Year 10A algebra worksheet

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Name: _____ Date: _____

Question 1

Simplify $3x/8 + x/8$.

Answer: _____

Question 2

Expand:

(a) $3(x + 4)$

(b) $x(x - 5)$

(c) $-2a(a + 3)$

Answer: _____

Question 3

Factorise $6x^3 + 9x^2 - 3x$.

Answer: _____

Question 4

Factorise $x^2 + 7x + 12$.

Answer: _____

Question 5

Factorise $6x^2 + 11x + 3$.

Answer: _____

Question 6

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

Answer: _____

Question 7

Mia and Theo are painting a fence together. Mia can paint $1/x$ of the fence per hour and Theo can paint $1/3x$ of the fence per hour, where x is the number of hours it would take Mia to paint the fence alone. Write a simplified expression for the fraction of the fence they complete together in one hour.

Answer: _____

Question 8

Expand and simplify:

(a) $(x + 3)(x + 5)$

(b) $(x - 4)(x + 2)$

Answer: _____

Question 9

Factorise $-12a^3b^2 + 8a^2b^3 - 4a^2b$.

Answer: _____

Question 10

Factorise each expression.

(a) $x^2 - 49$

(b) $x^2 - 10x + 25$

Answer: _____

Year 10A algebra: answers and worked solutions

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Question 1

Key idea: When denominators are the same, add the numerators and keep the denominator.

1. Add the numerators: 3x + x = 4x 2. Write over the common denominator: 4x/8 3. Simplify by dividing numerator and denominator by 4: x/2

Answer: x/2

Question 2

Answer: (a) 3x + 12 (b) x^2 - 5x (c) -2a^2 - 6a

Question 3

Key idea: Find the HCF of all terms, write it outside the brackets, then divide each term by the HCF to find what goes inside.

1. Find the HCF of the coefficients 6, 9 and 3: the HCF is 3. 2. Find the HCF of x^3, x^2 and x: the lowest power is x^1 = x. 3. So the overall HCF is 3x. 4. Divide each term by 3x: ($6x^3$)/(3x) = 2x^2, ($9x^2$)/(3x) = 3x, -3x/3x = -1 5. Write the factorised form: $6x^3$ + $9x^2$ - 3x = 3x(2x^2 + 3x - 1)

Check: 3x(2x^2 + 3x - 1) = $6x^3$ + $9x^2$ - 3x ✓

Answer: 3x(2x^2 + 3x - 1)

Question 4

Key idea: Find two integers that multiply to 12 and add to 7.

1. List factor pairs of 12: (1, 12), (2, 6), (3, 4). 2. Check which pair adds to 7: 3 + 4 = 7. ✓ 3. Write the factorised form: (x + 3)(x + 4). 4. **Verify by expanding:** (x + 3)(x + 4) = x^2 + 4x + 3x + 12 = x^2 + 7x + 12. ✓

Answer: (x + 3)(x + 4)

Question 5

Key idea: For a non-monic quadratic ax^2 + bx + c, find two numbers that multiply to ac and add to b, then split the middle term and factorise by grouping.

1. Identify a = 6, b = 11, c = 3, so ac = 6 × 3 = 18. 2. Find two numbers that multiply to 18 and add to 11: these are 2 and 9. 3. Split the middle term: $6x^2$ + 2x + 9x + 3. 4. Factorise by grouping in pairs: 2x(3x + 1) + 3(3x + 1). 5. Factor out the common bracket: (3x + 1)(2x + 3).

Answer: $(3x + 1)(2x + 3)$

Question 6

Key idea: Expand each product fully, then subtract, taking care to change every sign of the second expansion.

1. $(x^2 - 3x + 2)(2x + 5) = 2x^3 + 5x^2 - 6x^2 - 15x + 4x + 10 = 2x^3 - x^2 - 11x + 10$ 2. $(x - 1)^3 = x^3 - 3x^2 + 3x - 1$ 3. Subtract: $2x^3 - x^2 - 11x + 10 - x^3 + 3x^2 - 3x + 1$ 4. Collect like terms: $x^3 + 2x^2 - 14x + 11$

Answer: $x^3 + 2x^2 - 14x + 11$

Question 7

Key idea: Add the two rates. Since the denominators are different, find a common denominator first.

1. Identify the two rates: $1/x$ and $1/3x$ 2. The lowest common denominator of x and 3x is 3x. 3. Rewrite the first fraction: $1/x = 3/3x$ 4. Add the fractions: $3/3x + 1/3x = 4/3x$

Answer: $4/3x$ of the fence per hour

Question 8

Answer: (a) $x^2 + 8x + 15$ (b) $x^2 - 2x - 8$

Question 9

Key idea: When the leading term is negative, take out a negative common factor so the first term inside the brackets is positive. Find the full HCF including all variables.

1. Find the HCF of the coefficients 12, 8 and 4: the HCF is 4. 2. Include the negative sign: take out -4. 3. Find the HCF of the variable parts: lowest power of a is a^2; lowest power of b is $b^1 = b$. So the variable HCF is a^2b. 4. Overall factor to take out: $-4a^2b$. 5. Divide e ach term by $-4a^2b$: $(-12a^3b^2)/(-4a^2b) = 3ab$, $(8a^2b^3)/(-4a^2b) = -2b^2$, $(-4a^2b)/(-4a^2b) = 1$ 6. W rite the factorised form: $-12a^3b^2 + 8a^2b^3 - 4a^2b = -4a^2b(3ab - 2b^2 + 1)$

Check: $-4a^2b(3ab - 2b^2 + 1) = -12a^3b^2 + 8a^2b^3 - 4a^2b$ ✓

Answer: $-4a^2b(3ab - 2b^2 + 1)$

Question 10

Key idea: Recognise special quadratic forms: $a^2 - b^2 = (a-b)(a+b)$ and $a^2 - 2ab + b^2 = (a - b)^2$.

Part (a) 1. Write $x^2 - 49$ as $x^2 - 7^2$. 2. Apply the difference of two squares rule: $(x - 7)(x + 7)$.

Part (b) 1. Check: $\sqrt{(25)} = 5$ and the middle term $-10x = -2 \times x \times 5$. ✓ 2. This is a perfect-square trinomial: $(x - 5)^2$. 3. **Verify:** $(x-5)^2 = x^2 - 10x + 25$. ✓

Answer: (a) $(x - 7)(x + 7)$ (b) $(x - 5)^2$