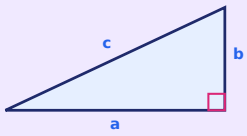
# Unit 6 · Right Triangles and Trigonometry Cheat Sheet

**Unit 6 focus:** the Pythagorean Theorem, special right triangles and trig ratios

## 1 PYTHAGOREAN THEOREM

In a right triangle with legs $a, b$ and hypotenuse $c$ (opposite the right angle): $a^2 + b^2 = c^2$.

**Example:** Legs 7 and 24
**Substitute:** $49 + 576 = c^2$
**Answer:** $c = 25$




## 2 CONVERSE: CLASSIFY BY SIDES

| Longest side $c$ | Triangle |
|---|---|
| $c^2 = a^2 + b^2$ | right |
| $c^2 < a^2 + b^2$ | acute |
| $c^2 > a^2 + b^2$ | obtuse |

Sides 6, 8, 11: $121 > 36 + 64 = 100$, so obtuse. Common triples: 3-4-5, 5-12-13, 8-15-17.

## 3 SPECIAL RIGHT TRIANGLES

| Triangle | Side ratio | Example |
|---|---|---|
| **45°-45°-90°** | $x : x : x\sqrt{2}$ | leg 5 → hyp $5\sqrt{2}$ |
| **30°-60°-90°** | $x : x\sqrt{3} : 2x$ | short leg 4 → $4\sqrt{3}$, 8 |

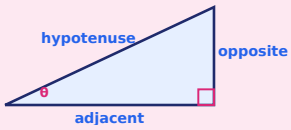
In a 30-60-90, the short leg is opposite 30° and the hypotenuse is twice it.

## 4 TRIG RATIOS: SOH-CAH-TOA

| Ratio | Definition |
|---|---|
| $\sin\theta$ | $\frac{\text{opposite}}{\text{hypotenuse}}$ |
| $\cos\theta$ | $\frac{\text{adjacent}}{\text{hypotenuse}}$ |
| $\tan\theta$ | $\frac{\text{opposite}}{\text{adjacent}}$ |

## 5 LABELING THE SIDES

- **Hypotenuse**: across from the right angle; always the longest.
- **Opposite**: across from the angle $\theta$ you are using.
- **Adjacent**: next to $\theta$, not the hypotenuse.




## 6 QUICK REMINDERS & COMMON MISTAKES

**✓ Do remember**

- Calculator in **degree** mode.
- Label opposite, adjacent and hypotenuse from the angle you are using.
- Round only at the end.

**✘ Common mistakes**

- $a^2 + c^2 = b^2$: $c$ must be the hypotenuse
- Opposite and adjacent swapped: they depend on the angle
- $\sin^{-1}$ to find a side: inverse trig finds angles

# Unit 6 · Right Triangles and Trigonometry Cheat Sheet

**More practice:** finding sides and angles with SOH-CAH-TOA, elevation and depression

## 1 FINDING A SIDE WITH SINE

Opposite and hypotenuse → sine.

**Example:** $35°$, hypotenuse 12, find the opposite side $x$.
**Ratio:** $\sin 35° = \frac{x}{12}$
**Solve:** $x = 12 \sin 35°$
**Answer:** $x \approx 6.9$

## 2 FINDING A SIDE WITH COSINE

Adjacent and hypotenuse → cosine.

**Example:** $40°$, hypotenuse 15, find the adjacent side $x$.
**Ratio:** $\cos 40° = \frac{x}{15}$
**Solve:** $x = 15 \cos 40°$
**Answer:** $x \approx 11.5$

## 3 SIDE IN THE DENOMINATOR

When the unknown is on the bottom, multiply, then divide.

**Example:** $\tan 28° = \frac{9}{x}$
**Rearrange:** $x = \dfrac{9}{\tan 28°}$
**Answer:** $x \approx 16.9$

## 4 FINDING AN ANGLE (INVERSE TRIG)

Know two sides, want the angle: use $\sin^{-1}$, $\cos^{-1}$ or $\tan^{-1}$.

**Example:** Opposite 7, adjacent 24
**Ratio:** $\tan \theta = \frac{7}{24}$
**Inverse:** $\theta = \tan^{-1}\left(\frac{7}{24}\right)$
**Answer:** $\theta \approx 16.3°$

## 5 ELEVATION & DEPRESSION

Both angles are measured from a **horizontal** line. Draw the right triangle, then use SOH-CAH-TOA.

**Example:** From 50 ft away, the angle of elevation to a roof is $32°$. Height?
**Ratio:** $\tan 32° = \frac{h}{50}$
**Solve:** $h = 50 \tan 32°$
**Answer:** $h \approx 31.2$ **ft**

## 6 CHOOSING THE RATIO

| | |
|---|---|
| Know or need opposite and hypotenuse | **sine** |
| Know or need adjacent and hypotenuse | **cosine** |
| Know or need opposite and adjacent | **tangent** |
| Know two sides, need the third (right triangle) | **Pythagorean Thm.** |