

# Math SL PROBLEM SET 23

## Section A (Short Answer)

1. **(A1.1 - E) (CA)** In a geometric series, the 3rd term is 45 and the sum of the first 10 terms is  $2266 \frac{77}{128}$ . If the terms of this series are increasing, 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  ${}^8nCr 5 \Rightarrow$  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  ${}^8nCr 5$ . Find the formula and use it to

evaluate  ${}_7C_5$  as well as  $\binom{9}{3}$

- d. Use the formula to evaluate  $\binom{7}{4} \binom{7}{2}$  as well as  $\binom{8}{4} - \binom{6}{2} + \binom{9}{3}$ .

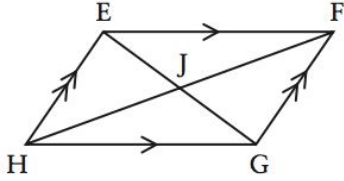
3. **(SP5.1, SP5.3) (CA)** The table below shows the number of minutes of sunshine per day in the first 100 days on the year of Sometown: *(Oxford 8.5, p171; Cirrito 13.5, p482)*

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.
4. **(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)*
5. **(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)

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6. **(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)  $\overrightarrow{GJ}$

## Section B (Extended Response/Investigation)

7. **(A1.1 - N) (CA)** Here are two geometric series: *(Cirrito 8.2.4, p263)*
- $2 + 1 + \frac{1}{2} + \frac{1}{4} + \frac{1}{8} + \dots$
  - $75 + 30 + 12 + 4.8 + \dots$
- b. For each series,
- Find the common ratio,  $r$ .
  - 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?
8. **(A1.2 - E, F2.3, F2.6) (CA)** Working with the parent function of  $f(x) = \ln(x)$ : *(Cirrito 5.3.4, p138)*
- Graph the function  $f(x) = \ln(x)$  and label the intercept(s) and asymptote(s).
  - State the domain and range of this parent function.
  - Find the equation of the inverse function of  $f(x) = \ln(x)$
  - (CI) Now put the calculator away and sketch and label the asymptote(s) and determine the intercept(s) and include them on your sketch:
    - $g(x) = \ln(x - 5) + 7$
    - $h(x) = -2\ln(x) + 3$
  - (CI) State the domain of  $f(x) = \ln(x^2 - 4)$