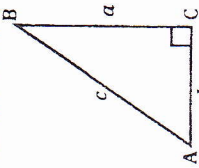# NOTES 9.4 & 9.5
TRIGONOMETRIC RATIOS IN RIGHT TRIANGLES

TRIGONOMETRIC RATIO:

A ratio of the sides of a right $\triangle$.

The three most common ratios are **SINE, COSINE, & TANGENT.**

$$\frac{S \; O}{\ln} \quad \frac{C \; a}{h} \quad \frac{T \; o}{a}$$

TRIGONOMETRIC RATIO	ABBREVIATION	DEFINITION	RATIO
Sine of A	Sin A	$\dfrac{\text{opposite side}}{\text{hypotenuse}}$	$\dfrac{a}{c}$
Cosine of A	cos A	$\dfrac{\text{adjacent side}}{\text{hypotenuse}}$	$\dfrac{b}{c}$
Tangent of A	tan A	$\dfrac{\text{opposite side}}{\text{adjacent side}}$	$\dfrac{a}{b}$
Sine of B	Sin B	$\dfrac{\text{opp}}{\text{hyp}}$	$\dfrac{b}{c}$
Cosine of B	cos B	$\dfrac{\text{adj}}{\text{hyp}}$	$\dfrac{a}{c}$
Tangent of B	tan B	$\dfrac{\text{opp}}{\text{adj}}$	$\dfrac{b}{a}$

EXAMPLE 1: Find sin A , cos A, tan A, sin B, cos B, and tan B. Express each ratio as a fraction.

$$\sin A = \frac{5}{13} \qquad \sin B = \frac{12}{13}$$
$$\cos A = \frac{12}{13} \qquad \cos B = \frac{5}{13}$$
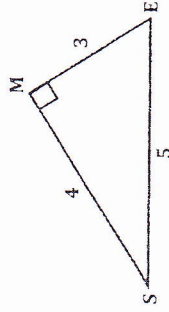$$\tan A = \frac{5}{12} \qquad \tan B = \frac{12}{5}$$
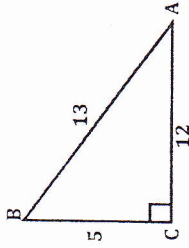
EXAMPLE 2: Find sin S, cos S, tan S, sin E, cos E, and tan E. Express each ratio as a fraction.

$$\sin S = \frac{3}{5} \qquad \sin E = \frac{4}{5}$$
$$\cos S = \frac{4}{5} \qquad \cos E = \frac{3}{5}$$
$$\tan S = \frac{3}{4} \qquad \tan E = \frac{4}{3}$$

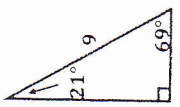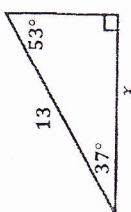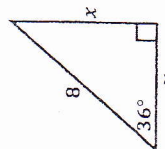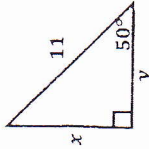You can use a calculator or a trig table to evaluate expressions involving trigonometric ratios.

EXAMPLE 3: Find each value using a calculator or a trig table. Round to the nearest ten-thousandth.

a) $\cos 41° = \underline{.7547}$ b) $\sin 78° = \underline{.9781}$

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TABLE OF TRIGONOMETRIC VALUES

m°∠A	sin A	cos A	tan A	m°∠A	sin A	cos A	tan A
1	0.0175	0.9998	0.0175	46	0.7193	0.6947	1.0355
2	0.0349	0.9994	0.0349	47	0.7314	0.6820	1.0724
3	0.0523	0.9986	0.0524	48	0.7431	0.6691	1.1106
4	0.0698	0.9976	0.0699	49	0.7547	0.6561	1.1504
5	0.0872	0.9962	0.0875	50	0.7660	0.6428	1.1918
6	0.1045	0.9945	0.1051	51	0.7771	0.6293	1.2349
7	0.1219	0.9925	0.1228	52	0.7880	0.6157	1.2799
8	0.1392	0.9903	0.1405	53	0.7986	0.6018	1.3270
9	0.1564	0.9877	0.1584	54	0.8090	0.5878	1.3764
10	0.1736	0.9848	0.1763	55	0.8192	0.5736	1.4281
11	0.1908	0.9816	0.1944	56	0.8290	0.5592	1.4826
12	0.2079	0.9781	0.2126	57	0.8387	0.5446	1.5399
13	0.2250	0.9744	0.2309	58	0.8480	0.5299	1.6003
14	0.2419	0.9703	0.2493	59	0.8572	0.5150	1.6643
15	0.2588	0.9659	0.2679	60	0.8660	0.50	1.7321
16	0.2756	0.9613	0.2867	61	0.8746	0.4848	1.8040
17	0.2924	0.9563	0.3057	62	0.8829	0.4695	1.8807
18	0.3090	0.9511	0.3249	63	0.8910	0.4540	1.9626
19	0.3256	0.9455	0.3443	64	0.8988	0.4384	2.0503
20	0.3420	0.9397	0.3640	65	0.9063	0.4226	2.1445
21	0.3584	0.9336	0.3839	66	0.9135	0.4067	2.2460
22	0.3746	0.9272	0.4040	67	0.9205	0.3907	2.3559
23	0.3907	0.9205	0.4245	68	0.9272	0.3746	2.4751
24	0.4067	0.9135	0.4452	69	0.9336	0.3584	2.6051
25	0.4226	0.9063	0.4663	70	0.9397	0.3420	2.7475
26	0.4384	0.8988	0.4877	71	0.9455	0.3256	2.9042
27	0.4540	0.8910	0.5095	72	0.9511	0.3090	3.0777
28	0.4695	0.8829	0.5317	73	0.9563	0.2924	3.2709
29	0.4848	0.8746	0.5543	74	0.9613	0.2756	3.4874
30	0.50	0.8660	0.5774	75	0.9659	0.2588	3.7321
31	0.5150	0.8572	0.6009	76	0.9703	0.2419	4.0108
32	0.5299	0.8480	0.6249	77	0.9744	0.2250	4.3315
33	0.5446	0.8387	0.6494	78	0.9781	0.2079	4.7046
34	0.5592	0.8290	0.6745	79	0.9816	0.1908	5.1446
35	0.5736	0.8192	0.7002	80	0.9848	0.1736	5.6713
36	0.5878	0.8090	0.7265	81	0.9877	0.1564	6.3138
37	0.6018	0.7986	0.7536	82	0.9903	0.1392	7.1154
38	0.6157	0.7880	0.7813	83	0.9925	0.1219	8.1443
39	0.6293	0.7771	0.8098	84	0.9945	0.1045	9.5144
40	0.6428	0.7660	0.8391	85	0.9962	0.0872	11.4301
41	0.6561	0.7547	0.8693	86	0.9976	0.0698	14.3007
42	0.6691	0.7431	0.9004	87	0.9986	0.0523	19.0811
43	0.6820	0.7314	0.9325	88	0.9994	0.0349	28.6363
44	0.6947	0.7193	0.9657	89	0.9998	0.0175	57.2900
45	0.7071	0.7071	1	90	1	0	Undefined

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EXAMPLE 4: Find the missing measurement(s). Round to the nearest hundredth.

a)

Equation: $\cos 69° = \dfrac{x}{9}$ OR $\sin 21° = \dfrac{x}{9}$

$x = 3.23$

b)

Equation: $\cos 37° = \dfrac{x}{13}$ OR $\sin 53° = \dfrac{x}{13}$

$x = 10.38$

c)

Equation: $\sin 36° = \dfrac{x}{8}$

$x = 4.70$

Equation: $\cos 36° = \dfrac{y}{8}$

$y = 6.47$

d)

Equation: $\sin 50° = \dfrac{x}{11}$

$x = 8.43$

Equation: $\cos 50° = \dfrac{y}{11}$

$y = 7.07$

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