Math SL PROBLEM SET 69

Section A (Short Answer)

1. **(F5.9 - E) (CA)** Introducing standardized z values: Given the following means and standard deviations, determine the z-value of the given data points. **(Cirrito 17.2, p567)**
   a. If $\mu = 90$ and $\sigma = 10$, find the z-value of $x = 100$. What does this z-value MEAN?
   b. If $\mu = 45$ and $\sigma = 5$, find the z-value of $x = 40$. What does this z-value MEAN?
   c. If $\mu = 120$ and $\sigma = 18$, find the z-value of $x = 140$. What does this z-value MEAN?
   d. If $\mu = 90$ and $\sigma = 10$, find the z-value of $x = 75$. What does this z-value MEAN?

2. **(F5.9 - E) (CA)** Working with Standardized z values: Given the following means and/or standard deviations and/or z-values and/or x data values, find the unknown. **(Cirrito 17.2, p567)**
   a. If $\mu = 53$ and $\sigma = 5$ and $x = 50$, solve for z.
   b. If $\mu = 90$ and $x = 81$ and $z = -0.975$, solve for σ.
   c. If $\sigma = 55$ and $x = 200$ and $z = -1.5$, solve for μ
   d. If $\mu = 90$ and $\sigma = 20$ and $z = 1.88$, solve for x.

3. **(T3.1 - R) (CI)** Simplify the following expressions, i.e. write each equation in terms of a single logarithm. **(Cirrito 7.4, p221)**
   a. $2\log_a(x) + 3\log_a(x + 1)$
   b. $5\log_b x - \frac{1}{2}\log_b(2x - 3) - 3\log_b(x + 1)$
   c. $2\ln x - 4\ln(1/y) - 3\ln(xy)$

4. **(CA6.6 - E) (CA)** The velocity, v, in ms^{-1} of a particle moving in a straight line is given by the function $v(t) = 2 - \sqrt{16 - t}$, $0 \le t \le 16$. **(Cirrito 22.6, p764)**
   a. Graph the velocity function.
   b. When is the particle stationary?
   c. Find the total distance travelled by the particle and find the displacement of the particle.
   d. After 7 seconds of motion, the object is located at the origin. Hence, find the equation of the position function of this particle.
   e. Find the acceleration function of this particle.

5. **(SP5.8 - R) (CA)** An X-ray has a probability of 0.95 of showing a fracture in a leg. If 5 different X-rays are taken of a particular leg, find the probability that **(Cirrito 16.3, p548)**
   a. all five X-rays identify the same fracture.
   b. the fracture does not show up.
   c. at least 3 X-rays show the fracture.
   d. At most one X-ray shows the fracture.
   e. Draw a histograph of this distribution.

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6. **(SP5.7 - R) (CA)** The number of cars passing an intersection during the hours of 4 pm and 6 pm follows the probability distribution modelled by the function $P(X = x) = \frac{(0.1)^x}{x!}e^{-0.1}$, $x = 0,1,2,3...$ where the random variable X denotes the number of cars that pass this intersection between 4pm and 6pm. **(Cirrito 16.1, p533)**
   a. Find (i) $P(X = 0)$ (ii) $P(X = 1)$
   b. Find the probability of observing at least two cars passing this intersection between 4pm and 6pm.
   c. Draw a histograph of this distribution.

Section B (Extended Response/Investigation)

7. **(CA6.5 - N) (CA)** Determine the following volumes of rotation when: **(Oxford 9.6, p318)**

   a. the region under the curve $f(x) = 2$ between $x = 0$ and $x = 5$ is rotated around the x-axis. What 3D solid is this? Use an appropriate volume formula to find volume and compare this volume (and formula) to the answer you got using the calculus.
   b. the region under the curve $f(x) = 2x$ between $x = 0$ and $x = 5$ is rotated around the x-axis. What 3D solid is this? Use an appropriate volume formula to find volume and compare this volume (and formula) to the answer you got using the calculus .
   c. the region under the curve $f(x) = \sqrt{4 - x^2}$ between $x = -2$ and $x = 2$ is rotated around the x-axis. What 3D solid is this? Use an appropriate volume formula to find volume and compare this volume (and formula) to the answer you got using the calculus .

8. **(SP5.1 - R) (CA)** The table below shows the number of minutes of sunshine in the first 100 days of the year in Newtown. **(Oxford 8D, p264)**

   a. Is the data discrete or continuous?
   b. What is the modal class?
   c. Find the mean number of minutes of sunshine.
   d. Construct a relative frequency histogram and hence a relative frequency polygon for this data set.
   e. Construct a cumulative frequency graph and use the CFG to estimate the IQR.

Minutes (m)	f
$0 \le m < 30$	12
$30 \le m < 60$	16
$60 \le m < 90$	20
$90 \le m < 120$	36
$120 \le m < 150$	16