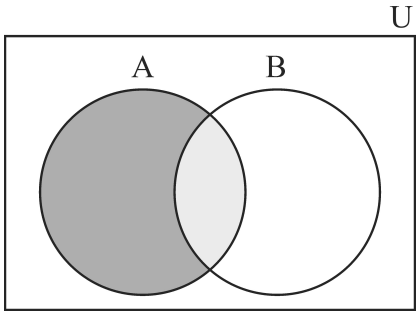
Answer any 6 questions from 1 to 8. Each carries 3 scores. **(6 × 3 = 18)**

1. (i) The shaded region in the given Venn diagram is **(1)**



(a) A' (b) B – A

(c) A – B (d) B'

(ii) If A = {–1, 0, 1}, write all subsets of the set A. **(2)**

2. (i) If $(x - 1, y + 2) = (2, 1)$, then the value of x and y are _____. **(1)**

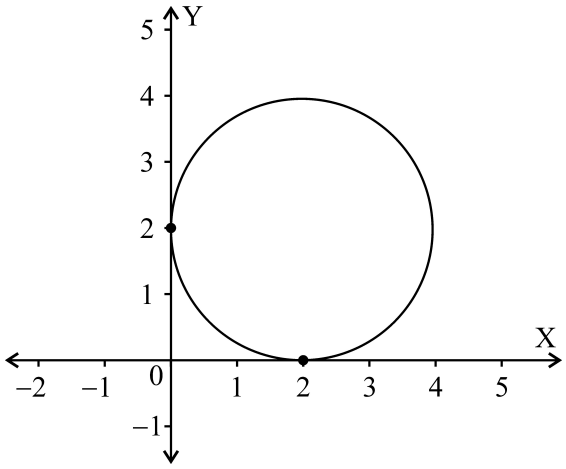
(ii) If A = {0, 1}, write A × A × A. **(2)**

3. Find the number of arrangements of the letters of the word 'MATHEMATICS'. How many of these start with H ?

4. (i) Name the octant in which the point (4, –5, 6) belongs. **(1)**

(ii) Find the distance between the points A(2, 3, 5) and B(4, 3, 1). **(2)**

5. Consider the following circle :



(i) Write the centre of the circle. **(1)**

(ii) Find the equation of the circle. **(2)**

6. (i) $\lim_{x \to 0} \frac{\sin x}{x} =$ _____. **(1)**

(ii) Evaluate $\lim_{x \to 0} \frac{\sin ax + bx}{ax}$. **(2)**

7. If $y = \frac{x-1}{x+2}$, then find $\frac{dy}{dx}$.

8. Consider the data :

5, 7, 6, 9, 4, 11, 8, 6

(i) Find the mean for the data. **(1)**

(ii) Also find the Mean Deviation about its Mean. **(2)**

Answer any 6 questions from 9 to 16. Each carries 4 scores. **(6 × 4 = 24)**

9. (i) $A \cup A' =$ _____. **(1)**

   (ii) If U = {1, 2, 3, 4, 5, 6}, A = {2, 3, 4} and B = {3, 4, 6}, then verify that $(A \cup B)' = A' \cap B'$. **(3)**

10. (i) Draw the graph of the function, $f : \mathbb{R} \to \mathbb{R}$ defined by $f(x) = |x - 2|$. **(2)**

    (ii) Find the domain and range of $f(x) = \frac{x-3}{x-4}$. **(2)**

11. (i) Show that $\sin^2 \frac{\pi}{6} + \cos^2 \frac{\pi}{3} - \tan^2 \frac{\pi}{4} = -\frac{1}{2}$. **(2)**

    (ii) Prove that $\frac{\cos 7x + \cos 5x}{\sin 7x - \sin 5x} = \cot x$ **(2)**

12. (i) Find the multiplicative inverse of the complex number z = 3 – 4i. **(2)**

    (ii) Express the complex number $\frac{1+i}{1-i}$ in $x + iy$ form. **(2)**

13. (i) Solve the linear inequality $\frac{2x-1}{3} \leq \frac{3x-2}{4}$. **(3)**

    (ii) Represent the solution in real line. **(1)**

14. (i) ${}^nC_r =$ _____. **(1)**

    (a) $\frac{n!}{r!}$ (b) $\frac{n!}{r!(n-r)!}$

    (c) $\frac{n!}{(n-r)!}$ (d) $\frac{(n-r)!}{r!}$

    (ii) In how many ways can one select a cricket team of eleven from 17 players in which only 5 players can bowl if each cricket team of 11 must include exactly 4 bowlers ? **(3)**

15. (i) Number of terms in the expansion of $(a + b)^n$ is **(1)**

(a) n (b) 2n

(c) 2^n (d) n + 1

(ii) Expand using Binomial theorem $\left(\frac{x}{3} - \frac{1}{x}\right)^5$. **(3)**

16. An ellipse has its foci at (± 5, 0) and length of major axis 26.

(i) Find the length of the minor axis. **(1)**

(ii) Find the length of the latusrectum and eccentricity of the ellipse. **(2)**

(iii) Also write the equation of the ellipse. **(1)**

Answer any 3 questions from 17 to 20. Each carries 6 scores. **(3 × 6 = 18)**

17. (i) How many terms of the G.P. 3, 3^2, 3^3, ... are needed to give the sum 120 ? **(2)**

(ii) The 5^{th}, 8^{th} and 11^{th} terms of a G.P. are p, q and s respectively. Show that $q^2 = ps$. **(2)**

(iii) Find the sum to infinite terms of the G.P., $1, \frac{1}{2}, \frac{1}{4}, \frac{1}{8}, ...$ **(2)**

18. (i) The equation of *x*-axis is **(1)**

(a) $x = k$ (b) $x = 0$

(c) $y = k$ (d) $y = 0$

(ii) Find the equation of the line through (2, 3) and perpendicular to the line through (2, 5) and (–3, 6). **(3)**

(iii) Find the distance of the point (2, –1) from the line $4x - 3y - 1 = 0$. **(2)**

19. Consider the following data :

Class	30-40	40-50	50-60	60-70	70-80	80-90	90-100
Frequency	3	7	12	15	8	3	2

(i) Find the mean. **(2)**

(ii) Find the variance. **(3)**

(iii) Find the Standard Deviation. **(1)**

20. (i) If two events A and B such that P(A) = $\frac{2}{5}$, P(B) = $\frac{1}{2}$ and P(A $\cap$ B) = $\frac{1}{5}$, then find P(A $\cup$ B). **(2)**

(ii) A bag contains 8 red and 5 white balls. Three balls are drawn at random. Find the probability that **(4)**

(a) All the three balls are white

(b) All the three balls are red

(c) One ball is red and two balls are white