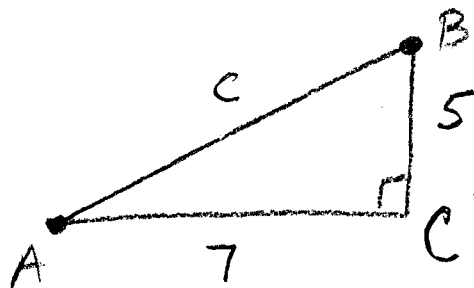
Degrees	Radians	Sin	Cos	Tan	Cot	
0	0.0000	0.0000	1.0000	0.0000	1.5708	90
1	0.0175	0.0175	0.9998	0.0175	57.290	89
2	0.0349	0.0349	0.9994	0.0349	28.636	88
3	0.0524	0.0523	0.9986	0.0524	19.081	87
4	0.0698	0.0698	0.9976	0.0699	14.301	86
5	0.0873	0.0872	0.9962	0.0875	11.430	85
6	0.1047	0.1045	0.9945	0.1051	9.5144	84
7	0.1222	0.1219	0.9925	0.1228	8.1443	83
8	0.1396	0.1392	0.9903	0.1405	7.1154	82
9	0.1571	0.1564	0.9877	0.1584	6.3138	81
10	0.1745	0.1736	0.9848	0.1763	5.6713	80
11	0.1920	0.1908	0.9816	0.1944	5.1446	79
12	0.2094	0.2079	0.9781	0.2126	4.7046	78
13	0.2269	0.2250	0.9744	0.2309	4.3315	77
14	0.2443	0.2419	0.9703	0.2493	4.0108	76
15	0.2618	0.2588	0.9659	0.2679	3.7321	75
16	0.2793	0.2756	0.9613	0.2867	3.4874	74
17	0.2967	0.2924	0.9563	0.3057	3.2709	73
18	0.3142	0.3090	0.9511	0.3249	3.0777	72
19	0.3316	0.3256	0.9455	0.3443	2.9042	71
20	0.3491	0.3420	0.9397	0.3640	2.7475	70
21	0.3665	0.3584	0.9336	0.3839	2.6051	69
22	0.3840	0.3746	0.9272	0.4040	2.4751	68
23	0.4014	0.3907	0.9205	0.4245	2.3559	67
24	0.4189	0.4067	0.9135	0.4452	2.2460	66
25	0.4363	0.4226	0.9063	0.4663	2.1445	65
26	0.4538	0.4384	0.8988	0.4877	2.0503	64
27	0.4712	0.4540	0.8910	0.5095	1.9626	63
28	0.4887	0.4695	0.8829	0.5317	1.8807	62
29	0.5061	0.4848	0.8746	0.5543	1.8040	61
30	0.5236	0.5000	0.8660	0.5774	1.7321	60
31	0.5411	0.5150	0.8572	0.6009	1.6643	59
32	0.5585	0.5299	0.8480	0.6249	1.6003	58
33	0.5760	0.5446	0.8387	0.6494	1.5399	57
34	0.5934	0.5592	0.8290	0.6745	1.4826	56
35	0.6109	0.5736	0.8192	0.7002	1.4281	55
36	0.6283	0.5878	0.8090	0.7265	1.3764	54
37	0.6458	0.6018	0.7986	0.7536	1.3270	53
38	0.6632	0.6157	0.7880	0.7813	1.2799	52
39	0.6807	0.6293	0.7771	0.8098	1.2349	51
40	0.6981	0.6428	0.7660	0.8391	1.1918	50
41	0.7156	0.6561	0.7547	0.8693	1.1504	49
42	0.7330	0.6691	0.7431	0.9004	1.1106	48
43	0.7505	0.6820	0.7314	0.9325	1.0724	47
44	0.7679	0.6947	0.7193	0.9657	1.0355	46
45	0.7854	0.7071	0.7071	1.0000	1.0000	45
Cos	Sin	Cot	Tan	Radians	Degrees	

Use for angles between 45 and 90 degrees.

SOHCAHTOA

ⓔ Find $\sin$, $\cos$, $\tan$ for $\angle A$ and $\angle B$

(Find EXACT value = simplified fraction, then compare with value from table & calculator)



$$c^2 = a^2 + b^2 \quad \therefore c^2 = 49 + 25$$

$$c = \sqrt{74} \sim 8.6023$$

$$\sin A = \frac{o}{h} = \frac{\text{EXACT}}{\boxed{\frac{5}{\sqrt{74}}}} = \frac{5}{\sqrt{74}} \cdot \frac{\sqrt{74}}{\sqrt{74}} = \frac{\text{EXACT}}{\boxed{\frac{5\sqrt{74}}{74}}}$$

"RATIONALIZED"
NO $\sqrt{}$ in bottom

$$\approx \frac{5}{8.6023} \approx \boxed{.5812} \text{ APPROXIMATE}$$

$$\cos A = \frac{a}{h} = \frac{7}{\sqrt{74}} = \frac{\boxed{\frac{7\sqrt{74}}{74}}}{\text{EXACT}} \approx \frac{7}{8.6023} = \boxed{.8137} \text{ APPROXIMATE}$$

$$\tan A = \frac{o}{a} = \frac{\boxed{\frac{5}{7}}}{\text{EXACT}} \approx \boxed{.7142} \text{ APPROXIMATE}$$

$$\sin B = \frac{7}{\sqrt{74}} \quad \cos B = \frac{5}{\sqrt{74}}$$

SEE ABOVE
FOR EXACT AND APPROXIMATE

* NOW
CAREFUL

$$\tan B = \text{SLOPE } B = \frac{o}{a} = \frac{\boxed{\frac{7}{5}}}{\text{EXACT}} = \boxed{1.4} \text{ EXACT}$$

WHY IS ONE $\tan > 1$
AND ONE IS < 1 ?

7.
If $\sin A \approx .5812$ CAN YOU FIND $\angle A$?

Using table $\Rightarrow$ find A SIN VALUE OF
.5812 (closest to it)
and read angle $\approx \underline{\underline{36^\circ}}$

The process of going backward
from the value of the sin to
the angle is called finding
the inverse of the sin $\Rightarrow \sin^{-1} A$
OR sometimes it is called the

$$\text{ARCSIN } A \quad \therefore \sin^{-1}(.5812) = \text{ARCSIN}(.5812) = 36^\circ$$

$$\therefore \angle B = 90 - 36 = 54^\circ$$

The "reciprocal" trig. functions

$$\sin \theta = \frac{O}{H} \quad \boxed{\csc \theta = \frac{H}{O}} = \text{COSECANT}$$

$$\text{OR} \quad \frac{1}{\sin \theta} = \frac{1}{\frac{O}{H}} = \frac{H}{O}$$

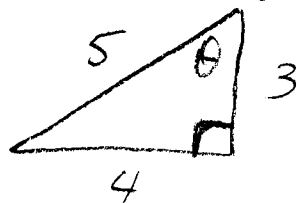
$$\cos \theta = \frac{A}{H} \quad \boxed{\sec \theta = \frac{H}{A}} = \text{SECANT}$$

$$\text{OR} \quad \frac{1}{\cos \theta} = \frac{1}{\frac{A}{H}} = \frac{H}{A}$$

$$\tan \theta = \frac{O}{A} \quad \boxed{\cot \theta = \frac{A}{O}} = \text{COTANGENT}$$

EX1
Pg 702

Find all 6 trig. functions for θ



$$\sin \theta = \frac{4}{5} \quad \therefore \csc \theta = \frac{5}{4}$$

$$\cos \theta = \frac{3}{5} \quad \therefore \sec \theta = \frac{5}{3}$$

$$\tan \theta = \frac{4}{3} \quad \therefore \cot \theta = \frac{3}{4}$$

Homework: Pg. 706 # 2, 4-6, 15