Name:

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Question 10 **(50 marks)**

Brian had to drive from his house to Cork for a job interview.
He drove at an average speed of 80 km per hour for the first $\frac{1}{2}$ hour.

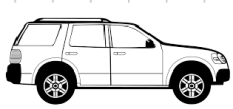
(a) **(i)** Find the distance, in km, driven by Brian in the first $\frac{1}{2}$ hour.

(ii) It then took him $1\frac{1}{2}$ hours to drive the remaining 117 km to Cork.
At what average speed, in km/h, did Brian drive the remaining 117 km?

(iii) Using the **total distance** travelled and the **total time** taken, what was Brian's average speed for the journey from his house to Cork?

Geraldine left home at 1:45 p.m. and drove to Longford. That took her 55 minutes.
She stopped for a 15-minute break in Longford and then drove on to Westport.

(a) At what time did she leave Longford?



(b) The distance from Longford to Westport is 135 km.
Her average speed for this part of the journey was 75 km/h.
How long did it take her to go from Longford to Westport?
Give your answer in hours and minutes.

(c) Later, Geraldine drove 135 km back to Longford.
She stopped for a break when she had travelled $\frac{3}{5}$ of the way.
How many kilometres had she travelled when she took her break?

(b) One sheet of paper is 0·0085 cm thick.

(i) Write 0·0085 in the form $a \times 10^n$, where $1 \leq a < 10$ and $n \in \mathbb{Z}$.

(ii) Carla wants to put 500 sheets of this paper into the paper tray of a printer.
The tray is 4 cm deep.
Is the tray deep enough to hold all 500 sheets of paper?
Give a reason for your answer.

Answer:

Reason:

(a) **(i)** Find the value of $(12 - 2) \times (3 + 1)$.

(ii) Find the value of $12 - 2 \times 3 + 1$.

(iii) Add brackets to make the statement in the box below correct.

$$12 - 2 \times 3 + 1 = 4$$

(b) A computer game costs €55. If Chris and Ruairí put their money together, they would need another €12 to buy the computer game.

(i) How much money do they have between them?

(ii) Ruairí has €7 more than Chris.
How much money does Chris have?

(b) Shane is driving from Cavan to Belfast. The journey is estimated to be 162 km.
He travels at an average speed of 72 km/h.

(i) How long will it take him to get there? Give your answer in hours and minutes.

(ii) Shane leaves Cavan at 2:55 p.m. What time should he expect to arrive in Belfast?

(iii) Shane's car uses 1 litre of petrol for every 15 km travelled. A litre of petrol costs 149·9 cent.
Find the cost of the petrol used on the journey.
Give your answer in euro and cent.

(a) Find the value of $x^2 - 2x + 5$ when $x = -3$.

(b) Simplify $3(5a - 1) - 4(a - 2)$.

(c) Solve the equation $m^2 + 2m - 5 = 0$. Give your answers correct to one decimal place.

(a) Solve the equation $3x-1=2x+5$.

(b) Write down the natural numbers, x, which satisfy the inequality $9-2x>1$.

(c) Ruairí is x years of age.

(i) Alex is 7 years older than Ruairí. Write down an expression in x for Alex's age.

Answer: _____

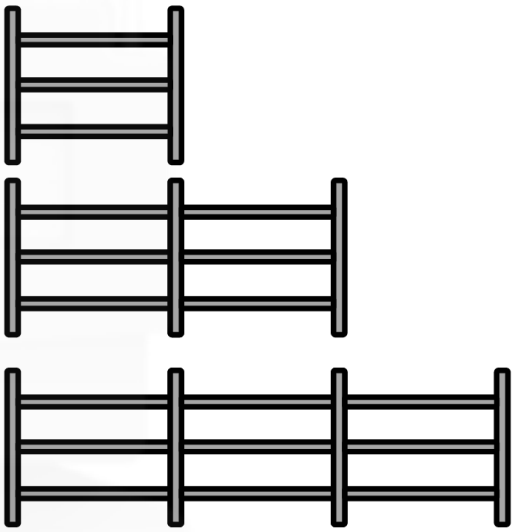
(ii) Aideen is three times as old as Ruairí. Write down an expression in x for Aideen's age.

Answer: _____

(iii) Aideen's age added to Alex's age is 47. How old is Ruairí?

Jim builds a fence by using three horizontal rails between each two vertical posts. Jim draws the diagrams below and begins to draw up a table to show the number of rails he will need depending on how many posts he uses.

Number of posts (x)	Number of rails (y)
2	3
3	6
4	
5	
6	



(a) Complete the table above.

Jim thinks that to find the number of rails needed he should subtract 1 from the number of posts used and multiply the answer by 3.

(b) Write an algebraic expression to represent Jim's rule, using x to represent the number of posts and y to represent the number of rails.

(c) Test your expression in **(b)** above using the numbers in one row of the table.

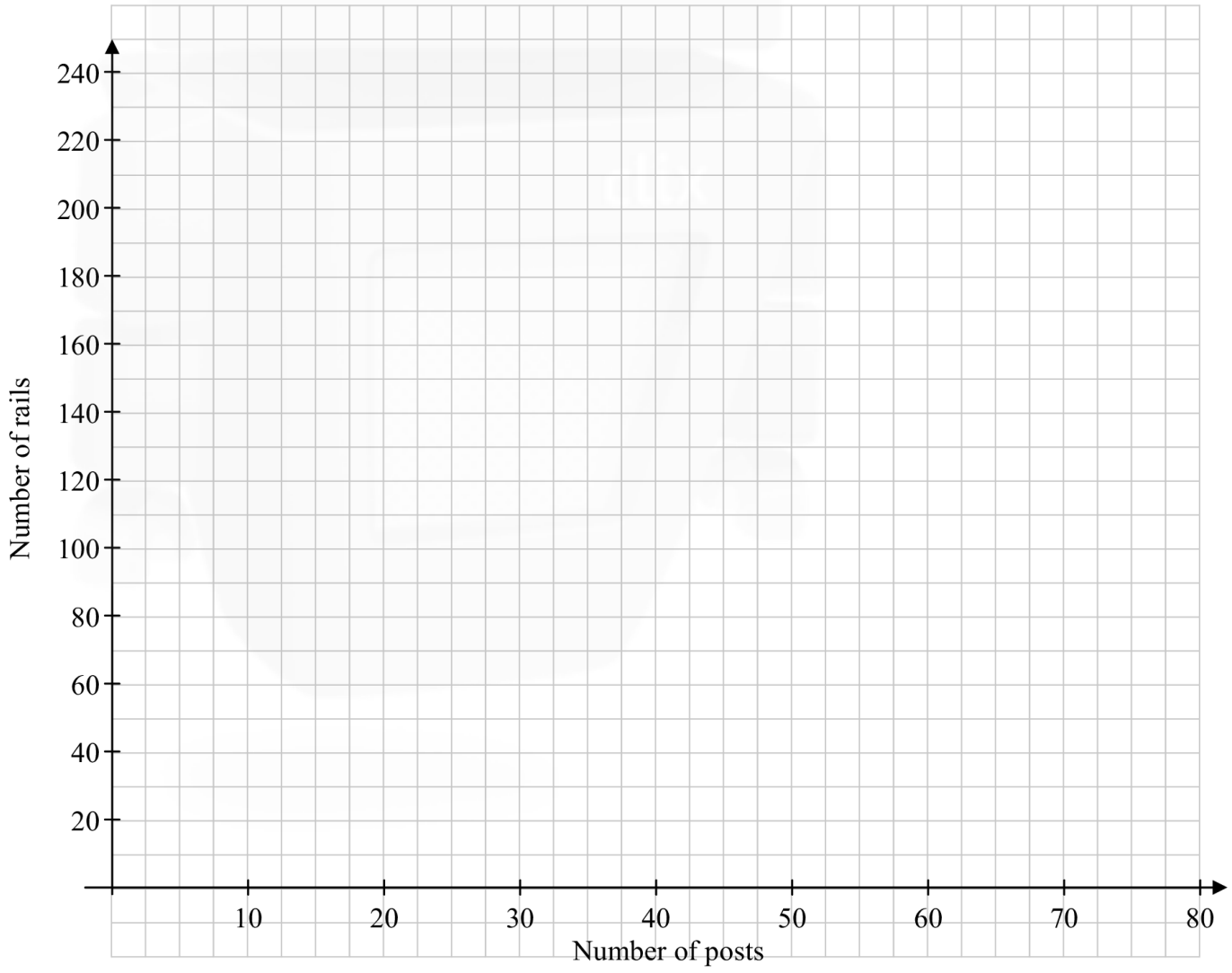
(d) Jim uses 60 posts for his fence. Find the number of rails he needs.

(e) Ann thinks that an alternative rule to find the number of rails is to multiply the number of posts by 3 and then subtract 3 from the answer. Write an algebraic expression to represent Ann's rule, using x to represent the number of posts and y to represent the number of rails.

(f) **(i)** Use Ann's rule to find how many rails are needed if 10 posts are used.

(ii) Use Ann's rule to find how many posts are used if 228 rails are needed.

(g) Draw the graph to represent Ann's rule for $0 \leq x \leq 75,\ x \in \mathbb{R}$.



(h) Ann needed 180 rails for another fences she built in the same way. Use your graph to find the number of posts she used in this fence.

(a) Find the value of $a^2 + b^2$ when $a = 20$ and $b = 21$.

(b) Given that $a^2 + b^2 = c^2$, find the value of c.

(c) Solve the equation $x^2 - 3x - 10 = 0$.

(a) Simplify $2(3x-6)-(4x-8)$.

(b) Solve the equation $7x-4=5x+16$.

(c) Write down the natural numbers which satisfy the inequality $3x-2\leq 13$.

(b) Solve the simultaneous equations;

$$x - y = 1$$
$$3x + y = 7.$$

Question 4 **(25 marks)**

(a) Evaluate $\dfrac{4h-2k}{3h+k}$ when $h=3$ and $k=1$.

(b) Solve the simultaneous equations

$$2x-3y=2$$
$$3x+5y=41$$

Question 5 **(25 marks)**

(a) Solve the equation $x^2 - 7x + 6 = 0$.

(b) Solve the equation $t^2 - 6t - 23 = 0$, giving your answers correct to two decimal places.

Question 8 **(75 marks)**

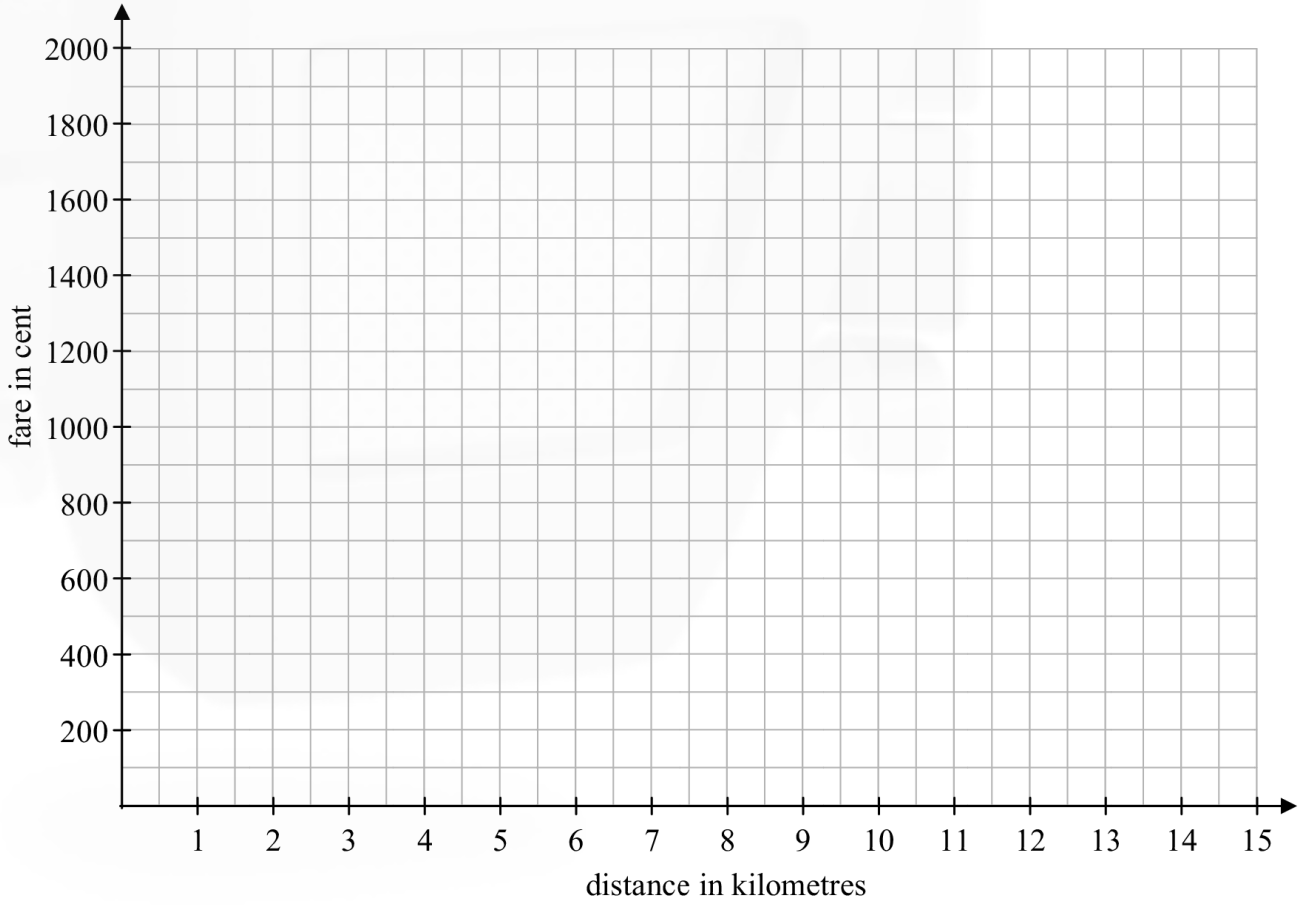
The fare for a taxi journey often depends only on the distance travelled. In such cases, for journeys up to 15 km, the fare is as follows:

- A fixed charge of €4·10 for the first kilometre, and
- A further charge of €1·03 per kilometre thereafter.

(a) Complete the table below showing the fare, **in cent**, for some journeys from 1 km to 15 km.

Distance (/km)	1	2	3	4	5	10	15
Fare (/cent)	410						

(b) Draw a graph to represent the taxi fare from 1 km up to 15 km.



(c) John needs to travel 3·7 km to get home. Use the graph to work out how much his taxi fare will be, in euro.

Answer: _____

(d) Mary has €10·00. Use the graph to work out how far she will be able to travel by taxi.

Answer: _____

(e) Write down a formula to represent the fare for any given distance in this range. State clearly the meaning of any letters used in your formula.

(f) Use your formula from part **(e)** to verify your answers to parts **(c)** and **(d)**.

(g) After the first fifteen kilometres, the rate goes up to €1·35 per kilometre. Give a reason that could justify this increase.

(h) Suppose that there is a suggestion to change the way that taxi fares are calculated. The suggestion is that the fare should be calculated using the formula:

$$f = 200 + 10d^2,$$

where f is the fare in cent and d is the distance travelled, in kilometres.

We want to see how fares worked out with this rule would compare to the old fares.
Using tables, graphs, or otherwise, work out which journeys, if any, would be cheaper with the new rule.