As a guideline, this paper should be completed in 1 hour.

You will need a Graphics Display Calculator (GDC) for this examination.
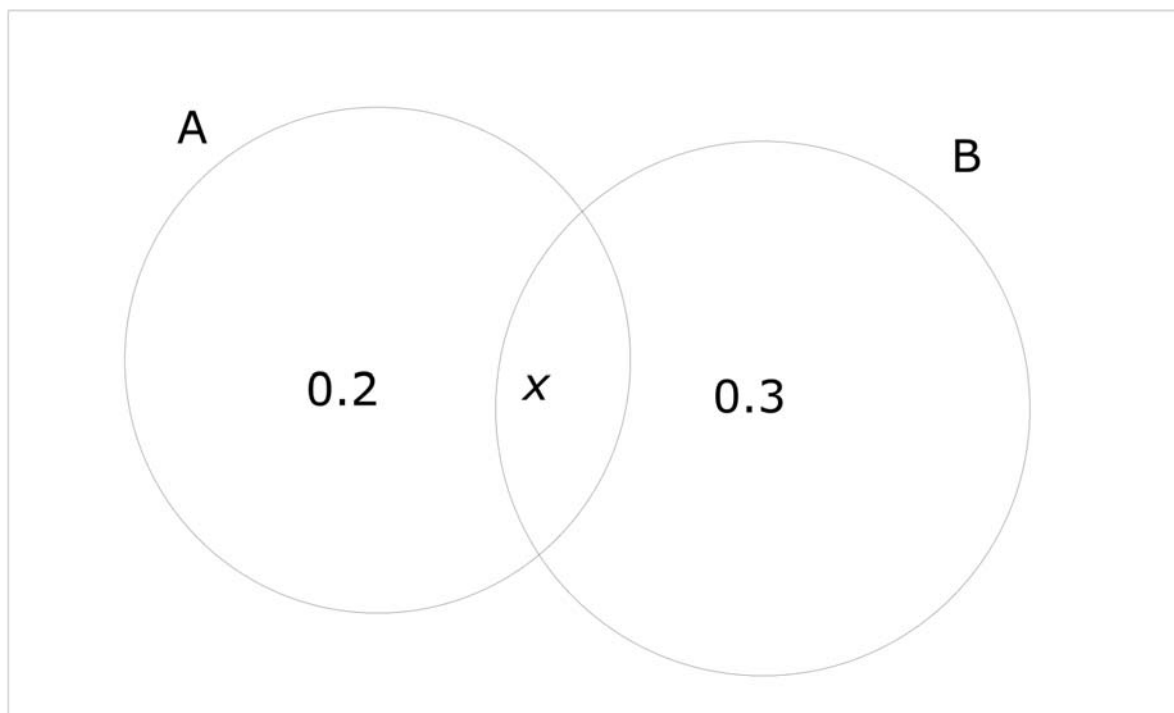
Section A [32 marks]

1. *[Maximum 4 marks]*

    $8000 is invested at a compound rate of interest of 5.6% per annum.

    a)   What will the value of the investment be at the end of 7 years?

    b)   The investment exceeds $13000 in the nth year.
         Find the value of n.

2. *[Maximum 6 marks]*

    The Venn diagram below shows the probabilities of events taking place.

    Given that events *A* and *B* are independent, find 2 values of *x*.

3.   *[Maximum 6 marks]*

Evaluate $\int_{1}^{2}\left(\dfrac{3}{x+3}\right)dx$, giving your answer to 3 significant figures.
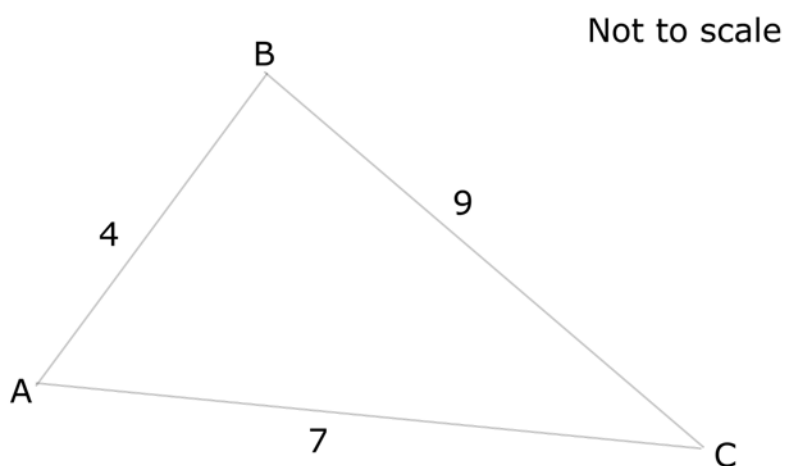
4.   *[Maximum 5 marks]*

In the expansion of $(2 - ax)^5$ the coefficient of x^2 is 5.

Find the value of *a*.

5.   *[Maximum 5 marks]*

Find the area in the triangle *ABC* drawn below.

6.   *[Maximum mark 5]*

Students sitting a Maths HL paper have marks that are normally distributed with a mean of 58 marks and a standard deviation of 16. The mark to achieve a grade 7 is set so that only 5% of the students can achieve a 7.

Calculate, to the nearest integer, the mark required to achieve a 7.

Section B [28 marks]

7.   *[Maximum mark 13]*

    i)   The population of a city is growing at a rate that is proportional to the city's present population. Mathematicians have designed a model to predict the future population of the city. It is written below.

        $P = Ae^{kt}$

        A and k are constants, t is the time in years and P is the population.
   When the initial model was designed in 1994 the population of the city was 130000. At the start of 1997 (when $t = 3$) the population was 160000.

        a)   Find the value of the constants A and k. Give your answers to 3 significant figures.

        b)   Use your model to find the year in which the city's population first exceeded 220000.   *[5 marks]*

    ii)   An arithmetic series has –3 as its third term and 21 as its ninth term. Find the sum of the first ten numbers in the sequence.
                                    [3 marks]

    iii)   A geometric series has a sum to infinity of 44. Its second term is $8\frac{1}{4}$.
        Find two set sets of solutions for the common ratio, r, and the first term, a, of the sequence.   *[5 marks]*

8. *[Maximum mark 15]*

    i)   The diagram below shows a sector of a circle with a radius of r and an angle at its origin of θ, measured in radians.

        The perimeter of the sector shape is 14 cm.
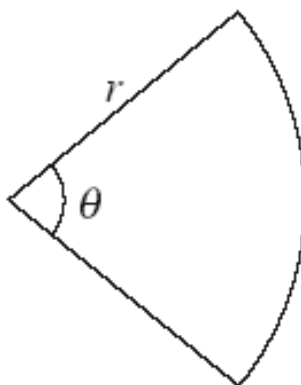
        a)   Write an equation for θ, in terms of r.   *[3 marks]*

        b)   Write down an expression for the area of the sector, A, in terms of r.   *[2 marks]*

        c)   Use your answer to b) to find the value(s) of r, when the area is 12 cm^2.   *[4 marks]*

    ii)   Find, in degrees, the values of θ in the interval $0° \le \theta \le 360°$ for which

$$4\sin^2\theta - 2\sin\theta = 4\cos^2\theta - 1$$

        Give your answers to the nearest degree.   *[6 marks]*

Paper A   IB SL Paper 2 Practice Papers

Answers

1. a) $11715   b) $n = 8$ (9 acceptable)

2. $x = 0.2, x = 0.3$

3. 0.463

4. $a = \pm \dfrac{1}{4}$

5. 13.4 units^2

6. 84 or 85 marks

7. i) a) $A = 130000, k = 0.0692$ b) 2001

    ii) 70

    iii) $u_1 = 11, r = \dfrac{3}{4}$ and $u_1 = 33, r = \dfrac{1}{4}$

8. i) a) $2r + \theta r = 14$ b) $A = \dfrac{1}{2}\theta r^2$

        c) $r = 3, r = 4$

    ii) $\theta = 49°, 131°, 210°, 330°$