ILLAWARRA TUTORING

This worksheet examines linear functions and their graphs. You will learn to identify the slope–intercept form, interpret the gradient (slope) and y–intercept in practical terms, and apply these ideas to real–world situations.

Easy Questions

1. Write the general form of a linear function in the form $y = mx + c$. Identify which part of the equation represents the slope and which represents the y–intercept.

2. For the function $y = 3x + 2$, state the value of the slope and the y–intercept.

3. Evaluate the function $y = -2x + 5$ when $x = 3$.

4. Answer True or False: The graph of any function of the form $y = mx + c$ is a straight line.

5. Sketch the graph of the function $y = 2x - 1$. Label the slope and the y–intercept on your diagram.

Intermediate Questions

6. A car travelling at a constant speed has its distance (in kilometres) given by $d = 60x + 5$, where x is the time in hours and 5 is the starting distance from a reference point. Explain what the slope and the y–intercept represent in this context.

7. A mobile phone plan is represented by $C = 0.25x + 10$, where C is the cost in dollars and x is the number of minutes used. Identify the interpretation of the slope and the y–intercept.

8. The following table shows values of x and y:

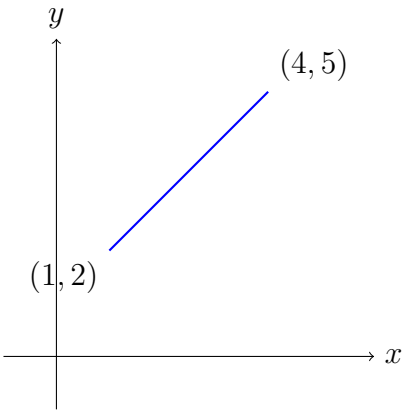
x	y
1	7
2	10
3	13
4	16

   Determine if the relationship between x and y is linear. Explain your reasoning.

9. Consider the function $y = mx + c$. Describe in plain words what happens to the graph when the value of m increases, assuming c remains constant.

10. For the function $y = mx+c$, explain what the effect on the graph is when c increases, while m remains the same.

11. Look at the diagram below and determine the equation of the line in the form $y = mx + c$.



12. Given $y = 4x - 3$, find the value of x when $y = 5$.

13. A taxi service charges a flat fee of $8 and then $2 per kilometre. Write a linear function in the form $y = mx + c$ to model the total fare, where x is the number of kilometres travelled. Identify the slope and y–intercept in your function.

14. For the function $y = -3x + 6$, calculate the value of y when $x = -2$.

15. In a scenario where the function $y = 7x + 4$ models the earning (in dollars) based on hours worked, explain what the slope represents.

16. Consider the linear function $y = 2x + 5$. If the rate of change (slope) increases to 4 while the starting value remains unchanged, write the new equation and describe the effect on the graph.

17. The temperature in a city is modelled by the function $T = -1x + 20$, where x is the number of hours after noon and T is the temperature in degrees Celsius. Explain the significance of the slope and discuss how the temperature changes over time.

18. For $y = 5x - 10$, determine the value of x for which $y = 0$. Explain the practical meaning of this point if the function represents profit.

19. Suppose the attendance at a school play is given by $A = 12x + 30$, where x is the number of weeks since tickets went on sale and A is the number of tickets sold. Predict the number of tickets sold after 5 weeks.

20. If the line $y = 3x + 2$ is shifted upward by 4 units, express the equation of the new line in slope–intercept form and explain your answer.

Hard Questions

21. A power company charges a monthly fee of $40 plus 0.15$ per kilowatt–hour of electricity used, modelled by $y = 0.15x + 40$. Explain in detail what the slope and y–intercept represent. Then, discuss how the equation would change if the base fee increased by $10 and the cost per kilowatt–hour decreased by 0.02$.

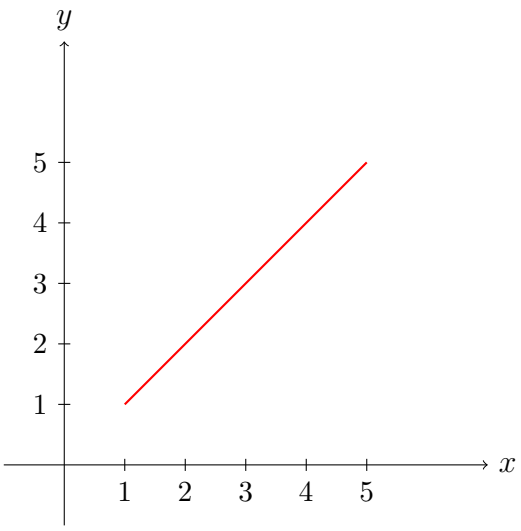
22. Consider the linear function $y = mx + c$. Describe the effect on the slope–intercept form if the whole function is multiplied by a constant factor k. Provide the new equation and explain what happens when $k > 1$, $0 < k < 1$, and if k is negative.

23. A taxi company revises its pricing. Initially, the fare is given by $y = 2.50x + 3$, where x represents kilometres travelled. If the company increases the base fee by $2 and decreases the per–kilometre rate by 0.50$, write the new linear function and explain the effect on each parameter.

24. The function $y = mx + c$ is used to model monthly sales. Discuss how a slight increase in m (with c remaining constant) affects the sales predictions over time. Provide a detailed explanation that includes an analysis of long–term consequences.

25. Two companies offer printing services. Company A charges $y = 0.10x + 5$ and Company B charges $y = 0.08x + 7$, where x is the number of pages printed. Determine for which values of x Company A is cheaper than Company B. Explain each step in your reasoning.

26. Examine the diagram below and estimate the slope and the y–intercept of the line. Provide your reasoning.



27. The function $y = mx + c$ is reflected across the y–axis. Write the equation of the reflected line and explain how both parameters change.

28. Discuss the differences in the graphs of $y = mx + c$ when m is positive, negative, and zero. Support your answer with a detailed explanation.

29. A company's profit is modelled by the function $y = 0.5x - 30$, where x is the number of units sold. Discuss how the profit function would change if production

costs increased. In your answer, focus on how the slope and intercept might be affected.

30. Discuss the potential limitations of modelling real–world phenomena with a linear function. Provide examples of situations where a linear model might fail and suggest alternative approaches that could address these limitations.