Unit 12 · Equation, Inequality and Graph

HARDER PRACTICE QUESTIONS · ANSWER KEY

Full marks 35

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

1 Spot the errors

ANSWER U · 4

i. $x > -4$. Dividing by -5 turns the sign round. Check: $x = 0$ gives $0 < 20$ ✓, and 0 is not < -4.
ii. $x < -2$. $-x > 2$; multiplying by -1 turns the sign. Check: $x = -3$ gives $3 + 3 = 6 > 5$ ✓.
iii. $y = -7$. $2 \times (-3) - 1 = -6 - 1 = -7$. He added the 1 instead of taking it away: $-6 + 1 = -5$.
iv. The circle must be **filled**: -1 itself is ≤ -1, so it is included.

MARKING SCHEME

✓ i. $x > -4$.
✓ ii. $x < -2$.
✓ iii. $y = -7$.
✓ iv. A filled circle at -1.

2 Coins in a purse

ANSWER A · 4

i. Let x be the number of Rs 5 coins and y the number of Rs 10 coins: $5x + 10y = 50$.
ii. **(0, 5), (2, 4), (4, 3), (6, 2), (8, 1), (10, 0)**: six pairs.
iii. Only (4, 3) has 7 coins: **4 coins of Rs 5 and 3 of Rs 10**. Check: $20 + 30 = 50$ ✓.
iv. An odd number of Rs 5 coins makes an amount ending in 5 (5, 15, 25…), and Rs 10 coins always make an amount ending in 0, so the total would end in 5, never Rs 50.

MARKING SCHEME

✓ i. $5x + 10y = 50$, letters named.
✓ ii. The six pairs.
✓ iii. 4 and 3.
✓ iv. The total would end in 5.

3 The goods lift

ANSWER A · 4

i. $70 + 40x \leq 600$.
ii. $40x \leq 530$, so $x \leq 13.25$. The greatest number is **13 boxes**.
iii. A filled circle at 13.25 with an arrow to the left, or dots at 0, 1, 2, …, 13. Part of a box can't be loaded, so only the whole numbers from 0 to 13 count.
iv. $70 + 130 + 40x \leq 600$: $40x \leq 400$, $x \leq 10$: **10 boxes**.

MARKING SCHEME

✓ i. $70 + 40x \leq 600$.
✓ ii. 13 boxes.
✓ iii. The number line, whole numbers only.
✓ iv. 10 boxes.

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4 Both at once

ANSWER A · 4

i. $2x > 4$, $x > \mathbf{2}$; $3x \leq 15$, $x \leq \mathbf{5}$.

ii. $x > 2$: a hollow circle at 2, the arrow to the right; $x \leq 5$: a filled circle at 5, the arrow to the left. The numbers under both arrows: **3, 4 and 5**.

iii. Dividing by -2 turns the sign: $x > \mathbf{-4}$; and $x < \mathbf{1}$.

iv. **−3, −2, −1 and 0**.

MARKING SCHEME

✓ i. $x > 2$ and $x \leq 5$.

✓ ii. 3, 4, 5, with the number line.

✓ iii. $x > -4$ and $x < 1$.

✓ iv. $-3, -2, -1, 0$.

5 Find the rule

ANSWER A · 4

i. y goes up 2 for each 1 of x, and starts at 3: $y = \mathbf{2x + 3}$.

ii. $2 \times 10 + 3 = \mathbf{23}$.

iii. $2 \times 5 + 3 = 13$ ✓ and $2 \times (-2) + 3 = -1$ ✓, but $2 \times 4 + 3 = 11$, not 12. **(5, 13) and (−2, −1)**.

iv. On the x-axis $y = 0$: $2x + 3 = 0$, $x = -1.5$. At **(−1.5, 0)**.

MARKING SCHEME

✓ i. $y = 2x + 3$.

✓ ii. 23.

✓ iii. (5, 13) and (−2, −1).

✓ iv. (−1.5, 0).

6 The taxi fare

ANSWER A · 4

i. $y = \mathbf{40}x + \mathbf{100}$. The fares: Rs **100, 180, 260 and 340**.

ii. A straight line through (0, 100), (2, 180), (4, 260) and (6, 340). It starts at Rs 100, not at 0: the fare before the taxi moves.

iii. **Rs 220** for 3 km ($40 \times 3 + 100 = 220$), and **5 km** for Rs 300 ($40 \times 5 + 100 = 300$).

iv. $60x < 40x + 100$, so $20x < 100$ and $x < \mathbf{5}$: the second taxi is cheaper for trips **shorter than 5 km**. At 5 km both cost Rs 300; for longer trips the first taxi is cheaper.

MARKING SCHEME

✓ i. $y = 40x + 100$, with the table.

✓ ii. The graph, a straight line from (0, 100).

✓ iii. Rs 220 and 5 km.

✓ iv. $60x < 40x + 100$: shorter than 5 km.

7 The fenced plot

ANSWER HA · 4

i. $2x + 2y = 40$, so $x + y = \mathbf{20}$.

ii. Breadths 5, 7, 9, 10; areas 75, 91, 99, **100**: the **10 m by 10 m** square has the biggest area.

iii. $x - y \geq \mathbf{3}$ (or $x \geq y + 3$).

iv. With $y = 20 - x$: $x - (20 - x) \geq 3$, $2x \geq 23$, $x \geq 11.5$, so x is 12 or more. The nearer to a square, the bigger the area: **12 m by 8 m, 96 m²**.

MARKING SCHEME

✓ i. $x + y = 20$.

✓ ii. Areas 75, 91, 99, 100: the square.

✓ iii. $x - y \geq 3$.

✓ iv. 12 m by 8 m, 96 m².

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8 Think: always, sometimes or never?

ANSWER HA · 4

i. **Always**: adding the same number to both sides keeps the sign.
ii. **Always**: multiplying both by a positive number keeps the sign.
iii. **Never**: multiplying by -1 turns the sign, so $-a < -b$ ($-3 < -2$; $-1 < 4$; $1 < 4$).
iv. **Sometimes**: $9 > 4$ is true, but with 1 and -4 it says $1 > 16$, which is false, and with -1 and -4 too. Squaring is not one of the rules: a negative number far from 0 has a big square.

MARKING SCHEME

- ✓ i. Always.
- ✓ ii. Always.
- ✓ iii. Never: the sign turns.
- ✓ iv. Sometimes, with a test that fails.

9 Make your own

ANSWER A · 3

For example:

i. $x + y = 5$; another answer is $x = 1$, $y = 4$.
ii. $-3x > 6$: dividing by -3 turns the sign, $x < -2$.
iii. "Stickers cost Rs 3 and toffees Rs 2; Ujwal spent Rs 20 on them." (2, 7) and (4, 4) both fit: $6 + 14 = 20$, $12 + 8 = 20$.

Any correct answers are right.

MARKING SCHEME

- ✓ i. An equation with (2, 3) as an answer, and one more.
- ✓ ii. An inequality needing division by a negative, giving $x < -2$.
- ✓ iii. A story and two answers.

Marks by level	Knowledge	Understanding	Application	Higher ability	Total
Marks	0	4	23	8	**35**

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