

Algebra 1.3

# Factors

Homework 19 September 2012

Do all odd numbered questions in Exercise 1.3

Using the highest common factor, factorise each of the following:

1.  $5x^2 - 10x$

2.  $6ab - 12bc$

3.  $3x^2 - 6xy$

4.  $2x^2y - 6x^2z$

5.  $2a^3 - 4a^2 + 8a$

6.  $5xy^2 - 20x^2y$

7.  $2a^2b - 4ab^2 + 12abc$

8.  $3x^2y - 9xy^2 + 15xyz$

9.  $4\pi r^2 + 6\pi rh$

## HCF Method

①  $5x(x-2)$

③  $3x(x-2y)$

⑤  $2a(a^2-2a+4)$

⑦  $2ab(a-2b+bc)$

⑨  $2\pi r(2r+3h)$

GROUPING METHOD

$$\begin{aligned} \textcircled{11} \quad & x^2 - ax + 3x - 3a \\ & x(x-a) + 3(x-a) \\ & = (x-a)(x+3) \end{aligned}$$

$$\begin{aligned} \textcircled{13} \quad & 8ax + 4ay - 6bx - 3by \\ & 4a(2x+y) - 3b(2x+y) \\ & (4a-3b)(2x+y) \end{aligned}$$

$$\begin{aligned} \textcircled{15} \quad & 6xy + 12yz - 8xz - 9y^2 \\ & 3y(2x-3y) + 4z(-3y+2x) \\ & (3y-4z)(2x-3y) \end{aligned}$$

$$\begin{aligned} \textcircled{17} \quad & 3ax^2 - 3ay^2 - 4bx^2 + 4by^2 \\ & 3a(x^2-y^2) - 4b(x^2-y^2) \\ & (3a-4b)(x^2-y^2) \leftarrow \text{DIFF. 2 SQUARES} \\ & (3a-4b)(x+y)(x-y) \end{aligned}$$

Using the difference of two squares, factorise the following:

- |                     |                     |                       |
|---------------------|---------------------|-----------------------|
| 18. $a^2 - b^2$     | 19. $x^2 - 4y^2$    | 20. $9x^2 - y^2$      |
| 21. $16x^2 - 25y^2$ | 22. $36x^2 - 25$    | 23. $1 - 36x^2$       |
| 24. $49a^2 - 4b^2$  | 25. $x^2y^2 - 1$    | 26. $4a^2b^2 - 16c^2$ |
| 27. $3x^2 - 27y^2$  | 28. $45 - 5x^2$     | 29. $45a^2 - 20$      |
| 30. $(2x+y)^2 - 4$  | 31. $(3a-2b)^2 - 9$ | 32. $a^4 - b^4$       |

$$\textcircled{19} \quad (x-2y)(x+2y)$$

$$\textcircled{21} \quad (4x-5y)(4x+5y)$$

$$\textcircled{23} \quad (1-6x)(1+6x)$$

$$\textcircled{25} \quad (xy-1)(xy+1)$$

$$\begin{aligned} \textcircled{27} \quad & 3(x^2-9y^2) \\ & = 3(x-3y)(x+3y) \end{aligned}$$

$$\begin{aligned} \textcircled{29} \quad & 5(9a^2-4) \\ & = 5(3a-2)(3a+2) \end{aligned}$$

$$\begin{aligned} \textcircled{31} \quad & (3a-2b-3)(3a-2b+3) \end{aligned}$$

$$33. \quad x^2 + 9x + 14$$

$$(x + 7)(x + 2)$$

$$35. \quad 2x^2 + 11x + 14$$

$$(2x + 7)(x + 2)$$

$$37. \quad x^2 - 11x + 28$$

$$(x - 4)(x - 7)$$

$$39. \quad 3x^2 - 17x + 20$$

$$(3x - 5)(x - 4)$$

$$41. \quad 2x^2 - 7x - 15$$

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

$$43. \quad 12x^2 - 11x - 5$$

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

FACTORS OF  $12x^2$

$$\begin{aligned} &(12x)(x) \\ &(6x)(2x) \\ &(4x)(3x) \end{aligned}$$

FACTORS OF  $-5$

$$\begin{aligned} &(1)(-5) \checkmark \\ &(-1)(5) \end{aligned}$$

$$45. \quad 3x^2 + 13x - 10$$

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

47.  $36x^2 - 7x - 4$

$$(9x - 4)(4x + 1)$$

$\overset{9x}{\text{---}}$   
 $\underset{-16x}{\text{---}}$

FACTORS OF  
 $36x^2$ 

$$\begin{aligned} &(36x)(x) \\ &(18x)(2x) \\ &(12x)(3x) \\ &(9x)(4x) \checkmark \\ &(6x)(6x) \end{aligned}$$

FACTORS OF  
 $-4$ 

$$\begin{aligned} &(1)(-4) \checkmark \\ &(2)(-2) \\ &(-1)(4) \end{aligned}$$

49.  $6y^2 + 11y - 35$

$$(3y - 5)(2y + 7)$$

$\overset{21y}{\text{---}}$   
 $\underset{-10y}{\text{---}}$

FACTORS OF  $6y^2$ 

$$\begin{aligned} &(6y)(y) \\ &(3y)(2y) \checkmark \end{aligned}$$

FACTORS OF  $-35$ 

$$\begin{aligned} &(35)(-1) \\ &(7)(-5) \checkmark \\ &(5)(-7) \\ &(1)(-35) \end{aligned}$$

51. Using the quadratic formula, factorise each of the following:

(i)  $x^2 + 3\sqrt{3}x + 6$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$a = 1$$

$$b = 3\sqrt{3}$$

$$c = 6$$

$$= \frac{-3\sqrt{3} \pm \sqrt{(3\sqrt{3})^2 - 4(1)(6)}}{2(1)}$$

$$= \frac{-3\sqrt{3} \pm \sqrt{27 - 24}}{2} = \frac{-3\sqrt{3} \pm \sqrt{3}}{2}$$

$$\Rightarrow = \frac{-4\sqrt{3}}{2} = -2\sqrt{3}$$

$$\text{AND} = \frac{-2\sqrt{3}}{2} = \sqrt{3}$$

These are  
the  
solutions  
(or roots)

$\Rightarrow$  FACTORS ARE

$$(x + 2\sqrt{3})(x + \sqrt{3})$$

52. Using both the sum and the difference of two cubes, factorise the following:

(i)  $a^3 + b^3$

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

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

52. Using both the sum and the difference of two cubes, factorise the following:

(ii)  $a^3 - b^3$

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

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

52. Using both the sum and the difference of two cubes, factorise the following:

(iii)  $8x^3 + y^3$

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

$$= (2x + y)(4x^2 - 2xy + y^2)$$

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

53. (i)  $27x^3 - y^3$                       (ii)  $x^3 - 64$                       (iii)  $8x^3 - 27y^3$

$$(i) = (3x - y)(9x^2 + 3xy + y^2)$$

$$(ii) = (x - 4)(x^2 + 4x + 16)$$

$$(iii) = (2x - 3y)(4x^2 + 6xy + 9y^2)$$

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

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

54. (i)  $8 + 27k^3$                       (ii)  $64 - 125a^3$                       (iii)  $27a^3 + 64b^3$

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

$$(ii) = (4 - 5a)(16 + 20a + 25a^2)$$

$$(iii) = (3a + 4b)(9a^2 - 12ab + 16b^2)$$