# PC11 Factoring Assignment Solutions

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

2. Factor by pulling out the GCF:
   $8x^6yz^3 - 12x^3y^4z^4 + 6x^2y^4z^5$
   $2x^2yz^3(4x^4 - 6xy^3z + 3y^3z^2)$

3. True or False:
   a. $(a+b)^2 = a^2 + b^2$
      False

   b. $x^2 + y^2 = (x+y)(x-y)$
      False

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

4. Factor $b^2 - 25$
   $(b+5)(b-5)$

5. Factor $100x^2 - 49y^8$
   $(10x + 7y^4)(10x - 7y^4)$

6. Factor $2x^3 - 50x$
   $2x(x^2 - 25)$
   $2x(x+5)(x-5)$

7. Factor $x^2 - 2x - 15$
   $(x-5)(x+3)$

8. Factor $6x^2 - x - 15$
   Rainbow method:
   $x^2 - x - 90$
   $\left(x - \frac{10}{6}\right)\left(x + \frac{9}{6}\right)$
   $\left(x - \frac{5}{3}\right)\left(x + \frac{3}{2}\right)$
   $= (3x - 5)(2x + 3)$

9. Factor $-4x^2 - 26x - 12$
   $-2(2x^2 + 13x + 6)$
   $-2(2x + 1)(x + 6)$

10. Factor $10x^2 - 140x + 330$
    $10(x^2 - 14x + 33)$
    $10(x - 11)(x - 3)$

11. Factor $12x^2 + 19x - 21$
    $(3x + 7)(4x - 3)$

12. Factor $x^2(x + 3) + 4(x + 3)$
    $(x + 3)(x^2 + 4)$

13. Factor $x^2(x - 5) + (5 - x)(25)$
    $x^2(x - 5) - (25)(x - 5)$
    $(x - 5)(x^2 - 25)$
    $(x - 5)(x + 5)(x - 5)$
    $(x - 5)^2(x + 5)$

14. Factor $(x^2 - 4)^2 - (x^2 - 4) - 12$
    $a^2 - a - 12$
    $(a - 4)(a + 3)$
    $(x^2 - 4 - 4)(x^2 - 4 + 3)$
    $(x^2 - 8)(x^2 - 1)$
    $(x^2 - 8)(x + 1)(x - 1)$

15. Enrichment: Factor $2\cos^2\theta + 3\cos\theta - 2$
    $2(\cos\theta)^2 + 3(\cos\theta) - 2$
    $2a^2 + 3a - 2$
    $(2a - 1)(a + 2)$
    $(2\cos\theta - 1)(\cos\theta + 2)$

16. Factor $\frac{x^2}{4} - 2x + 3$
    $\frac{1}{4}(x^2 - 8x + 12)$
    $\frac{1}{4}(x - 6)(x - 2)$

17. Factor $\pi^{6x} - e^2$
    $(\pi^{3x})^2 - e^2$
    $a^2 - e^2$
    $(a + e)(a - e)$
    $(\pi^{3x} + e)(\pi^{3x} - e)$

18. Factor by grouping: $6x^3 + 3x^2 + 8x + 4$
    $3x^2(2x + 1) + 4(2x + 1)$
    $(2x + 1)(3x^2 + 4)$

19. Find the possible values of $k$ such that
    $4x^2 + kx - 6$ can be factored
    $(4x + 1)(x - 6) = 4x^2 - 23x - 6 \rightarrow k = -23$
    $(4x - 1)(x + 6) = 4x^2 + 23x - 6 \rightarrow k = 23$
    $(4x + 2)(x - 3) = 4x^2 - 10x - 6 \rightarrow k = \pm 10$
    $(4x - 6)(x + 1) = 4x^2 - 2x - 6 \rightarrow k = \pm 2$
    $(4x - 3)(x + 2) = 4x^2 + 5x - 6 \rightarrow k = \pm 5$
    $(2x + 1)(2x - 6) = 4x^2 - 10x - 6$ (same $k$ value)
    $(2x - 1)(2x + 6) = 4x^2 + 10x - 6$ (same $k$ value)
    $(2x + 2)(2x - 3) = 4x^2 - 2x - 6 \rightarrow k = \pm 2$ (same $k$ value)
    **8** unique $k$ values