Pair of Linear Equations in Two Variables

Free Response Questions

Q: 1 Anjali solved the following equations for the value of x. **[1]**

(i) $5x - 2y = 4$
(ii) $3x - y = 8$

Her solution is given below.

Step 1: Multiplied equation (ii) by 2 on both sides.

$6x - 2y = 16$.............(iii)

Step 2: Solved equations (i) and (iii) to get $x = (-20)$.

$$
\begin{array}{r}
5x - 2y = 4 \\
-6x + 2y = 16 \\
\hline
-x \qquad = 20
\end{array}
$$

Anjali made a mistake while solving this. What was her mistake? Also, find the correct value of *x.*

Q: 2 State true or false for the below statement and justify your answer **[1]**

A pair of linear equations represented by intersecting lines can have two solutions.

Q: 3 A pair of linear equations is shown below. **[1]**

$(k - 1)x + y = k + 1$
$(k^2 - 1)x + (k + 1)y = 1 - k^2$

If $k > 1$, then how many solutions does this pair of equations have?

Q: 4 The equations of the lines l_1, l_2, and l_3 are given by $5x + 3y = 2p$, $35x + 21y = pq$, and $100x + 4qy = 240$, respectively, where p and q are real numbers. **[2]**
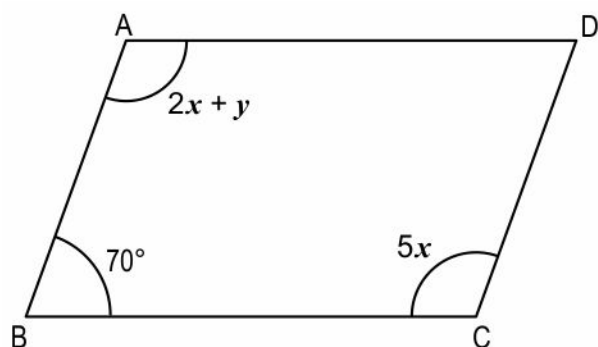
(i) For what values of p and q does the line l_3 coincide with l_1? Show your steps.
(ii) For the values of p and q found in question (i), are the lines l_1 and l_2 parallel? Justify your answer.

(Note: The figure is not to scale.)

Find the values of *x* and *y*. Show your steps.

Q: 6 Anisha lives 15 km away from her school. She walks to the bus stop and takes a bus to **[5]** school everyday.

If she goes to the nearest bus stop, she needs to walk for 3 km and cover the rest by bus. This takes her 1.5 hours. If she walks to a bus stop further away, she needs to walk for 5 km and cover the rest by bus. This takes her 2 hours.

Frame equations and solve them to find the average speed Anisha walks at, as well as the average speed of the bus. Show your steps.

Q.No	What to look for	Marks
1	Identifies that Anjali made a mistake in step 2 and 16 on the right hand side should be (-16).	0.5
	Solves correctly to find $(-x) = (-12)$ or $x = 12$ as follows: $\begin{aligned} 5x - 2y &= 4 \\ -6x + 2y &= -16 \\ \hline -x &= -12 \end{aligned}$	0.5
2	States that the statement is false.	0.5
	Gives the reason that a pair of linear equations represented by intersecting lines have only one point of intersection on the lines, which is a unique solution.	0.5
3	Finds the ratio of the coefficients and concludes that there is no solution. For example, finds the ratio of coefficients as $\frac{1}{k+1} = \frac{1}{k+1} \neq \frac{1}{1-k}$, for $k > 1$.	1
4	i) Uses the condition for coincident lines for l_1 and l_3 as shown below: $\frac{a_1}{a_3} = \frac{b_1}{b_3} = \frac{c_1}{c_3}$ Finds $p = 6$ and $q = 15$.	1
	ii) Checks if $l_1 \parallel l_2$ using the following relation: $\frac{a_1}{a_2} = \frac{b_1}{b_2} \neq \frac{c_1}{c_2}$ Finds that $\frac{5}{35} = \frac{3}{21} \neq \frac{12}{90}$. Hence concludes that $l_1 \parallel l_2$.	1

Q.No	What to look for	Marks
5	**Uses the properties of parallelograms to make the following equations:** **(i) 2 x + y = 5 x** **(ii) 5 x + 70° = 180°**	**1**
	Solves equation (ii) to get x = 22°.	**0.5**
	Substitutes x = 22° in equation (i) to get y = 66°.	**0.5**
6	**Takes average speed while walking and average speed of bus as x km/h and y km/h respectively.**	**0.5**
	Uses speed = $\frac{distance}{time}$ to frame equations $\frac{3}{x} + \frac{12}{y} = \frac{3}{2}$ and $\frac{5}{x} + \frac{10}{y} = 2$ respectively.	**1**
	Substitutes $\frac{1}{x} = m$ and $\frac{1}{y} = n$, where m and n are also variables.	**0.5**
	Solves equations $3m + 12n = 1.5$ and $5m + 10n = 2$ to find the values of m and n as $\frac{3}{10}$ and $\frac{1}{20}$ respectively.	**2**
	Finds the average speed of Anisha as $x = \frac{10}{3}$ km/h and average speed of bus as y = 20 km/h.	**1**