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

You will need a Graphics Display Calculator (GDC) for this examination.

Section A [36 marks]

1. *[Maximum 6 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]*

    Give the set of solutions that satisfy the equation,

    $$\left|x^2 - 2\right| > 3$$

3. *[Maximum 6 marks]*

    A committee of 4 is to be chosen from 8 delegates at a conference. 3 delegates are from the same country, and all the other delegates come from different countries to each other.

    Find how many different combinations of nationalities can make up the committee of 4.

4. *[Maximum 6 marks]*

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

    Find the value of a.

5. *[Maximum 6 marks]*

    Find the angle between the plane $3x - 2y + 4z = 4$ and the y-axis. Give your answer to the nearest degree.

6.   *[Maximum 6 marks]*

Find the point of intersection of the three planes,

$x - 2y + 3z = 15$
$2x - y + z = 10$
$3x + y - 2z = -5$

Section B [24 marks]

7.   *[Maximum mark 24]*

i)   Bella and Rosie play each other three times at table tennis. The probability of Bella winning the first game is 0.6. If Bella wins the first game the probability of Bella winning the next game or any subsequent game increases by 0.1. However, if Bella loses the first game, or any subsequent game, then the probability of winning Bella next game decreases by 0.1.

   a)   Find the probability of Bella winning three games in succession.   *[2 marks]*

   b)   Find the probability that Bella won her first game, given that she wins her second game.   *[2 marks]*

   c)   Show that probability that Bella wins 2 games and loses 1 game is 0.312.   *[3 marks]*

   d)   Copy and complete the table to show the probabilities of Bella winning *x* games of table tennis.

Games won (x)	0	1	2	3
Probability				

[4 marks]

   e)   Find the expected number of games won E(*X*) and the variance V(*X*) of the games won.   *[4 marks]*

ii)   The IQ of students in a high school in country *X* is normally
      distributed with a mean of 96 and a standard deviation of 14.

   a)   Any student who scores more than 125 marks is awarded
        with a prize. If there are 700 students in the school, find
        the number of students who are entitled to a prize.
        [3 marks]

   b)   20% of the students' score between *x* and 125 marks, and
        are entitled to a special certificate. Find the minimum mark
        required to qualify for a certificate.   *[3 marks]*

   c)   In country *Y* the same test is sat and 4% of the students
        score more than 128 and 25% of the students score more
        than 112.

        Find the mean (μ) and the standard deviation (σ), given
        that the distributions of IQ scores in the country are
        normal.   *[3 marks]*

Answers

1. a) $11715   b) 8th or 9th year.

2. $x > 2.24$ and $x < -2.24$

3. 30

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

5. 112°

6. (2,-1,5)

7. i)   a) 0.336

        b) 0.7

        d)

X	0	1	2	3
P($X=x$)	0.12	0.232	0.312	0.336

        e) $E(x) = 1.864$ $V(x) = 1.03$

    ii) a) 13

        b) 104 (or 105)

        c) $\mu = 101.97, \sigma = 14.87$