

# Yale Physics Olympics

Team Name \_\_\_\_\_

## Fermi Quiz

*Aim:* To estimate the values of various quantities. 15 Questions total!

*Materials:* Pen, paper, and 4 imaginative, innovative minds. **Use of electronic devices is seriously frowned upon (FORBIDDEN) for this event.**

*Method:* Except for question 15, provide only the power of 10 (it can be negative!) that best answers the question by combining quantities you already know. Question #15 will be a tiebreaker for all events and will not be scored unless there is a tie.

*Conditions:* The answers must be entered in the units specified. **WRITE CLEARLY!**

*Ranking:* Each question's score is based on the difference between our answer and your answer. **A penalty applies for leaving answers blank**, so take your best guess if you can't calculate an answer or don't have time.

1) **How many times** could you cover the US with dollar bills if you created a physical dollar for all US currency in circulation?  times  
Answer: 10   
(Hint: circ. = \$2.3 trillion)

2) Hanging downward from one end, how long can a human hair be **in miles** before it will break under its own weight (assume you are on Earth's surface)?  miles  
Answer: 10

3) **How many motor vehicles** are totaled **per year** in the world? Answer: 10  vehicles

4) What is the **ratio** of stars in the milky way to stars in the universe? Answer: 10

5) **How many people** in the US are currently on the phone talking to an actual real-life customer service representative?  people  
Answer: 10

(TURN OVER)

- 6) If you printed out every photo on every US resident's phone camera roll as a 4x6 inch photo, **how many trees** would you need? Answer: 10  trees
- 7) How many **words per minute** are being typed right now if you include everyone in the world? Answer: 10  wpm
- 8) If everyone in the world between the ages of 15 and 64 started running continuously, how long **in weeks** would it take for the collective distance traveled to add up to one light year? Answer: 10  weeks
- 9) As a **fraction of the total volume of Earth's oceans**, how much fresh water per century is flowing into it from all terrestrial sources (i.e. rivers, streams etc.)? Answer: 10
- 10) Within the US, what is the total **weight difference in kilograms** between their charged and uncharged states of all active phone batteries? (Hint:  $E=mc^2$ ) Answer: 10  kg
- 11) Assuming the US currency persists, how long will it take **in years** for the last physical penny to drop out of circulation if we stop making new ones now? Answer: 10  years
- 12) What diameter balloon (**in meters**) would you need to hold all the air in all inflated hollow sports balls? Answer: 10  meters
- 13) **How many battleships** could you build with all currently existing gym weights (dumbbells, kettlebells, barbell plates, machine weight stacks, etc)? Answer: 10  ships
- 14) What surface area **in square miles** could be painted with all the nail polish currently available for purchase? Answer: 10  sq. miles

For the following question, enter a number with **at least 4 significant figures** (e.g. xxxx).

- 15) **TIEBREAKER:** How **many years** would it take to cover the entire state of Connecticut with pizza given Connecticut's current daily production by all its pizza restaurants?

Give your answer to at least 4 significant figures.

Answer:  years