

THREE DIMENSIONAL GEOMETRY

ANGLE BETWEEN TWO PLANES

EXERCISE

(FOR COMPETITIVE EXAM)

Q.1 Determine the angle between two planes. $\vec{r} \cdot (2\hat{i} - \hat{j} + \hat{k}) = 3$ and $\vec{r} \cdot (3\hat{i} + 2\hat{j} - 3\hat{k}) = 5$

(A) $\cos^{-1} \frac{1}{\sqrt{22}}$

(B) $\cos^{-1} \frac{1}{\sqrt{6}}$

(C) $\cos^{-1} \frac{1}{\sqrt{132}}$

(D) $\cos^{-1} \frac{1}{\sqrt{13}}$

Q.2 If the planes $A_1x + B_1y + C_1z + D_1 = 0$ and $A_2x + B_2y + C_2z + D_2 = 0$ are perpendicular to each other, which of the following statements is correct?

(A) $\frac{A_1 + B_1 + C_1}{A_2 + B_2 + C_2} = 0$

(B) $A_1 + A_2 + B_1 + B_2 + C_1 + C_2 = 0$

(C) $A_1 + B_1 + C_1 = A_2B_2C_2$

(D) $A_1A_2 + B_1B_2 + C_1C_2 = 0$

Q.3 Determine the angle between the planes. $6x - 3y + 7z = 8$ and $2x + 3y - 2z = 5$?

(A) $\cos^{-1} \frac{11}{\sqrt{98}}$

(B) $\cos^{-1} \frac{11}{\sqrt{1598}}$

(C) $\cos^{-1} \frac{13}{\sqrt{198}}$

(D) $\cos^{-1} \frac{11}{1598}$

Q.4 Which set of provided planes are perpendicular to each other?

(A) $\vec{r} \cdot (2\hat{i} + 2\hat{j} + \hat{k}) = 5$ and $\vec{r} \cdot (\hat{i} + 2\hat{j} + 2\hat{k}) = 5$

(B) $\vec{r} \cdot (\hat{i} - 2\hat{j} + \hat{k}) = 7$ and $\vec{r} \cdot (\hat{i} + \hat{j} + 2\hat{k}) = 2$

(C) $\vec{r} \cdot (2\hat{i} - 2\hat{j} + \hat{k}) = 4$ and $\vec{r} \cdot (\hat{i} + 2\hat{j} + 2\hat{k}) = 5$

(D) $\vec{r} \cdot (3\hat{i} - 2\hat{j} + \hat{k}) = 2$ and $\vec{r} \cdot (\hat{i} + 2\hat{j} + 8\hat{k}) = 8$

Q.5 Determine the angle between the planes. $\vec{r} \cdot (4\hat{i} + \hat{j} - 2\hat{k}) = 6$ and $\vec{r} \cdot (5\hat{i} - 6\hat{j} + \hat{k}) = 7$?

(A) $\cos^{-1} \frac{12}{\sqrt{1302}}$

(B) $\cos^{-1} \frac{1}{\sqrt{1392}}$

$$(C) \cos^{-1} \frac{23}{\sqrt{102}}$$

$$(D) \cos^{-1} \frac{15}{\sqrt{134}}$$

Q.6 Which of the following groups of planes are parallel to each other?

(A) $2x+3y+4z=8$ and $3x+9y+12z=7$

(B) $2x+3y+4z=2$ and $4x+6y+8z=9$

(C) $3x+2y+4z=0$ and $3x+4y+2z=0$

(D) $2x+4y+8z=9$ and $4x+2y+7z=0$

ANSWER KEY

1. (C) $\cos^{-1} \frac{1}{\sqrt{132}}$

2. (D) $A_1A_2 + B_1B_2 + C_1C_2 = 0$

3. (B) $\cos^{-1} \frac{11}{\sqrt{1598}}$

4. (C) $\vec{r} \cdot (2\hat{i} - 2\hat{j} + \hat{k}) = 4$ and $\vec{r} \cdot (\hat{i} + 2\hat{j} + 2\hat{k}) = 5$

5. (A) $\cos^{-1} \frac{12}{\sqrt{1302}}$

6. (B) $2x+3y+4z=2$ and $4x+6y+8z=9$