EXERCISE SET 4 ANSWER KEY

1. **A** According to the table, the population of culture A increases by 200 bacteria every minute, indicating a linear relationship with a slope of 200. (Remember that the slope of a function is equivalent to its **unit rate of change**.) Choice (A) is the only option that indicates a line with slope 200.

2. **B** The table indicates that culture B is not increasing linearly, since the population difference from minute to minute is not constant, but increasing. This rules out choices (A) and (D). By substituting $t = 0$, $t = 1$ and $t = 2$, we can see that only the function in (B) gives the correct populations. Notice that the base of the exponential, 1.2, indicates that the population grows by 20% each minute.

3. **C** At the 2 minute mark, the populations are 920 and 720, respectively, so culture A has a population that is $(920 - 720)/720 \times 100\% = 27.8\%$ greater.

4. **B** If we use the population equation (see question 1), we can solve for t. Plugging in 2,000 for P gives us $2{,}000 = 200t + 520$, which gives a solution of $t = 7.4$ minutes. Since 0.4 minutes equals $0.4 \times 60 = 24$ seconds, the time elapsed is 7 minutes 24 seconds.

5. **C** In the first 3 minutes, culture B grew from 500 to 864 bacteria, which is an increase of $(864 - 500)/500 \times 100\% = 72.8\%$.

6. **B** The total revenue for each ticket type equals the price per ticket times the number of tickets sold. Therefore, the price for each senior ticket is $\$96 \div 16 = \$6$.

7. **D** One adult ticket costs $\$630 \div 84 = \$7.50$, and one student ticket costs $\$495 \div 110 = \$4.50$, so each adult ticket costs \$3 more.

8. **C** The average price per ticket equals the total revenue for all tickets divided by the number of tickets: $(\$630 + \$200 + \$96 + \$495)/250 = \$5.684$.

9. **A** The median price of 250 tickets is the average of the prices of the 125th and 126th tickets, if the price for each ticket is listed in increasing order. The ticket prices, in increasing order, are \$4.50 for students (110 tickets), \$5.00 for children (40 tickets), \$6.00 for seniors (16 tickets), and \$7.50 for adults (84 tickets). With this ordering, the 125th and 126th price are both \$5.00.

10. **B** The earliest the first Tuesday could be is the 1st, so the earliest the third Tuesday could be is the 15th.

11. **C** The latest the first Tuesday could be is the 7th, so the latest the third Tuesday could be is the 21st.

12. **C** In 1970, nuclear energy consumption was 0.24, and in 1990 it was 6.10. This represents an increase of $(6.10 - 0.24)/0.24 \times 100\% = 2{,}442\%$.

13. **D** In 2010, non nuclear renewables accounted for $8.09/97.63 \times 100\% = 8.3\%$ of consumption, which would correspond to a $0.083 \times 360° = 29.88°$ central angle.

14. **B** In 1970, the total "non-greenhouse" energy was $0.24 + 4.07 = 4.31$. Therefore the percent that was nuclear is $0.24/4.31 \times 100\% = 5.6\%$.

15. **D** In 2010, this percent was $8.43/(8.43 + 8.09) \times 100\% = 51\%$.

16. **C** The total non nuclear renewable energy consumption for the four years is $2.98 + 4.07 + 6.04 + 8.09 = 21.18$, and the total energy consumption is $34.61 + 67.84 + 84.47 + 97.63 = 284.55$. Therefore the percent is $21.18/284.55 \times 100\% = 7.4\%$.

17. **D** In 1950, fossil fuel consumption was 31.63, and in 2010 it was 81.11. This is an increase of $(81.11 - 31.63)/31.63 \times 100\% = 156\%$.

18. **B** In 1970, the renewability index was $4.07/67.84 = 0.060$, and in 2010 it was $8.09/97.63 = .082$. This is a percent increase of $(0.082 - 0.060)/0.060 \times 100\% = 37\%$.

19. **B** In 1990, the percent of consumption from fossil fuels was $72.33/84.47 \times 100\% = 85.6\%$, and in 2010 it was $81.11/97.62 \times 100\% = 83.1\%$.

20. **A** The annual rate of increase is the total increase divided by the time span in years. The total increase is $8.09 - 2.98 = 5.11$. Over a 60-year span, this gives a rate of $5.11/60 = 0.085$.

21. **C** In the 40 year span from 1970 to 2010, fossil fuel consumption increased at a rate of $(81.11 - 63.52)/40 = 0.44$ QBTU/Yr. In 25 more years at this rate, the consumption should be $81.11 + 25(0.44) = 92.11$ QBTU.