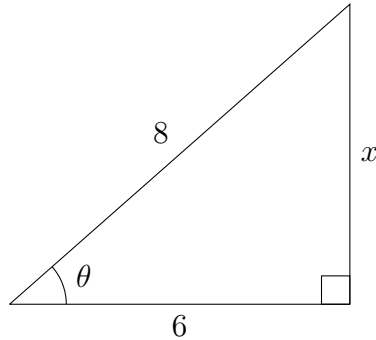# Trig Exact from Exact

Example Problems

EXAMPLE 1: Given that $\cos(\theta) = \dfrac{5}{8}$, find the exact value of $\sin(\theta)$.

SOLUTION: Since we know that $\cos$ is the ratio between the adjacent and hypotenuse, we can draw a triangle that represents the question.
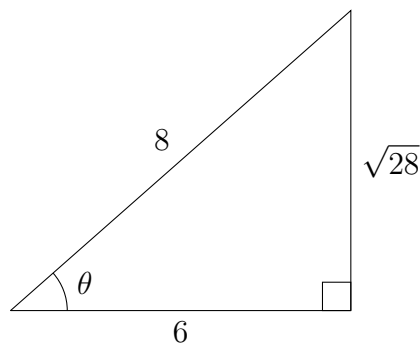

Now that this triangle has been drawn, we can see that despite not knowing the size of the angle θ we can find the length of the missing side using Pythagoras' theorem,

$$x^2 = 8^2 - 6^2,$$
$$x^2 = 28,$$
$$x = \sqrt{28}.$$

Now we have the length of both the opposite side and hypotenuse, we can calculate the exact value of $\sin(\theta)$,

$$\sin(\theta) = \frac{\sqrt{28}}{8}.$$

Question Bank

1. For each of the given trig ratios, find the **exact value** of the second ratio.

   a) If $\cos(\alpha) = \dfrac{3}{5}$, find $\tan(\alpha)$.

   b) If $\sin(\phi) = \dfrac{5}{13}$, find $\cos(\phi)$.

   c) If $\tan(\theta) = \dfrac{15}{4}$, find $\cos(\theta)$.

   d) If $\sin(\alpha) = \dfrac{21}{24}$, find $\cos(\alpha)$.

   e) If $\cos(x) = \dfrac{15}{22}$, find $\tan(x)$.

   f) If $\tan(A) = \dfrac{12}{47}$, find $\sin(A)$.

   g) If $\cos(\beta) = \dfrac{13}{45}$, find $\sin(\beta)$.

   h) If $\sin(y) = \dfrac{105}{343}$, find $\cos(y)$.

   i) If $\sin(X) = 0.125$, find $\cos(X)$.

   j) If $\cos(Y) = 0.68$, find $\tan(Y)$.

   k) If $\tan(C) = 5$, find $\sin(C)$.

   l) If $\tan(B) = 12$, find $\cos(B)$.

Answers

1. a) $\dfrac{4}{3}$

   b) $\dfrac{12}{13}$

   c) $\dfrac{4}{\sqrt{241}}$

   d) $\dfrac{\sqrt{135}}{24}$ or $\dfrac{\sqrt{15}}{8}$

   e) $\dfrac{\sqrt{259}}{15}$

   f) $\dfrac{12}{\sqrt{2353}}$

   g) $\dfrac{\sqrt{1856}}{45}$ or $\dfrac{8\sqrt{29}}{45}$

   h) $\dfrac{\sqrt{106624}}{343}$ or $\dfrac{8\sqrt{34}}{49}$

   i) $\dfrac{\sqrt{63}}{8}$ or $\dfrac{3\sqrt{7}}{8}$

   j) $\dfrac{\sqrt{336}}{17}$ or $\dfrac{4\sqrt{21}}{17}$

   k) $\dfrac{5}{\sqrt{26}}$

   l) $\dfrac{1}{\sqrt{145}}$