Car Engineering Concept Design

When setting to the task of conceiving a new car, I remind myself what the basics of an automobile are:

“a self-propelled means of transporting PEOPLE”

The starting point I use is the PEOPLE needing to be transported.

In the Ferrari case, it so far means 1 (racing single seaters), 2, or 4 people.
Meet OSCAR, the car designer’s manikin:
OSCAR’s “zero” is the so-called H-Point, which corresponds to the hip joint.
Starting from the H-point, the interior space requirements may be defined:
The H-Point travels as a result of the seat’s adjustment travel envelope
If the car we are designing needs a more upright stance, the foot-to-H point vertical distance will increase, while the longitudinal distance will decrease.
Extreme sports cars need a very reclined stance in order to reduce vehicle height; the foot-to-H point vertical distance will decrease, while the longitudinal distance will increase.
Cars with more than one row will derive their overall dimension also from the distance between the rows of seats.
Ferraris historically have never had more than two rows
The distance between front and rear row determine the leg space the second row will have; this dimension directly influences wheelbase.
Once the stance and interior space have been established, the vehicle’s height becomes an almost direct consequence.

These consideration are needed in three dimensions (width).
Some basic requirements for cabin entry and exit need to be defined
→ door seal limits
→ possible door hinge axis
Other vehicle components can now be laid out

Rarely can component characteristics be specified as a vehicle’s concept progresses; we are usually dealing with a given component set (engine, transmission, suspension) if not with a complete platform.
Wheel positioning is very critical in determining front-to-rear mass bias, which in turn affects greatly the vehicle’s three main dynamic areas:

**CORNERING - TRACTION - BRAKING**

It is a very iterative process; it helps if the general vehicle architecture has been envisioned before starting, otherwise it will turn into a journey in the unknown, which is generally unsatisfactory.
Wheel positioning in width is affected by relatively few elements; Front wheels are placed allowing for engine, structure, and steer angles...
...rear wheels are placed allowing mostly for cabin space and/or alignment with front wheels
Other vehicle requirements have to be brought in...
→ fuel capacity as a consequence of desired range
→ luggage space
... as well as safety considerations...

→ crash collapse space
→ occupant space for safety
... and legislation:

→ visibility
→ bumper placement
At this point, the vehicle’s main dimensions and proportions are preliminarily set longitudinally, vertically,...

→ wheelbase
→ overhangs and therefore overall length
→ ground clearance and overall height
...and laterally

→ front and rear tracks
→ front and rear passenger access
→ head space (roof width)
→ overall width + door opening
THE BASICS NEEDED IN ORDER TO KICK OFF THE STYLING ACTIVITY ARE ESTABLISHED

→ we have the

VEHICLE PACKAGE!