

SMACON INTERNATIONAL

S.6 PURE MATHEMATICS WEEK 2 EXAM 2025 TERM ONE

SECTION A (40 MARKS)

*Answer **all** questions from this section*

1. Solve the simultaneous equation

$$\frac{x}{5} = \frac{y+2}{2} = \frac{z-1}{4} \text{ and } 3x + 4y + 2z - 25 = 0, \quad (05 \text{ marks})$$

2. If $a^3 + b^3 = 0$, prove that $\log(a + b) = \frac{1}{2}(\log a + \log b + \log 3)$ given that $a + b \neq 0$.
(05 marks)

3. Solve the equation $(x - 7)(x - 3)(x + 5)(x + 1) = 1680$ (05 marks)

4. Find the four numbers in an A.P such that their sum is 20 and sum of the squares is 120. (05 marks)

5. A cricket team of 11 players is to be formed from 16 players including 4 bowlers and 2 wicket keepers. In how many ways can a team be formed so that the team consists at least 3 bowlers and at least one wicket keeper? (05 marks)

6. Find the angle between the pair of lines

$$r = (1 + 2\beta)i + (3 + \beta)j + (5 + 2\beta)k \text{ and } r = \begin{pmatrix} 3 \\ 1 \\ 16 \end{pmatrix} + \mu \begin{pmatrix} 2 \\ 0 \\ 5 \end{pmatrix} \quad (05 \text{ marks})$$

7. Mr. Kiranda wishes to enclose a rectangular piece of land at Naalya ss of area 1250cm^2 whose one side is bounded by a straight bank of a river. Find the least possible length of barbed wire required. (05 marks)

8. Solve $\sin x - \sin 4x = \sin 2x - \sin 3x$ for $-\pi \leq x \leq \pi$. (05 marks)

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SECTION B (60MARKS)

Answer **all** questions from this section.

9. (a) The roots of a quadratic equation $x^2 - px + q = 0$ are α and β .
- determine the equation whose roots are $\alpha^2 + \beta^{-2}$ and $\beta^2 + \alpha^{-2}$ expressing the coefficients in terms of P and Q
 - prove further that if P and Q are both real, then this equation can have roots of $p = 0$ or $p = \sqrt{4q}$.
- (b) find p such that $x^2 - 5x + 6 = 0$ and $x^2 + px - 10 = 0$ have a common root.
10. (a) A curve is defined by the parametric equations;
 $x = k^2 - t$ and $y = 3k + 4$. find the equation of the tangent to the curve at (2, 10).
- (b) Differentiate the following to the simplest form;
- $(x + 1)^{\frac{1}{2}}(x + 2)^2$
 - $\frac{2x^2 + 3x}{(x - 4)^2}$
11. (a) Show that $\frac{\sin 3\theta \sin 6\theta + \sin \theta \sin 2\theta}{\sin 3\theta \cos 6\theta + \sin \theta \cos 2\theta} = \tan 5\theta$
- (b) Solve the equation from $0^\circ \leq \theta \leq 360^\circ$
- $$2\sin\theta(5\cos 2\theta + 1)\sin^2\theta = 1.$$
12. (a) Show that $\left| \frac{z-2}{z-3} \right| = 2$ represents a circle. find its centre and radius.
- (b) if z_1 and z_2 both satisfy $z + \bar{z} = 2|z - 1|$ and $\arg(z_1 - z_2) = \frac{\pi}{4}$. find $\text{Im}(z_1 + z_2)$.
13. (a) Beginning in January, a person plans to deposit \$ 100 at the end of each month in to an account earning 9% compounded monthly. Each year taxes must be paid on the interest earned during that year. Find the interest earned during each year for the first 3-years.
- (b) Find the equation of a plane containing the line $\mathbf{r} = (2\mathbf{i} + \mathbf{k}) + \lambda(-\mathbf{i} + \mathbf{j})$ and passing through the point with position vector $\mathbf{i} + 3\mathbf{k}$.

END

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