ANSWERS AND EXPLANATIONS TO SOLVING QUADRATIC PROBLEMS

1) **C**. Remember the Zero Product Property. It states that if the product of two elements is equal to zero, than one or the other of the two elements must equal zero. To find the solutions to a quadratic equation we can thus set up each of the two factors to equal 0:

$$2x-3=0$$

$$\frac{2}{3}x+6=0$$

Now we use basic algebra to solve for x and find what the solutions are. We begin with the first factor.

$$2x-3=0$$

$$2x=3$$

$$x=\frac{3}{2}$$

And the second:

$$\frac{2}{3}x+6=0$$

$$\frac{2}{3}x=-6$$

$$x=-9$$

So, our two solutions are $\frac{3}{2}$ and -9 .

2) **B**. A few ways we could approach this. One way would be to back solve, but remember, the question asks for x+4, not x. Thus, we could set each answer equal to x+4 and solve quickly. X+4=13 would make x=9. Then we could plug in 9 to see if it works. However, this method could be time consuming.
We could also solve this down traditionally using factoring or the quadratic equation, that's what I'll do. First, we subtract 36 from both sides to set the quadratic equation equal to 0.

$$x^2+5x-36=0$$

Now we factor the quadratic and solve for the solutions.

$$\left(x+9\right)\left(x-4\right)=0$$

The solutions are -9 and 4. However, the solution we are concerned with is greater than 0 as stated by the problem. This means that we will set x equal to 4 and plug into the expression "x+4" to find our answer:

$$4+4=8$$

3) **A.** The quadratic equation in this problem cannot simply be factored so we must use the quadratic formula to find our solutions.

$$x=\frac{-b\pm\sqrt{b^2-4ac}}{2a}$$

Now we just plug in our values and simplify.

$$x=\frac{-30\pm\sqrt{\left(30\right)^2-4\left(5\right)\left(-23\right)}}{2\left(5\right)}$$

$$x=\frac{-30\pm\sqrt{900+460}}{10}$$

$$x=\frac{-30\pm\sqrt{1360}}{10}$$

4) **C**. We can simplify this equation before we factor it by dividing both sides by 2 to get the simplified equation below.

$$6x^2+7x-20=0$$

Now we can factor this equation.

$$(3x-4)(2x+5)=0$$

Solve for x to find the two values that could be x.

$$3x-4=0$$
$$3x=4$$
$$x=\frac{4}{3}$$

$$2x+5=0$$
$$2x=-5$$
$$x=-\frac{5}{2}$$

Now That we have our solutions, we must multiply them to find the product.

$$\frac{4}{3}\times-\frac{5}{2}=-\frac{20}{6}$$

Simplified, it is $-\frac{10}{3}$.

5) **D**. First, let's expand the left side to get something like the equation below.

$$abx^2+5ax+2bx+10=21x^2+41x+10$$

Notice that ab is the coefficient of x^2. With a little "matchy matchy," matching up coefficients of the x^2 terms on both sides of the equation above, we see that $ab=21$. We also know from the problem that $a+b=10$, so we can isolate b in this given equation and use substitution into the equation we just created to find out the value of a.

$$b=10-a$$
$$a(10-a)=21$$
$$10a-a^2-21=0$$
$$a^2-10a+21=0$$

We can now factor this quadratic and solve for its solutions.

$$(a-7)(a-3)=0$$

a can either be 7 or 3, which would in turn make b 3 or 7 respectively as these two variables again add to 10. However, the problem states that $a>b$ so the value of a must be 7

6) **A**. Set up the quadratic equation to equal to 0.

$$x^2-3x-1=0$$

Since the equation is not factorable, we must use the quadratic formula to find the solutions to this equation.

$$x=\frac{-(-3)\pm\sqrt{(-3)^2-4(1)(-1)}}{2(1)}$$
$$x=\frac{3\pm\sqrt{9+4}}{2}$$
$$x=\frac{3\pm\sqrt{13}}{2}$$

7) **A**. Substitute c into function k to find out the quadratic function.

$$k(x) = 4x^2 + 3x + 5x + 3$$

$$k(x) = 4x^2 + 8x + 3$$

When we factor this function, we get:

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

Now we solve for the solutions:

$$2x + 3 = 0$$
$$2x = -3$$
$$x = -\frac{3}{2}$$

$$2x + 1 = 0$$
$$2x = -1$$
$$x = -\frac{1}{2}$$

8) **C**. Add 144 to both sides to set the quadratic equal to 0.

$$18x^2 - 108x + 144 = 0$$

Now factor:

$$(6x-12)(3x-12) = 0$$

Now solve for the possible x-values:

$$6x - 12 = 0$$
$$6x = 12$$
$$x = 2$$

$$3x - 12 = 0$$
$$3x = 12$$
$$x = 4$$

The two possible solutions for this quadratic equation are 4 and 2 so their sum would be 6.

9) **B**. First, we need to find out the value of a so we can determine what our quadratic function is.
We know that when x is 3, the output is 9, so we can use those values to determine the coefficient of x.

$$(3)^2 + a(3) - 12 = 9$$
$$9 + 3a - 12 = 9$$
$$3a = 12$$
$$a = 4$$

The coefficient of x is 4, so now we can plug in 6 to find the value of $h(6)$.

$$(6)^2 + 4(6) - 12 = h(6)$$
$$36 + 24 - 12 = h(6)$$
$$48 = h(6)$$

10) **A**. A fraction is undefined when the denominator is equal to zero. With this in mind, we set the quadratic expression in the denominator equal to zero and solve for x.

$$x^2+6x-40=0$$

When factored we get:

$$(x-4)(x+10)=0$$

When we solve for x we get 4 and -10 for our possible x values.