PRACTICE PAPER 01 (2026-27)
CHAPTER 11 : THREE DIMENSIONAL GEOMETRY

SUBJECT: MATHEMATICS	**MAX. MARKS:** 40
CLASS: XII	**DURATION:** 1½ hrs

General Instructions:

(i) All questions are compulsory.

(ii) This question paper contains 20 questions divided into five Sections A, B, C, D and E.

(iii) Section A comprises 10 MCQs of 1 mark each (Q9 and Q10 are Assertion–Reason questions). Section B comprises 4 questions of 2 marks each. Section C comprises 3 questions of 3 marks each. Section D comprises 1 question of 5 marks with an internal choice. Section E comprises 2 case study based questions of 4 marks each, with internal choice in the last sub-part.

(iv) There is no overall choice. Internal choices have been provided where indicated.

(v) Use of calculators is not permitted.

SECTION – A

Questions 1 to 10 carry 1 mark each.

1. If a line has direction ratios 2, −1, −2, then its direction cosines are

(a) 2, −1, −2 (b) 1/3, −1/3, −1/3

(c) 2/3, −1/3, −2/3 (d) 2/9, −1/9, −2/9

2. The direction cosines of the line joining the points (1, 2, −1) and (4, 6, 11) are

(a) 3, 4, 12 (b) 3/13, 4/13, 12/13

(c) 1/13, 2/13, 11/13 (d) 3/169, 4/169, 12/169

3. If a line makes angles α, β, γ with the coordinate axes, then $\sin^2\alpha + \sin^2\beta + \sin^2\gamma$ is equal to

(a) 1 (b) 3

(c) 0 (d) 2

4. The Cartesian equation of the line passing through the point (2, −1, 0) and having direction ratios 3, 1, −2 is

(a) $\frac{x-2}{3} = \frac{y+1}{1} = \frac{z}{-2}$ (b) $\frac{x-3}{2} = \frac{y-1}{-1} = \frac{z+2}{0}$

(c) $\frac{x-2}{3} = \frac{y+1}{1} = \frac{z}{2}$ (d) $\frac{x+2}{3} = \frac{y-1}{1} = \frac{z}{-2}$

5. The angle between the lines with direction ratios 1, 2, 2 and 2, −2, 1 is

(a) 0° (b) 30° (c) 60° (d) 90°

6. The lines $\frac{x-1}{2} = \frac{y-2}{3} = \frac{z+1}{4}$ and $\frac{x+2}{k} = \frac{y}{6} = \frac{z-5}{8}$ are parallel if k equals

(a) 3 (b) 4 (c) 6 (d) 2

7. The distance between the parallel lines $\vec{r} = (\hat{i} + \hat{j}) + \lambda(3\hat{i} + 4\hat{j})$ and $\vec{r} = (\hat{i} + \hat{j} + 5\hat{k}) + \mu(3\hat{i} + 4\hat{j})$ is

(a) 25 (b) 1 (c) 5 (d) 5/3

8. If the direction cosines of a line are l, m, n with l = m = n, then each of them is equal to

(a) ±1/3 (b) ±1/√3 (c) ±√3 (d) ±1/2

For Q9 and Q10, a statement of Assertion (A) is followed by a statement of Reason (R). Choose the correct answer out of the following choices.

(a) Both A and R are true and R is the correct explanation of A.

(b) Both A and R are true but R is not the correct explanation of A.

(c) A is true but R is false.

(d) A is false but R is true.

9. Assertion (A): The direction cosines of the line $\frac{x}{1} = \frac{y}{2} = \frac{z}{3}$ are $\frac{1}{\sqrt{14}}, \frac{2}{\sqrt{14}}, \frac{3}{\sqrt{14}}$.

Reason (R): If a, b, c are direction ratios of a line, its direction cosines are

$\frac{a}{\sqrt{a^2+b^2+c^2}}, \frac{b}{\sqrt{a^2+b^2+c^2}}, \frac{c}{\sqrt{a^2+b^2+c^2}}$ (taking the positive sign).

10. Assertion (A): The lines with direction ratios 1, 2, 3 and 2, 4, 6 are parallel.

Reason (R): Two lines with direction ratios a_1, b_1, c_1 and a_2, b_2, c_2 are parallel if $a_1a_2 + b_1b_2 + c_1c_2 = 0$.

SECTION – B

Questions 11 to 14 carry 2 marks each.

11. Find the direction cosines of the line passing through the points (1, 1, 1) and (3, 4, 7).

12. Find the Cartesian equation of the line passing through the points (3, −1, 2) and (1, 1, 3).

13. Find the angle between the lines $\vec{r} = (\hat{i} + \hat{j}) + \lambda(\hat{i} + \hat{k})$ and $\vec{r} = (2\hat{j} - \hat{k}) + \mu\hat{i}$.

14. Find the direction cosines of a line which makes angles 90°, 135° and 45° with the x, y and z axes respectively.

SECTION – C

Questions 15 to 17 carry 3 marks each.

15. Find the Cartesian equation of the line passing through the point (2, −1, 3) and perpendicular to both the lines $\frac{x-1}{1} = \frac{y+2}{2} = \frac{z}{1}$ and $\frac{x}{2} = \frac{y-3}{1} = \frac{z+1}{-1}$.

16. Show that the lines $\vec{r} = (\hat{i} + 2\hat{j} + 3\hat{k}) + \lambda(2\hat{i} + 2\hat{j} + \hat{k})$ and $\vec{r} = (4\hat{i} - \hat{j}) + \mu(\hat{i} - 2\hat{j} + 2\hat{k})$ are perpendicular to each other.

17. Find the shortest distance between the lines $\vec{r} = (4\hat{i} + \hat{j} + 2\hat{k}) + \lambda(\hat{i} + 2\hat{j} + 2\hat{k})$ and $\vec{r} = (\hat{i} + \hat{j} + 2\hat{k}) + \mu(2\hat{i} + \hat{j} - 2\hat{k})$.

SECTION – D

Question 18 carries 5 marks.

18. Find the shortest distance between the lines $\frac{x-1}{1} = \frac{y-2}{2} = \frac{z+1}{2}$ and $\frac{x-3}{2} = \frac{y-1}{1} = \frac{z-2}{-2}$. Are the lines intersecting?

OR

Find the distance between the parallel lines $\vec{r} = (\hat{i} + 2\hat{j} + 3\hat{k}) + \lambda(\hat{i} + 2\hat{j} + 2\hat{k})$ and $\vec{r} = (3\hat{i} + 3\hat{j} + \hat{k}) + \mu(\hat{i} + 2\hat{j} + 2\hat{k})$.

SECTION – E (Case Study Based Questions)

Questions 19 and 20 carry 4 marks each.

19. Two drones fly along straight paths in space (all distances in hundreds of metres). Drone 1 flies along the line $\frac{x-1}{2} = \frac{y-1}{3} = \frac{z-1}{6}$ and drone 2 flies along the line $\frac{x-1}{6} = \frac{y-3}{2} = \frac{z}{-3}$.

Based on the above information, answer the following questions:

(i) Find the direction cosines of the path of drone 1. (1)

(ii) Find the angle between the two paths. (1)

(iii) Find the shortest distance between the two paths. (2)

OR

(iii) Show that the two paths do not meet. (2)

20. A straight cable is stretched between two poles. Pole A is at the point A(1, 2, 0) and pole B is at the point B(3, −4, 3), where distances are in metres.

Based on the above information, answer the following questions:

(i) Find the direction ratios and direction cosines of the cable AB. (1)

(ii) Write the vector equation of the line AB. (1)

(iii) Write the Cartesian equation of the line AB and find the angle the cable makes with the z-axis. (2)

OR

(iii) Find the coordinates of the point on the cable at height z = 6 m. (2)

— End of Question Paper —