Math SL PROBLEM SET 18

Section A (Short Answer)

1. (**A1.3 - N**) (**CA**) Use the nCr command on your calculator to evaluate the following: *(Cirrito 14.2, p498, Cirrito 4.1.1, p95)*

   a. $\binom{6}{0}$ and $\binom{6}{1}$ and $\binom{6}{2}$ and $\binom{6}{3}$ and $\binom{6}{4}$ and $\binom{6}{5}$ and $\binom{6}{6}$.

   b. Hence or otherwise, expand $(2x^2 - 5)^6$

   c. State the value of the coefficient of the term containing x^8.

2. (**SP5.4 - E**) (**CA**) Here is a data set: *(Oxford 8.5, p171; Cirrito 13.5, p482)*

x	11	12	13	14	15	16	17
y	21	43	31	34	29	55	33

   a. Draw a scatter plot on graph paper.

   b. Find the median point and hence, draw the line of best fit such that your line goes through this median point.

   c. Determine the equation of the line of best fit from your GDC and draw it on the graph as well.

3. (**T3.5 - E**) (**CI**) Solve the following trigonometric equations on the domain of $0 \leq x \leq 2\pi$: *(Cirrito 10.4, p351)*

   a. $4sin^2(x) = 1$

   b. $cos(x - \frac{\pi}{6}) = -\frac{1}{2}$

4. (**A1.2 - N**) (**CA**) For the following logarithmic expressions, evaluate them and make connections: *(Cirrito 7.4, p221)*

   a. Evaluate $log_3 25$ and $2 \times log_3 5$. Compare your answers.

   b. Evaluate $log_5 16$ and $4 \times log_5 2$. Compare your answers.

   c. Evaluate $ln\ 32$ and $5 \times ln\ 2$. Compare your answers.

   d. Make a general statement about simplifying $log_b (x^K)$

5. (**T3.6 - R**) (**CA**) The diagram shows a part of the support structure for a tower. The main parts are two identical triangles ABC and ADE. You know that AC = DE = 27.4 m and that BC = AE = 23.91 m and that the angles ACB and AED are 58°. Find: *(Cirrito 9.5.1, p290, Cirrito 9.5.4, p300)*
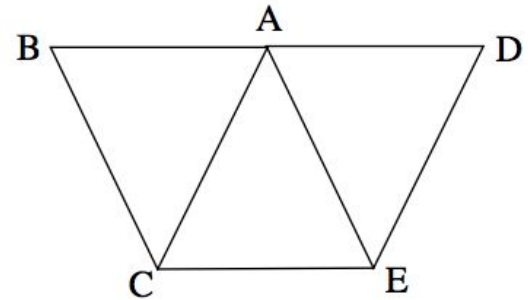
   a. The distance BD,
   b. The distance BE

6. (**T3.3 - N**) (**CI**) Use your knowledge of special right triangles to work out the following questions and explore relationships: *(Cirrito 10.1.2, p316; Cirrito 10.2.1, p327; Cirrito 10.2.2, p332)*

   a. Evaluate $sin\left(\frac{2\pi}{3}\right)$ and $cos\left(\frac{2\pi}{3}\right)$ and then evaluate $\frac{1}{2}sin\left(\frac{4\pi}{3}\right)$. Compare.
   b. Evaluate $sin\left(\frac{3\pi}{4}\right)$ and $cos\left(\frac{3\pi}{4}\right)$ and then evaluate $\frac{1}{2}sin\left(\frac{6\pi}{4}\right)$. Compare.
   c. Evaluate $sin\left(\frac{5\pi}{6}\right)$ and $cos\left(\frac{5\pi}{6}\right)$ and then evaluate $\frac{1}{2}sin\left(\frac{10\pi}{6}\right)$. Compare.
   d. Make a statement about a general relationship that may be emerging from these questions. (Compare the angles and compare the ratios/outputs)
   e. Use your statement in part (d) to answer the following question ⇒ if sin(A) = ¾, what would sin(2A) equal?

7. (**SP5.2 - R,N**) (**CA**) Here are the percentages of Mr. S's last IM3 quiz. *(Oxford 8.6, p276)*

   87%, 93%, 78%, 99%, 95%, 71%, 87%, 85%, 91%, 83%

   a. Determine the mean and standard deviation of the class quiz results.
   b. List the grades that lie more than 1 standard deviation from the mean score. List those which lie more than 2 standard deviations from the mean.
   c. Mr. S decides to subtract 10% to everyone's score. Find the new mean and standard deviation.
   d. Mr. S decides to half everyone's grade. What is the new mean and standard deviation?
   e. Mr. D. has 15 students in his class and his class average was 95%. What would be the average of the quiz for the combined two classes?

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Section B (Extended Response/Investigation)

8. (**SP5.4 - N**) (**CA**) An experiment is run, wherein a metal bar is heated and its length is measured in order to determine the correlation between the heat applied to the metal and its length. *(Oxford 10.3, p345; Oxford 10.4, p349)*

Heat (°C)	40	45	50	55	60	65	70	75	80
Length (mm)	20	20.12	20.20	20.21	20.25	20.25	20.34	20.47	20.61

    a. Draw a scatter plot on your calculator.

    b. Determine the equation of the line of best fit from your GDC.

    c. Comment on the strength of the relationship, using both the r and r^2 values.

    d. To show that you understand what the values of r or r^2 communicate, draw any scatterplot wherein the scatter plot shows your understanding of the role of the r and r^2 values:

        i.   r = 0.5
        ii.   r = -0.75
        iii.   r = -0.25