Year 11 Math Homework

Student Name: _____	**Grade**: _____
Date: _____	**Score**: _____

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3 Year 11 Topic 3 — Basic Algebra Part 1

3.1 Directed Numbers

Exercise 3.1.1 If x = 6 , y = -4 and z = -2, find the value of the following:

1. $5x - 8$

2. $4(x - z)$

3. $(3y)^2$

4. $2x(y + z)$

5. $2x^2 - z$

6. $2x + 3y - 4z$

7. $2x^2 - 3y^2$

8. $\frac{x+y}{x-y}$

3.2 Addition and Subtraction of Like Terms

Exercise 3.2.1 Simplify the following expressions by collecting like terms.

1. $2x^2y - 3xy^2 - x^2y + 5xy^2$

2. $2ab^2 - 3a^2b + 3a^2b^2 - 5a^2b$

3. $5x^2 + 3y^2 - 2x^2$

4. $9a^2 - 3ab + 5ab - 6a^2$

5. $3xyz + 5yxz - 2zyx$

Exercise 3.2.2 Simplify the following expressions by removing the brackets and collecting like terms.

1. $8x - 5(2x - 3y)$

2. $5a(a - 2b) + 3a(2a - b)$

3. $3(x^2 + x - 5) - 2(x^2 - 3x + 4)$

4. $4a(2a + b) - a(a + 2b)$

5. $5x(2x + 1) - (x^2 + x)$

3.3 Substitution in Formulae

Exercise 3.3.1 Given $V = \pi r^2 h$, find, correct to 2 decimal places:

1. V *when* $r = 3.5\,cm$ *and* $h = 6\,cm$.

2. r *when* $V = 275cm^3$ *and* $h = 14\,cm$.

3. h *when* $V = 108\,cm^3$, *and* $r = 2.5\,cm$

3.4 Quadratic Trinomials

1. Distributive Law: $a(b+c) = ab + ac$ and $(a+b)(c+d) = ac + ad + bc + bd$
2. Quadratic Trinomials:
   - $(x+m)(x+n) = x^2 + (m+n)x + mn$
   - $(a+b)^2 = a^2 + 2ab + b^2$
   - $(a-b)^2 = a^2 - 2ab + b^2$
3. The expansion of $(a+b)^3$ and $(a-b)^3$:
   - $(a+b)^3 = a^3 + 3a^2b + 3ab^2 + b^3$
   - $(a-b)^3 = a^3 - 3a^2b + 3ab^2 - b^3$

Exercise 3.4.1 Expand the following expressions:

1. $(3x-3)^2$

2. $(x+3)(2x-3)$

3. $(x-2)(2x^2+x-1)$

4. $(x-3)(x+3)(x+3)$

5. $(2x+3)^3$

6. $(x^2-y^2)^3$

3.5 Factorisation

- $a^2 - b^2 = (a - b)(a + b)$
- $a^3 + b^3 = (a + b)(a^2 - ab + b^2)$
- $a^3 - b^3 = (a - b)(a^2 + ab + b^2)$

Exercise 3.5.1 Factorising the following expressions:

1. $36a^2 - 49b^2$

2. $a^3 - a^2b - 9a + 9b$

3. $x^3 - xy^2$

4. $x^3 + 3x^2 - 4x - 12$

5. $x^3 + 2x^2 - xy^2 - 2y^2$

6. $x^3 + (x - y)^3$

7. $(2x + 1)^3 + (2x - 1)^3$

3.6 Simplification of Fractions

Exercise 3.6.1 Simplify each of the following expressions:

1. $\frac{8x^2-4xy}{8xy}$

2. $\frac{2xy-12x}{x^2+xy}$

3. $\frac{x^2-y^2}{(x+y)^2}$

4. $\frac{x^2+xy}{xy+y^2}$

5. $\frac{3x^2-xy}{xy} \times \frac{x^2y}{3xy-y^2}$

6. $\frac{x^3+y^3}{x^2-y^2}$

3.7 Addition and Subtraction of Fractions

Exercise 3.7.1 Simplify:

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

2. $\frac{x}{3} + \frac{4x}{5} - \frac{2x}{6}$

3. $\frac{1}{x+y} + \frac{1}{x-y}$

4. $\frac{x}{x^2-y^2} - \frac{y}{x^2-y^2}$

5. $\frac{6}{3x-2} - \frac{8}{4x+1}$

6. $\frac{1}{x+3} + \frac{x+4}{x^2+5x+6}$

3.8 Miscellaneous Exercises

Exercise 3.8.1 Express each of the following as a single fraction with a rational denominator.

1. $\frac{2\sqrt{2}-5\sqrt{3}}{3\sqrt{6}-\sqrt{15}}$

2. $\frac{1}{\sqrt{3}-1}+\frac{2}{\sqrt{3}+1}$

3. $\frac{\sqrt{5}+\sqrt{3}}{\sqrt{5}-\sqrt{3}}-\frac{\sqrt{5}-\sqrt{3}}{\sqrt{5}+\sqrt{3}}$

4. $\frac{1}{x-1}+\frac{1}{x+1}-\frac{2}{x^2-1}$, *where* $x=2\sqrt{3}-1$.

Exercise 3.8.2 Simplify the following:

1. $\frac{x^2-6x+8}{x^2-x-2}$

2. $\frac{12x+9}{15} \times \frac{5}{4x+3}$

3. $\frac{2y}{3x-y} \times \frac{15x^2-5xy}{10xy}$

4. $\frac{(x+y)^3-x^3}{y}$

Exercise 3.8.3 Express each of the following as a single fraction.

1. $\frac{1}{x^2-4} - \frac{1}{x+2}$

2. $\frac{3x+1}{3x-1} + \frac{3x-1}{3x+1}$

3. $\frac{4x}{x^2-16} - \frac{2}{x+4}$

4. $\frac{4}{x^2-4} + \frac{1}{x+2} + \frac{1}{x-2}$

Exercise 3.8.4 Factorise the following:

1. $x^3 + 2x^2 - xy^2 - 2y^2$

2. $x^6 - y^6$

3. $(x + y)^3 - (x - y)^3$

4. $2(x + y)^3 + 54$