

Factor the following.

1) $20x^2 - 28x$ 2 terms G.C.F

$$4x(5x-7)$$

2) $x^2 - 81$ 2 terms Diff of Squares

$$\sqrt{x^2} = x \quad \sqrt{81} = 9$$

$$(x+9)(x-9)$$

3) $x^2 + 3x - 40$ 3 terms: $a=1$: X-method short
 $a=1 \quad b=3 \quad c=-40$

$$\begin{array}{r} 8 \\ \times 3 \\ \hline -40 \\ \hline -5 \end{array}$$

$$(x+8)(x-5)$$

4) $3x^2 + 10x + 7$ 3 terms: $a \neq 1$: no G.C.F. X-method long,
 $a=3 \quad b=10 \quad c=7$

$$\begin{array}{r} 21 \\ \times 3 \\ \hline 10 \end{array}$$

$$\begin{array}{l} 3x^2 + 3x + 7x + 7 \\ \hline 3x(x+1) + 7(x+1) \end{array}$$

$$(3x+7)(x+1)$$

5) $4x^2 - 16y^2$ 2 terms! G.C.F.

$$4(x^2 - 4y^2) \text{ Now diff of squares.}$$

$$\sqrt{x^2} = x \quad \sqrt{4y^2} = 2y$$

$$4(x+2y)(x-2y)$$

6) $15x^3 + 10x^2 - 40x$ 3 terms! G.C.F

$$5x(3x^2 + 2x - 8)$$

$$a=3 \quad b=2 \quad c=-8$$

$$\begin{array}{r} 6 \\ \times 2 \\ \hline -4 \end{array}$$

3 terms: $a \neq 1$: X-method long

$$\begin{array}{l} 3x^2 + 6x - 4x - 8 \\ \hline 3x(x+2) - 4(x+2) \end{array}$$

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

7) $3x^3 - 4x^2 - 12x + 16$ 4 terms: no G.C.F grouping.

$$x^2(3x-4) - 4(3x-4)$$

$$(3x-4)(x^2-4) \leftarrow \text{diff of squares}$$

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

8) $12x^2 - 40x - 32$ 3 terms: G.C.F

$$4(3x^2 - 10x - 8)$$

$$a=3 \quad b=-10 \quad c=-8$$

$$\begin{array}{r} -24 \\ \times 2 \\ \hline -10 \end{array}$$

3 terms: $a \neq 1$: X-method long

$$\begin{array}{l} 3x^2 - 12x + 2x - 8 \\ \hline 3x(x-4) + 2(x-4) \end{array}$$

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

G.C.F then 3 terms and X method short.

9) $x^3 - 15x^2 + 54x$

$x(x^2 - 15x + 54)$

$x(x-9)(x-6)$

~~$\begin{matrix} 54 & & -6 \\ -9 & & \\ & -15 & \end{matrix}$~~

10) $9x^2 - 25y^2$ 2 terms. diff of squares

$\sqrt{9x^2} = 3x$ $\sqrt{25y^2} = 5y$

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

11) $2x^5y^3 - 4x^2y + 30xy^2$ G.C.F

$2xy(x^4y^2 - 2x + 15y)$

12) $x^3 + 3x^2 - x - 3$ 4 terms. Grouping.

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

$(x+3)(x^2 - 1)$ diff of squares

$\sqrt{x^2} = x$ $\sqrt{1} = 1$

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

13) $54x^3y - 18x^2y^2 + 27xy^3$ G.C.F.

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

14) $9x^2 - 49y^2$ 2 terms diff of squares.

$\sqrt{9x^2} = 3x$ $\sqrt{49y^2} = 7y$

$(3x - 7y)(3x + 7y)$

15) $64y^4 - 16y^6$ 2 terms. G.C.F then Difference of Δ s.

$16y^4(4 - y^2)$

$\sqrt{4} = 2$ $\sqrt{y^2} = y$

$16y^4(2+y)(2-y)$

16) $n^3 - 5n^2 - 50n$

$n(n^2 - 5n - 50)$

$a=1$ $b=-5$ $c=-50$

~~$\begin{matrix} & -50 & \\ -10 & & 5 \\ & -5 & \end{matrix}$~~

$n(n-10)(n+5)$

17) $4x^3 + 12x^2 - 25x - 75$

$4x^2(x+3) - 25(x+3)$

$(x+3)(4x^2 - 25)$

$\sqrt{4x^2} = 2x \quad \sqrt{25} = 5$

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

18) $3x^2 - 57x + 180$

$3(x^2 - 19x + 60)$

$a=1 \quad b=-19 \quad c=60$

$\begin{array}{r} 60 \\ -15 \quad -4 \end{array}$

$x^2 - 15x - 4x + 60$

$x(x-15) - 4(x-15)$

$3(x-15)(x-4)$

19) $4x^2 - x - 14$

$a=4 \quad b=-1 \quad c=-14$

$\begin{array}{r} -56 \\ 8 \quad -7 \end{array}$

$\frac{4x^2 + 8x - 7x - 14}{4x(x+2) - 7(x+2)}$

$(x+2)(4x-7)$

20) $8x^2 + 16x - 10$

$2(4x^2 + 8x - 5)$

$a=4 \quad b=8 \quad c=-5$

$\begin{array}{r} -20 \\ 10 \quad -2 \end{array}$

$\frac{4x^2 + 10x - 2x - 5}{2(2x+5) - 1(2+5)}$

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

21) If the area of a rectangle can be represented by $x^2 - 5x - 14$, what two expressions could represent the dimensions of the rectangle? (Hint: Area = Length x Width)

$x^2 - 5x - 14 = (x-7)(x+2) = L \times W$

$\begin{array}{r} -14 \\ -7 \quad 2 \\ -5 \end{array}$

Solve the following equations by factoring. Remember to get $ax^2 + bx + c = 0$ first.

22) $x^2 + 4x - 32 = 0$

$a=1 \quad b=4 \quad c=-32$

$\begin{array}{r} -32 \\ 8 \quad -4 \\ 4 \end{array}$

$(x+8)(x-4) = 0$

$x+8=0 \quad x-4=0$

$x=-8 \quad x=4$

23) $x^2 - 14x - 51 = 0$

$a=1 \quad b=-14 \quad c=-51$

$\begin{array}{r} -51 \\ -17 \quad 3 \\ -14 \end{array}$

$(x-17)(x+3) = 0$

$x-17=0 \quad x+3=0$

$x=17 \quad x=-3$

$$24) x^2 = 18x - 81$$

$$-18x + 81 \quad -18x + 81$$

$$(x-9)(x-9) = 0$$

$$x^2 - 18x + 81 = 0$$

$$a=1 \quad b=-18 \quad c=81$$

$$\begin{array}{r} 81 \\ -9 \\ \hline -18 \end{array}$$

$$x-9=0$$

$$\boxed{x=9}$$

$$25) 4x^2 + 7x - 17 = 3x^2 + 12x - 3$$

$$-3x^2 - 12x + 3 \quad -3x^2 - 12x + 3$$

$$x^2 - 5x - 14 = 0$$

$$a=1 \quad b=-5 \quad c=14$$

$$\begin{array}{r} -14 \\ -7 \\ \hline -5 \end{array}$$

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

$$x-7=0 \quad x+2=0$$

$$\boxed{x=7 \quad x=-2}$$

$$26) 3x^2 + 9x - 30 = 0$$

$$3(x^2 + 3x - 10) = 0$$

$$a=1 \quad b=3 \quad c=-10$$

$$\begin{array}{r} -10 \\ 5 \\ \hline 3 \end{array}$$

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

$$x+5=0 \quad x-2=0$$

$$\boxed{x=-5 \quad x=2}$$

$$27) 5x^2 - 25x = 5x - 40$$

$$-5x + 40 \quad -5x + 40$$

$$5x^2 - 30x + 40 = 0$$

$$5(x^2 - 6x + 8) = 0$$

$$a=1 \quad b=-6 \quad c=8$$

$$\begin{array}{r} 8 \\ -4 \\ \hline -6 \end{array}$$

$$5(x-4)(x-2) = 0$$

$$x-4=0 \quad x-2=0$$

$$\boxed{x=4 \quad x=2}$$

$$28) 6x^2 - x - 2 = 0$$

$$a=6 \quad b=-1 \quad c=-2$$

$$\begin{array}{r} -12 \\ -4 \\ \hline -1 \end{array}$$

$$6x^2 - 4x + 3x - 2 = 0$$

$$2x(3x-2) + 1(3x-2) = 0$$

$$(3x-2)(2x+1) = 0$$

$$3x-2=0 \quad 2x+1=0$$

$$3x=2 \quad 2x=-1$$

$$\boxed{x=\frac{2}{3} \quad x=-\frac{1}{2}}$$

$$29) 2x^2 - 8 = 31x - 2x^2$$

$$+2x^2 - 31x - 8 \quad -31x + 2x^2$$

$$4x^2 - 31x - 8 = 0$$

$$a=4 \quad b=-31 \quad c=-8$$

$$\begin{array}{r} -32 \\ -32 \\ \hline -31 \end{array}$$

$$4x^2 - 32x + x - 8$$

$$4x(x-8) + 1(x-8) = 0$$

$$(x-8)(4x+1) = 0$$

$$x-8=0$$

$$\boxed{x=8}$$

$$4x+1=0$$

$$4x=-1$$

$$\boxed{x=-\frac{1}{4}}$$

$$30) 18x^2 = 24x$$

$$-24x \quad -24x$$

$$18x^2 - 24x = 0$$

$$6x(3x-4) = 0$$

$$6x=0$$

$$\boxed{x=0}$$

$$3x-4=0$$

$$3x=4$$

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

$$31) 3x^2 - 48 = 0$$

$$3(x^2 - 16) = 0$$

$$\sqrt{x^2} = x \quad \sqrt{16} = 4$$

$$3(x+4)(x-4) = 0$$

$$x+4=0 \quad x-4=0$$

$$\boxed{x=-4 \quad x=4}$$