ILLAWARRA TUTORING

This worksheet will help you calculate and interpret the gradient of a straight line. You will practise finding the gradient between two points using the formula $m = \dfrac{y_2 - y_1}{x_2 - x_1}$ and explore its meaning as a rate of change.

Easy Questions

1. Write the formula for the gradient of a line connecting the points (x_1, y_1) and (x_2, y_2).
2. Calculate the gradient of the line joining the points $(2, 3)$ and $(5, 9)$.
3. For the line given by $y = 4x + 1$, state its gradient.
4. Determine the gradient of a horizontal line.
5. Determine the gradient of a vertical line.

Intermediate Questions

6. Find the gradient of the line segment that joins the points $(1, 2)$ and $(4, 8)$.
7. Calculate the gradient between the points $(-3, 5)$ and $(2, -5)$.
8. Determine the gradient of the line passing through $(0, 0)$ and $(7, 14)$.
9. Compute the gradient of the line joining $(3, -4)$ and $(7, 0)$.
10. A line passes through $(-2, 8)$ and $(1, 2)$. Calculate its gradient.
11. A straight line with gradient 2 passes through $(2, 3)$ and $(x, 9)$. Find the value of x.
12. Find the gradient of the line passing through the points $(5, 12)$ and $(9, 20)$.
13. Use the gradient formula to calculate the gradient between $(-1, -3)$ and $(3, 5)$.
14. Plot any two distinct points of your choice on graph paper and calculate the gradient between them.
15. A machine increases its output by 6 units for every 3 units increase in input. What is the gradient representing this rate of change?
16. In your own words, explain what the gradient of a line represents.

17. Calculate the gradient of the line segment joining $(10, 15)$ and $(4, 3)$.

18. Compute the gradient between the points $(-4, -2)$ and $(0, 6)$.

19. Determine which line has a greater gradient: the line through $(3, 7)$ and $(6, 19)$ or the line through $(3, 7)$ and $(6, 13)$.

20. Identify the gradient of a line that falls by 3 units for every 5 units increase in the horizontal direction.

Hard Questions

21. Given that a line passes through the points $(a, 2a + 1)$ and $(3a, 8)$, derive an expression for the gradient in terms of a.

22. A line with gradient m passes through $(3, 7)$. Express the y-intercept c in terms of m if the line is written in the form $y = mx + c$.

23. The points $(x, 2)$ and $(4, 8)$ lie on a line. Express the gradient in terms of x and determine the value of x for which the gradient is 3.

24. A dataset shows that when the independent variable increases by 2 units, the dependent variable increases by 5 units. What is the gradient of the line connecting any two points in this dataset?

25. Consider the line $y = mx + c$ and the points $(-1, m(-1) + c)$ and $(2, m(2) + c)$ on it. Write the expression for the gradient between these points and simplify your answer.

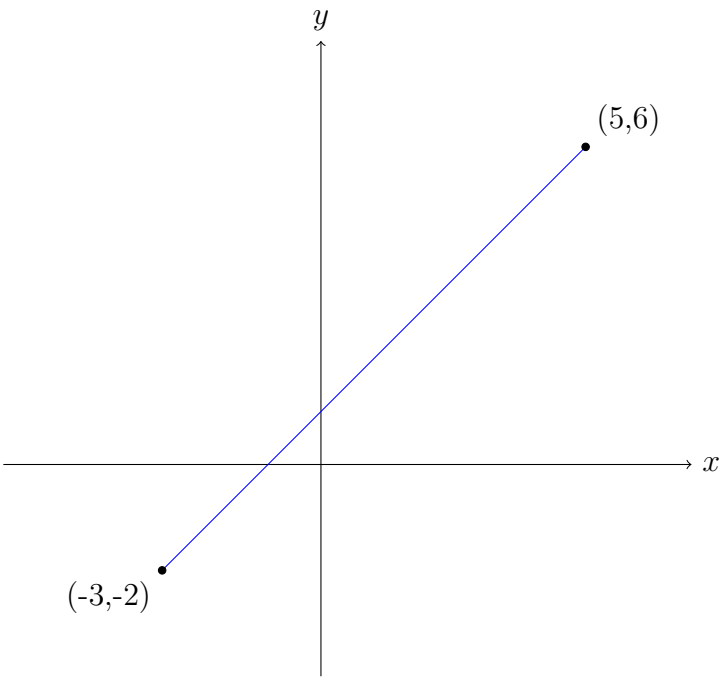
26. A line passes through $(-2, k)$ and $(4, 10)$. Express the gradient in terms of k and then determine the value of k if the gradient is 2.

27. Compute the gradient between the points $(2^2, 3^2)$ and $(3^2, 5^2)$.

28. A line segment has endpoints $(3.5, -2.1)$ and $(8.5, 3.9)$. Calculate the gradient and express your answer as a decimal rounded to two decimal places.

29. A line is represented by the parametric point $(t, 2t + 3)$ and also passes through $(4, 11)$. Verify that the gradient calculated from these two points is consistent with the rate 2.

30. A line passes through the points $(-3, -2)$ and $(5, 6)$.



Calculate the gradient of the line using these points. Then, write a few sentences explaining what this gradient indicates about the line's steepness.