OO Design and Programming

2nd Tutorial

Bikes and Tyres

Consider the following simplified description of tyres and bikes.

> A tyre has a current pressure (a floating point number), and an immutable maximal pressure (a floating point number). When a tyre is created, its current pressure is set half its maximal pressure. Every time a tyre is inflated, its current pressure increases by 10.00, unless the current pressure exceeds the maximal pressure, in which case the current pressure is set to 0.0. The details of a tyre may be printed, which consist of the maximal pressure, the current pressure, and the pressure ratio (the ratio of current pressure to maximal pressure).
>
> A bike has a front tyre, a back tyre, and an immutable maximal speed (a floating point number). The speed of a bike is calculated as the product of its maximal speed and the minimum of the pressure ratios of the two tyres. The details of a bike may be printed, which consist of the maximal speed, the current pressure, and the details of the two tyres.

a Develop a UML class diagram to describe the above.

b Write C++ class headers to support the above (ie no bodies).

c Write C++ functions to test the functions of the classes in b.

d Write a C++ main program where:

- Tyre `w1` has a maximal pressure of `80.0`, and tyre `w2` has a maximal pressure of `30.0`. Bike `b` has tyre `w1` at the front, and `w2` at the back, and a maximal speed of `100.`
- Tyres `w1` and `w2` are inflated
- The details of `b` are printed.

e Write the bodies of the functions introduced in b.