've each quadratic equation by factoring.

1) $x^2 - 4x - 12 = 0$

$(x-6)(x+2) = 0$

$\boxed{X=6}$ $\boxed{X=-2}$

2) $10x^2 - 9x = 0$

$X(10X-9) = 0$

$\boxed{X=0}$ $\boxed{X=9/10}$

3) $x^2 - 16 = 0$

$(x+4)(x-4) = 0$

$\boxed{X = \pm 4}$

4) $15x^2 + 19x + 6 = 0$

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$(15x^2 + 10x) + (9x + 6) = 0$

$5X(3x+2) + 3(3x+2) = 0$

$(5x+3)(3x+2) = 0$

$\boxed{X = -\frac{3}{5}}$

$\boxed{X = -\frac{2}{3}}$

Solve each quadratic equation by using the quadratic formula.

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

$X = \dfrac{9 \pm \sqrt{-9^2 - 4(1)(14)}}{2(1)}$

$\dfrac{9 \pm \sqrt{25}}{2} = \dfrac{9 \pm 5}{2}$

$\boxed{\begin{array}{l} X = 7 \\ X = 2 \end{array}}$

6) $x^2 - 3x = 40$

$x^2 - 3x - 40 = 0$

$X = \dfrac{3 \pm \sqrt{-3^2 - 4(1)(-40)}}{2(1)}$

$\dfrac{3 \pm \sqrt{169}}{2} = \dfrac{3 \pm 13}{2}$

$\boxed{X=8}$ $\boxed{X=-5}$

7) $5x^2 - 2x + 4 = 0$

$X = \dfrac{2 \pm \sqrt{-2^2 - 4(5)(4)}}{2(5)}$

$X = \dfrac{2 \pm \sqrt{-76}}{10}$

$X = \dfrac{2 \pm 2i\sqrt{19}}{10} = \boxed{\dfrac{1 \pm i\sqrt{19}}{5}}$

8) $2x^2 + 7x = 0$

$X = \dfrac{-7 \pm \sqrt{7^2 - 4(2)(0)}}{2(2)}$

$\dfrac{-7 \pm \sqrt{49}}{4}$ $\dfrac{-7+7}{4} = 0$

$\dfrac{-7-7}{4} = -7/2$

$\boxed{\begin{array}{l} X = 0 \\ X = -7/2 \end{array}}$

9) $6x^2 - 2x - 1 = 0$

$X = \dfrac{2 \pm \sqrt{-2^2 - 4(6)(-1)}}{2(6)}$

$\dfrac{2 \pm \sqrt{28}}{12} = \dfrac{2 \pm 2\sqrt{7}}{12}$

$\boxed{X = \dfrac{1 \pm \sqrt{7}}{6}}$

Solve by extracting the root of each quadratic equation.
(the end of completing the square)

10. $(x+3)^2 = 19$

$X + 3 = \pm\sqrt{19}$

$\boxed{X = -3 \pm \sqrt{19}}$

11. $(2x+1)^2 - 3 = 9$

$(2x+1)^2 = 12$

$2x+1 = \pm\sqrt{12}$

$2x+1 = \pm 2\sqrt{3}$

$\boxed{X = -1 \pm 2\sqrt{3}}$

12. $(x-4)^2 = (x+3)^2$

$X - 4 = X + 3$

$0 = 7$

$\boxed{\emptyset}$

Find the value of c that makes each trinomial a perfect square.

13. $x^2 + 12x + c$

$\dfrac{12}{2} = 6^2 = 36$

$x^2 + 12x + 36$

14. $x^2 - 20x + c$

$\dfrac{-20}{2} = -10^2 = 100$

$x^2 - 20x + 100$

15. $x^2 - 5x + c$

$\left(\dfrac{-5}{2}\right)^2 = \dfrac{25}{4} = 6.25$

$x^2 - 5x + 6.25$

16. $x^2 + \frac{1}{2}x + c$

$\dfrac{1}{2} \cdot \dfrac{1}{2} \left(\dfrac{1}{4}\right)^2 = \dfrac{1}{16}$

$x^2 + \dfrac{1}{2}x + \dfrac{1}{16}$

Solve each quadratic equation by completing the square.

17. $x^2 - 14x + 19 = 0$ $\dfrac{-14}{2} = -7^2 = 49$

$x^2 - 14x + 49 = -19 + 49$

$(x-7)^2 = 30$

$x - 7 = \pm\sqrt{30}$

$\boxed{x = 7 \pm \sqrt{30}}$

18. $x^2 - 4x - 21 = 0$ $\left(\dfrac{-4}{2}\right)^2 = 4$

$x^2 - 4x + 4 = 21 + 4$

$(x-2)^2 = 25$

$x - 2 = \pm 5$

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

$\boxed{x = 7} \qquad \boxed{x = -3}$

19. $\dfrac{2x^2}{2} - \dfrac{10x}{2} + \dfrac{5}{2} = \dfrac{0}{2}$ $\left(\dfrac{-5}{2}\right)^2 = 6.25$

$x^2 - 5x + \dfrac{5}{2} = 0$

$x^2 - 5x + 6.25 = -5/2 + 6.25$

$\left(x - \dfrac{5}{2}\right)^2 = \dfrac{15}{4}$

$x - \dfrac{5}{2} = \dfrac{\sqrt{15}}{2}$

$\boxed{x = \dfrac{5 \pm \sqrt{15}}{2}}$

20. $\dfrac{5x^2}{5} - \dfrac{35x}{5} + \dfrac{60}{5} = \dfrac{0}{5}$ $\left(\dfrac{-7}{2}\right)^2 = \dfrac{49}{4}$

$x^2 - 7x + 12 = 0$

$x^2 - 7x + \dfrac{49}{4} = -12 + \dfrac{49}{4}$

$\left(x - \dfrac{7}{2}\right)^2 = \dfrac{1}{4}$

$x - \dfrac{7}{2} = \pm \dfrac{1}{2}$

$x - \dfrac{7}{2} = \dfrac{1}{2} \qquad x - \dfrac{7}{2} = -\dfrac{1}{2}$

$\boxed{x = 4} \qquad \boxed{x = 3}$

21. $\dfrac{3x^2}{3} - \dfrac{13x}{3} + \dfrac{4}{3} = \dfrac{0}{3}$ $-\dfrac{13}{3} \cdot \dfrac{1}{2} = \left(-\dfrac{13}{6}\right)^2$

$x^2 - \dfrac{13}{3}x + \dfrac{4}{3} = 0$

$x^2 - \dfrac{13}{3}x + \dfrac{169}{36} = -\dfrac{4}{3} + \dfrac{169}{36}$

$\left(x - \dfrac{13}{6}\right)^2 = \dfrac{121}{36}$ $\boxed{x = 4}$

$x - \dfrac{13}{6} = \pm \dfrac{11}{6}$ $\boxed{x = \dfrac{1}{3}}$