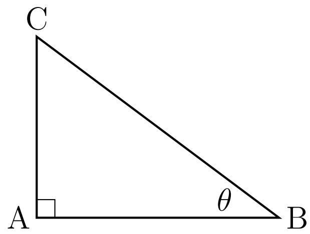
This worksheet will help you learn to define and use sin, cos, and tan ratios in right-angled triangles so that you can solve problems effectively.

Easy Questions

1. Write down the definitions of sin, cos, and tan for an acute angle in a right-angled triangle.
2. In a right-angled triangle, the side opposite an acute angle θ has length 3 and the hypotenuse has length 5. Calculate $\sin\theta$.
3. In a right-angled triangle, if the side adjacent to an acute angle θ is 4 and the hypotenuse is 5, compute $\cos\theta$.
4. In a right-angled triangle, the side opposite θ is 6 and the side adjacent to θ is 8. Calculate $\tan\theta$.
5. Sketch a right-angled triangle and label one of the acute angles as θ. Clearly indicate the side opposite θ, the side adjacent to θ, and the hypotenuse.

Intermediate Questions

6. A right-angled triangle has side lengths 6, 8, and 10. Identify the acute angle opposite the side of length 6 and write the expressions for sin, cos, and tan for that angle.
7. For a right-angled triangle, write an expression for $\sin\theta$ in terms of the side lengths when the side opposite θ is a and the hypotenuse is c.
8. Below is a right-angled triangle diagram. Label the side opposite, the side adjacent, and the hypotenuse relative to the acute angle θ.



9. In a right-angled triangle with side lengths 7, 24, and 25, find the value of $\tan\theta$ for the acute angle opposite the side of length 7.

10. Write down the definition of the tangent ratio in a right-angled triangle.

11. Determine the sine of an acute angle θ in a right-angled triangle where the side opposite θ is 9 and the hypotenuse is 15.

12. Find the cosine of θ in a right-angled triangle if the side adjacent to θ is 5 and the hypotenuse is 13.

13. Using the definitions, express $\tan\theta$ in terms of $\sin\theta$ and $\cos\theta$.

14. A right-angled triangle has side lengths 10, 24, and 26. Write down the expressions for $\sin\theta$, $\cos\theta$, and $\tan\theta$ for the acute angle opposite the side of length 10.

15. In a right-angled triangle, if $\sin\theta = 0.6$, provide an equivalent ratio of whole numbers that could represent the lengths of the side opposite θ and the hypotenuse.

16. Consider a right triangle with sides proportional to 3, 4, and 5. Write down the numerical values of $\sin\theta$, $\cos\theta$, and $\tan\theta$ for the acute angle opposite the side of length 3.

17. In an isosceles right-angled triangle, the two legs are equal. Find the values of $\sin\theta$, $\cos\theta$, and $\tan\theta$ for one of the acute angles.

18. In a right-angled triangle with side lengths 8, 15, and 17, calculate $\sin\theta$ for the acute angle opposite the side of length 8.

19. For a right-angled triangle with side lengths 9, 12, and 15, determine $\cos\theta$ for the acute angle adjacent to the side of length 12.

20. Write a general expression for $\tan\theta$ in a right-angled triangle where the length of the side opposite θ is x and the length of the side adjacent to θ is y.

Hard Questions

21. Let a right-angled triangle have sides with lengths $3x$, $4x$, and $5x$. Write down the expressions for $\sin\theta$, $\cos\theta$, and $\tan\theta$ for the acute angle opposite the side of length $3x$.

22. In a right-angled triangle, the side opposite an acute angle θ is given by $2k + 1$ and the hypotenuse is $4k + 3$. Express $\sin\theta$ in simplest form.

23. In a right triangle the side adjacent to an acute angle θ is $x + 2$ and the hypotenuse is $2x + 3$. Write an expression for $\cos\theta$ and state any restrictions on x required for a valid right triangle.

24. If $\tan\theta = \dfrac{x-1}{2x+3}$ in a right-angled triangle, write an expression for $\sin\theta$ in terms of $\cos\theta$.

25. Explain why, in a right-angled triangle, both $\sin\theta$ and $\cos\theta$ are positive for the acute angles.

26. A right-angled triangle has side lengths 5, 12, and 13. Without calculating the numerical value of the angles, write the expressions for $\sin\theta$, $\cos\theta$, and $\tan\theta$ for the acute angle opposite the side of length 5, and simplify the ratios if possible.

27. In a right-angled triangle the sides are given as $2m$, $3m$, and k, with k as the hypotenuse. Write an expression for $\sin\theta$, where θ is the acute angle opposite the side of length $2m$, and determine the condition that k must satisfy in terms of m.

28. Consider a right-angled triangle in which the side opposite an acute angle θ is $a+1$ and the hypotenuse is $2a+3$. Provide the expression for $\sin\theta$ and discuss briefly how $\sin\theta$ changes as a increases.

29. Draw a detailed diagram of a right-angled triangle with side lengths 6, 8, and 10. Label the acute angle θ so that the side opposite θ is 6. Using arrows and labels on your diagram (drawn with pen and paper), indicate where the sine, cosine, and tangent ratios are applied.

30. Explain why the trigonometric ratios sin, cos, and tan are defined only for the acute angles of a right-angled triangle, and discuss the limitations this definition imposes when dealing with obtuse angles.