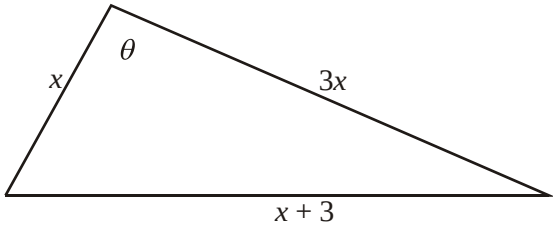
CHALLENGE QUESTIONS

IB - SL MATHEMATICS

1. The area of the triangle shown below is 2.21 cm^2. The length of the shortest side is x cm and the other two sides are $3x$ cm and $(x + 3)$ cm.



(a) Using the formula for the area of the triangle, write down an expression for $\sin\theta$ in terms of x.

(2)

(b) Using the cosine rule, write down and simplify an expression for $\cos\theta$ in terms of x.

(2)

(c) (i) Using your answers to parts (a) and (b), show that,

$$\left(\frac{3x^2 - 2x - 3}{2x^2}\right)^2 = 1 - \left(\frac{4.42}{3x^2}\right)^2$$

(1)

(ii) Hence find

(a) the possible values of x;

(2)

(b) the corresponding values of θ, **in radians**, using your answer to part (b) above.

(3)

(Total 10 marks)

2. A farmer owns a triangular field ABC. The side [AC] is 104 m, the side [AB] is 65 m and the angle between these two sides is 60°.

(a) Calculate the length of the third side of the field.

(3)

(b) Find the area of the field in the form $p\sqrt{3}$, where p is an integer.

(3)

Let D be a point on [BC] such that [AD] bisects the 60° angle. The farmer divides the field into two parts by constructing a straight fence [AD] of length x metres.

(c) (i) Show that the area of the smaller part is given by $\frac{65x}{4}$ and find an expression for the area of the larger part.

(ii) Hence, find the value of x in the form $q\sqrt{3}$, where q is an integer.

(8)

(d) Prove that $\frac{\text{BD}}{\text{DC}} = \frac{5}{8}$.

(6)

(Total 20 marks)

3. In the triangle ABC, $\hat{A} = 30°$, $a = 5$ and $c = 7$. Find the difference in area between the two possible triangles for ABC.

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(Total 6 marks)