Math SL PROBLEM SET 19

Section A (Short Answer)

1. (**A1.1 - E**) (**CA**) In a geometric series, the 3rd term is 45 and the sum of the first 50 terms is 2735. Find the first term and the common ratio. *(Cirrito 8.2.2, p257)*

2. (**A1.3 - N**) (**CA**) These questions involve the concept of combinations, nCr and counting. *(Cirrito 14.2, p498)*

   a. In how many ways can 5 different IB courses be selected from a list of 8 different IB courses?

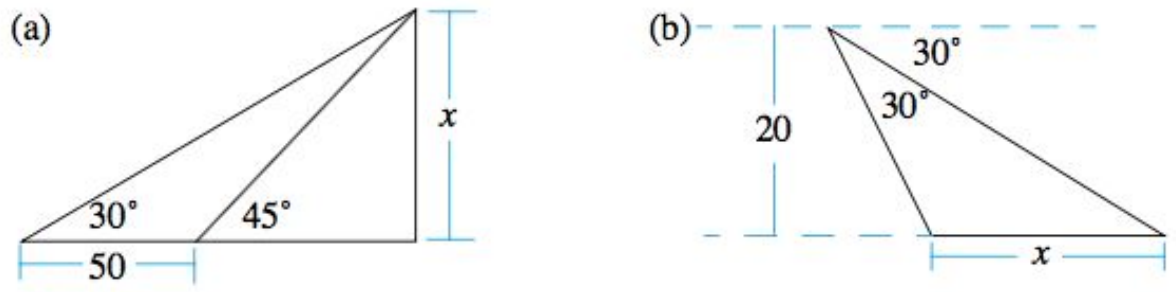
   b. Use your calculator to evaluate 8 nCr 5 ⇒ also written as $\binom{8}{5}$ and also written as ${}_8C_5$ and read as 8 choose 5.

   c. There is a formula you can use to evaluate 8 nCr 5. Find the formula and use it to evaluate ${}_7C_5$ as well as $\binom{9}{3}$

   d. Use the formula to evaluate $\binom{7}{4}\binom{7}{2}$

   e. Use your calculator to evaluate $\binom{8}{4} - \binom{6}{2} + \binom{9}{3}$

3. (**T3.6 - R**) (**CI**) Find the exact value of x in the following diagrams: *(Cirrito 9.1, p273; Oxford 13.1, p48)*



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4. (**A1.3 - N**) (**CA**) For the following binomial expansions: ***(Cirrito 4.1.1, p95, Cirrito 4.1.2, p100)***

   a. Use Pascal's triangle to expand $(x + 2y)^5$
   b. Use the binomial theorem to expand $(2 - x^3)^6$ (Hint: nCr as per Q2)

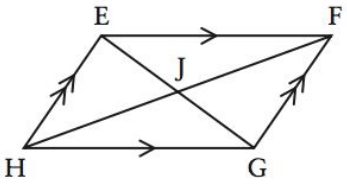
5. (**SP5.1, SP5.3**) (**CA**) The table below shows the number of minutes of sunshine per day in the first 100 days on the year of Sometown: ***(Oxford 8.5, p171; Cirrito 13.5, p482)***

minutes	$0 \leq m < 30$	$30 \leq m < 60$	$60 \leq m < 90$	$90 \leq m < 120$	$120 \leq m < 150$
frequency	12	16	20	36	16

   a. Is the data discrete or continuous?
   b. What is the modal class?
   c. Estimate the mean and the standard deviation of the minutes of sunshine.
   d. Use graph paper and construct a cumulative frequency graph.
   e. Where might Sometown be located? Explain.

6. (**A1.1 - E**) (**CA**) In an arithmetic series, the tenth term is 25 and the sum of the first 10 terms is 160. Find the sum of the first 24 terms. ***(Cirrito 8.1.2, p245)***

7. (**V4.1 - N**) (**CI**) Consider the parallelogram EFGH with diagonals EG and FH that intersect at J. ***(Cirrito 12.3, p415)***



a) Express each vector as the sum of two other vectors in two ways.
i) $\overrightarrow{HF}$ **ii)** $\overrightarrow{FH}$ **iii)** $\overrightarrow{GJ}$

b) Express each vector as the difference of two other vectors in two ways.
i) $\overrightarrow{HF}$ **ii)** $\overrightarrow{FH}$ **iii)** $\overrightarrow{GJ}$

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Section B (Extended Response/Investigation)

8. (**A1.1 - N**) (**CA**) Here are two geometric series: *(Cirrito 8.2.4, p263)*

   i. $2 + 1 + ½ + ¼ + ⅛ + \ldots\ldots$
   ii. $75 + 30 + 12 + 4.8 + \ldots..$

   b. For each series,
      i. Find the common ratio, r.
      ii. Use your calculator to find S_{10}, S_{15} and S_{20}. Record the complete value (no rounding)

   c. Do you notice any patterns? Why do you think this is happening?

   d. Now use your calculator to evaluate S_{50}. Do you think your calculator is correct? Why or why not?

   e. What does the term "convergent series" mean?

9. (**A1.2 - E, F2.3, F2.6**) (**CA**) Working with the parent function of $f(x) = \ln(x)$: *(Cirrito 5.3.4, p138)*

   a. Graph the function $f(x) = \ln(x)$ and label the intercept(s) and asymptote(s).
   b. State the domain and range of this parent function.
   c. Find the equation of the inverse function of $f(x) = \ln(x)$
   d. (CI) Now put the calculator away and sketch and label the asymptote(s) and determine the intercept(s) and include them on your sketch:
      i. $g(x) = \ln(x - 5) + 7$
      ii. $h(x) = -2\ln(x) + 3$
   e. (CI) State the domain of $f(x) = \ln(x^2 - 4)$