## multille # # 'S PL Mixer Round Answers

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## Fall 2014 CHMMC

1. 0.83; calculator; [0.7;1]

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- 2. 13.4L; current market rate; [6.7; 26.8]
- 3. about 400 billion; NPR; [200 billion; 800 billion]

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multille # # 3 PS

- 4. 45,086,079; Mathematica; [20 million; 100 million]
- 5. 45,060; Wikipedia List of spaceflight records; [22,500; 90,000]
- 6. 130 billion; Wikipedia; [65 billion; 260 billion]
- \* '3 % 7. 31,000; "How much time do Americans spend eating?." The Free Library. 2008 Frozen Food Digest, Inc. 10 Nov. 2014; [15,500; 62,000]

With the the the the

- 8. Not known exactly; my inbox; [400; 800]
- 9. Solving  $\frac{421+b}{421}\frac{b-1}{b} < 1$  gives  $b < \frac{1+\sqrt{1685}}{2}$ , so b < 20.99. Therefore he should sell when b = 20, or k = 345. minitute ## # B PK mutitute \$6 \*\* mistitute ## #
- 10. 45 6 = 39
- 11. player 1 loses
- 12. 8/7 Let 2y = x, so we are trying to find the max of

$$\frac{2^n y^n}{1+y+\dots y^{2n}}$$

By the AM-GM inequality, we know

$$\frac{2^{n}y^{n}}{1+y+\dots y^{2n}}$$

$$y^{n} = \sqrt[2n+1]{1+y+y^{2}+\dots y^{2n}} \le \frac{1+y+\dots y^{2n}}{2n+1}$$

with equality iff  $1 = y = \cdots = y^{2n} = 1$ . Thus the function maximizes at y = 1, giving  $\frac{2^n}{2n+1}$ . mythte # # '& R myitte # \*\* it's 13. 2/3 Telescoping, we see that 

astitute # # 13 PK

y

$$a_n = a_1 - \frac{z}{1} + \frac{z}{2} + \frac{z}{n} - \frac{z}{n+1}$$

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Therefore,  $a_n = \frac{z(n+1)-zn}{n(n+1)} =$  $\frac{z}{n(n+1)}$  so  $a_y = \frac{z}{y(y+1)}$ .





