ELEMENTARY ALGEBRA

Part I:

1. If \(4(x - 3) = 2x + 5\) then \(x = \) ?

2. If \(a = 5\) and \(b = -2\), what is the value of the expression \(4a^2 - 3b + 5\) ?

3. Completely factor \(ax + bx + 3a + 3b\).

4. For all \(x\) and \(y\), \((3x + 2y)(x + 3y) = \) ?

5. \((3\sqrt{2} - 4)(7\sqrt{2} - 5\sqrt{3}) = \) ?

6. Factor completely and find solutions for: \(3x^2 - 4x - 15 = 0\).

7. For all \(x \neq -2\), \(\frac{x^2 - 7x - 18}{x + 2} = \) ?

8. \(6\sqrt{3} + 7\sqrt{5} - \sqrt{9} - \sqrt{2} = \)

9. Find the set of all \(x\) which satisfy the equation: \(5 - 2x \leq 7\).

10. Write an equation for the following: The difference between four times a number and half the number is 7 more than 3 times the number.

ELEMENTARY ALGEBRA

Part II:

1. If \(\frac{4x - 3}{2} = 3x\), then \(x = \) ?  
   a) 3/2  b) -3/2  c) -3  d) 3

2. If \(x = -2\) and \(y = 3\), what is the value of the expression \(x^2 - 7xy + 37\) ?  
   a) -43  b) 49  c) 41  d) -35

3. Which is the completely factored form of \(-6x^2 + 36x\)?  
   a) \(-6x(x + 6)\)  b) \(6x(x + 6)\)  c) \(-6x(x - 6)\)  
   d) \(x(-6x + 36)\)
4. Find the product: 
   a) $6x^2 + 9xy - 15y^2$
   b) $5x^2 + 2xy + 2y^2$
   c) $6x^2 - 15y^2$
   d) $6x^2 + 21xy + 15y^2$

5. $(3\sqrt{3} - \sqrt{2})(5\sqrt{2} - \sqrt{3}) = \ ?$
   a) 85  b) $16\sqrt{6} - 47$  c) $16\sqrt{6} - 19$  d) $14\sqrt{6} - 19$

6. Which pair of answers include one factor and one solution of
   $x^2 + 8x + 12 = 0$?
   a) $(x+6), x = 2$  b) $(x+12), x = -8$
   c) $(x+3), x = -4$  d) $(x+2), x = -6$

7. If $x \neq 0$ or 2, $\frac{x^2 - 4}{x^2 - 2x} = \ ?$
   a) $\frac{2}{x}$  b) 2  c) $\frac{x + 2}{x}$  d) 3

8. $3\sqrt{4} - 2\sqrt{5} + 3\sqrt{5} - 4 = \ ?$
   a) $2 + \sqrt{5}$  b) $3\sqrt{4} + \sqrt{5} - 4$  c) $-23$  d) 5

9. Find the set of all $y$ which satisfy: $3y - 7 > -11y$.
   a) $y > 2$  b) $y < 2$  c) $y > \frac{1}{2}$  d) $y < -\frac{1}{2}$

10. Which equation represents the statement: Four times a number less six is equal to five more than twice the number.
   a) $4(x-6) = 5 + 2x$  b) $4x - 6 = 5 + 2x$  c) $6 - 4x = 2(5 + x)$

Note: There is only one answer, but there may be several ways to obtain the answer. Only one method is suggested.

Solutions to Elementary Algebra Part I:

1. First distribute the 4 across the parenthesis. $4x - 12 = 2x + 5$
   Then collect $x$'s on one side, constants on the other side. $2x = 17$
   Finally, isolate $x$ by dividing both sides by 2. $x = \frac{17}{2}$

2. Replace letters with the numbers assigned. $4(5)^2 - 3(-2)+5$
   $= 4 \cdot 25 + 6 + 5 = 100 + 6 + 5 = 111$
   Remembering the product of two negative numbers is positive $-3(-2) = +6$.

3. Factor by grouping. From the first two terms factor out the common factor "x". From the second two terms factor out the common factor "3".
   $x(a + b) + 3(a + b)$
   Then factor out the resulting common factor "a + b" $= (a + b)(x + 3)$.

4. FOIL Multiply the first two terms in each parenthesis, then the outer two, then the inner two and finally the last two terms.
4. FOIL: Multiply the first two terms in each parenthesis, then the outer two, then the inner two and finally the last two terms. 
\[(3x)(x) + (3x)(3y) + (2y)(x) + (2y)(3y) = 3x^2 + 9xy + 2xy + 6y^2\]
Finish by collecting like terms: \[3x^2 + 11xy + 6y^2\].

5. FOIL to get:
\[(3\sqrt{2})(7\sqrt{2}) + (3\sqrt{2})(-5\sqrt{3}) + (-4)(7\sqrt{2}) + (-4)(-5\sqrt{3})\]
Multiply the numbers in front of the radical together and the numbers inside the radical together for each product:
\[21\sqrt{4} - 15\sqrt{6} - 28\sqrt{2} + 20\sqrt{3} = 21(2) - 15\sqrt{6} - 28\sqrt{2} + 20\sqrt{3} = 42 - 15\sqrt{6} - 28\sqrt{2} + 20\sqrt{3}\]. There are NO like terms so this is as simple as it gets.

6. This is a quadratic so the goal is to find two binomials which when multiplied together will produce the expression given. 
\[(3x + 5)(x - 3) = 0\]. Set each factor equal to zero and solve for x.
\[3x + 5 = 0 \text{ so } x = -\frac{5}{3} \text{ and } x - 3 = 0 \text{ so } x = 3\].

7. Factor the numerator: \[\frac{(x - 9)(x + 2)}{(x + 2)}\] and cancel the common factor of \((x + 2)\) that appears in both the numerator and denominator. Answer: \((x - 9)\).

8. Add coefficients of like radicals: \[(6 + 7)\sqrt{3} - \sqrt{6} - \sqrt{2}\]
Note that 9 is a perfect square: \[13\sqrt{3} - 3\sqrt{2}\].

9. Subtract all the constants to one side: \[-2x \leq 2\]
Divide by -2 remembering to switch the direction of the inequality sign if multiplying or dividing by a negative number: \[x \geq \frac{2}{-2}\] so the solution set is \[x \geq -1\].


Solutions to Elementary Algebra Part II:

1) b  2) b  3) c  4) a  5) c  6) d  7) c  8) a  9) c  10) b