In this worksheet you will learn about the conditions that make lines parallel or perpendicular and how to find their equations. You will answer questions ranging from identifying slopes to proving properties and applying these concepts in geometric contexts.

Easy Questions

1. Determine the slope of the line given by $y = 2x + 3$.

2. State the slope of any line parallel to the line $y = -\dfrac{1}{2}x + 7$.

3. If a line has slope 3, what is the slope of any line perpendicular to it?

4. Determine if the lines with slopes 4 and 4 are parallel.

5. Decide whether the lines with slopes 5 and $-\dfrac{1}{5}$ are perpendicular.

Intermediate Questions

6. Write the equation of the line parallel to $y = 2x - 3$ that passes through the point $(1, 4)$ using the point-slope form.

7. Write the equation of the line perpendicular to $y = -3x + 2$ that passes through the point $(-2, 5)$.

8. A line parallel to $y = \dfrac{1}{2}x + 6$ passes through $(4, 2)$. Find its y-intercept.

9. Find the equation of the line that is perpendicular to $y = \dfrac{2}{3}x + 5$ and passes through $(3, -1)$.

10. Find the intersection point of the line $y = 2x + 1$ and the line that is perpendicular to it and passes through $(2, 3)$.

11. Write the equation of the line parallel to $y = -x + 4$ that passes through $(-1, 2)$.

12. Determine whether the lines $y = \dfrac{3}{4}x - 2$ and $y = -\dfrac{4}{3}x + 1$ are parallel, perpendicular, or neither.

13. Calculate the slope of a line perpendicular to the line joining the points $(1, 3)$ and $(5, 11)$.

14. Given that a line through $(0, -5)$ is parallel to $y = -\frac{1}{3}x + 2$, write its equation.

15. Find the equation of the line perpendicular to $y = \frac{5}{2}x - 8$ that passes through $(4, 10)$.

16. Determine the intersection point of the line $y = 3x + 2$ and the line perpendicular to it passing through $(1, -1)$.

17. Verify whether the lines given by $2y = 4x + 6$ and $y = 2x - 3$ are parallel.

18. For the line $y = -\frac{2}{5}x + 7$, find the slope of a line perpendicular to it, and then write the equation of that perpendicular line passing through $(5, 0)$ using the point-slope form.

19. Determine the gradient and y-intercept of the line given by $y - 3 = -\frac{3}{4}(x + 2)$ and decide if it is parallel or perpendicular to the line $y = \frac{4}{3}x - 1$.

20. Find the equation of the line perpendicular to $y = \frac{1}{2}x + 3$ that passes through the midpoint of the segment joining $(2, 5)$ and $(6, 9)$.

Hard Questions

21. Prove that if two lines are both perpendicular to a third line, then they are parallel.

22. Find the equation of the line parallel to $y = \frac{3}{5}x - 2$ that passes through the intersection point of the lines $y = -\frac{5}{3}x + 4$ and the line through $(0, 0)$ which is perpendicular to $y = \frac{3}{5}x - 2$.

23. Determine the equation of the line that is equidistant from the parallel lines $y = 2x + 1$ and $y = 2x - 5$.

24. A circle with centre $(3, 4)$ is tangent to the line $y = 2x + 1$. Using the diagram below, find the equation of the line perpendicular to the tangent that passes through the point of tangency.
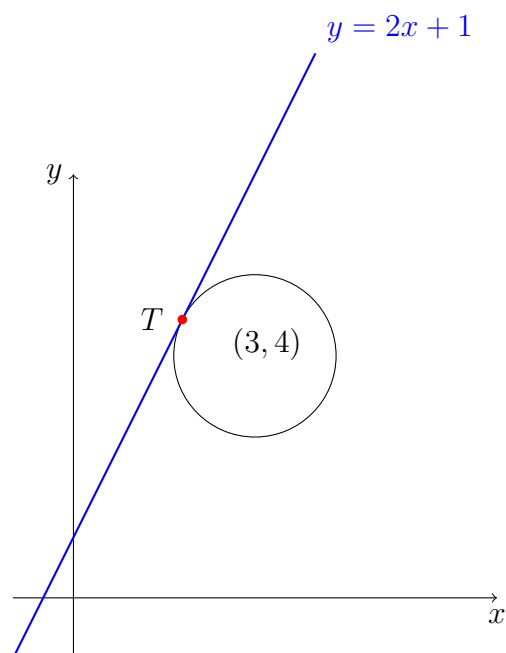
25. Find the equation of the line that is perpendicular to $y = -\dfrac{2}{3}x + 7$ and passes through the intersection point of $y = -\dfrac{2}{3}x + 7$ and $y = \dfrac{1}{3}x - 2$.

26. A quadrilateral has one side given by $y = \dfrac{4}{5}x + 1$ and an adjacent side which is perpendicular to it and passes through $(2, -3)$. Find the equations of both these sides.

27. Determine the distance between the parallel lines $y = 3x + 4$ and $y = 3x - 2$.

28. Find the area of the parallelogram formed by the lines $y = x + 2$, $y = x - 3$, $x = 1$ and $x = 5$.

29. Determine the equation of the line perpendicular to $y = \dfrac{1}{2}x - 3$ that has an x-intercept at $(6, 0)$.

30. Find the coordinates of the point where the line perpendicular to $y = -2x + 5$ through $(2, -1)$ intersects the line parallel to $y = 3x + 1$ that passes through $(-1, 4)$.