Mixed Number Arithmetic

$2\frac{3}{4} + 1\frac{4}{5}$

$= 3\frac{15+16}{20}$

$= 3\frac{31}{20}$

$= 4\frac{11}{20}$

Addition

$7\frac{1}{4} - 2\frac{2}{3}$

$= 4\frac{3-8}{12}$ (12+)

$= 4\frac{7}{12}$

Subtraction

Exercise

$5\frac{5}{6} + 1\frac{4}{5}$

$= 6\frac{25+24}{30}$

$= 6\frac{49}{30}$

$= 7\frac{19}{30}$

$8\frac{2}{5} - 3\frac{2}{3}$

$= 8\frac{6-10}{15}$ (15+, 4)

$= 4\frac{11}{15}$

Multiplication

$2\frac{1}{4} \times 3\frac{2}{3}$

$= \frac{9}{4} \times \frac{11}{3_1}$ (3)

$= \frac{3 \times 11}{4 \times 1}$

Division

$7\frac{1}{2} \div 1\frac{2}{3}$

$= \frac{15}{2} \div \frac{5}{3}$

$= \frac{15}{2} \times \frac{3}{5_1}$ (3)

$= \frac{33}{4}$

$= 8\frac{1}{4}$

$= \frac{3 \times 3}{2 \times 1}$

$= \frac{9}{2}$

$= 4\frac{1}{2}$

Exercise

$6\frac{1}{4} \times 1\frac{1}{10}$

$= \frac{25}{4} \times \frac{11}{10_2}$

$= \frac{5 \times 11}{4 \times 2}$

$= \frac{55}{8}$

$= 6\frac{7}{8}$

$8\frac{1}{3} \div 1\frac{1}{4}$

$= \frac{25}{3} \div \frac{5}{4}$

$= \frac{25}{3} \times \frac{4}{5_1}$

$= \frac{5 \times 4}{3 \times 1}$

$= \frac{20}{3}$

$= 6\frac{2}{3}$

Expanding and Factorising

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

$= 12x - 18 + 3x + 12$

$= 15x - 6$

Ex 2

$$(2x-5)(x-4)$$

$$= 2x^2 - 5x - 8x + 20$$

$$= 2x^2 - 13x + 20$$

Ex 3

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

$$= [x^2 + x - 4x - 4](2x+3)$$

$$= [x^2 - 3x - 4](2x+3)$$

$$= 2x^3 - 6x^2 - 8x$$
$$\quad + 3x^2 - 9x - 12$$

$$= 2x^3 - 3x^2 - 17x - 12$$

Exercise

1) $5(x+4) - 2(x-3)$

$= 5x + 20 - 2x + 6$

$= 3x + 26$

2) $(2x+3)(2x+3)$

$= 4x^2 + 6x + 6x + 9$

$= 4x^2 + 12x + 9$

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

$= [x^2 + x + 2x + 2](x+3)$

$= [x^2 + 3x + 2](x+3)$

$= x^3 + 3x^2 + 2x$
$\quad + 3x^2 + 9x + 6$

$= x^3 + 6x^2 + 11x + 6$

Factorising

Ex1 $6x^2y^5 + 4x^3y^2$

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

Ex2 $8p^4q^4r^4 + 4p^7q^6r^5 + 12p^2q^4r^3$

$= 4p^2q^4r^3(2p^2r + p^5q^2r^2 + 3)$

Exercise

1) $10p^5q - 5p^3q^3 = 5p^3q(2p^2 - q^2)$

2) $6h^4k^2 - 9h^3k^3 = 3h^3k^2(2h - 3k)$

Quadratic Equations

Ex 1 Solve $x^2 + 5x + 6 = 0$

$(x + 2)(x + 3) = 0$

+1 +6
−1 −6
+2 +3 ✓
−2 −3

Either $x + 2 = 0$ or $x + 3 = 0$

$x = -2$ $\qquad$ $x = -3$

Ex 2 $x^2 - 6x - 16 = 0$

$(x + 2)(x - 8) = 0$

+1 −16
−1 +16
+2 −8 ✓

Either $x + 2 = 0$ or $x - 8 = 0$

$x = -2$ $\qquad$ $x = 8$

Exercise Solve

1) $x^2 - 3x - 10 = 0$

$(x + 2)(x - 5) = 0$

Either $x + 2 = 0$ or $x - 5 = 0$

$x = -2$ $\qquad$ $x = 5$

2) $x^2 - 9x + 14 = 0$

$(x-2)(x-7) = 0$

Either $x-2=0$ or $x-7=0$

$\underline{x=2}$ $\underline{x=7}$

3) $x^2 + 2x + 1 = 0$

$(x+1)(x+1) = 0$

$x+1=0$ or $x+1=0$

$\underline{x=-1}$ $\underline{x=-1}$

Difference of Two Squares

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

$x^2 - 36 = x^2 - 6^2 = (x+6)(x-6)$

$y^2 - 81 = y^2 - 9^2 = (y+9)(y-9)$

$4p^2 - 9q^2 = (2p)^2 - (3q)^2 = (2p+3q)(2p-3q)$

Exercise

1) $x^2 - 25 = x^2 - 5^2 = (x+5)(x-5)$

2) $y^2 - 100 = y^2 - 10^2 = (y+10)(y-10)$

3) $16x^2 - y^2 = (4x)^2 - y^2 = (4x+y)(4x-y)$

4) $4h^2 - 49k^2 = (2h)^2 - (7k)^2 = (2h+7k)(2h-7k)$

Substitution into Formulae

Ex 1 $s = ut + \frac{1}{2}at^2$

Find s when $u = 0$, $a = 10$, $t = 3$

$s = 0 \times 3 + \frac{1}{2} \times 10 \times 3^2$

$s = 0 + 45$

$s = 45$

Exercise

Find s when $u = 4$, $a = 2$, $t = 5$

$s = 4 \times 5 + \frac{1}{2} \times 2 \times 5^2$

$s = 20 + 25$

$s = 45$