Answers should be **exact** if possible (e.g. $\frac{3}{7}$ instead of $0.42857\cdots$, or $\sqrt{2}$ instead of $1.414\cdots$) If exact answers are not possible, approximations should be given to **at least** 4 decimal places.

1. Convert the following angles from degrees to radians [Write answer in the form $\frac{m}{n}\pi$].

a. 4° **b.** 12° **c.** 18° **d.** 20° **e.** 28° **f.** 48° **g.** 140° **h.** 198°

2. Convert the following angles from degrees to radians [Write answer in the form $\frac{m}{n}\pi$].

a. 6° **b.** 8° **c.** 15° **d.** 27° **e.** 54° **f.** 72° **g.** 138° **h.** 160°

3. Convert the following angles from degrees to radians [Write answer in the form $\frac{m}{n}\pi$].

a. 56° **b.** 240° **c.** 312° **d.** 318° **e.** 438° **f.** 498° **g.** 520° **h.** 528°

4. Convert the following angles from degrees to radians [Write answer in the form $\frac{m}{n}\pi$].

a. 32° **b.** 36° **c.** 42° **d.** 52° **e.** 78° **f.** 108° **g.** 210° **h.** 546°

5. Convert the following angles from radians to degrees

a. $\frac{3}{5}\pi$ (rad) **b.** $\frac{5}{12}\pi$ (rad) **c.** $\frac{7}{36}\pi$ (rad) **d.** $\frac{8}{15}\pi$ (rad)

e. $1.8\overline{6}\,\pi$ (rad) **f.** 1.375π (rad) **g.** 0.1234 (rad)

6. Convert the following angles from radians to degrees

a. $\frac{7}{9}\pi$ (rad) **b.** $\frac{3}{20}\pi$ (rad) **c.** $\frac{4}{15}\pi$ (rad) **d.** $\frac{7}{6}\pi$ (rad)

e. $1.\overline{6}\,\pi$ (rad) **f.** 2.35π (rad) **g.** 4.00553 (rad)

7. Convert the following angles from radians to degrees

a. $\frac{32}{15}\pi$ (rad) **b.** $\frac{105}{36}\pi$ (rad) **c.** $\frac{182}{72}\pi$ (rad) **d.** $\frac{24}{5}\pi$ (rad)

e. $3.9\overline{3}\,\pi$ (rad) **f.** 6.625π (rad) **g.** 5.4321 (rad)

8. Convert the following angles from radians to degrees

a. $\frac{17}{20}\pi$ (rad) **b.** $\frac{23}{18}\pi$ (rad) **c.** $\frac{19}{15}\pi$ (rad) **d.** $\frac{71}{12}\pi$ (rad)

e. $1.5\overline{7}\,\pi$ (rad) **f.** 3.15π (rad) **g.** 6.126106 (rad)

9. Compute the following values using the given table

[Do not use decimal approximations]

θ	$0°$	$30°$	$45°$	$60°$	$90°$
$\sin\theta$	0	$\frac{1}{2}$	$\frac{1}{\sqrt{2}}$	$\frac{\sqrt{3}}{2}$	1
$\cos\theta$	1	$\frac{\sqrt{3}}{2}$	$\frac{1}{\sqrt{2}}$	$\frac{1}{2}$	0

a. $\sin(135°)$ **b.** $\cos(270°)$ **c.** $\tan(-330°)$

d. $\csc\left(\frac{2}{3}\pi\right)$ **e.** $\sec\left(-\frac{5}{4}\pi\right)$ **f.** $\cot\left(\frac{7}{6}\pi\right)$

10. Compute the following values using the given table

[Do not use decimal approximations]

θ	$0°$	$30°$	$45°$	$60°$	$90°$
$\sin\theta$	0	$\frac{1}{2}$	$\frac{1}{\sqrt{2}}$	$\frac{\sqrt{3}}{2}$	1
$\cos\theta$	1	$\frac{\sqrt{3}}{2}$	$\frac{1}{\sqrt{2}}$	$\frac{1}{2}$	0

a. $\sin(215°)$ **b.** $\cos(-210°)$ **c.** $\tan(-510°)$

d. $\csc\left(-\frac{7}{6}\pi\right)$ **e.** $\sec\left(\frac{2}{3}\pi\right)$ **f.** $\cot\left(-\frac{5}{4}\pi\right)$

11. Compute the following values using the given table

[Do not use decimal approximations]

θ	$0°$	$30°$	$45°$	$60°$	$90°$
$\sin\theta$	0	$\frac{1}{2}$	$\frac{1}{\sqrt{2}}$	$\frac{\sqrt{3}}{2}$	1
$\cos\theta$	1	$\frac{\sqrt{3}}{2}$	$\frac{1}{\sqrt{2}}$	$\frac{1}{2}$	0

a. $\sin(-315°)$ **b.** $\cos(180°)$ **c.** $\tan(240°)$

d. $\csc\left(-\frac{19}{6}\pi\right)$ **e.** $\sec\left(\frac{2}{3}\pi\right)$ **f.** $\cot\left(-\frac{5}{4}\pi\right)$

12. Compute the following values using the given table

[Do not use decimal approximations]

θ	$0°$	$30°$	$45°$	$60°$	$90°$
$\sin\theta$	0	$\frac{1}{2}$	$\frac{1}{\sqrt{2}}$	$\frac{\sqrt{3}}{2}$	1
$\cos\theta$	1	$\frac{\sqrt{3}}{2}$	$\frac{1}{\sqrt{2}}$	$\frac{1}{2}$	0

a. $\sin(-330°)$ **b.** $\cos(300°)$ **c.** $\tan(180°)$

d. $\csc\left(\frac{13}{6}\pi\right)$ **e.** $\sec\left(-\frac{7}{2}\pi\right)$ **f.** $\cot\left(\frac{13}{4}\pi\right)$

13. Let $O = (0,0)$ and $Q = (1,0)$. The point P on the unit circle, in the third quadrant, has $x-$coordinate: $x_P = -0.8$. If $\angle POQ = \theta$ compute

a. $\sin(\theta)$ **b.** $\cos(\theta)$ **c.** $\tan(\theta)$ **d.** $\csc(\theta)$ **e.** $\sec(\theta)$ **f.** $\cot(\theta)$ **g.** θ (in degrees)

14. Let $O = (0,0)$ and $Q = (1,0)$. The point P on the unit circle, in the second quadrant, has $x-$coordinate: $x_P = -\frac{3}{5}$. If $\angle POQ = \theta$ compute

a. $\sin(\theta)$ **b.** $\cos(\theta)$ **c.** $\tan(\theta)$ **d.** $\csc(\theta)$ **e.** $\sec(\theta)$ **f.** $\cot(\theta)$ **g.** θ (in degrees)

15. Let $O = (0,0)$ and $Q = (1,0)$. The point P on the unit circle, in the third quadrant, has $y-$coordinate: $y_P = -\frac{5}{13}$. If $\angle POQ = \theta$ compute

a. $\sin(\theta)$ **b.** $\cos(\theta)$ **c.** $\tan(\theta)$ **d.** $\csc(\theta)$ **e.** $\sec(\theta)$ **f.** $\cot(\theta)$ **g.** θ (in degrees)

16. Let $O = (0,0)$ and $Q = (1,0)$. The point P on the unit circle, in the fourth quadrant, has $x-$coordinate: $x_P = 0.6$. If $\angle POQ = \theta$ compute

a. $\sin(\theta)$ **b.** $\cos(\theta)$ **c.** $\tan(\theta)$ **d.** $\csc(\theta)$ **e.** $\sec(\theta)$ **f.** $\cot(\theta)$ **g.** θ (in degrees)

17. Find the angles θ (in degrees) in the following cases

a. $\sin(\theta) = -\frac{\sqrt{3}}{2}$ with $180° \le \theta \le 360°$ **b.** $\cos(\theta) = -\frac{\sqrt{3}}{2}$ with $0° \le \theta \le 180°$

c. $\tan(\theta) = -1$ with $90° \le \theta \le 270°$ **d.** $\csc(\theta) = -2$ with $90° \le \theta \le 270°$

e. $\sec(\theta) = -2$ with $0° \le \theta \le 360°$ **f.** $\cot(\theta) = -\sqrt{3}$ with $0° \le \theta \le 360°$

18. Find the angles θ (in degrees [exact values]) in the following cases

a. $\sin(\theta) = -\frac{1}{2}$ with $-90° \le \theta \le 90°$ **b.** $\cos(\theta) = -\frac{1}{\sqrt{2}}$ with $-90° \le \theta \le 90°$

c. $\tan(\theta) = 1$ with $700° \le \theta \le 990°$ **d.** $\csc(\theta) = -\frac{2}{\sqrt{3}}$ with $-270° \le \theta \le -90°$

e. $\sec(\theta) = 2$ with $-720° \le \theta \le -90°$ **f.** $\cot(\theta) = -\frac{1}{\sqrt{3}}$ with $450° \le \theta \le 900°$

19. Find the angles θ (in degrees [exact values]) in the following cases

a. $\sin(\theta) = -\frac{\sqrt{2}}{2}$ with $-90° \le \theta \le 90°$ **b.** $\cos(\theta) = -\frac{1}{2}$ with $-90° \le \theta \le 90°$

c. $\tan(\theta) = -\sqrt{3}$ with $630° \le \theta \le 810°$ **d.** $\csc(\theta) = -\sqrt{2}$ with $-270° \le \theta \le -90°$

e. $\sec(\theta) = -\frac{2}{3}\sqrt{3}$ with $-720° \le \theta \le -90°$ **f.** $\cot(\theta) = -1$ with $450° \le \theta \le 900°$

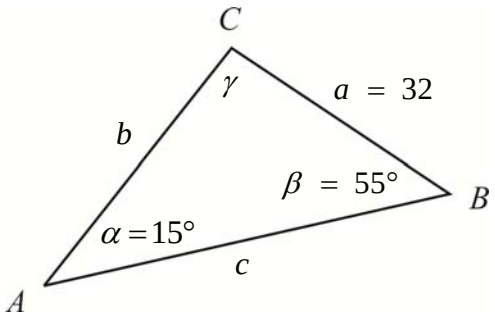
20. Find the angles θ (in degrees [exact values]) in the following cases

a. $\sin(\theta) = -\frac{1}{\sqrt{2}}$ with $-180° \le \theta \le 145°$ **b.** $\cos(\theta) = \frac{1}{2}$ with $-250° \le \theta \le 175°$

c. $\tan(\theta) = \sqrt{3}$ with $630° \le \theta \le 810°$ **d.** $\csc(\theta) = -2$ with $-270° \le \theta \le -90°$

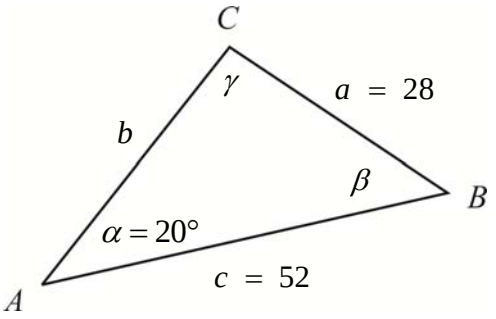
e. $\sec(\theta) = -1$ with $-720° \le \theta \le 180°$ **f.** $\cot(\theta) = -\sqrt{3}$ with $-450° \le \theta \le 270°$

21. A triangle has angles $\alpha = 15°$, $\beta = 55°$ and side $a = 32$



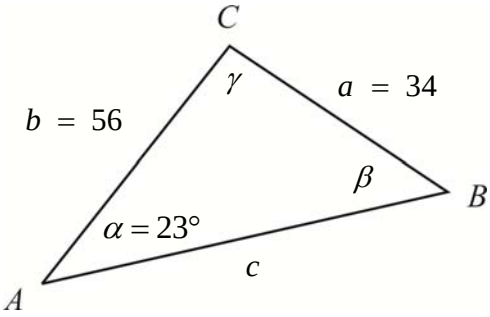
Compute **a.** γ **b.** b **c.** c **d.** Area of ΔABC **e.** Distance of C to $\overline{AB}$

22. A triangle has angle $\alpha = 20°$, and sides $a = 28$ and $c = 52$



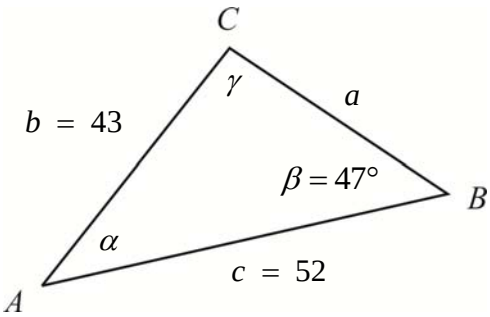
Compute **a.** γ **b.** β **c.** b **d.** Area of ΔABC **e.** Distance of C to $\overline{AB}$

23. A triangle has angle $\alpha = 23°$, and sides $a = 34$ and $b = 56$



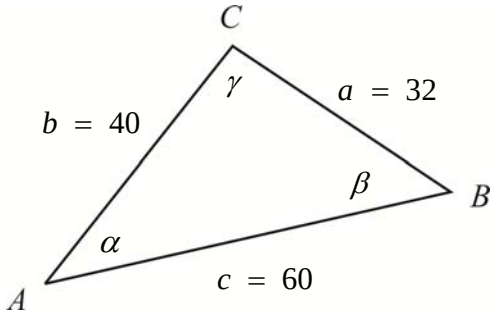
Compute **a.** γ **b.** β **c.** c **d.** Area of ΔABC **e.** Distance of C to $\overline{AB}$

24. A triangle has angle $\beta = 47°$, and sides $b = 43$ and $c = 52$



Compute **a.** γ **b.** α **c.** c **d.** Area of ΔABC **e.** Distance of C to $\overline{AB}$

25. A triangle has sides $a = 32$, $b = 40$ and $c = 60$



Compute **a.** α **b.** β **c.** γ **d.** Area of ΔABC **e.** Distance of C to $\overline{AB}$

26. If $\sin(\theta) = -0.3456$ and θ is in the third quadrant, find

a. $\cos(\theta)$ **b.** $\tan(\theta)$ **c.** $\csc(\theta)$ **d.** $\sec(\theta)$ **e.** $\cot(\theta)$ **f.** θ (in degrees)

27. If $\cot(\theta) = -1.2345$ and θ is in the second quadrant, find

a. $\sin(\theta)$ **b.** $\cos(\theta)$ **c.** $\tan(\theta)$ **d.** $\csc(\theta)$ **e.** $\sec(\theta)$ **f.** θ (in degrees)

28. If $\sec(\theta) = -2.3456$ and θ is in the third quadrant, find

a. $\sin(\theta)$ **b.** $\cos(\theta)$ **c.** $\tan(\theta)$ **d.** $\csc(\theta)$ **e.** $\sec(\theta)$ **f.** θ (in degrees)

29. If $\csc(\theta) = -3.125$ and θ is in the fourth quadrant, find

a. $\sin(\theta)$ **b.** $\cos(\theta)$ **c.** $\tan(\theta)$ **d.** $\csc(\theta)$ **e.** $\sec(\theta)$ **f.** θ (in degrees)

30. Graph the following functions [No calculator: shifts and such of the basic functions]

a. $f(x) = \sin(x) + 1$ **b.** $g(x) = 2 - \cos(x)$ **c.** $h(x) = 5 - \tan(x)$
d. $k(x) = 3 - \sin(x + \pi)$ **e.** $l(x) = \cos(x - \pi) + 3$ **f.** $m(x) = \tan(x - \pi/2) + 5$
g. $n(x) = 2\sin(x)$ **h.** $p(x) = \sin(2x)$ **i.** $q(x) = 3 + 4\cos(2x)$

31. Graph the following functions [No calculator: shifts and such of the basic functions]

a. $f(x) = 1 - \cos(x)$ **b.** $g(x) = 2 + \sin(x)$ **c.** $h(x) = 3 + \cot(x)$
d. $k(x) = 3 + \cos(x + \pi)$ **e.** $l(x) = \sin(x - \pi) - 2$ **f.** $m(x) = \tan(x + \pi/2) - 5$
g. $n(x) = \cos(2x)$ **h.** $p(x) = 2\sin(x)$ **i.** $q(x) = 1 - 2\sin(2x)$

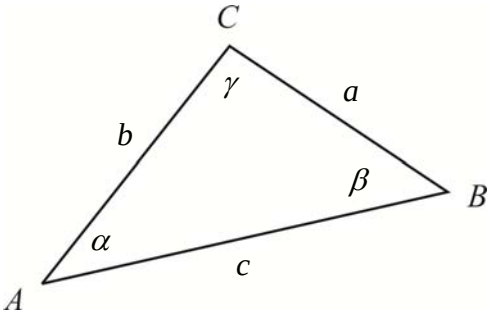
32. Use trig identities to exactly compute the following [e.g. $\sin(75°) = \sin(30° + 45°)$]

a. $\sin(15°)$ **b.** $\cos(195°)$ **c.** $\tan(-165°)$
d. $\csc(195°)$ **e.** $\sec(-75°)$ **f.** $\cot(105°)$
g. $\sin(22.5°)$ **h.** $\cos(82.5°)$ **i.** $\tan(22.5°)$

33. Use trig identities to exactly compute the following [e.g. $\sin(75°) = \sin(30° + 45°)$]

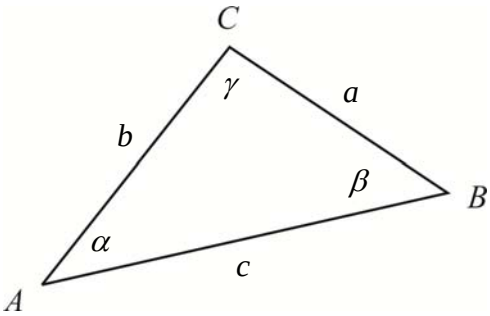
a. $\sin(75°)$ **b.** $\cos(15°)$ **c.** $\tan(-105°)$
d. $\csc(105°)$ **e.** $\sec(165°)$ **f.** $\cot(195°)$
g. $\sin(7.5°)$ **h.** $\cos(22.5°)$ **i.** $\tan(82.5°)$

34. Find the areas of the following triangles



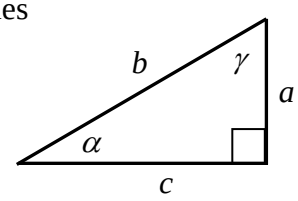
a. $a=8,\ b=15$ and $c=17$
b. $a=12,\ b=37$ and $c=35$
c. $a=8,\ b=4$ and $c=6$
d. $a=15,\ b=9$ and $c=7$
e. $\alpha=45°,\ b=5$ and $c=6$
f. $\alpha=60°,\ b=9$ and $c=7$
g. $\alpha=30°,\ b=5$ and $a=4$
h. $\alpha=30°,\ b=5$ and $a=7$
i. $\alpha=30°,\ \beta=45°$ and $c=10$
j. $\alpha=135°,\ \beta=30°$ and $c=10$

35. Find the areas of the following triangles



a. $a=3,\ b=4$ and $c=5$
b. $a=5,\ b=12$ and $c=13$
c. $a=7,\ b=5$ and $c=6$
d. $a=14,\ b=9$ and $c=7$
e. $\alpha=30°,\ b=5$ and $c=6$
f. $\alpha=45°,\ b=9$ and $c=7$
g. $\alpha=60°,\ b=5$ and $a=10$
h. $\alpha=30°,\ b=10$ and $a=20$
i. $\alpha=60°,\ \beta=45°$ and $c=20$
j. $\alpha=30°,\ \beta=45°$ and $c=35$

36. Find the lengths of all the sides of the following right triangles



a. $a=3,\ b=5$
b. $a=5,\ c=12$
c. $a=7,\ c=8$
d. $c=7,\ a=12$
e. $a=7,\ b=8$
f. $c=7,\ b=12$
g. $\gamma=25°,\ b=8$
h. $\gamma=35°,\ c=10$
i. $\gamma=25°,\ a=8$
j. $\alpha=35°,\ c=10$