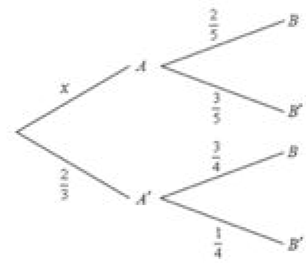
Math SL PROBLEM SET 61

1. **(SP5.6 - R) (CI)** The diagram below shows the probability tree for events A and B, with $\mathrm{P}(A) = x$.

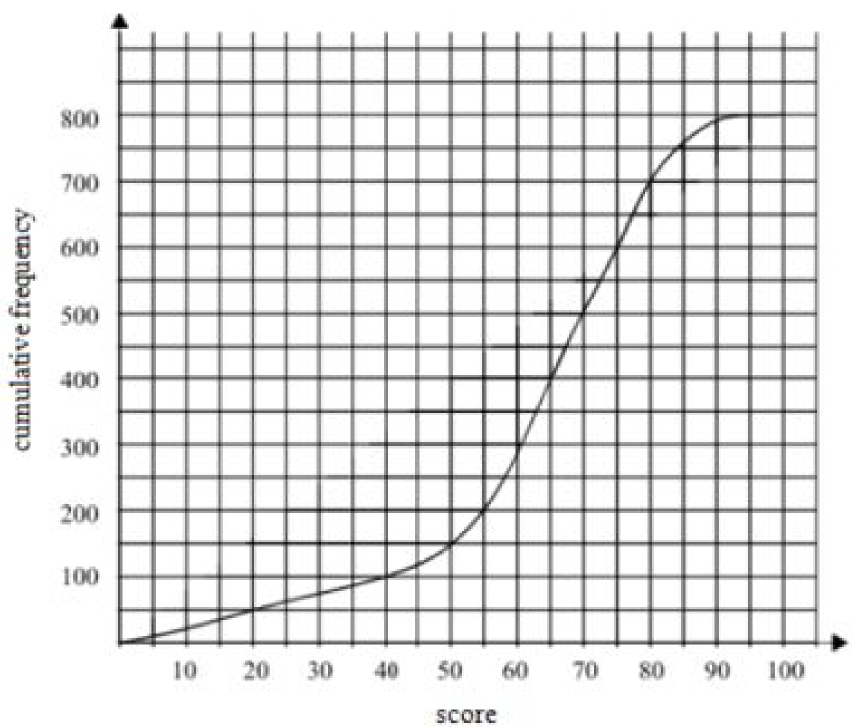


   a. Write down the value of x.
   b. Find $\mathrm{P}(B)$.
   c. Find $\mathrm{P}(A|B)$.

2. **(SP5.3 - R) (CI)** Last year's Math SL May exam was scored out of 100 and was written by 800 students in Egypt. The cumulative frequency graph is shown below.

Exam score (s)	Number of students
$0 \le s < 20$	50
$20 \le s < 40$	--
$40 \le s < 60$	200
$60 \le s < 80$	--
$80 \le s < 100$	100

   a. Write down the median score.
   b. Find the interquartile range.
   c. Complete the frequency table.
   d. Hence, show that the mean exam score is 61.25



3. **(A1.1 - R) (CI)** The first three terms of an infinite geometric sequence, A_n, are 81, 54 and 36.

   a. Determine the value of r.
   b. Find the value of the sixth term.
   c. Find the sum to infinity for this sequence.

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4. **(CA6.2, CA6.3 - R) (CI)** Consider the function $y = \frac{x^2}{4} - \sqrt{x}$, $x > 0$.

   a. Find $\frac{dy}{dx}$.
   b. Point A is the minimum point on the graph of the function. Find the coordinates of A

5. **(T3.3, 3.5 - R) (CI)** Given the equation $\cos(2x) - \cos^2(x) - 3\cos(x) = \sin^2(x)$, for $0 \leq x \leq 2\pi$.

   a. Which identities could you use to solve this equation? Explain/justify your reasoning.
   b. Hence, or otherwise, solve the equation $\cos(2x) - \cos^2(x) - 3\cos(x) = \sin^2(x)$

6. **(V4.2, V4.3, V4.4 - R) (CI)** A line, L_1, passes through P(2,-1,0) and is parallel to $\vec{r} = \begin{pmatrix} 0 \\ 2 \\ -5 \end{pmatrix} + t\begin{pmatrix} 1 \\ 4 \\ 2 \end{pmatrix}$.

   a. Write down a vector equation for L_1, in the form of $r = a + \lambda b$.
   b. Find a unit vector that is parallel to L_1.

   A second line, L_2, is represented by the vector equation $\vec{m} = \begin{pmatrix} 1 \\ 4 \\ 1 \end{pmatrix} + \mu\begin{pmatrix} k \\ 1 \\ -1 \end{pmatrix}$.

   c. The line L_2 is perpendicular to L_1. Show that $k = -2$.
   d. The lines L_1 and L_2 intersect at the point Q. Find the coordinates of Q

7. **(F2.1, F2.2, F2.3, F2.6, CA6.2 - R) (CI)** Let g be the function given by $g(x) = \ln(2x - 4)$.

   a. The function g was obtained by applying two transformations to $y = \ln(x)$.

      i. What transformations were applied to $y = \ln(x)$?
      ii. Hence, or otherwise, sketch $g(x) = \ln(2x - 4)$, labelling any asymptote(s) and any x- or y-intercepts.

   b. A line that is tangent to g at the point where $x = 6$ is drawn. Determine the equation of this tangent line.

   c. Determine the equation of $g^{-1}(x)$.