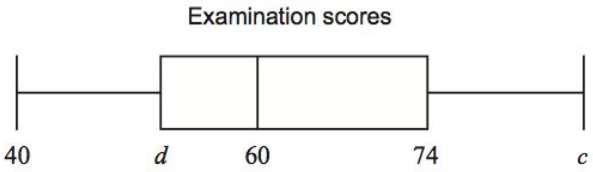
Math SL PROBLEM SET 86

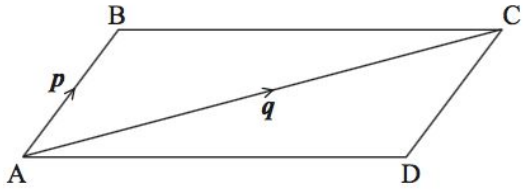
Section A (Skills/Concepts Consolidation)

1. **(SP5.1) (CI)** The following box-and-whisker plot represents the examination scores of a group of students.



   a. Write down the median score.
   b. The range of the scores is 47 marks, and the interquartile range is 22 marks. Find the value of c and d

2. **(V4.1) (CI)** The following diagram shows the parallelogram ABCD. Let AB = $\boldsymbol{p}$ and AC = $\boldsymbol{q}$. Find each of the following vectors in terms of $\boldsymbol{p}$ and/or $\boldsymbol{q}$: (i) CB, (ii) CD, (iii) DB.



3. **(C6.5) (CI)** Let $f`(x) = 6x^2 - 5$. Given that $f(2) = 3$, find $f(x)$.

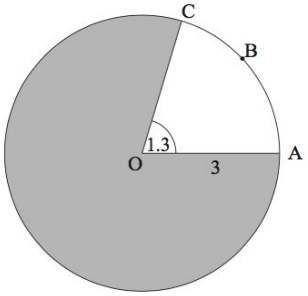
4. **(T3.4) (CI)** Let $f(x) = 3\sin(\pi x)$. Determine the amplitude of f and the period of f and hence sketch the graph of $y = f(x)$, for $0 \leq x \leq 3$.

5. **(F2.1) (CI)** Let $f(x) = (x - 5)^3$ for $x \in \mathrm{R}$.
   a. Find $f^{-1}(x)$
   b. Let g be a function so that $f \circ g(x) = 8x^6$. Find $g(x)$.

6. **(A1.3) (CI)** In the expansion of $(3x + 1)^n$, the coefficient of the term in x^2 is $135n$, where $n \in Z^+$. Find n.

7. **(A1.1) (CI)** An arithmetic sequence has the first term ln a and a common difference of ln 3. The 13^{th} term in the sequence is 8 ln 9. Find the value of a.

8. **(T3.1) (CA)** The following diagram shows a circle with centre O and radius 3 cm. Points A, B, and C lie on the circle, and AOC = 1.3 radians .
   a. Find the length of arc ABC.
   b. Find the area of the shaded region.



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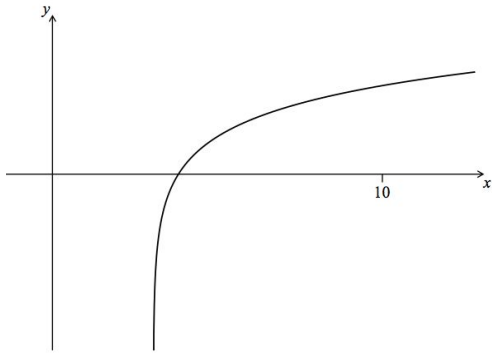
9. **(SP5.7) (CA)** The following table shows the probability distribution of a discrete random variable X. Find the value of k and hence, find E(X).

x	0	1	2	3
$P(X=x)$	0.15	k	0.1	$2k$

10. **(F2.6, C6.5) (CA)** Let $f(x) = 2\ln(x-3)$, for $x > 3$. The following diagram shows part of the graph of f.

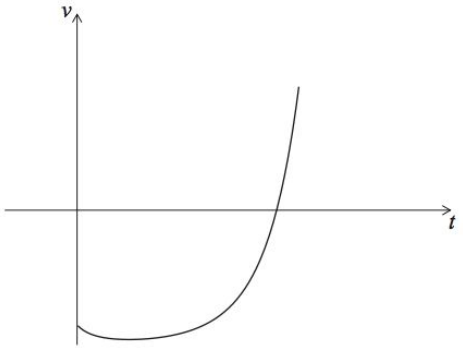


   a. Find the equation of the vertical asymptote to the graph of f.
   b. Find the x-intercept of the graph of f.
   c. The region enclosed by the graph of f, the x-axis and the line $x = 10$ is rotated 360° about the x-axis. Find the volume of the solid formed.

11. **(A1.1) (CA)** The first three terms of a geometric sequence are $u_1 = 0.64$, $u_2 = 1.6$, and $u_3 = 4$.
   a. Find the value of r.
   b. Find the value of S_6.
   c. Find the least value of n such that $S_n > 75\,000$.

12. **(SP5.6) (CA)** Let C and D be independent events with $P(C) = 2k$, $P(D) = 3k^2$, where $0 < k < 0.5$.
   a. Write down an expression for $P(C \cap D)$ in terms of k.
   b. Given that $P(C \cap D) = 0.162$, find k.
   c. Find $P(C' \mid D)$.

13. **(C6.6) (CA)** The velocity v m s^{-1} of a particle after t seconds is given by $v(t) = (0.3t + 0.1)^t - 4$, for $0 \le t \le 5$. The following diagram shows the graph of v.



   a. Find the value of t when the particle is at rest.
   b. Find the value of t when the acceleration of the particle is 0.

14. **(C6.1) (CA)** Let $f(x) = \ln(x^2)$, for $x \neq 0$.
   a. Show that $f'(x) = \frac{2}{x}$.
   b. The tangent to the graph of f at a point $P(d, f(d))$ passes through another point $Q(1,-3)$. Find the value of d.