

## Making a Pedal Pitch - Possible Research Topics

The following are some ideas for guiding a brainstorming session. Numbering corresponds to exercise numbers.

1. Wheel diameter:
  - Is it possible to fill front panniers so full that the bags limit the turning radius of the bicycle?
  - What is the turning radius needed for streets that intersect at various angles?
  - Does the size of the wheel affect the turning radius (compare a BMX bicycle with a mountain bicycle)?
  - Is there a relationship between wheel diameter and coasting distance?
2. Banking of race courses:
  - Calculate the speeds for which a particular bicycle racecourse or velodrome is designed.
3. Reading and making graphs:
  - Create a time and distance graph to describe a summer biathlon competition (cross-country cycling and marksmanship).
  - Create a time and distance graph to describe an Ironman Triathlon (running, swimming, cycling)
4. Bicycle falling over:
  - Has a bicycle or tricycle falling over been used in comedy? Do they fall over at fast or slow speeds?
  - Why are bicycle helmets needed?
  - Who wears them ... in your community, in your state, nationally?
  - For a child, teen, or adult, what is the sitting height on a typical tricycle or bicycle for each age group (hot wheels, small bicycle, BMX, trail bicycle, touring bicycle, racing bicycle, an old fashioned bicycle with large front wheel and small back wheel, unicycle)?
  - What are safe ways to transport a child using a bicycle? Is a child safer seated behind the rider, in front of the rider (using a specialized seat and pedals), in a towed cart? See <http://www.burley.com/>.
5. Power:
  - What are the advantages and disadvantages of a recumbent bicycle?
  - What are current speed records for bicycles?
  - What limits the upper speed of a bicycle?
  - What is drafting? See the movie *Breaking Away*.
  - How much power is generated by all the bicycles being ridden simultaneously in a fitness or health club?
  - How many minutes or hours of bicycling energy is provided by a “Power Bar”?

6. Average speed:
  - Research the Tour de France and Race Across America and calculate average speeds for these bicyclists. Compare the races and speeds in view of terrain (elevation, steepness of hills or mountains, lengths of races or stages, etc.)
  
7. Gearing:
  - Do we need to buy a 21-speed bicycle for commuting on a flat road?
  - What is the fewest number of gear needed for various activities?
  - Is it true that some bicycles have only one gear in velodrome races?
  
8. Miscellaneous:
  - What are the benefits of licensing bicycles?
  - What are the benefits of having a rider's license for bicycle riding?
  - When is it correct to ride facing traffic (if ever) and when is it correct to ride with traffic (if ever)?
  - Art and math: Create a video presentation that shows the path of a reflector mounted on a wheel as the bicycle travels from left to right. Research the resulting curve.
  - History: How did Orville and Wilbur Wright use bicycles to research flight and help them build their airplane?
  - Circus performers: Why did tightrope performers on a bicycle use a long pole? How does the bicycle stay on the tightrope?
  - Engineering: What is the relationship between frame tubing size and weight allowances?

Advice for students: As you conduct research, something more interesting is likely to appear. That is a typical life experience. Finish your original topic and then use any remaining extra time and energy on the item that caught your attention. Do something extra with it, for the edification of everyone.