Unit 12 · Equation and Graph

HARDER PRACTICE QUESTIONS · ANSWER KEY

Full marks 29

Give the marks for the points in the marking scheme; an answer in other words that says the same is right.

1 Three lines

ANSWER A · 4

i. For $y = 2x - 1$: $(0, -1)$, $(1, 1)$, $(2, 3)$. For $x + y = 5$: $(0, 5)$, $(2, 3)$, $(5, 0)$.

The lines cross at **(2, 3)**, so $x = 2$ and $y = 3$.

ii. For $x - y = -1$: $(0, 1)$, $(2, 3)$, $(4, 5)$. The line goes through $(2, 3)$. Working it out: $2 - 3 = -1$. ✓

Yes: all three lines meet at one point.

MARKING SCHEME

- ✓ Tables of points for the two lines.
- ✓ Two straight lines drawn correctly.
- ✓ $(2, 3)$.
- ✓ Yes: the third line drawn, and $2 - 3 = -1$.

2 When the lines don't help

ANSWER HA · 3

i. **There is no solution.** The lines are parallel, so they never cross. And $x + y$ can't be 3 and 6 at the same time.

ii. The second equation is the first multiplied by 2, so both are **the same line**. Every point on it fits both, so there are **many solutions**, such as $(0, 3)$, $(1, 2)$ and $(3, 0)$.

MARKING SCHEME

- ✓ The three lines drawn; two of them lie on top of each other.
- ✓ i. No solution: parallel lines never cross.
- ✓ ii. The same line, so many solutions.

3 In a real setting

ANSWER A · 4

i. $y = \mathbf{30}x + \mathbf{50}$ and $y = \mathbf{20}x + \mathbf{100}$.

ii. A: $(0, 50)$, $(5, 200)$, $(10, 350)$. B: $(0, 100)$, $(5, 200)$, $(10, 300)$. They cross at **(5, 200)**.

iii. For a trip of 5 km, both taxis charge Rs 200.

iv. 3 km: A costs Rs 140 and B Rs 160, so **A is cheaper**. 8 km: A costs Rs 290 and B Rs 260, so **B is cheaper**.

MARKING SCHEME

- ✓ Both equations.
- ✓ Both lines, crossing at $(5, 200)$.
- ✓ Both taxis cost Rs 200 for 5 km.
- ✓ A for 3 km, and B for 8 km.

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4 A number and its digits

ANSWER HA · 4

i. **10**$x + y$ and **10**$y + x$.
ii. $x + y = 9$. And $(10y + x) - (10x + y) = 27$, so $9y - 9x = 27$ and $y - x = 3$.
iii. The lines cross at (3, 6), so the number is **36**. (Check: $3 + 6 = 9$ and $63 - 36 = 27$. ✓)

MARKING SCHEME

✓ $10x + y$ and $10y + x$.
✓ $x + y = 9$ and $y - x = 3$.
✓ The lines cross at (3, 6).
✓ 36.

5 One root gives the other

ANSWER HA · 3

Put $x = 3$: $9 + 3k - 12 = 0$, so $k =$ **1**.
$x^2 + x - 12 = 0$, so $(x + 4)(x - 3) = 0$, and the other root is **−4**.

MARKING SCHEME

✓ 3 put in the equation.
✓ $k = 1$.
✓ The other root is −4.

6 Spot the error

ANSWER U · 3

Test: $x = 16$ gives $14 \times 19 = 266$, not 14. Her method works only when the product is **0**: a product of 14 doesn't need a factor of 14.
$x^2 + x - 6 = 14$, so $x^2 + x - 20 = 0$, $(x + 5)(x - 4) = 0$, and $x =$ **4 or −5**.

MARKING SCHEME

✓ The mistake: one side must be 0 before the factors are set equal to anything.
✓ $x^2 + x - 20 = 0$.
✓ $x = 4$ or −5.

7 A frame

ANSWER A · 4

i. **12 + 2**x and **8 + 2**x.
ii. $(12 + 2x)(8 + 2x) = 2 \times 96 = 192$. So $96 + 40x + 4x^2 = 192$, and dividing by 4, $x^2 + 10x - 24 = 0$.
iii. $(x + 12)(x - 2) = 0$, so $x = 2$ or −12. A width can't be negative, so the frame is **2 cm** wide. (Check: $16 \times 12 = 192$. ✓)

MARKING SCHEME

✓ $12 + 2x$ and $8 + 2x$.
✓ $x^2 + 10x - 24 = 0$.
✓ $x = 2$ or −12.
✓ 2 cm, since a width can't be negative.

8 Think

ANSWER HA · 2

Sneha. Dividing by x isn't allowed if x may be 0.
Get 0 on one side: $x^2 - 5x = 0$, so $x(x - 5) = 0$, and $x =$ **0 or 5**. ($0^2 = 5 \times 0$. ✓)

MARKING SCHEME

✓ Sneha is right: he divided by x, which may be 0.
✓ $x(x - 5) = 0$, so $x = 0$ or 5.

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9 Make your own

HA · 2

ANSWER

For example, $x + y = 2$ and $x - y = 4$. Both fit $(3, -1)$.

Quadratic: $(x - 3)(x + 1) = 0$, so $x^2 - 2x - 3 = 0$.

MARKING SCHEME

- ✓ Two equations that $(3, -1)$ fits.
- ✓ $x^2 - 2x - 3 = 0$, or a multiple of it.

Marks by level	Knowledge	Understanding	Application	Higher ability	Total
Marks	0	3	12	14	**29**

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