Essential Math 10 – Trigonometry Problems

1. In the diagram, label the hypotenuse, the opposite side, and the adjacent side relative to angle C.

2. Classify each triangle as scalene, isosceles, equilateral, or right.

   a) Right
   b) 1.2 mm 1.2 mm
      1.2 mm
   c) 6° 6°
      6°
   d) 2.8" 3.3"
      3.4"
   e) isosceles (equal angles, unequal sides)
   f) equilateral

Scalene – a triangle having sides unequal length.
Isosceles – a triangle having two sides of equal length.
Equilateral – a triangle having all its sides the same length.
Right – a triangle in which one angle is a right (90°) angle.
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3. Determine the size of angle A.

4. Determine the size of angle B.

5. Determine the size of angle C.

6. Calculate the length of dimension x.
7. Calculate the length of dimension $x$.

$$a = \sqrt{92^2 - 3.5^2} = (91.93 \text{ cm})$$

8. Solve the missing sides in the triangles below:

- \(a = \sqrt{21.5^2 - 15^2} = 15.40''\)
- \(c = \sqrt{1.1^2 + 6.8^2} = 6.96''\)
- \(x = \frac{25}{\sin 10.5} = 45.6\text{ mm}\)

9. Solve the missing sides in the triangles below:

- \(\tan 44 = \frac{x}{3.55}\) \(x = 3.43\text{ cm}\)
- \(\cos 32 = \frac{11.95}{x}\) \(x = 14.09\text{ mm}\)
- \(\tan 15 = \frac{0.275}{x}\) \(x = 1.03''\)

10. If a triangle has angles of measure $53^\circ$ and $71^\circ$, then what is the measure of the third angle?

\(180 - 53 - 71 = 56^\circ\)
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11. Solve the missing sides in the triangles below:

\[ \tan 40° = \frac{x}{58} \quad \cos 60° = \frac{5.4}{y} \]

\[ x = 48.67 \quad y = 109.48 \]

\[ \tan 60° = \frac{4.4}{x} \quad \sin 60° = \frac{4.4}{y} \]

\[ x = 2.59 \quad y = 5.08 \]

12. Calculate the length of side AC.

\[ x = \sqrt{13^2 - 5^2} \]

\[ x = 12 \]

13. Calculate the value of side “x”.

\[ \cos 69° = \frac{20}{x} \]

\[ x = 55.81 \]
14. Find the value of the indicated angle.

\[ \theta = \sin^{-1} \left( \frac{21}{23} \right) \]

\[ \theta \approx 65.93^\circ \]

15. A ski slope falls a vertical height of 550 metres for a distance of 1750 m traveled down the ski hill. What is the measure of angle A to the nearest degree?

\[ A = \sin^{-1} \left( \frac{550}{1750} \right) \]

\[ A \approx 18.32^\circ \]

16. A wire will be attached straight from the top of a 20-foot pole to the ground. If it needs to make a 60° angle with the ground, how long must the wire be?
17. Calculate the length of the staircase.

18. A roof is shaped like an isosceles triangle. The slope of the roof makes an angle of $24^\circ$ with the horizontal, and has an altitude of 3.5 m. Determine the width of the roof, to the nearest tenth of a metre.

19. Calculate the length of dimension $x$. 

\[ \tan 24 = \frac{3.5}{x} \]

\[ x = 7.86 \]

\[ x \times 2 = 15.72 \text{ m wide} \]
20. A sailor on the deck of a ship observes an airplane in the sky. Label the diagram using the following terms:

- Horizontal line (2 of them)
- Line of sight
- Angle of elevation
- Angle of depression

a) The sailor uses a simple clinometer to measure the angle of elevation. A diagram of the clinometer is shown below. What is the angle of elevation shown?

b) If the sailor tilts her head 30° upwards to see the plane, and the plane is flying at an altitude of 3000m, what is the horizontal distance from the boat to the plane?
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21. A telephone pole is secured with a guy-wire as shown in the diagram. The guy-wire makes an angle of 75° with the ground and is secured 6 m out from the pole. Determine the approximate length of the telephone pole to the nearest metre.

22. The Fenelon Place Elevator in Dubuque, Iowa runs on a set of tracks that is 296 feet long and rises 189 feet from its starting place to the top of the hill. What is the angle of the tracks?

23. Laura is flying a kite at a local park. She lets out 60 m of her kite string, which makes an angle of 68° with the ground. Determine the height of the kite above the ground, to the nearest tenth of a metre. Sketch and solve.
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24. A temporary logging road is built along the side of a hill that is 135 feet high. According to local regulations, the road can have a grade of no more than 8%.

a) Convert the 8% grade to an angle (nearest tenth of a degree).

\[\text{grade} = \frac{\text{rise}}{\text{run}} = \frac{8}{100}\]

\[
\text{angle} = \tan^{-1} \left( \frac{8}{100} \right) \\
\text{angle} \approx 4.57^\circ
\]

b) How long will the road be if it is built to the angle determined in part a) and goes to the very top of the hill?

\[
\text{road length} = \frac{\text{opposite}}{\sin \text{angle}} = \frac{135}{\sin 4.57^\circ} \\
\text{road length} \approx 1.694 \text{ miles}
\]

25. A person at the top of a 50-foot-tall tower sees a car at 10° below the horizontal. How far is the car from the base of the tower?

\[
\tan 10^\circ = \frac{50}{\text{adj}} \\
\text{adj} = \frac{50}{\tan 10^\circ} \\
\text{adj} \approx 283.56 \text{ feet}
\]
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26. A ship’s destination is 30 miles north and 12 miles east. At what angle should it head to go straight to its destination?

\[
\theta = \tan^{-1} \left( \frac{12}{30} \right) = 21.80^\circ \text{ East of North}
\]

27. Suppose a mountain road descends 2000 feet over the course of 4 miles. If the slope of the road were constant, at what angle would it descend?

\[
\theta = \sin^{-1} \left( \frac{2000}{21120} \right) = 5.43^\circ
\]

28. Calculate the distance \( x \).

\[
\tan 28^\circ = \frac{0.75}{x}
\]

\[
x = \frac{0.75}{\tan 28^\circ} = 1.41 + 0.375 = 1.785''
\]