1. Evaluate the following definite integrals.

\[(a) \int_{0}^{5/2} \frac{dx}{\sqrt{25 - x^2}} \quad (b) \int_{\pi/6}^{\pi/2} \sin x e^{\cos x} \, dx \]

\[(c) \int_{\log 7}^{1} \frac{e^x \, dx}{e^x + 1} \quad (d) \int_{2}^{3\sqrt{15}} x^5 \sqrt{x^3 + 1} \, dx \]

2. Find the area between the graphs of \( y = e^x \) and \( y = \sin x \), between \( x = 0 \) and \( x = \pi \).

3. Find the area enclosed by the graphs of \( y = x^2 \) and \( y = 6 + 4x - x^2 \).

4. Find the area enclosed by the graphs of \( y = x^3 - 3x^2 - 10x + 3 \) and \( y = 3 \).

5. (a) A bag contains 8 red, 7 white and 5 black marbles. If three marbles are drawn together from the bag, find the probability that they contain: (i) exactly two white marbles, (ii) at least two white marbles.

5. (b) In choosing three letters from the word MACQUARIE, what is the probability of choosing: (i) exactly one vowel (ii) at least one vowel?

6. (a) Find the number of ways of arranging 5 ladies and 5 gentlemen around a table. Given that Emily, Roger and James are amongst these 10 people, find the probability that Emily will sit between Roger and James.

6. (b) The letters of the word CALCULUS are arranged in a row. How many different arrangements are possible? If one arrangement is chosen at random, what is the probability that it begins with "U" and ends with "U"?

6. (c) The seven characters (three letters and four numerals) in ABC2003 are arranged in a row. How many different arrangements are possible? If one arrangement is chosen at random, what is the probability that the three letters will be together?

Answers: 1. (a) \( \pi/6 \) \quad (b) \( e^{\sqrt{3}/2} - 1 \) \quad (c) \( 2 \log 2 \) \quad (d) \( 4316/45 \) \quad 2. \( e^\pi - 3 \)

3. \( 64/3 \) \quad 4. \( 375/4 \)