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Core Mathematics C2 Advanced Subsidiary Extension Practice Paper Time: 1 hour 30 minutes (1) In the binomial expansion of  $(p + qx)^r$  where  $0 the constant is 16 and the coefficients of the terms in <math>x^3$  and  $x^2$  are equal. Find the values of the integers p, q and r showing clearly how you found each.

(5 marks)

(2) Two circles  $C_1$  and  $C_2$  both have the coordinate axes as tangents. The equation of  $C_1$  is  $(x-a)^2 + (y-b)^2 = 25$  where a < 0, b > 0The equation of  $C_2 (x-c)^2 + (y-d)^2 = 16$  where c, d > 0  $C_1$  touches the *x* axis at the point *A* and has its centre at the point *B*   $C_2$  touches the *x* axis at the point *D* and has its centre at the point *C* Find the area of the quadrilateral *ABCD* giving your answer as an exact fraction. (9 marks)

(3)  $r(x) = p \cos^2(x) - 1, p > 1$ 

(a) Sketch the graph of y = r(x) for  $-2\pi \le x \le 2\pi$  showing any points where the graph meets or crosses the coordinate axes. (4 marks)

The line y = 1 intersects the graph y = s(x) where  $s(x) = t \cos^2(x) - 1$ , t > 0 four times in the interval  $-2\pi \le x \le 0$ . Given the vertical distance between the maximum and minimum points of s(x) is 4 (b) Find the *x* coordinates of the four points of intersection of y = 1 and y = s(x) for  $-2\pi \le x \le 0$  (6 marks)

(4) The function h(x) is transformed to give the function g(x) where  $g(x) = x^3 + x^2 - 20x$ . The transformation from h(x) to g(x) is a scale factor stretch of 0.5 parallel to the *x* axis. Find the area trapped between the curve and the *x* axis for the function h(x). (9 marks)

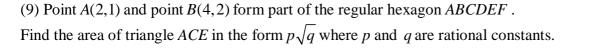
(5) A circle has equation  $(x-a)^2 + (y-a)^2 = a^2$  where *a* is a constant. The line y + x - a = 0 splits the area of the circle into 2 parts,  $A_1$  and  $A_2$  where  $A_1 > A_2$ . Find the area of  $A_2$  giving your answer in the form  $\frac{a^2}{b}(c\pi + d)$  where *b*, *c* and *d* are integers. (8 marks)

(6) A geometric series has first term *a* and common ratio *r* where *a* and *r* are positive constants. The fourth term of the series is  $p^{-1}$ , the sum to infinity of the series is *p* and the sum of the first two terms of the series is 0.75*p* where *p* is a positive constant. Find the values of *a*, *r* and *p*. (9 marks)

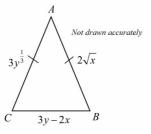
(7) The points *ABCD* with coordinates A(3,1), B(8,6), C(11,-3) and D(p,q) all line on the circumference of a circle drawn clockwise from A to D. Find the size of angle *CDA* giving your answer in radians to 3 SF.

(9 marks)

(8) In the triangle *ABC* the length BC = 6cm. Find the size of angle *CAB* in radians and the perimeter of triangle *ABC*. You must show clearly how you found your answers.



(7 marks)



## (9 marks)