**ECON 256: Midterm Practice Math/Formula Questions**

1. Suppose a country has a population of 20 million people and a GDP of 1 billion dollars. What is the GDP per capita of the country?

   GDP per Capita = $1billion/20million = $1000million/20million people = $50/person

2. Population by Daily Income (PPP)

| Daily Income | Between 0 and 50 cents | Between 50 cents and 1 dollar | Between 1 and 1.5 dollars | Between 1.5 and 2 Dollars | Total Population of Country |
|---|---|---|---|---|---|
| Millions of Persons | 2 | 3 | 5 | 7 | 30 |

Suppose the Poverty Line is $2/day. What is the Poverty Headcount Ratio (Poverty Rate) in percent?

$$H = \frac{2+3+5+7}{30} = \frac{17}{30} = 0.57 = 57\%$$

3. Use the following formula: Total Growth $= 100 \times \left(\left(\frac{100+r}{100}\right)^N - 1\right)$. If the growth rate is 10 percent, what will total growth be after 2 years? (Reported as percentage and rounded to nearest integer)

$$\text{Total Growth} = 100 \times \left(\left(\frac{100+10}{100}\right)^2 - 1\right) = 100 \times (1.1^2 - 1) = 100 \times 0.21 = 21\%$$

4. Consider the production function $Y = K^{0.5}L^{0.5}$. How much output do we get if $K = 9$ and $L = 4$?
   - **A.** 6.5, **incorrect since formula is not $\frac{9}{2} + \frac{4}{2}$**
   - B. 5, **incorrect since formula is not $3 + 2$**
   - C. 6, since $(9)^{0.5} \times (4)^{0.5} = 3 \times 2 = 6$ <- This is correct answer
   - D. 9, **incorrect since formula is not $\frac{9}{2} \times \frac{4}{2}$**

The Dynamics of the Solow Growth Model are determined by the following two equations (I plugged in a savings rate of 10 percent, depreciation rate for capital of 10 percent, TFP=4, a capital share of 0.5):

$$\frac{K_{t+1}}{L_{t+1}} = (1 - 0.10)\frac{K_t}{L_t} + 0.10\frac{Y_t}{L_t}$$

$$\frac{Y_t}{L_t} = 4\left(\frac{K_t}{L_t}\right)^{0.5}$$

5. Suppose $\frac{K_0}{L_0} = 9$, what is $\frac{Y_0}{L_0}$? Use the above equations for the Solow Growth Model.

$$\frac{Y_0}{L_0} = 4\left(\frac{K_0}{L_0}\right)^{0.5} = 4(9)^{0.5} = 4 \times 3 = 12$$

6. Suppose $\frac{K_0}{L_0} = 9$, what is $\frac{K_1}{L_1}$? Use the above equations for the Solow Growth Model.

$$\frac{K_1}{L_1} = (1 - 0.10)\frac{K_0}{L_0} + 0.10\frac{Y_0}{L_0} = (0.9) \times 9 + 0.1 \times 12 = 9.3$$

7. In the Solow Growth Model, steady state output per worker is given by the equation

$$\frac{Y}{L} = A^{\frac{1}{1-\alpha}}\left(\frac{s}{\delta}\right)^{\frac{\alpha}{1-\alpha}}$$

Suppose $s = 0.4$, $\delta = 0.2$, $\alpha = 0.5$, and $A = 5$. What is $\frac{Y}{L}$?

$$\frac{Y}{L} = (5)^{\frac{1}{1-0.5}}\left(\frac{0.4}{0.2}\right)^{\frac{0.5}{1-0.5}} = 5^2 \times (2)^1 = 50$$

8. The Law of Motion for Capital is

$$K_{t+1} = (1 - \delta)K_t + I_t$$

Suppose $K_0 = 0$, the depreciation rate is 10 percent, and investment each period is always equal to 100. What is $K_2$?

$$K_1 = (1 - 0.10) \times K_0 + I_0 = (1 - 0.10) \times 0 + 100 = 0 + 100 = 100$$

$$K_2 = (1 - 0.10) \times K_1 + I_1 = (1 - 0.10) \times 100 + 100 = 90 + 100 = \mathbf{190}$$