Algebra: Expanding, Factorising, & Inequalities

Practice Worksheet (Problem Solving)

I Do

(a) Expand and simplify $3(2x - 5) - 2(x + 4)$.

..... (2)

(b) Factorise fully $18a^2b - 12ab^2$.

..... (2)

(c) Solve the inequality $5y - 3 > 2y + 12$.

..... (2)

(Total for Question is 6 marks)

Video walkthrough

We Do

(a) Expand and simplify $4(3x - 2) - 3(x + 5)$.

. . . . . (2)

(b) Factorise fully $20x^2y - 15xy^2$.

. . . . . (2)

(c) Solve the inequality $7y - 4 > 3y + 16$.

. . . . . (2)

(Total for Question is 6 marks)

You Do 1

(a) Expand and simplify $5(2x + 1) - 2(3x - 4)$.

. . . . . (2)

(b) Factorise fully $24p^2q^2 + 16pq^3$.

. . . . . (2)

(c) Solve the inequality $6y + 2 < 2y + 22$.

. . . . . (2)

(Total for Question is 6 marks)

You Do 2

(a) Expand and simplify $x(x+4) - x(x-3)$.

..... (2)

(b) Factorise fully $14m^3n - 21mn^3$.

..... (2)

(c) Solve the inequality $8 - 3y \leq 2y + 33$.

..... (2)

(Total for Question is 6 marks)

You Do 3

(a) Expand and simplify $2x(3x-1) - 3x(x+2)$.

..... (2)

(b) Factorise fully $36a^3b^2 - 27a^2b^3 + 9a^2b^2$.

..... (2)

(c) Solve the inequality $2(3y-1) > 4(y+2)$.

..... (2)

(Total for Question is 6 marks)

Challenge 1

(a) Expand and simplify $(2x - 3)(x + 4) - (x - 2)^2$.

. . . . . (3)

(b) Factorise fully $18x^3 - 50xy^2$.

. . . . . (3)

(Total for Question is 6 marks)

Challenge 2

(a) Solve the inequality $-5 < 3x + 4 \leq 19$.

. . . . . (3)

(b) Write down all the possible integer values of x that satisfy the inequality.

. . . . . (2)

(Total for Question is 5 marks)

Extreme Challenge

Solve the inequality:

$$\frac{2x - 1}{3} - \frac{x + 4}{2} > 1$$

Show clear algebraic working.

(Total for Question is 4 marks)

Answers & Worked Solutions

I Do

(a) Multiply out both brackets carefully, watching the negative sign on the second bracket:
$3(2x-5) = 6x - 15$
$-2(x+4) = -2x - 8$
Collect like terms: $6x - 2x - 15 - 8 = \mathbf{4x - 23}$
(b) Find the Highest Common Factor (HCF) of 18 and 12, which is 6.
The highest power of a in both terms is a. The highest power of b is b.
HCF $= 6ab$. Factorising this out gives: $\mathbf{6ab(3a - 2b)}$
(c) Subtract $2y$ from both sides: $3y - 3 > 12$
Add 3 to both sides: $3y > 15$
Divide by 3: $\mathbf{y > 5}$

We Do

(a) $4(3x-2) - 3(x+5) = 12x - 8 - 3x - 15$
Simplify: $\mathbf{9x - 23}$
(b) HCF of 20 and 15 is 5. Letters: xy.
Factorise out $5xy$: $\mathbf{5xy(4x - 3y)}$
(c) $7y - 4 > 3y + 16 \implies 4y - 4 > 16 \implies 4y > 20 \implies \mathbf{y > 5}$

You Do 1

(a) $5(2x+1) - 2(3x-4) = 10x + 5 - 6x + 8$ (Note: $-2 \times -4 = +8$)
Simplify: $\mathbf{4x + 13}$
(b) HCF of 24 and 16 is 8. Letters: pq^2.
Factorise out $8pq^2$: $\mathbf{8pq^2(3p + 2q)}$
(c) $6y + 2 < 2y + 22 \implies 4y + 2 < 22 \implies 4y < 20 \implies \mathbf{y < 5}$

You Do 2

(a) $x(x+4) - x(x-3) = x^2 + 4x - x^2 + 3x$ (Note: $-x \times -3 = +3x$)
Simplify: $x^2 - x^2 = 0$. Result is $\mathbf{7x}$
(b) HCF of 14 and 21 is 7. Letters: mn.
Factorise out $7mn$: $\mathbf{7mn(2m^2 - 3n^2)}$
(c) $8 - 3y \leq 2y + 33$.
Add $3y$ to both sides: $8 \leq 5y + 33$
Subtract 33 from both sides: $-25 \leq 5y$
Divide by 5: $-5 \leq y$, which can be written as $\mathbf{y \geq -5}$

You Do 3

(a) $2x(3x-1) - 3x(x+2) = 6x^2 - 2x - 3x^2 - 6x$
Simplify: $\mathbf{3x^2 - 8x}$
(b) HCF of $36, 27$, and 9 is 9. Letters: a^2b^2.
Factorise out $9a^2b^2$: $\mathbf{9a^2b^2(4a - 3b + 1)}$ (Do not forget the $+1$ at the end)
(c) Expand both sides first: $6y - 2 > 4y + 8$
Subtract $4y$: $2y - 2 > 8$
Add 2: $2y > 10 \implies \mathbf{y > 5}$

Challenge 1

(a) Expand first pair of brackets: $(2x-3)(x+4) = 2x^2 + 8x - 3x - 12 = 2x^2 + 5x - 12$

Expand second bracket: $(x-2)^2 = (x-2)(x-2) = x^2 - 4x + 4$

Subtract the second from the first: $(2x^2 + 5x - 12) - (x^2 - 4x + 4)$

$= 2x^2 + 5x - 12 - x^2 + 4x - 4 = \mathbf{x^2 + 9x - 16}$

(b) First, take out the highest common factor, which is $2x$:

$18x^3 - 50xy^2 = 2x(9x^2 - 25y^2)$

The expression inside the bracket is a Difference of Two Squares:

$(3x)^2 - (5y)^2 = (3x - 5y)(3x + 5y)$

Fully factorised: $\mathbf{2x(3x - 5y)(3x + 5y)}$

Challenge 2

(a) Treat the double inequality by performing the same operations on all three parts.

$-5 < 3x + 4 \leq 19$

Subtract 4 from all parts:

$-9 < 3x \leq 15$

Divide all parts by 3:

$\mathbf{-3 < x \leq 5}$

(b) The integer values must be strictly greater than -3 and less than or equal to 5.

Integers: $\mathbf{-2, -1, 0, 1, 2, 3, 4, 5}$

Extreme Challenge

$\frac{2x-1}{3} - \frac{x+4}{2} > 1$

Multiply the entire inequality by the lowest common multiple of the denominators, which is 6, to clear the fractions:

$6 \times \left(\frac{2x-1}{3}\right) - 6 \times \left(\frac{x+4}{2}\right) > 6 \times 1$

Simplify the multipliers:

$2(2x - 1) - 3(x + 4) > 6$

Expand the brackets carefully:

$4x - 2 - 3x - 12 > 6$

Simplify the left hand side:

$x - 14 > 6$

Add 14 to both sides:

$\mathbf{x > 20}$