

INDUS INTERNATIONAL SCHOOL , BANGALORE

HALF YEARLY EXAMINATIONS – DEC. 2010 – REVISION QUESTION BANK

GRADE: 11 (MATH. STUDIES)

1. A woman deposits \$100 into her son's savings account on his first birthday. On his second birthday she deposits \$125, \$150 on his third birthday, and so on.

- (a) How much money would she deposit into her son's account on his 17th birthday?
- (b) How much in total would she have deposited after her son's 17th birthday?

2. The first four terms of an arithmetic sequence are shown below.

1, 5, 9, 13,.....

- (a) Write down the n^{th} term of the sequence.
- (b) Calculate the 100th term of the sequence.
- (c) Find the sum of the first 100 terms of the sequence.

3. A National Lottery is offering prizes in a new competition. The winner may choose one of the following.

Option one: \$1000 each week for 10 weeks.

Option two: \$250 in the first week, \$450 in the second week, \$650 in the third week, increasing by \$200 each week for a total of 10 weeks.

Option three: \$10 in the first week, \$20 in the second week, \$40 in the third week continuing to double for a total of 10 weeks.

- (a) Calculate the amount you receive in the tenth week, if you select
 - (i) **option two;**
 - (ii) **option three.**
- (b) What is the total amount you receive if you select **option two**?
- (c) Which option has the greatest total value? Justify your answer by showing all appropriate calculations.

4. On Vera's 18th birthday she was given an allowance from her parents. She was given the following choices.

- Choice A \$100 every month of the year.
Choice B A fixed amount of \$1100 at the beginning of the year, to be invested at an interest rate of 12% per annum, compounded monthly.
Choice C \$75 the first month and an increase of \$5 every month thereafter.
Choice D \$80 the first month and an increase of 5% every month.

- (a) Assuming that Vera does not spend any of her allowance during the year, calculate, for each of the choices, how much money she would have at the end of the year.
- (b) Which of the choices do you think that Vera should choose? Give a reason for your answer.
- (c) On her 19th birthday Vera invests \$1200 in a bank that pays interest at $r\%$ per annum compounded annually. Vera would like to buy a scooter costing \$1452 on her 21st birthday. What rate will the bank have to offer her to enable her to buy the scooter?

5. The fourth term of an arithmetic sequence is 12 and the tenth term is 42.

- (a) Given that the first term is u_1 and the common difference is d , write down two equations in u_1 and d that satisfy this information.
- (b) Solve the equations to find the values of u_1 and d .

6. Ann and John go to a swimming pool.

They both swim the first length of the pool in 2 minutes.

The time John takes to swim a length is 6 seconds more than he took to swim the previous length.

The time Ann takes to swim a length is 1.05 times that she took to swim the previous length.

- (a) (i) Find the time John takes to swim the third length.
(ii) Show that Ann takes 2.205 minutes to swim the third length.
- (b) Find the time taken for Ann to swim a total of 10 lengths of the pool.

7. The n^{th} term of an arithmetic sequence is given by $u_n = 63 - 4n$.

- (a) Calculate the values of the first two terms of this sequence.
- (b) Which term of the sequence is -13 ?
- (c) Two consecutive terms of this sequence, u_k and u_{k+1} , have a sum of 34. Find k .

8. The sixth term of an arithmetic sequence is 24. The common difference is 8.

- (a) Calculate the first term of the sequence.

The sum of the first n terms is 600.

- (b) Calculate the value of n .

9. Two students Ann and Ben play a game. Each time Ann passes GO she receives \$15. Each time Ben passes GO he receives 8% of the amount he already has. Both students start with \$100.
- (a) How much money will Ann have after she has passed GO 10 times?
 - (b) How much money will Ben have after he passes GO 10 times?
 - (c) How many times will the students have to pass GO for Ben to have more money than Ann?

10. (a) The first term of an arithmetic sequence is -16 and the eleventh term is 39 . Calculate the value of the common difference.
- (b) The third term of a geometric sequence is 12 and the fifth term is $\frac{16}{3}$.
All the terms in the sequence are positive.
Calculate the value of the common ratio.

11. The first three terms of an arithmetic sequence are

$$2k + 3, 5k - 2 \text{ and } 10k - 15.$$

- (a) Show that $k = 4$.
 - (b) Find the values of the first three terms of the sequence.
 - (c) Write down the value of the common difference.
 - (d) Calculate the 20th term of the sequence.
 - (e) Find the sum of the first 15 terms of the sequence.
12. The fifth term of an arithmetic sequence is 20 and the twelfth term is 41 .
- (a) (i) Find the common difference.
(ii) Find the first term of the sequence.
 - (b) Calculate the eighty-fourth term.
 - (c) Calculate the sum of the first 200 terms.

13. Give all answers in this question correct to the **nearest dollar**

Clara wants to buy some land. She can choose between two different payment options. Both options require her to pay for the land in **20** monthly installments.

Option 1: The first installment is \$2500. Each installment is \$200 more than the one before.

Option 2: The first installment is \$2000. Each installment is 8% more than the one before.

- (a) If Clara chooses option 1,
 - (i) write down the values of the second and third installments;
 - (ii) calculate the value of the final installment;
 - (iii) show that the **total amount** that Clara would pay for the land is \$88 000.
- (b) If Clara chooses option 2,
 - (i) find the value of the second installment;
 - (ii) show that the value of the fifth installment is \$2721.
- (c) Clara knows that the **total amount** she would pay for the land is not the same for both options. She wants to spend the least amount of money. Find how much she will save by choosing the cheaper option.

14. The population of Bangor is growing each year. At the end of 1996, the population was 40 000. At the end of 1998, the population was 44 100. Assuming that these annual figures follow a geometric progression, calculate

- (a) the population of Bangor at the end of 1997;
- (b) the population of Bangor at the end of 1992.

15. The tuition fees for the first three years of high school are given in the table below.

Year	Tuition fees (in dollars)
1	2000
2	2500
3	3125

These tuition fees form a geometric sequence.

- (a) Find the common ratio, r , for this sequence.
 - (b) If fees continue to rise at the same rate, calculate (to the nearest dollar) the total cost of tuition fees for the first six years of high school.
16. A basketball is dropped vertically. It reaches a height of 2 m on the first bounce. The height of each subsequent bounce is 90% of the previous bounce.
- (a) What height does it reach on the 8th bounce?
 - (b) What is the total vertical distance travelled by the ball between the first and sixth time the ball hits the ground?
17. A geometric sequence has all its terms positive. The first term is 7 and the third term is 28.
- (a) Find the common ratio.
 - (b) Find the sum of the first 14 terms.

18. Consider the geometric sequence $8, a, 2, \dots$ for which the common ratio is $\frac{1}{2}$.
- Find the value of a .
 - Find the value of the eighth term.
 - Find the sum of the first twelve terms.

19. A geometric progression G_1 has 1 as its first term and 3 as its common ratio.

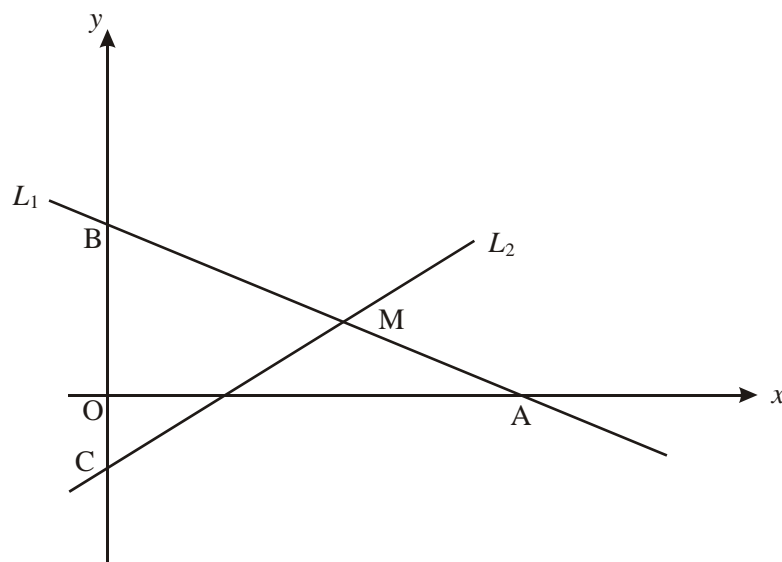
- The sum of the first n terms of G_1 is 29 524. Find n .

A second geometric progression G_2 has the form $1, \frac{1}{3}, \frac{1}{9}, \frac{1}{27}, \dots$

- State the common ratio for G_2 .
- Calculate the sum of the first 10 terms of G_2 .
- Explain why the sum of the first 1000 terms of G_2 will give the same answer as the sum of the first 10 terms, when corrected to three significant figures.

20. The line L_1 shown on the set of axes below has equation $3x + 4y = 24$. L_1 cuts the x -axis at A and cuts the y -axis at B.

Diagram not drawn to scale



- Write down the coordinates of A and B.

M is the midpoint of the line segment [AB].

- Write down the coordinates of M.

The line L_2 passes through the point M and the point C (0, -2).

(c) Write down the equation of L_2 .

(d) Find the length of

(i) MC;

(ii) AC.

21. The coordinates of the vertices of a triangle are P (-2, 6), Q (6, 2) and R (-8, a).

(a) On graph paper, mark the points P and Q on a set of coordinate axes. Use 1 cm to represent 1 unit on each axis.

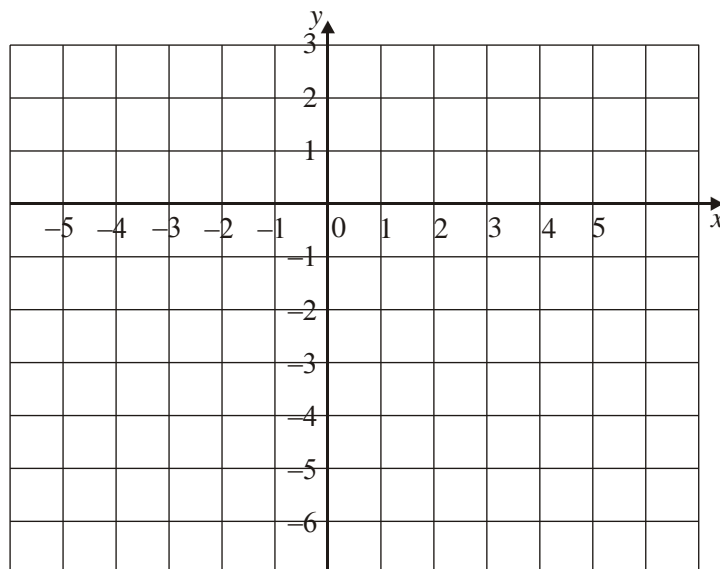
(b) (i) Calculate the distance PQ.

(ii) Find the gradient of the line PQ.

(iii) If angle RPQ is a right angle, what is the gradient of the line PR?

(iv) Use your answer from (b) (iii), or otherwise, to find the value of 'a'.

22.



(a) On the grid above, draw a straight line with a gradient of -3 that passes through the point (-2, 0).

(b) Find the equation of this line.

23. The vertices of quadrilateral ABCD as shown in the diagram are A (-8, 8), B (8, 3), C (7,-1) and D (-4, 1). The gradient of the line AB is $-\frac{5}{16}$.

(a) Calculate the gradient of the line DC.

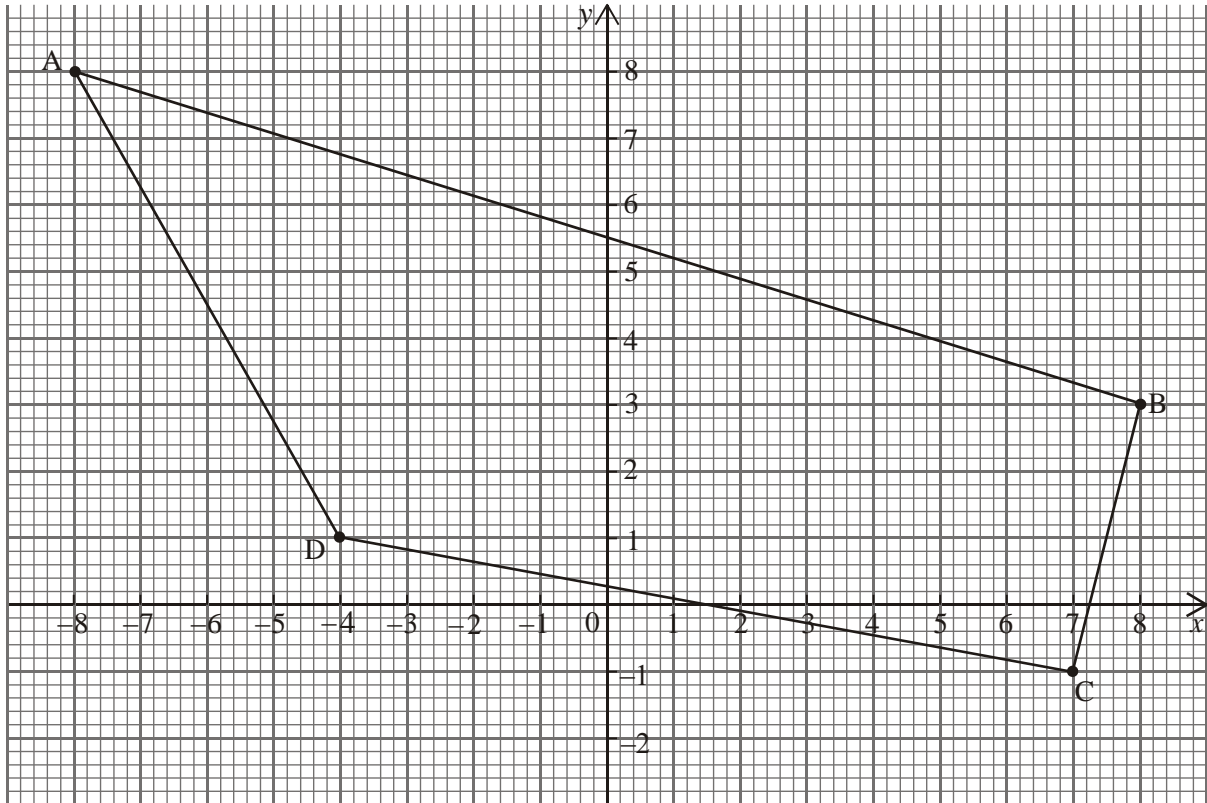
(b) State whether or not DC is parallel to AB and give a reason for your answer.

The equation of the line through A and C is $3x + 5y = 16$.

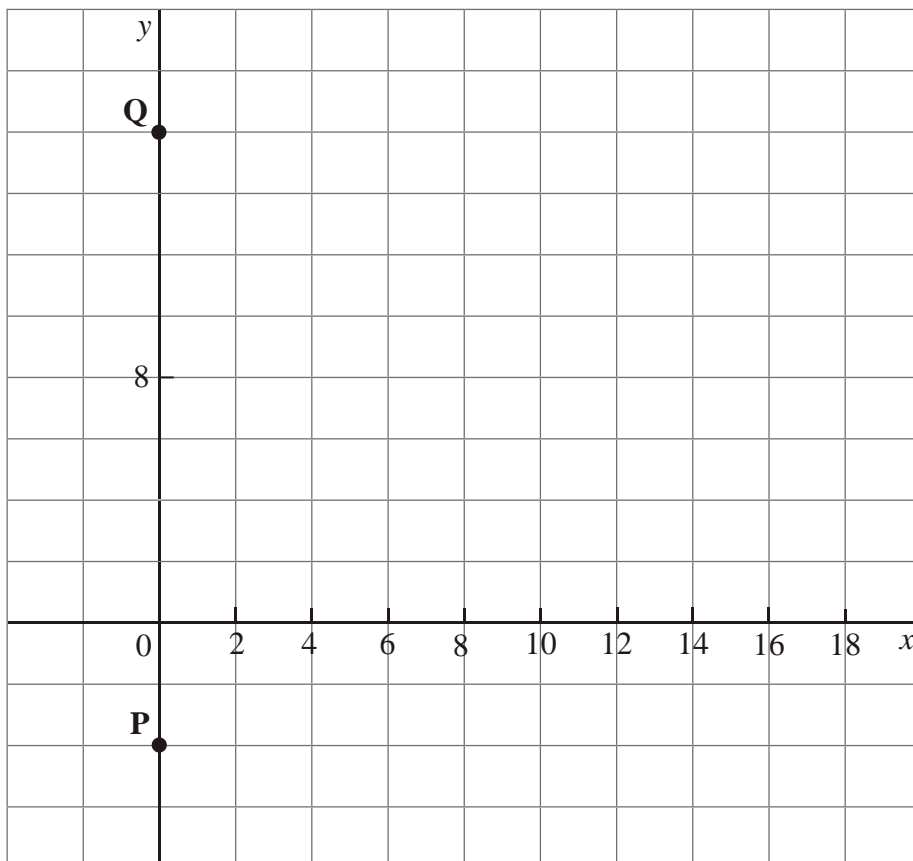
- (c) Find the equation of the line through B and D expressing your answer in the form $ax + by = c$, where a, b and $c \in \mathbb{Z}$.

The lines AC and BD intersect at point T.

- (d) Calculate the coordinates of T.



24. Points P(0, -4), Q(0, 16) are shown on the diagram.



(a) Plot the point R (11,16).

(b) Calculate angle \widehat{QPR} .

M is a point on the line PR. M is 9 units from P.

(c) Calculate the area of triangle PQM.

25. $P(4, 1)$ and $Q(0, -5)$ are points on the coordinate plane.

(a) Determine the

(i) coordinates of M , the midpoint of P and Q ;

(ii) gradient of the line drawn through P and Q ;

(iii) gradient of the line drawn through M , perpendicular to PQ .

The perpendicular line drawn through M meets the y -axis at $R(0, k)$.

(b) Find k .

26. The mid-point, M , of the line joining $A(s, 8)$ to $B(-2, t)$ has coordinates $M(2, 3)$.

(a) Calculate the values of s and t .

(b) Find the equation of the straight line perpendicular to AB , passing through the point M .

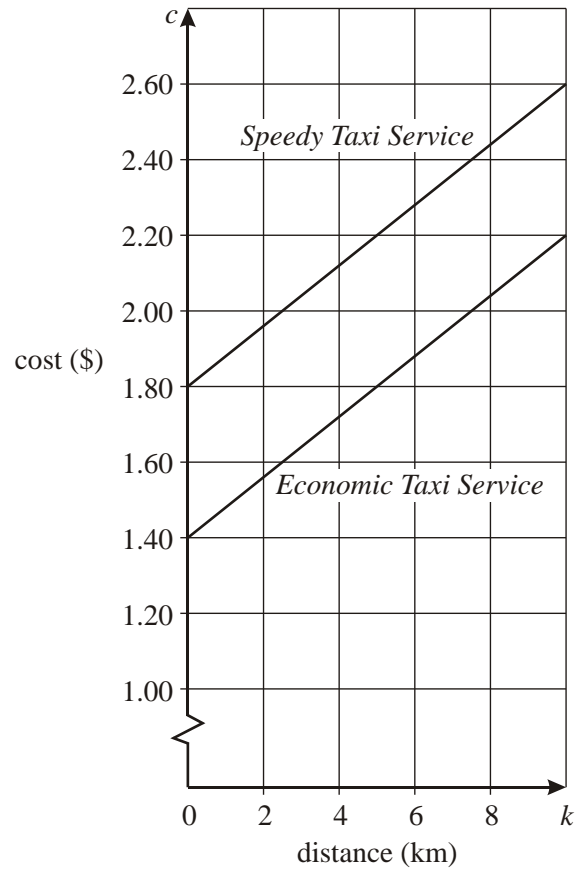
27. The gradients of several lines are as follows:

Line	a	b	c	d	e	f	g	h
Gradient	-3	$\frac{-5}{2}$	$\frac{1}{3}$	0.5	$\frac{3}{6}$	$\frac{-2}{5}$	$\frac{5}{-2}$	0.4

(a) Find two pairs of lines that are parallel to each other.

(b) Find any two pairs of lines that are at right angles to each other.

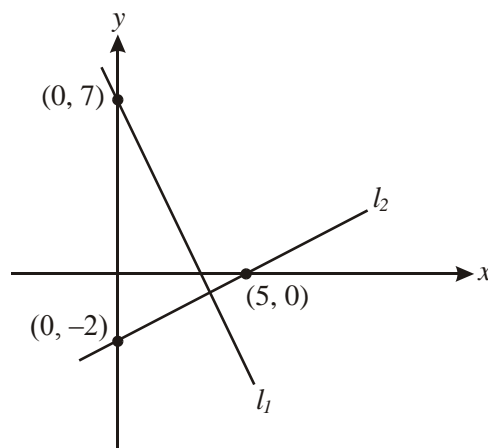
29. The costs charged by two taxi services are represented by the two parallel lines on the following graph. The *Speedy Taxi Service* charges \$1.80, plus 10 cents for each kilometre.



- (a) Write an equation for the cost, c , in \$, of using the *Economic Taxi Service* for any number of kilometres, k .
- (b) Bruce uses the *Economic Taxi Service*.
- How much will he pay for travelling 7 km?
 - How far can he travel for \$2.40?

30. The following diagram shows the lines l_1 and l_2 , which are perpendicular to each other.

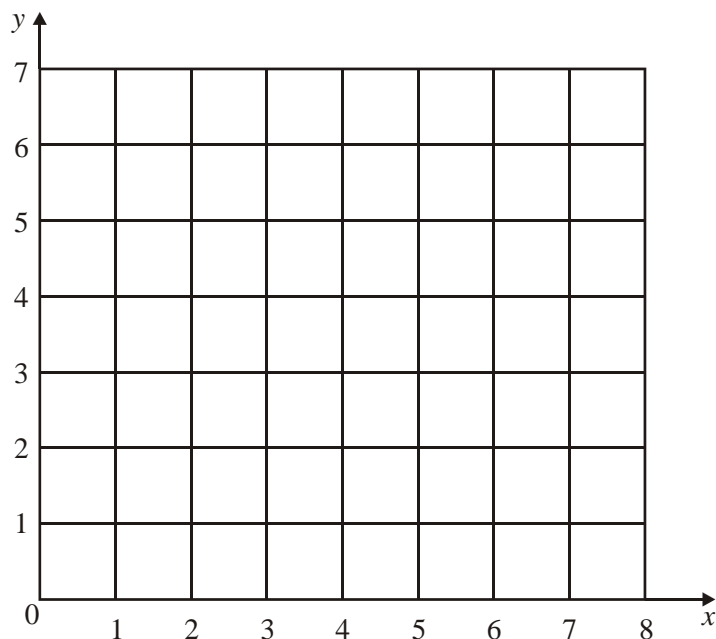
Diagram not to scale



- (a) Calculate the gradient of line l_1 .
- (b) Write the equation of line l_1 in the form $ax + by + d = 0$ where a , b and d are integers, and $a > 0$.

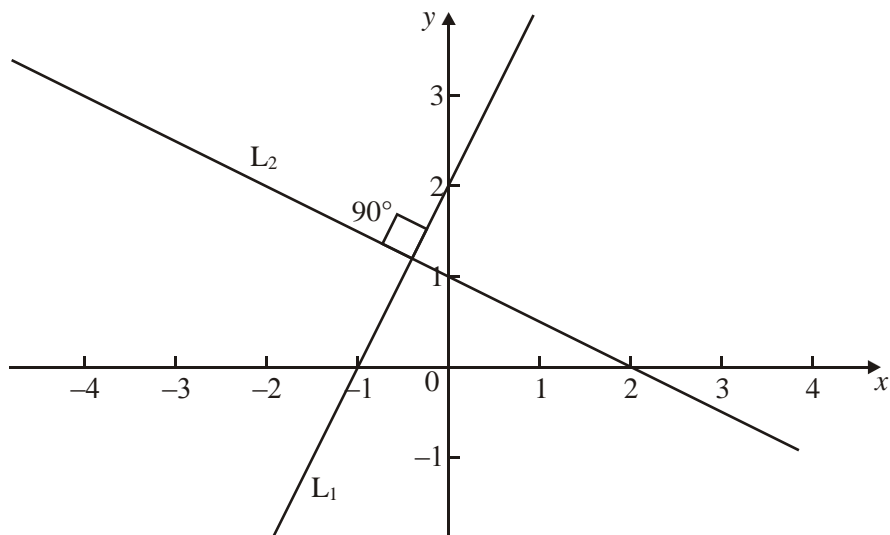
31. Two points are given as A (4, 3) and B(5, 7).

- (a) Plot these points on the grid below.



- (b) Join the points with a straight line.
- (c) Calculate the gradient of the line AB.

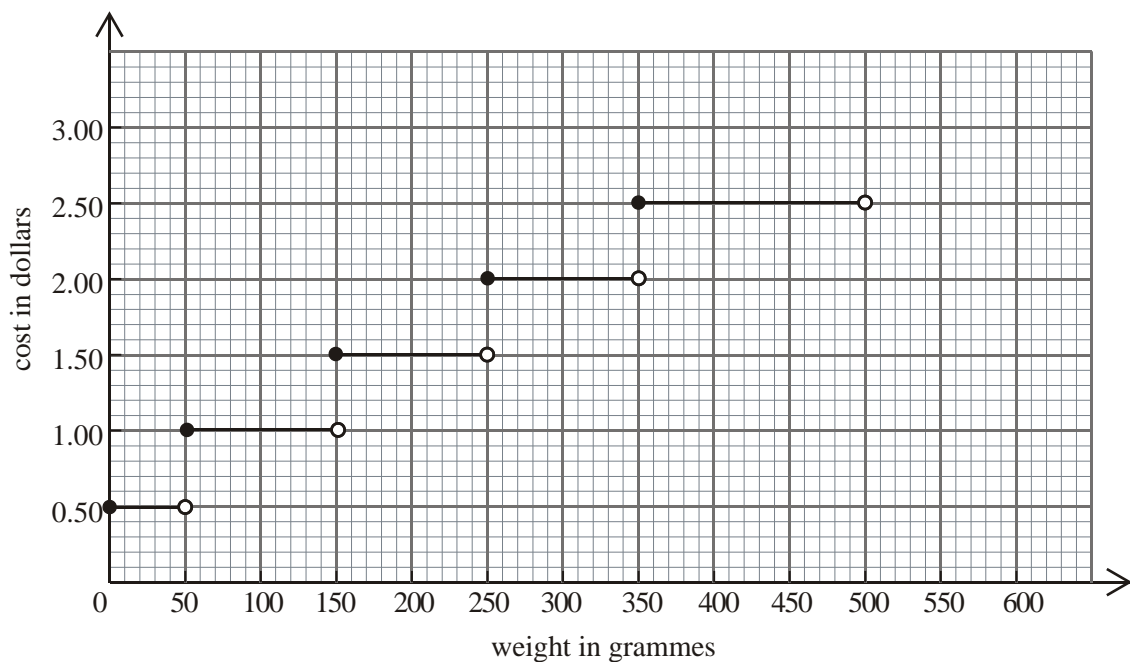
32. A student has drawn the two straight line graphs L_1 and L_2 and marked in the angle between them as a right angle, as shown below. The student has drawn one of the lines incorrectly.



Consider L_1 with equation $y = 2x + 2$ and L_2 with equation $y = -\frac{1}{4}x + 1$.

- Write down the gradients of L_1 and L_2 **using the given equations**.
- Which of the two lines has the student drawn incorrectly?
- How can you tell from the answer to part (a) that the angle between L_1 and L_2 should not be 90° ?
- Draw the correct version of the incorrectly drawn line on the diagram.

33. The graph shows the cost, in dollars, of posting letters with different weights.



- Write down the cost of posting a letter weighing 60 g.
- Write down the cost of posting a letter weighing 250 g.

Kathy pays 2.50 dollars to post a letter.

- Write down the range for the weight, w , of the letter.