# Mathematics Qualifying Examination

# Sample Paper

**Section: Statistics & Probability**

Q 1: A ball is drawn at random from a box containing 6 red balls, 4 white balls and 5 blue balls. Determine the probability that the ball drawn is

1. Red
2. White
3. Blue
4. Not red
5. Red or white

Q 2: Find the probability of 4 turning up at least once in two tosses of a fair die?

Q 3: Over the course of a rugby competition, a record is kept of the number of penalties conceded per game. The results are presented in the following frequency distribution:

|  |  |
| --- | --- |
| **Number of Penalties Conceded** | **Number of Games** |
| 0 | 0 |
| 1 | 3 |
| 2 | 5 |
| 3 | 8 |
| 4 | 2 |
| 5 | 2 |

Calculate the **standard deviation** of the distribution.

**Section: Geometry & Trigonometry**

Q 4: Find all the values of for which , where .

Q 5: Find the equation of the perpendicular bisector of the line segment [AB], where A is the point (−14, 10) and B is the point (26, −22).

**Section: Number Systems**

Q 6: is one root of the equation where , and Write the other root.

Q 7: Express in polar form and calculate . Express the results both in polar and rectangular forms.

**Section: Algebra**

Q 7: Solve the simultaneous equations:

Q 8: Given the equation :

1. Show that the roots are real for all values of .
2. Find the roots of the equation in terms of .

**Section: Functions**

Q 9: is the closed interval . That is, . The function is defined on by

with .

1. Find the maximum and minimum values of .
2. State whether is *injective*. Give a reason for your answer.

Q 10:The equation of a circle is . Find and hence find the slope of the tangent to the circle at the point .