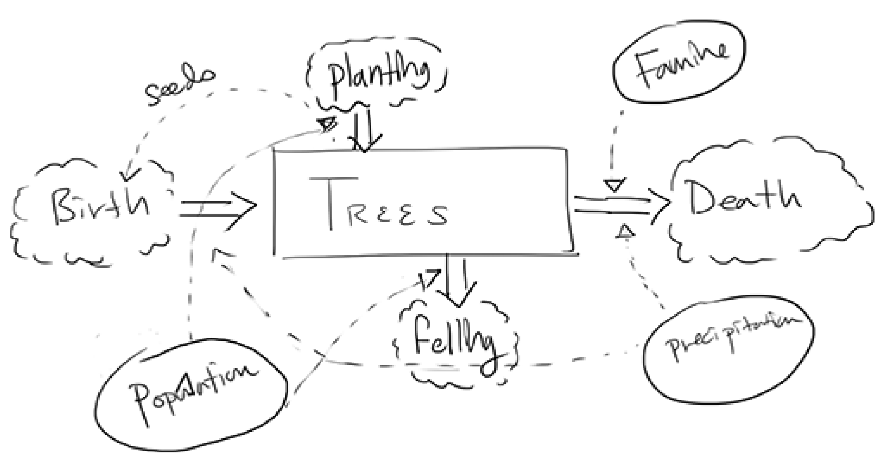
Exercise 1-1.

1. Stocks
2. Stocks
3. Stocks
4. ~~Flows~~ Neither; after I sought explanation from the solutions, I understood it as it neither represented a quantity, nor contributed to it.
5. ~~Stocks~~ Neither; I thought since there is a set cap to the battery charge, it may as well be conceptualized as a contained quantity (like water in a bowl); i.e. although it is not a physical quantity, it can be mathematically quantified, in numbers, dependent on inflow(charging) and outflow(use)
6. Flows
7. ~~Stocks & Flows~~ Neither; I thought speed is a stock since it is certainly a quantity that stays put (the law of inertia) without external interference, which is acceleration/deceleration. Likewise, I thought speed is also a flow since it impacts the distance of the runner from a fixed point. Although the solution does not regard distance as a stock, I reasoned that since distance is also a scalar quantity, it might as well be a stock – I may be in for too much abstraction.
8. Stocks
9. ~~Stocks~~ The reasoning is akin to that of #7(since it represents a rate).
10. Stocks
11. ~~Stocks~~ The reasoning is akin to that of #7.
12. ~~Flows~~ I missed the “per adult” part.
13. Flows
14. Stocks
15. Flows
16. ~~Flows~~ Again, I thought temperature might as well be regarded as a stock, but I may be in for too much abstraction.

Exercise 1-2.



- Tree = The net amount of trees in the Northeastern United States
- Birth = “Source” of tree influx, impacted by seeds which are dependent on the size of tree stock.
- Death = Destination of dead trees.

- Population = Human population
- Planting = Deliberate efforts to reforestation, commanded by eco-loving people.
- Felling = Cutting down trees as to utilize them as resources, impacted by human demand.
- Famine = Diseases which often causes trees' decimation.
- Precipitation = Water supply, to which the sustenance of trees are reliant.
- I thought I was to delineate the relationship between the various labels in the diagram; to explicitly identify them in their conceptual representation :
- Source : Birth
- Sink : Death
- Stock : # of trees in Northeastern U.S.
- Inflow : Birth & Planting
- Outflow : Death & Felling
- Links & Variables : Human Population impacts Planting & Felling; # of trees impact the rate of birth; Precipitation affects the general growth and sustenance of trees – thus birth and death. Famine accounts for (partially) the death rate of trees.
- Generally, I feel that this model is more or less adequate in describing the dynamics of tree growth in New England; I certainly did not consider other natural factors, like sunlight, nutrients in the soil, harmful substances in the air, the supply of oxygen, etc., which I feel are often constant (at least in the observable time range) and would simply complicate the model.

Exercise 1-3.

(a) dW/dt = G(W,a,i) – E(e) – H(o)
(b) 1. dI/dt = P(I,R,Df) – C(I,Dc);
    2. dP/dt = D(R,T,Df) – P(I,R,Df);
    3. dU/dt = -D(R,T,Df);

In (a):

- W = Water in Lake Mead <Stock>
- t = Time point (…though trivial)
- G = Inflow through Glen Canyon Dam <Flow>
- a = Availability of water <Variable>
- i = Inflow Policy <Variable>
- E = Outflow through Evaporation <Flow>
- e = Evaporation rate <Variable>
- H = Outflow through Hoover Dam <Flow>
- O = Outflow Policy <Variable>

In (b) :

- I = Current Inventory <Stock>
- t = Time point (trivial)

- P = Production <Flow>
- R = Proven Reserves <Stock>
- Df = Forecasted Demand <Variable>
- C = Consumption <Flow>
- Dc = Current Demand <Variable>
- D = Discovery <Flow>
- T = Technology <Variable>
- U = Ultimately recoverable oil <Stock>

Exercise 1-4.

update_stocks.m :

```
reserve = reserve- 32; %billion barrels
inventory = inventory + 32 - 32; %ditto
```

check_stocks.m :

```
disp(reserve); %billion barrels
disp(inventory); %ditto
```

Execution:

```
>> reserve =1700;
>> inventory = 6.9;
>> check_stocks
    1700
  6.9000

>> update_stocks
>> check_stocks
    1668
  6.9000

>> update_stocks
>> check_stocks
    1636
  6.9000

>> update_stocks
>> check_stocks
    1604
  6.9000
```

- Running the scripts thereafter yielded a linear decrease of the inventory (-32 billion barrels/year).

- This model is inadequate for the prediction of global oil supply, due to its naïve assumptions (constant rates). That is, it fails to take account of technological innovations which can factor into the efficiency of oil use and perhaps the demand for oil altogether: i.e. the development of alternative energy sources or – in the negative side – the emergence of a new industry which may greatly increase the demand for oil.