Pearson

Activity 4

Use the copy of the Pure 2 specification and the practice paper 2 (the second specimen paper) to find the coverage of the paper.

What students need to learn:		Guidance
1. Proof		
1.1	Understand and use the structure of mathematical proof, proceeding from given assumptions through a series of logical steps to a conclusion; use methods of proof stated below:	
1.2	Proof by exhaustion	Proof by exhaustion. This involves trying all the options. Suppose x and y are odd integers less than 7. Prove that their sum is divisible by 2.
1.3	Disproof by counter example.	Disproof by counter example – show that the statement "$n^2 - n + 1$ is a prime number for all values of n" is untrue.
2. Algebra and functions		
2.1	Simple algebraic division; use of the Factor Theorem and the Remainder Theorem.	Only division by $(ax + b)$ or $(ax - b)$ will be required. E.g. Students should know that if $f(x) = 0$ when $x = \frac{b}{a}$, then $(ax - b)$ is a factor of $f(x)$. Students may be required to factorise cubic expressions such as $x^3 + 3x^2 - 4$ and $6x^3 + 11x^2 - x - 6$. Students should be familiar with the terms 'quotient' and 'remainder' and be able to determine the remainder when the polynomial $f(x)$ is divided by $(ax + b)$.
3. Coordinate geometry in the (x, y) plane		
3.1	Coordinate geometry of the circle using the equation of a circle in the form $(x - a)^2 + (y - b)^2 = r^2$ and including use of the following circle properties: (i) the angle in a semicircle is a right angle; (ii) the perpendicular from the centre to a chord bisects the chord; (iii) the perpendicularity of radius and tangent.	Students should be able to find the radius and the coordinates of the centre of the circle, given the equation of the circle and vice versa.

What students need to learn:		Guidance
4.	**Sequences and series**	
4.1	Sequences, including those given by a formula for the nth term and those generated by a simple relation of the $x_{n+1} = \mathrm{f}(x_n)$.	
4.2	Understand and work with arithmetic sequences and series, including the formula for the nth term and the sum of a finite arithmetic series; the sum of the first n natural numbers.	The proof of the sum formula should be known. Understanding of $\sum$ notation will expected.
4.3	Increasing sequences, decreasing sequences and periodic sequences.	
4.4	Understand and work with geometric sequences and series, including the formulae for the nth term and the sum of a finite geometric series; the sum to infinity of a convergent geometric series, including the use of $\lvert r \rvert < 1$.	For example, given the sum of a series students should be able to use logs to find the value of n. The proof of the sum formula for a finite series should be known. The sum to infinity may be expressed as S_∞.
4.5	Binomial expansion of $(a + bx)^n$ for positive integer n.	The notations $n!$, $\binom{n}{r}$ and ${}^nC_r$ may be used.
5.	**Exponentials and logarithms**	
5.1	$y = a^x$ and its graph.	$a > 0$, $a \neq 1$
5.2	Laws of logarithms.	To include $\log_a(xy) \equiv \log_a x + \log_a y$, $\log_a\left(\frac{x}{y}\right) \equiv \log_a x - \log_a y$ $\log_a x^k \equiv k \log_a x$, $\log_a\left(\frac{1}{x}\right) \equiv -\log_a x$, $\log_a a = 1$ where $a, x, y > 0$, $a \neq 1$.
5.3	The solution of equations of the form $a^x = b$.	Students may use the change of base formula.

What students need to learn:		Guidance
6. Trigonometry		
6.1	Knowledge and use of $\tan\theta = \frac{\sin\theta}{\cos\theta}$, and $\sin^2\theta + \cos^2\theta = 1$.	
6.2	Solution of simple trigonometric equations in a given interval.	Students should be able to solve equations such as $\sin\left(x+\frac{\pi}{2}\right) = \frac{3}{4}$ for $0 < x < 2\pi$, $\cos(x + 30°) = \frac{1}{2}$ for $-180° < x < 180°$, $\tan 2x = 1$ for $90° < x < 270°$, $6\cos^2 x + \sin x - 5 = 0$ for $0 \leqslant x < 360°$, $\sin^2\left(x+\frac{\pi}{6}\right) = \frac{1}{2}$ for $-\pi \leqslant x < \pi$.
7. Differentiation		
7.1	Applications of differentiation to maxima and minima and stationary points, increasing and decreasing functions.	To include applications to curve sketching. Maxima and minima problems may be set in the context of a practical problem.
8. Integration		
8.1	Evaluation of definite integrals.	
8.2	Interpretation of the definite integral as the area under a curve.	Students will be expected to be able to evaluate the area of a region bounded by a curve and given straight lines. For example, find the finite area bounded by the curve $y = 6x - x^2$ and the line $y = 2x$. $\int x\,dy$ will not be required. Students will be expected to be able to evaluate the area of a region bounded by two curves.
8.3	Approximation of area under a curve using the trapezium rule.	For example, use the trapezium rule to approximate $\int_0^1 \sqrt{(2x+1)}\,dx$ using four strips. Use of increasing number of trapezia to improve accuracy and an estimate of the error may be required.