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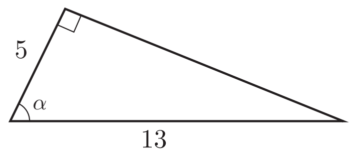
1 For the right triangle in the figure on the right, find the sine, cosine, and tangent of the angle α

a) $\sin\alpha =$

b) $\cos\alpha =$

c) $\tan\alpha =$

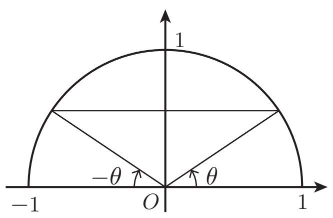


2 Referring to the figure on the right, express the following expressions in terms of $\sin\theta$, $\cos\theta$, $\tan\theta$.

a) $\sin(180° - \theta) =$

b) $\cos(180° - \theta) =$

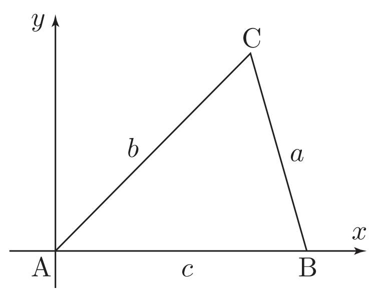
c) $\tan(180° - \theta) =$



3 Complete the following table.

θ	0°	30°	45°	60°	90°	120°	135°	150°	180°
$\sin\theta$									
$\cos\theta$									
$\tan\theta$									

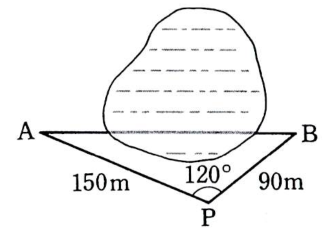
4 For the right triangle $\triangle$ABC in the figure on the right, if we set the coordinate axes as shown in the figure on the right, the coordinates of the three vertices are A$(0, 0)$, B$(c, 0)$, C$(b\cos A, b\sin A)$, respectively. Let a be the length of the opposite side of A, etc. Then, the length of the side BC equals a^2. Using the formula that the distance d between to points (x_1, y_1), (x_2, y_2) is given by $d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$, prove the *Law of Cosines*.



5 As shown in the right figure, to find the distance between two points A and B across the pond, we measured PA, PB, and ∠APB and found

PA= 150m, PB= 90m, ∠APB= 120°.

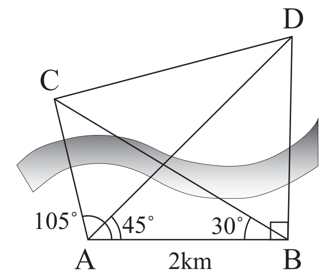
Find the distance between A and B.



6 Two points A and B are 2 km apart. If you look at two points C and D in the other side of the river from A, and from B, the angles are as follows

$\angle BAC = 105°$, $\angle BAD = 45°$,
$\angle ABC = 30°$, $\angle ABD = 90°$

a) Find the distance between A and C, and between A and D.
[Hint : Use the law of sines to $\triangle$ABC. $\triangle$ABD is a right traingle.]



b) Find the distance between C and D. [Hint : Use the law of cosine to $\triangle$CAD.]

7 Convert the following angles to radians.

a) 12° = b) 15° = c) 36° = d) 45° =

e) 90° = f) 120° = g) 135° = h) 150° =

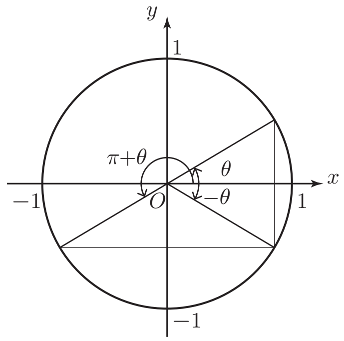
(continues on the reverse side)

8 Convert each radian measure to degrees.

a) $\dfrac{\pi}{10} =$ b) $\dfrac{\pi}{5} =$ c) $\dfrac{2\pi}{3} =$ d) $\dfrac{5\pi}{12} =$

e) $\dfrac{5\pi}{4} =$ f) $\dfrac{3\pi}{2} =$ g) $\dfrac{7\pi}{4} =$ h) $3\pi =$

9 Referring to the figure on the right, express the following expressions in terms of $\sin\theta$, $\cos\theta$, $\tan\theta$.



a) $\sin(-\theta) =$

b) $\cos(-\theta) =$

c) $\tan(-\theta) =$

d) $\sin(\pi+\theta) =$

e) $\cos(\pi+\theta) =$

f) $\tan(\pi+\theta) =$

10 Find each of the following values

a) $\sin\dfrac{16\pi}{3} =$ b) $\cos\left(-\dfrac{13\pi}{6}\right) =$ c) $\tan\left(-\dfrac{11\pi}{6}\right) =$

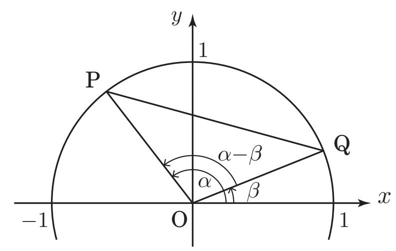
11 Solve each of the following equations for θ with $0 \leqq \theta < 2\pi$.

a) $\sin\theta = \dfrac{\sqrt{3}}{2}$ b) $\sqrt{2}\cos\theta = 1$

12 Solve each of the following inequalites for θ with $0 \leqq \theta < 2\pi$.

a) $\cos\theta \leqq \dfrac{\sqrt{3}}{2}$ b) $\sin\theta > \dfrac{1}{2}$

13 We want to prove the addition formula by referring to the figure on the right.



a) Use the law of cosines to △OPQ to express PQ^2 in terms of $\cos(\alpha-\beta)$.

b) Knowing that the coordinates of P and Q are $P(\cos\alpha, \sin\alpha)$ and $Q(\cos\beta, \sin\beta)$, respectively, express PQ^2 in terms of $\cos\alpha$, $\cos\beta$, $\sin\alpha$, and $\sin\beta$.

c) Combine the results of a) and b), show the addition formula for $\cos(\alpha-\beta)$.

d) Using the relation $\sin\theta = \cos\left(\dfrac{\pi}{2}-\theta\right)$, show the addition formula for $\sin(\alpha+\beta)$.

[Hint : $\cos\left(\frac{\pi}{2}-(\alpha+\beta)\right) = \cos\left(\left(\frac{\pi}{2}-\alpha\right)-\beta\right)$.]

14 Solve each of the following equations for θ with $0 \leqq x < 2\pi$.

a) $\sin 2x = \cos x$ b) $\cos 2x + 3\cos x - 1 = 0$

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