In general, you want to try to make estimations by minimizing stuff you need to look up and just come up with a general scheme which can be refined later.

For the tree question, it looks like most of you looked up the answer first, and then retrofitted a procedure to get the "right" number. I expected that and this is something to correct.

Also in general, estimates mean not exact numbers. So for instance a percentage of 85% is the same as 100% for purposes of making an estimate.

Question 1: How many gallons of gasoline are used in the US on a daily basis?	
Assumptions	
USA Population	3.30E+08
Average Household size	2.5
Total households in US	**1.32E+08**
Percentage household with a car	85
Average Number of cars per household	2
Percentage cars that are operable	90
Aproximate number of cars in US in use	**2.02E+08**
Average miles driven per year per vehicle	15000
Average miles driven per day	41.10
Average total miles driven in US daily	**8.30E+09**
Average MPG	25
Total gallons/day in US	**3.32E+08**
Reality check: The ammount of gas used daily is 384 million gallons (2015).	

This is a good way to setup these problems, just make a table of what is needed to be known to solve the problem. There are many different ways to do estimations as you will see in the various ways the problems were approached

Question 1: How many gallons of gasoline are used in the US on a daily basis?

1) I drive less than the average person so I have decided to use data from a daily commut
   I am going to estimate that an average person drives 40 miles five days/week in a car t
   gets 20 miles/gallon of gas.
2) As of 2019 there were 227,754,100 licensed drivers.
3) 40 miles/day * 5 days/week = 200 miles / week
4) 200 miles/week / 20 miles/gallon = 10 gallons of gas/week
5) 10 gallons of gas/week / 7 days/week = 1.43 gallons of gas/day
6) 227,754,100 drivers * 1.43 gallons of gas/day = 325,688,363 gallons of gas/day

325 million

- Takes about 5 seconds to pick up 1 book
- 12 books per minute --> 720 books per hour
- Part time students work about 24 hours per 2 week
- 24 x 720 = 17,280 books picken up
- 2,000,000/17,280 = about 116 students needed

time to re-shelf 1 book: 10 min
total min for 2 million books: 10*2,000,000– 20,000,000–333,333.3 hours
work hours in 2 weeks: 80
work hours needed in two weeks to re-shelve books: 333,333.3/80= 4166.7 weeks
part time shifts in one work week: 2
part time workers needed: 4166.7/2– 2083
2083 students working 20 hours/week to reshelf the books in two weeks.
If there is one additional shift/day because the library is open late or students work 6 hours instead of 4: 333,333.3/120–2777.8 shifts/3 workers– 926 students

Books -> hours -> 2 weeks -> workers

1) 2 million books / 25 books/hour – 80,000 hours
2) 80,000 hours / 2 weeks = 40,000 hours/week
3) 40,000 hours/week / 20 hours/person = 2000 people/week (over estimation, ideally people would be faster but accounting for error)

Residential: (150 gallons per week) x (52 weeks) = 7800 gallons per year for one household

According to the census bureau, ~80% of residences in the US have a washing machine.

(104 million households) x (7800 gallons) = 811 billion gallons per year for residential sector

Question 3: How many gallons of water are used annually for washing clothes in the US?				
Assumtions			**Knowns**	
total us population	3.30E+08		weeks in year	52
average household size	3			
average gallons per load wash	35			
number of loads per week	4			
Calculations				
total gallons used weekly	1.54E+10			
total gallons annually for US	8.01E+11			

Number of trees on my 5 acre apartment complex property: 30
Number of acres in the world: 126,000,000,000
Number of trees in the world: 30* 126,000,000,000= 3,780,000,000,000
Acres without trees: ½
Acres with trees twice as dense: ½
3,780,000,000,000/2*2−3,780,000,000,000,000

4000 trillion --> reality check

Question 4: How many trees are there currently on the planet?

- 30% of earth's surface is forests
- 50,000-100,000 trees per square km
- 40 million square km of forest
- 40,000,000 x 75,000 = 3 trillion trees
- Error: trees in urban areas and in other areas not considered forests, planting of new trees, deforestation

The amazon forest is estimated to have about 400 billion trees. Almost 6 million square km of the amazon is forested. This means that the Amazon rainforest has about 65,000 trees per square km. Keeping this tree rate, the Congo basin is about 2 million square km, giving it an estimate of 130 billion trees. The island of New Guinea has about 51 billion trees at this rate. I would estimate the rest of the tropical rainforests of the world to cover about 2 million square km (central america, pacific islands, southeastern asia), giving us 130 billion more trees. These are super loose estimations, so I am going to give myself some estimate cushion.

I estimate that the tropical rainforests of the world hold about around one trillion trees.

Taiga:

The taiga (aka boreal forest) is the world's biggest land biome, occupying about 17 million square km across the globe.

I'm going to go with much less trees per square km here. I'm going to estimate an average of 30,000 trees per square km. Under that estimate, the Taiga is home to about 500 billion trees.

The rest of the world's forests:

I am going to assume that the rest of the world's forested areas are between 10,000 and 40,000 trees per square km. I am referring to Pacific NW, Eastern US, most of Europe, and central Asia. These large regions are generally considered to have abundant woodlands and natural forested areas. I estimated the rest of this forested land mass to be about 31 million square km, and with an overall average of 20,000 trees per square km, that gave me 1.6 trillion trees.

I estimate about 3.1 trillion trees on Earth

Question 5: How many total miles does the US Interstate system comprise? (yes you can easily find the answer which is about 48,000 miles - the point here is figure out how to estimate that number)			
Assumptions		**Knowns**	
Appoximate number of east/west interstate routes	7	total interstate length in miles	48000
Appoximate number of north/south interstate routes	17		
Average length from eastcoast to west coast	2800		
Average length from southern border to northern border	1600		
Total east west interstate miles	19600		
total north south interstate miles	27200		
total interstate miles	46800		

How Many Vehicles	1.5 per household	130 million households	About 200 million vehicles	Estimate 50 miles a day driven	25mpg = 2 gallons per day per vehicle	400 million Gallons per day

Books per day Per student	>100 <10000	So say 1000	2million / 1000 = 2000 days	2000/14 =140 Workers needed		

130 million households	2 loads per week =100 per year	Gallons per load (large range) adopt 25	130 million x100 x25	350 billion gallons	US uses about 300 billion gallons per day

How many trees are there in the World?

What is the Earth's Land Surface?

(4)(pi)*6400 km^2*25% ~400 million km^2

What percent of the Earth is Tree Habitable?

Certainly not 100% but likely greater than 50%; so let's say 75% (which is really no different than 100% in this kind of estimation)

How many trees are there in a typical square km?

Don't know – do some research

Amazon basin, from satellite images has about 400 billion trees over 5.5 million sq km of rain forest or about 75,000 trees per sq km

Tree plantations in PNW ~ 120 trees/acre ~ 30,000 trees per sq km

Woodall etal 2005: The relative density of Forests in the US shows an average of about 100 trees per hectare ~ 10,000 km^2

Most of the world is neither the amazon basin or a managed forest in the PNW; so we will assume the rest of the world, over large areas (Europe, Russia, china, etc) comes in at 10,000 trees per sq km

So, let's use that and see what we get:

400 million *.75 * 10,000 = 3 trillion trees

Note: In Sept. 2015 Crowther et al based on detailed analysis arrived at a global figure of 3.04 trillion which they claim was an order of magnitude large than originally estimated – by the way 10% of 3 Trillion = amazon basin!