ADDITION OF VECTORS

PREVIOUS EAMCET BITS

1. In a quadrilateral ABCD, the point P divides DC in the ratio 1 : 2 and Q is the midpoint of AC. If $\overrightarrow{AB}+2\overrightarrow{AD}+\overrightarrow{BC}-2\overrightarrow{DC}=k\overrightarrow{PQ}$, then k = **[EAMCET 2009]**

   1) – 6 2) – 4 3) 6 4) 4

   Ans: 1

Sol. $A=\overline{a}, B=\overline{b}, C=\overline{c}, D=\overline{d}$

$\therefore\ P=\dfrac{\overline{c}+2\overline{d}}{3}, Q=\dfrac{\overline{a}+\overline{c}}{2}$

$\therefore\ \overrightarrow{AB}+2\overrightarrow{AD}+\overrightarrow{BC}-2\overrightarrow{DC}=K\overrightarrow{PQ}$

$\Rightarrow k=-6$

2. The position vectors of P and Q are respectively a and b. If R is a point on $\overleftrightarrow{PQ}$ such that $\overleftrightarrow{PR}=5\overleftrightarrow{PQ}$, then the position vector of R is **[EAMCET 2008]**

   1) 5b – 4a 2) 5b + 4a 3) 4b – 5a 4) 4b + 5a

   Ans: 1

Sol. $\overrightarrow{PR}=5\overrightarrow{PQ}\Rightarrow\overrightarrow{OR}-\overrightarrow{OP}=5\left(\overrightarrow{OQ}-\overrightarrow{OP}\right)\Rightarrow\overrightarrow{OR}=5\overrightarrow{OQ}-4\overrightarrow{OP}=5b-4a$

3. If the points whose position vectors are $2\vec{i}+\vec{j}+\vec{k}, 6\vec{i}-\vec{j}+2\vec{k}$ and $14\vec{i}-5\vec{j}+p\vec{k}$ are collinear, then the value of p is **[EAMCET 2007]**

   1) 2 2) 4 3) 6 4) 8

   Ans: 2

Sol. $\left(x_1,y_1,z_1\right)=\left(2,1,1\right);$

$\left(x_2,y_2,z_2\right)=\left(6,-1,2\right);$

$\left(x_3,y_3,z_3\right)=\left(14,-5,P\right)$

$\dfrac{x_1-x_2}{x_2-x_3}=\dfrac{z_1-z_2}{z_2-z_3}\Rightarrow P=4$

4. The position vector of a point lying on the line joining the points whose position vectors are $\vec{i}+\vec{j}-\vec{k}$ and $\vec{i}-\vec{j}+\vec{k}$ is **[EAMCET 2006]**

   1) $\vec{j}$ 2) $\vec{i}$ 3) $\vec{k}$ 4) $\vec{0}$

   Ans: 2

Sol. Vector which is collinear with given two vector by verification answer is i.

5. I : Two non-zero, non-collinear vectors are linearly dependent. **[EAMCET 2005]**

   II: Any three coplanar vectors are linearly dependent.

   Which of the above statements is true?

   1) Only I 2) Only II 3) Both I and II 4) Neither I nor II

   Ans: 3

Sol. By conceptual

6. Observe the following statements : **[EAMCET 2005]**

A : Three vectors are coplanar if one of them is expressible as a linear combination of the other two.
R : Any three coplanar vectors are linearly dependent.
The which of the following is true?
1) Both A and R are true and R is the correct reason for A
2) Both A and R are true but R is not the correct reason for A
3) A is true, R is false
4) A is false, R is true
Ans: 2

Sol. From the definition A and R are true but R is not correct explanation of A

7. If $\vec{i}+2\vec{j}+3\vec{k}, 3\vec{i}+2\vec{j}+\vec{k}$ are sides of a parallelogram, then a unit vector parallel to one of the diagonals of the parallelogram is **[EAMCET 2004]**

1) $\frac{\vec{i}+\vec{j}+\vec{k}}{\sqrt{3}}$ 2) $\frac{\vec{i}-\vec{j}+\vec{k}}{\sqrt{3}}$ 3) $\frac{\vec{i}+\vec{j}-\vec{k}}{\sqrt{3}}$ 4) $\frac{-\vec{i}+\vec{j}-\vec{k}}{\sqrt{3}}$

Ans: 1

Sol. diagonal $= 4\vec{i}+4\vec{j}+4\vec{k}$

$\therefore$ unit vector parallel to diagonal $=\frac{\vec{i}+\vec{j}+\vec{k}}{\sqrt{3}}$

8. If G is the centroid of the ΔABC, then $\overrightarrow{GA}+\overrightarrow{BG}+\overrightarrow{GC}=$ **[EAMCET 2004]**

1) $2\overrightarrow{GB}$ 2) $2\overrightarrow{GA}$ 3) $\vec{0}$ 4) $2\overrightarrow{BG}$

Ans: 4

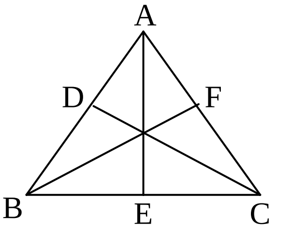
Sol. $\overrightarrow{GA}+\overrightarrow{GB}+\overrightarrow{GC}=0$

$\Rightarrow \overrightarrow{GA}+\overrightarrow{BG}+\overrightarrow{GC}=2\overrightarrow{BG}$

9. If D, E and F are respectively the midpoints of AB, AC and BC in ΔABC, then $\overrightarrow{BE}+\overrightarrow{AF}=....$ **[EAMCET 2003]**

1) $\overrightarrow{DC}$ 2) $\frac{1}{2}\overrightarrow{BF}$ 3) $2\overrightarrow{BF}$ 4) $\frac{3}{2}\overrightarrow{BF}$

Ans: 1



Sol. Let $\overrightarrow{OA}=\vec{a}, \overrightarrow{OB}=\vec{b}, \overrightarrow{OC}=\vec{c}$

$\overrightarrow{OF}=\frac{\vec{a}+\vec{c}}{2}, \overrightarrow{OE}=\frac{\vec{b}+\vec{c}}{2}$

$\overrightarrow{BE}+\overrightarrow{AF}=\overrightarrow{OE}-\overrightarrow{OB}+\overrightarrow{OF}-\overrightarrow{OA}$

$=\vec{c}-\frac{1}{2}\left(\vec{a}+\vec{b}\right)=\overrightarrow{DC}$

10. If $\vec{a},\vec{b},\vec{c}$ are three non-coplanar vectors, then the vector equation $\vec{r}=(1-p-q)\vec{a}+p\vec{b}+q\vec{c}$ represents is **[EAMCET 2003]**

1) Straight line 2) Plane
3) Plane passing through the origin 4) Sphere

Ans: 2

Sol. $r=(1-p-q)\vec{a}+P\vec{b}+q\vec{c}$ is a plane passing through a, b and c where p and q are scalars.

11. If three points A, B and C having position vector is (1, x, 3) (3, 4, 7) and (y, -2, -5) respectively and if they are collinear, then (x, y) = **[EAMCET 2002]**

1) (2, –3) 2) (–2, 3) 3) (–2, –3) 4) (2, 3)

Ans: 1

Sol. $\overline{AB} = t\ \overline{AC} \Rightarrow (2, 4-4, 4)$

$= t(y-1, -2-x, -8)$

$\frac{2}{y-1} = \frac{4-x}{-2-x} = \frac{4}{-8} \Rightarrow \frac{2}{y-1} = \frac{-1}{2} \Rightarrow y = -3$

$\frac{4-x}{-2-x} = \frac{-1}{2} \Rightarrow x = 2$

12 If the position vectors of the vertices of a triangle are $2\vec{i} - \vec{j} + \vec{k}, \vec{i} - 3\vec{j} - 5\vec{k}$ and $3\vec{i} - 4\vec{j} - 4\vec{k}$ then it is a …….triangle **[EAMCET 2002]**

1) Equilateral 2) Isosceles 3) Right angled isosceles 4) Right-angled

Ans: 4

Sol. Let $A = (2, -1, 1), B = (1, -3, -5), C = (3, -4, -4)$ are the vertical of ΔABC

$AB^2 = 1 + 4 + 36 = 41$

$BC^2 = 4 + 1 + 1 = 6$; $AC^2 = 1 + 9 + 25 = 35$

$AB^2 = AC^2 + BC^2$

$\therefore\ \Delta ABC$ is right angled triangle.

13. If $\vec{a} = \vec{i} + 4\vec{j}, \vec{b} = 2\vec{i} - 3\vec{j}\ \ \vec{c} = 5\vec{i} + 9\vec{j}$, then C **[EAMCET 2001]**

1) $5\vec{a} + \vec{b}$ 2) $\vec{a} + 2\vec{b}$ 3) $\vec{a} + 3\vec{b}$ 4) $3\vec{a} + \vec{b}$

Ans: 4

Sol. Let $\vec{C} = t\vec{a} + \vec{b}$

$\Rightarrow 5i + 9j = t(i + 4j) + (2i - 3j)$

t = 3 $\therefore \vec{C} = 3\vec{a} + \vec{b}$

14. ABCD is a parallelogram, with AC, BD as diagonals. Then $\overrightarrow{AC} - \overrightarrow{BD} =$ **[EAMCET 2001]**

1) $4\overrightarrow{AB}$ 2) $3\overrightarrow{AB}$ 3) $2\overrightarrow{AB}$ 4) $\overrightarrow{AB}$

Ans: 3

Sol. $\overrightarrow{AC} - \overrightarrow{BD} = \overrightarrow{AB} + \overrightarrow{BC} - \left(\overrightarrow{BA} + \overrightarrow{AD}\right)$

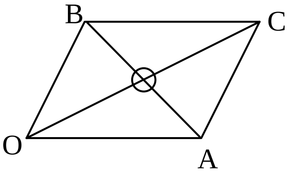
$= \overrightarrow{AB} + \overrightarrow{BC} - \left(-\overrightarrow{AB} + \overrightarrow{BC}\right) = 2\overrightarrow{AB}$

15. If OACB is a parallelogram with $\overrightarrow{OC} = \vec{a}$ and $\overrightarrow{AB} = \vec{b}$ then $\overrightarrow{OA}$ **[EAMCET 2000]**

1) $\vec{a} + \vec{b}$ 2) $\vec{a} - \vec{b}$ 3) $\frac{1}{2}\left(\vec{b} - \vec{a}\right)$ 4) $\frac{1}{2}\left(\vec{a} - \vec{b}\right)$

Ans: 4

Sol. Mid point of $\overrightarrow{OC}$ = Mid point of $\overrightarrow{AB}$



$\frac{\vec{a}}{2} = \frac{\overrightarrow{OA} + \overrightarrow{OB}}{2}$

$\vec{a} = 2\overrightarrow{OA} + \overrightarrow{OB} - \overrightarrow{OA}$; $\vec{a} = 2\overrightarrow{OA} + \vec{b} \Rightarrow \overrightarrow{OA} = \frac{1}{2}\left(\vec{a} - \vec{b}\right)$

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