Fermi Questions
Beachwood Invitational 1/28/23
Answer Key

Question	Answer
1. How many students are competing in today's Beachwood Invitational Division C across all teams? **15 students per team, 31 teams, 15*31 = 465, 4.65*10^2, Answer: 2**	**2**
2. How many Earths, placed side-by-side, would it take to stretch across the Milky Way Galaxy? **The Earth's diameter is about 8,000 miles. The Milky Way is about 100,000 lightyears across. A lightyear is 5.88*10^12 miles. (5.88*10^12)*100,000/8,000 = 7.35*10^13. Answer: 14**	**14**
3. How long ago, in months, was the first Science Olympiad National Tournament? **According to the SOINC website, the first Science Olympiad National Tournament was in 1985. This occurred about 38 years ago, 38*12=456 months ago, or 4.56*10^2. Answer: 2**	**2**
4. What is the population density of Ohio, in people per acre? **The population of Ohio is approximately 11.78 million people. Ohio covers 28.688 million acres. 1.178*10^7 / 2.8688*10^7 = 0.4106 = 4.16*10^-1. Answer: -1**	**-1**
5. How many matchbox cars placed end-to-end would it take to make a straight line from Cleveland, OH to Cincinnati, OH? **A standard matchbox car is 7 centimeters long. Cleveland to Cincinnati is 352 kilometers. 352 km / 7 cm is 5.028*10^6. Answer: 7**	**7**
6. How many volleyballs would fit in Lake Erie? **The volume of Lake Erie is 119 cubic miles, or 484 km^3. A volleyball has a volume of 3,635 cubic centimeters. 484 km^3 * (1*10^15 cm^3/km^3) / 3,635 cm^3 is 1.33*10^14. Answer: 14**	**14**
7. 7^17 **7^17 = 2.3*10^14. Answer: 14**	**14**

Question	Answer
8. 13^46 **13^46 = 1.74*10^51. Answer: 51**	**51**
9. How many Earths would fit in the Moon? **Volume of the Earth is 1.083*10^12 cubic kilometers. Volume of the Moon is 2.19*10^10 cubic kilometers.** **(2.19*10^10)/(1.083*10^12) = 0.0203 = 2.03*10^-2. Answer: -2**	**-2**
10. How many total legs would there be in a great hundred dogs plus a score of cats? **Great hundred is 120. Score is 20. Dogs and cats have 4 legs. 140*4 is 560. 5.6*10^2. Answer: 3**	**3**
11. How many honey bees are there in the world? **According to scientific studies, there are approximately 2 trillion honey bees. 2*10^12. Answer: 12**	**12**
12. How long, in minutes, would it take the average person to type Shakespeare's *Romeo and Juliet*? **Romeo and Juliet has 24,545 words. The average person types 40 words per minute. It would take 613 minutes, or 6.13*10^2 minutes. Answer: 2**	**2**
13. How many days ago did John Hancock "John Hancock" the Declaration of Independence? **John Hancock was the first signer of the Declaration of Independence on August 2, 1776. This was approximately 90,000, or 9*10^4 days ago. This can also be estimated by saying it was about 250 years ago, with about 300 days in a year. This gives an answer of 75,000, or 7.5*10^4, days, and 250*65 won't be enough to reach 500,000 days, so this is an acceptable estimate. Answer: 5**	**5**
14. If the entire US population stood in a socially-distanced line, how many millimeters would it stretch? **335 million people. 3.35*10^8 * 6 feet * 12in/ft * 25.4mm/in = 6.126*10^11 mm. Answer: 12**	**12**
15. What is the land area of Earth in hectares? **According to the UN Food and Agricultural Organization, there are approximately 13 million hectares of land on Earth. 1.3*10^7 hectares. Answer: 7**	**7**

Fermi Questions

Question	Answer
16. How many runs have been scored in the history of Major League Baseball? **According to MLB, approximately 2 million runs have been scored. 2*10^6. Answer: 6**	**6**
17. How many accounts follow the most-followed Twitter account? **Currently, former President Barack Obama has the most followers, with 133.4 million. Answer: 8**	**8**
18. How many letters are in the English Alphabet? **There are 26 letters in English. 2.6*10^1. Answer: 1**	**1**
19. How many grains of rice are in a 10 kilogram bag of rice? **A grain of rice is 0.03 grams. 10 kg / 0.03 g is 333,333 grains, or 3*10^5. Answer: 5**	**5**
20. What are the odds of getting heads on 12 consecutive flips of a standard quarter? **The probability of getting heads on a single flip is 0.50. The probability of getting heads on 12 consecutive flips is 0.5^12, or 0.000244. 2.44*10^-4. Answer: -4** **Alternatively, the odds of heads on flip is ½. The odds of heads on 12 consecutive flips is 1/(2^12). Same answer either way!**	**-4**
21. How many Earths does a single water molecule weigh? **An H2O molecule weighs approximately 18 AMU (or 18 daltons). The earth weighs approximately 5.972*10^24 kg. An AMU is 1.6*10^-27 kg. 18*(1.6*10^-27)/(5.972*10^24) is 4.8*10^-51. Answer: -51**	**-51**
22. How tall was Robert Pershing Wadlow, the tallest known human in history, in attometers? **Robert Pershing Wadlow was 8 ft, 11.1 inches, or 2.72 m, at the time of his death. An attometer is 10^-18 meters, so Wadlow was 2.72*10^18 attometers. Answer: 18**	**18**
23. What is the weight of an average male Asian elephant, measured in average adult American men? **A male Asian elephant weighs about 5000 kg on average, and an average adult American man weighs about 90 kg. 5000/90 is 5.5*10^1. Answer: 2**	**2**

Fermi Questions

Question	Answer
24. How much does an average woman's fingernail weigh in rontograms? **A fingernail weighs approximately 1 gram. 1 rontogram is 10^-27 g. Answer: 27.**	**27**
25. What is the speed of light in meters per second? **The speed of light is 3*10^8 m/s. Answer: 8**	**8**
26. If every fish on earth was being hunted by every cat on earth, how many cats would there be per fish? **There are about approximately 600 million cats, and 3.5 trillion fish. (6*10^8) / (3.5*10^12) is 1.7*10^-4. Answer: -4.**	**-4**
27. How many gigaparsecs is it from Beachwood, OH, to Marietta, OH? **Beachwood to Marietta is about 252 km. One lightyear is about 10*10^13 km. One gigaparsec is 3.26 billion lightyears. 252 / ((10*10^13)*(3.26*10^9)) is 7.73*10^-22. Answer:: -21**	**-21**
28. How many text characters are in the content pages of Wikipedia? **The total content of Wikipedia contains approximately 25.2 billion characters. 2.5*10^10. Answer: 10**	**10**
29. How much electricity was used globally in 2022, in picojoules? **About 25,000 Terawatt-hours were used in 2022. A Terawatt-hour is 3.6*10^15 joules. 1 picojoule is 1*10^-12 joules. (2.5*10^4)*(3.6*10^15)/(1*10^-12). 9*10^31. Answer: 32**	**32**
30. How many regular M&Ms would fit inside the sun? Assume the M&Ms do not melt or stick together. **According to Mars Inc., who manufactures M&Ms, the volume of an M&M is 0.636 mL, or 6.36*10^-1 cm^3. The volume of the sun is 1.412*10^12 km^3. (6.36*10^-1)/((1*10^-15)*(1.412*10^12)) equals 2.2*10^27 M&Ms. Answer: 27**	**27**
31. How many standard lab goggles would it take to equal the weight of a full-grown adult blue whale? **Lab goggles weigh approximately 70g, or 0.07kg. An adult blue whale weighs approximately 150 tons, or 136,227kg. (1.36227*10^5kg)/0.07kg. That means it would take 1.946*10^6 goggles. Answer: 6**	**6**

Question	Answer
32. How many grains of sand are there on the beaches and deserts on Earth? **According to researchers at the University of Hawai'i, there are about 7.5*10^18 grains of sand in Earth's beaches and deserts. Answer: 19**	**19**
33. How many days would it take Usain Bolt to run the average distance from the Earth to the moon and back, assuming he runs continuously and at world-record pace the entire time? **Usain Bolt's world-record 100m dash took 9.58 seconds, making his speed 37.58 km/hr. The average distance between the earth and the moon is 384,400 km, making a round trip 768,800 km. 768,800 km / 37.58km/hr = 2.0457*10^4 hours. This means it would take Bolt a whopping 852 days to complete the trip! Answer: 3**	**3**
34. What is the brightness of the sun, in lumens? **According to NASA, the brightness of the sun is 3.57*10^28 lumens. Answer: 28**	**28**
35. How many fortnights ago did dinosaurs become extinct? **Dinosaurs went extinct about 65 million years ago. That is 2.372*10^10 days. There are 14 days in a fortnight, for a total of 1.69*10^9 fortnights. Answer: 9**	**9**
36. How many replacement passenger automobile tires are sold in the US every year? **According to researchers, about 222 million replacement tires are sold in the US per year. 2.22*10^8. Answer: 8**	**8**
37. What is the height of Mt. Everest in exameters? **An exameter is 10^18 meters. At the summit, Mt. Everest is approximately 8,848 meters tall, or 8.84*10^-15 exameters. Answer: -14**	**-14**
38. How many human babies are born every year? **According to the UN Population Division, there are about 133.99 million babies born every year. Answer: 8**	**8**
39. An ampere is equal to how many electrons per second? **The definition of an ampere is 6.28*10^18 electrons moving past a point per second. Answer: 19**	**19**

Question	Answer
40. How many faces are there on a rhombicosidodecahedron? **A rhombicosidodecahedron, aka Rectified Rhombic Triacontahedron, is an Archimedean solid. It consists of 20 triangular, 30 square, and 12 pentagonal faces, for a total of 62 faces. Answer: 2**	**2**
41. How many standard Oreos placed flat, side by side, would it take to circle the earth at the equator? **According to Nabisco, Oreos are 4.45 cm wide, about 5 cm. The distance around the Earth at the equator is 40,075 km, about 40,000 km. That means it will take about 800,000,000 Oreos to go around the earth, or 8*10^8 cookies. Answer: 9**	**9**
42. How many keys are on a standard piano? **A standard piano has 88 keys. Answer: 2**	**2**
43. How many pizzas are ordered in the US every year on Super Bowl Sunday? **According to the American Pizza Community, there are about 12.5 million pizzas ordered on Super Bowl Sunday in the US. Answer: 7**	**7**
44. What is the volume of Lake Erie, in attoliters? **The volume of Lake Erie is approximately 119 cubic miles, or 480 km^3, or 4.8*10^11 kiloliters. There are 10^21 attoliters per kiloliter, so 4.8*10^32 attoliters. Answer: 32**	**32**
45. What is the volume of a regulation golf ball, in hectoliters? **A regulation golf ball is 43mm in diameter, making its volume 40.677 cm^3. 1 cm^3 = 1 mL, and 1 mL = 1*10^-5 hL. This means the volume is 0.0004 hL = 4*10^-4 Answer: -4.**	**-4**
46. How long would it take a person walking at average human walking speed to travel the distance from NYC to LA? **The average walking speed of a human is 3 mph. The distance between NYC and LA is about 2,445.55 mi. 2.445*10^3 miles / 3 miles/hour = 815 hours = 8*10^2 hours. Answer: 3**	**3**

Question	Answer
47. How much water goes over Niagara Falls every year, in teraliters? **According to the Niagara Falls State Park, 757,500 gallons of water go over Nlagara Falls every second. That makes $6.5448*10^{10}$ gallons per day. There are 3.79 liters in a gallon, and 365 days in a year. $9.05*10^{13}$. Teraliter is 10^{12}. $9.05*10^{13}/10^{12} = 9.05*10^{1}$. Answer: 2**	**2**
48. How many leaflets do *Aesculus glabra* (Ohio Buckeye) leaves usually contain? **One of the notable traits of the Ohio Buckeye is having leaves with 5 leaflets. $5*10^{0}$. Answer: 1**	**1**
49. 78^{42} **About $3*10^{79}$. Answer: 79**	**79**
50. How many calories will your team expend on this test if you use your full time allotment? **An hour of light work, such as test taking, expends about 120 Calories per hour. 1 Calorie = 1 kilocalorie, ergo, 120 Calories = 120 kilocalories. This test is 50 minutes, so it burns about 100 kilocalories. 100 kcal*10^{3} cal/kcal = 100,000 calories = $1*10^{5}$ calories. If you have a teammate, your total calories expended = $2*10^{5}$. The exponent is the same in both cases, Answer: 5.**	**5**