Question	Answer	Solution
1.	If a polynomial $f(x)$ is divided by $x - k$, then the remainder is $r = f(k)$.	If a polynomial f(x) is divided by $x - k$, then the remainder is r = f(k).
3.	$x + 5 + \frac{3}{x-4}$	$\begin{array}{r} x + 5 \\ x - 4 \overline{\big) x^2 + x - 17} \\ \underline{x^2 - 4x} \\ 5x - 17 \\ \underline{5x - 20} \\ 3 \end{array}$ $\frac{x^2 + x - 17}{x - 4} = x + 5 + \frac{3}{x-4}$
5.	$x^2 + 4x + 7 + \frac{9}{x-1}$	$\begin{array}{r} x^2 + 4x + 7 \\ x - 1 \overline{\big) x^3 + 3x^2 + 3x + 2} \\ \underline{x^3 - x^2} \\ 4x^2 + 3x \\ \underline{4x^2 - 4x} \\ 7x + 2 \\ \underline{7x - 7} \\ 9 \end{array}$ $\frac{x^3 + 3x^2 + 3x + 2}{x - 1} = x^2 + 4x + 7 + \frac{9}{x-1}$
7.	$3x + 8 + \frac{-4x + 1}{x^2 + x}$	$\begin{array}{r} 3x + 8 \\ x^2 + x \overline{\big) 3x^3 + 11x^2 + 4x + 1} \\ \underline{3x^3 + 3x^2} \\ 8x^2 + 4x \\ \underline{8x^2 + 8x} \\ -4x + 1 \end{array}$ $\frac{3x^3 + 11x^2 + 4x + 1}{x^2 + x} = 3x + 8 + \frac{-4x + 1}{x^2 + x}$
9.	$5x^2 - 12x + 37 + \frac{-122x + 109}{x^2 + 2x - 4}$	$\begin{array}{r} 5x^2 - 12x + 37 \\ x^2 + 2x - 4 \overline{\big) 5x^4 - 2x^3 - 7x^2 + 0x - 39} \\ \underline{5x^4 + 10x^3 - 20x^2} \\ -12x^3 + 13x^2 + 0x \\ \underline{-12x^2 - 24x^2 - 48x} \\ 37x^2 + 48x - 39 \\ \underline{37x^2 + 74x - 148} \\ -26x + 109 \end{array}$ $\frac{5x^4 - 2x^3 - 7x^2 - 39}{x^2 + 2x - 4} = 5x^2 - 12x + 37 + \frac{-26x + 109}{x^2 + 2x - 4}$

11.	$2x + 3 + \frac{25}{x-5}$	$\begin{array}{r\|rrr} 5 & 2 & -7 & 10 \\ & & 10 & 15 \\ \hline & 2 & 3 & 25 \end{array}$ $\frac{2x^2 - 7x + 10}{x-5} = 2x + 3 + \frac{25}{x-5}$
13.	$x + 4 + \frac{-15}{x+4}$	$\begin{array}{r\|rrr} -4 & 1 & 8 & 1 \\ & & -4 & -16 \\ \hline & 1 & 4 & -15 \end{array}$ $\frac{x^2 + 8x + 1}{x+4} = x + 4 - \frac{15}{x+4}$
15.	$x^2 - x - 4 + \frac{-18}{x-4}$	$\begin{array}{r\|rrrr} 4 & 1 & -5 & 0 & -2 \\ & & 4 & -4 & -16 \\ \hline & 1 & -1 & -4 & -18 \end{array}$ $\frac{x^3 - 5x^2 - 2}{x-4} = x^2 - x - 4 - \frac{18}{x-4}$
17.	$x^3 + x^2 - 2x + 1 + \frac{-6}{x-6}$	$\begin{array}{r\|rrrrr} 6 & 1 & -5 & -8 & 13 & -12 \\ & & 6 & 6 & -12 & 6 \\ \hline & 1 & 1 & -2 & 1 & -6 \end{array}$ $\frac{x^4 - 5x^3 - 8x^2 + 13x - 12}{x-6} = x^3 + x^2 - 2x + 1 - \frac{6}{x-6}$
19.	The degree of the answer should be reduced by 1; $x^2 + 2x - 1 + \frac{1}{x-2}$. $\begin{array}{r\|rrrr} 2 & 1 & 0 & -5 & 3 \\ & & 2 & 4 & -2 \\ \hline & 1 & 2 & -1 & 1 \end{array}$	The division was done correctly, however, there is an error in how the quotient is written. $\begin{array}{r\|rrrr} 2 & 1 & 0 & -5 & 3 \\ & & 2 & 4 & -2 \\ \hline & 1 & 2 & -1 & 1 \end{array}$ $\frac{x^3 - 5x + 3}{x-2} = x^2 + 2x - 1 + \frac{1}{x-2}$

21.	$(x - 6)(x - 5)(x + 1)$	$\begin{array}{r\|rrrr} 6 & 1 & -10 & 19 & 30 \\ & & 6 & -24 & -30 \\ \hline & 1 & -4 & -5 & 0 \end{array}$ $f(x) = x^3 - 10x^2 - 19x + 30$ $= (x - 6)(x^2 - 4x - 5)$ $= (x - 6)(x - 5)(x + 1)$
23.	$(x - 8)(x + 2)(x + 4)$	$\begin{array}{r\|rrrr} 8 & 1 & -2 & -40 & -64 \\ & & 8 & 48 & 64 \\ \hline & 1 & 6 & 8 & 0 \end{array}$ $f(x) = x^3 - 2x^2 - 40x - 64$ $= (x - 8)(x^2 + 6x + 8)$ $= (x - 8)(x + 4)(x + 2)$
25.	$(x - 4)(x - 3)(x + 9)$	$\begin{array}{r\|rrrr} -9 & 1 & 2 & -51 & 108 \\ & & -9 & 63 & -108 \\ \hline & 1 & -7 & 12 & 0 \end{array}$ $f(x) = x^3 + 2x^2 - 51x + 108$ $= (x + 9)(x^2 - 7x + 12)$ $= (x + 9)(x - 4)(x - 3)$
27.	$(2x - 7)(x - 3)(x - 1)$	$\begin{array}{r\|rrrr} 1 & 2 & -15 & 34 & -21 \\ & & 2 & -13 & 21 \\ \hline & 2 & -13 & 21 & 0 \end{array}$ $f(x) = 2x^3 - 15x^2 + 34x - 21$ $= (x - 1)(2x^2 - 13x + 21)$ $= (x - 1)(2x - 7)(x - 3)$
29.	-1, 6	$\begin{array}{r\|rrrr} -3 & 1 & -2 & -21 & -18 \\ & & -3 & 15 & 18 \\ \hline & 1 & -5 & -6 & 0 \end{array}$ $f(x) = x^3 - 2x^2 - 21x - 18$ $= (x + 3)(x^2 - 5x - 6)$ $= (x + 3)(x - 6)(x + 1)$ The other zeros are 6 and -1.

31.	$-\frac{2}{5}, \frac{3}{2}$	$\begin{array}{r\|rrrr} 7 & 10 & -81 & 71 & 42 \\ & & 70 & -77 & -42 \\ \hline & 10 & -11 & -6 & 0 \end{array}$ $f(x) = 10x^3 - 81x^2 + 71x + 42$ $= (x - 7)(10x^2 - 11x - 6)$ $= (x - 7)(5x + 2)(2x - 3)$ The other zeros are $-\frac{2}{5}$ and $\frac{3}{2}$.
33.	$\frac{-4 \pm \sqrt{14}}{2}$	$\begin{array}{r\|rrrr} 9 & 2 & -10 & -71 & -9 \\ & & 18 & 72 & 9 \\ \hline & 2 & 8 & 1 & 0 \end{array}$ $f(x) = 2x^3 - 10x^2 - 71x - 9$ $= (x - 9)(2x^2 + 8x + 1)$ $x = \frac{-8 \pm \sqrt{64 - 4(2)}}{2(2)} = \frac{-8x \pm \sqrt{56}}{4}$ $= \frac{-4 \pm \sqrt{14}}{2}$ The other zeros are about -0.13 and -3.87.
35.	D	D; $\begin{array}{r\|rrrr} -6 & 4 & 15 & -63 & -54 \\ & & -24 & 54 & 54 \\ \hline & 4 & -9 & -9 & 0 \end{array}$ $f(x) = 4x^3 + 15x^2 - 63x - 54$ $= (x + 6)(4x^2 - 9x - 9)$ $= (x + 6)(4x + 3)(x - 3)$ The zeros are -6, $-\frac{3}{4}$, and 3.

37.	$x + 8$	$(x - 1)(x + 6) = x^2 + 5x - 6$ $w = \dfrac{x^3 + 13x^2 + 34x - 48}{x^2 + 5x - 6}$ $\begin{array}{r} x + 8 \\ x^2 + 5x - 6 \overline{\smash{)}\, x^3 + 13x^2 + 34x - 48} \\ \underline{x^3 + 5x^2 - 6x} \\ 8x^2 + 40x - 48 \\ \underline{8x^2 + 40x - 48} \\ 0 \end{array}$ The missing dimension is $x + 8$.
39.	A	A; $\begin{array}{r\|rrrr} 5 & 1 & -1 & k & -30 \\ & & 5 & 20 & 30 \\ \hline & 1 & 4 & k + 20 & 0 \end{array}$ For $x - 5$ to be a factor, the remainder must be zero. In the last column 30 must be added to -30 to get zero. $k + 20$ must equal 6 in order to have a product of 30 to add to the -30. $k + 20 = 6$ so, $k = -14$.