PROBLEM #1
What does it cost to apply a chip and seal surface treatment to one mile of county gravel road?

SCENARIO:

Farmer Henrys has called several times now wanting something to be done with the one mile stretch of County Road 50 South lying in front of his farm. He claims that the traffic volume has risen significantly the last three years due to new development near the area.

You clock the distance from the highway yard at 25 miles on your pickup odometer. The gravel road shows the signs of heavy traffic volume, but the base looks sound. You estimate four hours of skilled motorgrader work to bring the surface to specifications. The vegetation is mowed on both sides of the road and the ditches are clean. Henrys must be responsible because the county mower has had several breakdowns this year and hasn't made it out this far.

During the inspection your assistant agrees that the surface treatment width is 20 feet.

Back at the office, you sit down at your desk to estimate the cost of this project. Pulling out your specifications for multiple surface treatments you decide that two treatments with 8's and 11's will be adequate. You estimate the spread rates to be:

The spread rate for the prime coat at 0.80 gallons per square yard.
The tack coat for 8's at 0.66 gallons per square yard.
The spread rate for 8's at 30 lbs per square yard.
The tack coat for 11's at 0.44 gallons per square yard.
The spread rate for 11's at 20 lbs per square yard.

The price at the quarry for gravel is $5.00 per ton. The petroleum company has delivered the bituminous material. You can just barely see the two smaller tankers near the chip spreader in the maintenance yard out of your office window. The prime coat cost 38 cents a gallon and the tack coat 47 cents a gallon.

How long is this job going to take? You estimate that the job will take one day and a half. That is if everything goes well with no breakdowns. A long half day to prepare the surface and apply the prime coat. Then the following day to apply the surface treatments.

You realize that the total cost of the project is more than just the cost of the materials, but also the real cost of the equipment as well as labor. The equipment available for the project are two double axle trucks with a capacity of 14 ton, the distributor truck, the motorgrader, the power broom, the chip spreader, and the pneumatic tire roller. Your past experience and cost records give the following cost per hour for the use of this equipment. The cost per hour includes depreciation, the operator, fuel, and maintenance.

<table>
<thead>
<tr>
<th>Equipment</th>
<th>Cost per Hour</th>
</tr>
</thead>
<tbody>
<tr>
<td>double axle truck</td>
<td>$44 per hour</td>
</tr>
<tr>
<td>motor grader</td>
<td>$60 per hour</td>
</tr>
<tr>
<td>chip spreader</td>
<td>$60 per hour</td>
</tr>
<tr>
<td>distributor truck</td>
<td>$70 per hour</td>
</tr>
<tr>
<td>power broom</td>
<td>$45 per hour</td>
</tr>
<tr>
<td>pneumatic tire roller</td>
<td>$50 per hour</td>
</tr>
</tbody>
</table>

You reach for a pad and paper and the calculator.

What is the estimated cost for this project?
PROBLEM #2
Removal of a 10,000 gallon underground tank from your maintenance yard.

SCENARIO:
Your assistant Gary stops by your office to show you an old maintenance record describing a 10,000 gallon diesel storage tank in your maintenance yard. It is described as being buried two feet below the surface. The drawing shows a cylindrical tank that looks longer than it is round, but no dimensions are given.

Gary says that the fill tube might be that four inch cap he noticed at the edge of the yard. Gary is able to remove the cap off the fill tube with a big pipe wrench. The measuring stick goes down into the ground a total distance of twelve and a half feet. Your tape measure reads two inches as the distance the fill tube is above the asphalt surface.

Back in the office, Gary remembers when the maintenance yard area was just gravel. That was before it was paved with four inches of asphalt material. The date on the maintenance record for the tank would indicate the surface was paved after the tank was originally set and described.

The county commissioners say that the tank is to come out of the ground immediately.

You reach for your pad of paper and the calculator.

How big an area of the asphalt surface must be dug up to remove the tank?

How much backfill is needed behind the removal of the 10,000 gallon underground tank?

How much asphalt material needs to be hauled to patch the hole made in the existing four inch asphalt surface?