**F.3 Mathematics – Supplementary Worksheet for NCM 3A Chapter 1**

**Solutions**

**Level 1**

1. (a) –36*a*2 + *b*2

= *b*2 – (6*a*)2

= (*b* + 6*a*)(*b* – 6*a*)

(b) 4*x*2*y*2 – 49*z*2

= (2*xy*)2 – (7*z*)2

= (2*xy* + 7*z*)(2*xy* – 7*z*)

2. (a) (3 – *m*)2 – 144

= (3 – *m*)2 – 122

= (3 – *m* + 12)(3 – *m* – 12)

= (15 – *m*)(–9 – *m*)

(b) (*x* + 2*y*)2 – 9*y*2

= (*x* + 2*y*)2 – (3*y*)2

= (*x* + 2*y* + 3*y*)(*x* + 2*y* – 3*y*)

= (*x* + 5*y*)(*x* – *y*)

3. (a) 9*a*2 – 30*ab* + 25*b*2

= (3*a*)2 – 2(3*a*)(5*b*)+ (5*b*)2

= (3*a* – 5*b*)2

(b) 16*x*2 + 56*xy* + 49*y*2

= (4*x*)2 + 2(4*x*)(7*y*) + (7*y*)2

= (4*x* + 7*y*)2

4. (a) 8*m*2 – 8*mn* + 2*n*2

= 2(4*m*2 – 4*mn* + *n*2)

= 2[(2*m*)2 – 2(2*m*)(*n*) + *n*2]

= 2(2*m* – *n*)2

(b) 3*a*2 + 12*ab* + 12*b*2

= 3(*a*2 + 4*ab* + 4*b*2)

= 3[*a*2 + 2(*a*)(2*b*) + (2*b*)2]

= 3(*a* + 2*b*)2

5. (a) 6*a*2 – *a* – 2

= (2*a* + 1)(3*a* – 2)

(b) 14*b*2 – 13*b* + 3

= (7*b* – 3)(2*b* – 1)

6. (a) 6*a*2 + 13*ab* – 5*b*2

= (3*a* – *b*)(2*a* + 5*b*)

(b) –4*a*2 – 10*ab* + 6*b*2

= –2(2*a*2 + 5*ab* – 3*b*2)

= –2(2a – *b*)(*a* + 3*b*)

7. (a) 8*x*3 – 125*y*3

= (2*x*)3 – (5*y*)3

= (2*x* – 5*y*)[(2*x*)2 + (2*x*)(5*y*) + (5*y*)2]

= (2*x* – 5*y*)(4*x*2 + 10*xy* + 25*y*2)

(b) *m*3*n*3 – 216*p*3

= (*mn*)3 – (6*p*)3

= (*mn* – 6*p*)[(*mn*)2 + (*mn*)(6*p*) + (6*p*)2]

= (*mn* – 6*p*)(*m*2*n*2 + 6*mnp* + 36*p*2)

8. (a) 16*x*3 + 2*y*3

= 2(8*x*3 + *y*3)

= 2[(2*x*)3 + *y*3]

= 2(2*x* + *y*)[(2*x*)2 – (2*x*)(*y*) + (*y*)2]

= 2(2*x* + *y*)(4*x*2 – 2*xy* + *y*2)

(b) 192*a*3 – 375*b*3

= 3(64*a*3 – 125*b*3)

= 3[(4*a*)3 – (5*b*)3]

= 3(4*a* – 5*b*)[(4*a*)2 + (4*a*)(5*b*) + (5*b*)2]

= 3(4*a* – 5*b*)(16*a*2 + 20*ab* + 25*b*2)

**Level 2**

1. (a) (*a* – *b*)2 – (*a* + *b*)2

= (*a* – *b* + *a* + *b*)[*a* – *b* – (*a* + *b*)]

= (2*a*)(*a* – *b* – *a* – *b*)

= (2*a*)(–2*b*)

= –4*ab*

(b) (2*x* – *y*)2 – (*x* + 2*y*)2

= (2*x* – *y* + *x* + 2*y*)[2*x* – *y* – (*x* + 2*y*)]

= (3*x* + *y*)(2*x* – *y* – *x* – 2*y*)

= (3*x* + *y*)(*x* – 3*y*)

2. (a) 25*m*2 – 36*n*2 – 5*m* – 6*n*

= (5*m*)2 – (6*n*)2 – 5*m* – 6*n*

= (5*m* + 6*n*)(5*m* – 6*n*) – (5*m* + 6*n*)

= (5*m* + 6*n*)(5*m* – 6*n* – 1)

(b) 81*a*4 – 256

= (9*a*2)2 – (16)2

= (9*a*2 + 16)(9*a*2 – 16)

= (9*a*2 + 16)[(3*a*)2 – 42]

= (9*a*2 + 16)(3*a* + 4)(3*a* – 4)

3. (a) 50*a*2 – 20*ab* + 2*b*2

= 2(25*a*2 – 10*ab* + *b*2)

= 2[(5*a*)2 – 2(5*a*)(*b*) + *b*2]

= 2(5*a* – *b*)2

(b) 16(*x* + *y*)2 – 24*x*(*x* + *y*)+ 9*x*2

= [4(*x* + *y*)]2 – 2[4(*x* + *y*)](3*x*)+ (3*x*)2

= [4(*x* + *y*) – 3*x*]2

= (4*x* + 4*y* – 3*x*)2

= (*x* + 4*y*)2

4. (a) 16*a*2 – 16*ab* + 4*b*2

= 4(4*a*2 – 4*ab* + *b*2)

= 4[(2*a*)2 – 2(2*a*)(*b*) + *b*2]

= 4(2*a* – *b*)2

(b) 16*a*2 – 16*ab* + 4*b*2 – 25*c*2

= 4(2*a* – *b*)2 – 25*c*2

= [2(2*a* – *b*)]2 – (5*c*)2

= [2(2*a* – *b*) + 5*c*][2(2*a* – *b*) – 5*c*]

= (4*a* – 2*b* + 5*c*)(4*a* – 2*b* – 5*c*)

5. (a) 60*a*2 – 28*ab* – 8*b*2

= 4(15*a*2 – 7*ab* – 2*b*2)

= 4(3*a* – 2*b*)(5*a* + *b*)

(b) –42*c*2 + 68*cd* – 16*d*2

= 2(–21*c*2 + 34*cd* – 8*d*2)

= 2(7*c* – 2*d*)(4*d* – 3*c*)

6. (a) 9*m*2 – 6*mn* + *n*2

= (3*m*)2 – 2(3*m*)(*n*) + *n*2

= (3*m* – *n*)2

(b) 9*m*2 – 6*mn* + *n*2 + 6*mp* – 2*np* + *p*2

= (3*m* – *n*)2 + 2(3*m* – *n*)*p* + *p*2

= (3*m* – *n + p*)2

7. (a) (2*x* – *y*)3 – (*x* + *y*)3

= [2*x* – *y* – (*x* + *y*)][(2*x* – *y*)2 + (2*x* – *y*)(*x* + *y*) + (*x* + *y*)2]

= (2*x* – *y* – *x* – *y*)(4*x*2 – 4*xy* + *y*2 + 2*x*2 + 2*xy* – *xy* – *y*2 + *x*2 + 2*xy* + *y*2)

= (*x* – 2*y*)(7*x*2 – *xy* + *y*2)

(b) 512*a*3 – 8*b*3

= 8(64*a*3 – *b*3)

= 8[(4*a*)3 – *b*3]

= 8(4*a* – *b*)[(4*a*)2 + (4*a*)(*b*) + *b*2]

= 8(4*a* – *b*)(16*a*2 + 4*ab* + *b*2)

8. (a) 27*m*3 – 1

= (3*m*)3 – 1

= (3*m* – 1)[(3*m*)2 + (3*m*)(1) + 12]

= (3*m* – 1)(9*m*2 + 3*m* + 1)

(b) 27*m*3 + 9*m* – 4

= 27*m*3 – 1 + 9*m* – 3

= (3*m* – 1)(9*m*2 + 3*m* + 1) + 3(3*m* – 1)

= (3*m* – 1)(9*m*2 + 3*m* + 1 + 3)

= (3*m* – 1)(9*m*2 + 3*m* + 4)