Math SL PROBLEM SET 11

Section A (Short Answer)

1. **(SP5.5 - R) (CI)** Of the 28 students in a class, 12 have a part time job, 22 have a part time job or do regular volunteer work, and 4 of the students have a part time job and do regular volunteer work. ***(Cirrito 15.2, p508)***
   a. Display the data in a Venn diagram.
   b. How many of the students do not have a part time job or do not volunteer regularly?
   c. How probable is it that a student does volunteer work given that they have a part time job?

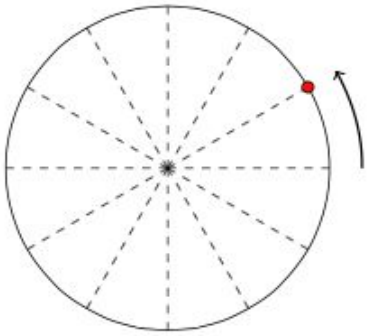
2. **(A1.2 - R) (CA)** Use your calculator to evaluate the following logarithmic expressions: $\log_6 36 =$?? and $\log_3 \frac{1}{9} =$??. So, in a log equation (like $\log_5 125 = 3$), explain the meaning/significance of the three numbers (the 5, the 125, the 3) ***(Cirrito 7.3, p217)***

3. **(A1.2 - R) (CA)** Solve the following logarithmic equations. ***(Cirrito 7.3, p217)***

   (a) $\log_2 x = 4$ (b) $\log_3 9 = x$ (c) $\log_4 x = \frac{1}{2}$

   (d) $\log_x 3 = \frac{1}{2}$ (e) $\log_x 2 = 4$ (f) $\log_5 x = 3$

4. **(T3.2 - E) (CA)** A wheel of radius 1 m has a single point marked on its circumference with a blob of red paint. Initially, the blob is level with the wheel's axle and the wheel is turned so that the blob rises initially. The blob starts to the right of the axle from our point of view, so initially it is 1 m to the right of the axle. ***(Cirrito 10.3, p337)***



   a. Use your calculator to determine how far the blob is to the right of the axle after the wheel has rotated through an angle of: 15°, 30°, 45°, 60°, 75°, 90°.

   b. Without using your calculator, determine how far the blob is to the right of the axle after the wheel has been rotated by 105°, 120°, 135°, 150°, 165°, 180°, 195°, 210°, 225°, 240°, 255°, 270°, 285°, 300°, 315°, 330°, 345°, 360°.

   c. Draw a graph showing how far the blob is to the right of the axle after the wheel has rotated through an angle of θ °.

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5. **(F2.1, F2.2, F2.5, F2.7 - R) (CI)** Consider the functions $f(x)$ and $g(x)$ where $f(x) = 3x - 2$ and $g(x) = x - 3$. ***(Cirrito 5.4.1, p148; Cirrito 5.4.2, p157)***

   a. Find the inverse function, f^{-1}.
   b. Given that $g^{-1}(x) = x + 3$, find $(g^{-1} \circ f)(x)$.
   c. Show that $(f^{-1} \circ g)(x) = \frac{x-1}{3}$.
   d. Solve $(f^{-1} \circ g)(x) = (g^{-1} \circ f)(x)$.

   Let $h(x) = \frac{f(x)}{g(x)}$, $x \neq 3$,

   e. Write down the **equations** of the asymptotes.
   f. Find the x- and y-intercept(s).
   g. **Sketch** the graph of h for $-6 \leq x \leq 10$ and $-4 \leq y \leq 10$.

Section B (Extended Response/Investigation)

6. **(F2.3; T3.4 - R) (CA)** Use your TI-84 and graph the function $T(x) = \cos(x)$ in Y_1 on the domain $-360° < x < 360°$. **(Cirrito 6.1, p167; Cirrito 6.2, p177)**

   a. Sketch $T(x) = \cos(x)$ and label the x-intercepts (zeroes) and **extrema** (max & min points)
   b. Then, on your calculator in Y_2, graph $Y_1(2x)$. Describe the graph - specifically how it has been transformed relative to Y_1 (being $y = \cos(x)$). What is the equation of this new function? Sketch it in your notes.
   c. Inactivate the equation in Y_2.
   d. Next, on your calculator in Y_3, graph $Y_1(\frac{1}{2}x)$. Describe the graph - specifically how it has been transformed relative to Y_1 (being $y = \cos(x)$). What is the equation of this new function? Sketch it in your notes.
   e. Inactivate the equation in Y_3.
   f. Then, on your calculator in Y_4, graph $Y_1(x - 60)$. Describe the graph - specifically how it has been transformed relative to Y_1 (being $y = \cos(x)$). What is the equation of this new function? Sketch it in your notes.
   g. Inactivate the equation in Y_4.
   h. Next, on your calculator in Y_5, graph $Y_1(x) + 2$. Describe the graph - specifically how it has been transformed relative to Y_1 (being $y = \cos(x)$). What is the equation of this new function? Sketch it in your notes.

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7. **(F2.3 - R) (CI)** Here is a graph of $y = f(x)$. Given the following mappings, identify the:

(Cirrito 6.1, p167; Cirrito 6.2, p177)

i. Transformations being communicated;
ii. Transform $y = f(x)$ and provide a graph of the new function (label critical points in your new graphs)

a. $g(x) = f(2x) + 3$
b. $g(x) = 4 - 2f(0.5x)$
c. $g(x) = -4 + 3f(x - 2)$