ILLAWARRA TUTORING

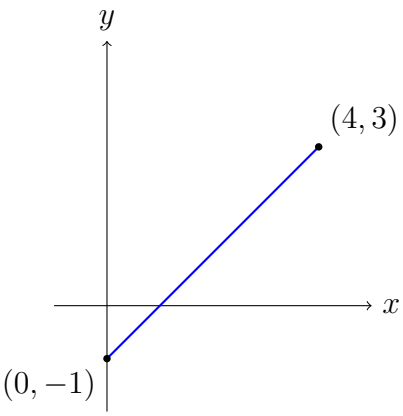
This worksheet will help you calculate and interpret the gradient (slope) of a straight line. You will learn how to compute the gradient from two points, understand its representation as a rate of change, and apply your knowledge to both numerical and real-life contexts.

Easy Questions

1. Write down the formula used to calculate the gradient of a line given two points (x_1, y_1) and (x_2, y_2).
2. Calculate the gradient of the line joining the points $(1, 2)$ and $(3, 6)$.
3. Explain in plain text what the gradient of a line represents in terms of rate of change.
4. A straight line has a gradient of 3. State whether the line is increasing or decreasing and briefly explain your answer.
5. Determine the gradient of a horizontal line and explain why the gradient of a vertical line is undefined.

Intermediate Questions

6. Calculate the gradient of the line joining the points $(-2, 7)$ and $(3, 12)$.
7. Find the gradient of the line that passes through $(0, -5)$ and $(4, 3)$.
8. Determine the gradient of the line joining the points $\left(\frac{1}{2}, 2\right)$ and $\left(\frac{3}{2}, 7\right)$.
9. Find the gradient of the line between the points $(4, 5)$ and $(4, 10)$ and explain your answer.
10. A line passes through the point $(2, 3)$ and has a gradient of 4. Calculate the change in y when x increases by 5.
11. A car travels such that its distance-time graph has a constant gradient of 60 km/h. Explain what this gradient indicates about the car's motion.
12. Using the diagram below, calculate the gradient of the line drawn.



13. Find the gradient of the line joining the points $(-3, 10)$ and $(2, 0)$.

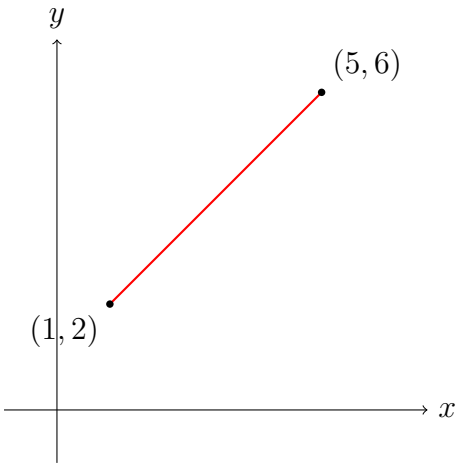
14. A line has a gradient of 0. Explain what this indicates about the line and describe the gradient of any line parallel to it.

15. From the equation $y = 2x + 1$, identify the gradient of the line.

16. Calculate the gradient of the line joining the points $(3, 4)$ and $(7, -2)$.

17. A line has a gradient of $\frac{2}{3}$ and passes through the origin. Find the change in y when x increases by 6.

18. Refer to the diagram below and calculate the gradient of the line joining the two labelled points.



19. A distance-time graph shows that the gradient is 80 km/h. Explain what this tells you about the motion represented in the graph.

20. Determine the gradient of the line joining the points $(-6, -4)$ and $(2, 12)$.

Hard Questions

21. The points $(-2, 3)$, $(0, 7)$, and $(4, 15)$ lie on a straight line. Verify that these points are collinear by calculating the gradients between pairs of points.

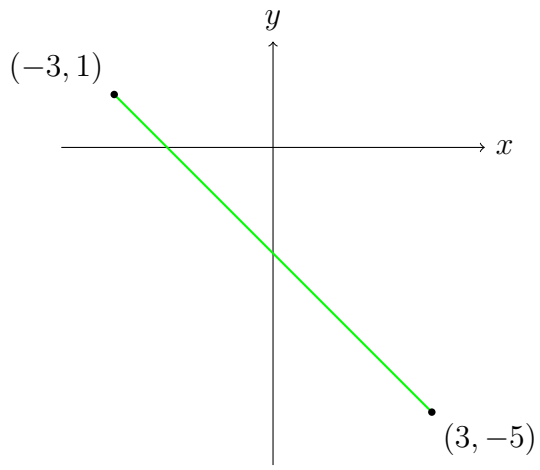
22. A line passes through the points $(a, 2a+1)$ and $(3a, 5a-2)$. Find an expression for the gradient in terms of a, and determine the value of a for which the line is horizontal.

23. The line joining the points $(1, k)$ and $(7, 3k+2)$ is horizontal. Find the value of k.

24. A line with gradient $m = -3$ passes through the point $(2, 5)$. If x increases by 4, determine the coordinates of the new point on the line.

25. Given that $y_2 - y_1 = 6$ when $x_2 - x_1 = 2$, compute the gradient m, and briefly explain what a negative gradient would imply about a line's direction.

26. On the coordinate grid in the diagram below, the line passes through the points $(-3, 1)$ and $(3, -5)$. Calculate the gradient.



27. The points $(p, 2)$ and $(p+4, 10)$ lie on a line. Express the gradient of the line in terms of p.

28. The line passing through the points $(-4, -8)$ and $(0, k)$ has a gradient of 3. Find the value of k.

29. In plain text, explain why the gradient of a horizontal line is 0 and why the gradient of a vertical line is undefined. Provide an example for each case.

30. A cyclist covers 15 kilometres in 0.5 hours. Calculate the gradient of the distance-time graph for the cyclist, and interpret its meaning in the context of speed.