

Some Fermi Questions

Note to teachers: This is NOT a student worksheet but a source of questions and ideas. Questions vary in their difficulty, so you will need to be selective.

Fermi questions often require students to make reasonable assumptions and estimates about the situation in order to come up with an approximate answer. Students should be reminded of the need to be able to explain and justify what they did when coming up with their solutions. Students' answers may differ from each other, but if students have made sensible estimates and assumptions then the different answers should be "close" to each other. Take advantage of opportunities to discuss students' different solution strategies and the effect of assumptions and estimates. You can also invent your own Fermi questions based on class experiences (e.g., after a trip to the zoo you might ask students how many fish are consumed by the seals in one year).

- 1) How many people could you fit into the classroom? How many soccer balls?
- 2) How old are you if you are a million seconds old? A million hours old? A million days old?
- 3) Could you fit \$1,000,000 worth of \$1 coins in your classroom? What about a billion dollars worth of \$1 coins?
- 4) How much money is spent in the school canteen each day? In a week? Over the year?
- 5) If all the people in Australia joined hands and stretched themselves out in a straight line, how long would it reach?
- 6) How long would it take to count to a million?
- 7) If all the people in the world moved to Victoria, how crowded would it be?
- 8) How many cups of water are there in a bath tub? What about in an Olympic pool?
- 9) How many grains of rice are in a 10kg bag?
- 10) How many pages would be needed to show a million stars?

- 11) How many children are needed to have a mass the same as an elephant?
- 12) How many packets are needed to measure a single line of M&Ms to a distance of 100m?
- 13) How many jelly beans fill a bucket?
- 14) How long would it take to drive to the moon (if you could!)?
- 15) What is the total mass in kilograms of all the students in your school?
- 16) What is the weight of garbage thrown away by each family every year?
- 17) How many pizzas are eaten by our class in one year?

- 18) If you had a stack of \$2 coins as tall as Mt Kosciusko, what would it be worth? Could you fit all the coins in your bedroom?
- 19) How far could you walk in one year?
- 20) How much water does your household use each week? Can you answer this without using a water bill?
- 21) How many blades of grass on a school oval?
- 22) Spend exactly \$1,000,000 using things for sale in the newspaper
- 23) How much paper is used at our school each week?
- 24) Imagine the earth is at one end of the school oval and the moon is at the other end. How far away is the sun?
- 25) How many beats will your heart make in a lifetime?
- 26) How many bricks are there in one wall of the classroom? The whole school?
- 27) How many books are read by children in our school/class in one year? About how many pages is that?
- 28) What distance will a ball point pen write?
- 29) How many times did the wheel of the bus turn on the class excursion?
- 30) How big a block of chocolate could you make using all the chocolate eaten by the class in a year?
- 31) How long would our class have to save to buy a car?
- 32) Get students to pose their own questions ...

Sharing and discussing strategies is paramount to this work.

Some useful information:

Radius of the earth: about 6,400 km
Distance of the earth from the sun: about 150 million km
Distance of the moon from the earth: about 380,000 km
Population of the world: about 6 billion
Population of Australia: about 20 million
Population of Melbourne: about 3.5 million
Area of Tasmania: about 68000 square km
Area of Victoria: about 228000 square km
Area of Australia: about 7,700,000 sq. km
Height of Mt Kosciusko: 2230m