

CLASS 10

MATHS

EXTRA QUESTIONS

Extra Questions: Class 10 Maths Chapter 3 Pair of Linear Equations in Two Variables

These go beyond Exercise 3.1 into genuine HOTS (Higher Order Thinking Skills) territory -- boat/stream speed problems, age problems solved via two equations, and a parameter-based consistency question. See the standard-level Exercise 3.1 Solutions first if you haven't already.

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Extra Questions (HOTS Level): Pair of Linear Equations in Two Variables (Class 10 Maths Chapter 3)

Q1. A boat goes 30 km upstream and 44 km downstream in 10 hours. In 13 hours, it can go 40 km upstream and 55 km downstream. Find the speed of the boat in still water and the speed of the stream.

Let boat speed = x km/h, stream speed = y km/h. Upstream speed = $(x-y)$, downstream speed = $(x+y)$.

$$30/(x-y) + 44/(x+y) = 10 \text{ and } 40/(x-y) + 55/(x+y) = 13.$$

Let $u = 1/(x-y)$, $v = 1/(x+y)$: $30u + 44v = 10$ and $40u + 55v = 13$. Multiplying the first by 4 and second by 3: $120u + 176v = 40$ and $120u + 165v = 39$. Subtracting: $11v = 1$, so $v = 1/11$. Substituting back: $30u + 4 = 10$, so $u = 1/5$.

So $x-y = 5$ and $x+y = 11$. Adding: $2x = 16$, $x = 8$; then $y = 3$.

Boat speed = 8 km/h, Stream speed = 3 km/h.

Q2. Five years hence, a father's age will be three times his son's age. Five years ago, the father was seven times as old as his son. Find their present ages.

Let father's present age = x , son's present age = y .

$$(x+5) = 3(y+5) \rightarrow x = 3y + 10$$

$$(x-5) = 7(y-5) \rightarrow x = 7y - 30$$

Equating: $3y + 10 = 7y - 30 \rightarrow 40 = 4y \rightarrow y = 10$, so $x = 40$.

Check: 5 years hence, $45 = 3 \times 15$ ✓. 5 years ago, $35 = 7 \times 5$ ✓.

Father = 40 years, Son = 10 years.

Q3. For what value of k will the pair of equations $kx + 3y = k - 3$ and $12x + ky = k$ have infinitely many solutions?

Writing both as $ax + by - c = 0$: $kx + 3y - (k-3) = 0$ and $12x + ky - k = 0$.

For infinitely many solutions: $k/12 = 3/k = (k-3)/k$.

From $k/12 = 3/k$: $k^2 = 36$, so $k = 6$ or $k = -6$.

Testing $k = 6$: $6/12 = 1/2$ and $(6-3)/6 = 1/2$ — matches.

Testing $k = -6$: $-6/12 = -1/2$ but $(-6-3)/-6 = 3/2$ — does not match.

$k = 6$.

Q4. Assertion (A): The pair of equations $x + 2y - 4 = 0$ and $2x + 4y - 12 = 0$ has no solution.

Reason (R): Two lines are parallel if $a_1/a_2 = b_1/b_2 \neq c_1/c_2$. Which is correct?

$a_1/a_2 = 1/2$, $b_1/b_2 = 2/4 = 1/2$, c_1/c_2 (writing as $x+2y-4=0$ and $2x+4y-12=0$) = $4/12 = 1/3$. Since $a_1/a_2 = b_1/b_2 \neq c_1/c_2$, the lines are parallel, so the system has no solution — Assertion is true.

The Reason correctly states the parallel-lines condition and correctly explains the Assertion.

Both A and R are true, and R is the correct explanation of A.

Q5. The sum of a two-digit number and the number obtained by reversing its digits is 66. If the digits differ by 2, find the number(s). How many such numbers are there?

Let the ten's digit = x , unit's digit = y . Number = $10x+y$, reversed number = $10y+x$.

$$(10x+y) + (10y+x) = 66 \rightarrow 11x + 11y = 66 \rightarrow x + y = 6.$$

Digits differ by 2, so $x-y = 2$ or $y-x = 2$.

Case 1: $x+y=6$, $x-y=2 \rightarrow x=4$, $y=2 \rightarrow$ number = 42.

Case 2: $x+y=6$, $y-x=2 \rightarrow x=2$, $y=4 \rightarrow$ number = 24.

Two such numbers exist: 42 and 24.

Q6. A fraction becomes $\frac{1}{3}$ when 1 is subtracted from the numerator, and becomes $\frac{1}{4}$ when 8 is added to the denominator. Find the fraction.

Let the fraction = $\frac{x}{y}$.

$$\frac{(x-1)}{y} = \frac{1}{3} \rightarrow 3(x-1) = y \rightarrow y = 3x - 3$$

$$\frac{x}{(y+8)} = \frac{1}{4} \rightarrow 4x = y+8 \rightarrow y = 4x - 8$$

$$\text{Equating: } 3x-3 = 4x-8 \rightarrow x = 5, \text{ then } y = 3(5)-3 = 12.$$

$$\text{Check: } \frac{(5-1)}{12} = \frac{4}{12} = \frac{1}{3} \text{ \✓}. \frac{5}{(12+8)} = \frac{5}{20} = \frac{1}{4} \text{ \✓}.$$

Fraction = $\frac{5}{12}$.

How These Differ From Exercise 3.1

Exercise 3.1 focuses on forming and graphing simple linear pairs and checking consistency using the ratio test. These HOTS questions require you to first recognise which variables to define (often a reciprocal substitution for speed/time problems, as in Q1), and combine that with the same elimination technique — exactly the kind of two-step reasoning the CBSE board favours for 4-5 mark questions.