Civil Engineering problems –

Answer to Question #1:

The worker hours to do the job are 30 * 12 * 8 = 2,880 worker hours. In the second situation we let x be the number of hours per day, and so

$$24 * 10 * x = 2880$$
$$x = 2880 \div (24 * 10) = 12 \text{ hours a day}$$

So the job could be done by 24 workers in 10 days working **12 hours a day.**

Answer to Question #2:

We could think of this problem as having three variables, but with a little trick we can write it with just one. Let's define the amounts of material like this.

cement	= 3x
sand	= 6x
gravel	= 8x

We don't know x yet, but can you see that the ratios are correct?

The next step is to find x with this equation.

$$3x + 6x + 8x = 850$$
or
$$17x = 850$$

We can now solve for x.

$$\frac{17x}{17} = \frac{850}{17}$$

$$x = 50$$

But you're not finished yet. The final step is to compute 8x to get the amount of gravel needed to make 850 cubic meters of cement.

$8x = 8 * 50 =$ **400 cubic meters of gravel**

Let's check our answer using the original ratio of materials (3:6:8) and adding:

cement	= 3 * 50	= 150 cubic meters of gravel
sand	= 6 * 50	= 300 cubic meters of gravel
gravel	= 8 * 50	= 400 cubic meters of gravel
		850 cubic meters of gravel

Chemical Engineering problem –

Answer to Question #3:

The total must be 1.2 kg at 62%

Let W = the weight of 60% alloy
Let 1.2 – W = the weight of the 65% alloy

This ensures that the TOTAL weight is 1.2 since W + (1.2 – W) = 1.2

Therefore, the equation to satisfy is

$0.60W + 0.65(1.2 – W) = 0.62 * 1.2$

Then

$0.60W + 0.65(1.2 – W) = 0.744$

0.744 is the weight of pure silver in 1.2 kg of the final mixture.

Now we need to determine how much of the other two alloys are needed.
Simplifying the above equation we get:

$0.60W + 0.78 – 0.65W = 0.744$
$0.60W – 0.65W = 0.744 – 0.78$
$– 0.05W = – 0.036$

Divide both sides by –0.05 to find W

$W = 0.72$ kg

Earlier we said
Let W = the weight of 60% alloy
Let 1.2 – W = the weight of the 65% alloy

Therefore, the answer is
W = **0.72 kg is required of the 60% alloy**, and
1.2 – W = 1.2 – 0.72 = **0.48 kg is required of the 65% alloy**