



MATHS

BOOKS - CENGAGE MATHS (ENGLISH)

VECTORS; DEFINITION, GEOMETRY RELATED TO VECTORS

Dpp 11

1. A line makes an angle θ both with x-axis and y-axis. A possible range of θ is

A. $\left[0, \frac{\pi}{4}\right]$

B. $\left[0, \frac{\pi}{2}\right]$

C. $\left[\frac{\pi}{4}, \frac{\pi}{2}\right]$

D. $\left[\frac{\pi}{6}, \frac{\pi}{3}\right]$

Answer: C



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2. A line segment has length 63 and direction ratios

are 3, -2, 6. The components of the line vector are

A. $-27, 18, 54$

B. $27, -18, 54$

C. $27, -18, 054$

D. $-7, -18, -54$

Answer: B



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3. If \vec{a} , \vec{b} and \vec{c} are position vectors of A, B, and C respectively of $\triangle ABC$ and if $|\vec{a} - \vec{b}| = 4$, $|\vec{b} - \vec{c}| = 2$, $|\vec{c} - \vec{a}| = 3$, then the distance between the centroid and incenter of $\triangle ABC$ is

A. 1

B. $\frac{1}{2}$

C. $\frac{1}{3}$

D. $\frac{2}{3}$

Answer: C



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4. Let O be an interior point of $\triangle ABC$ such that $\overrightarrow{OA} + 2\overrightarrow{OB} + 3\overrightarrow{OC} = 0$. Then the ratio of area of $\triangle ABC$ to area of $\triangle AOC$ is

A. 2

B. $\frac{3}{2}$

C. 3

D. $\frac{5}{2}$

Answer: C



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5. In a three-dimensional coordinate system, P , Q , and R are images of a point $A(a, b, c)$ in the $x - y$, $y - z$ and $z - x$ planes, respectively.

If G is the centroid of triangle PQR , then area of triangle AOG is (O is the origin) a. 0 b.

$a^2 + b^2 + c^2$ c. $\frac{2}{3}(a^2 + b^2 + c^2)$ d. none of

these

A. 0

B. $a^2 + b^2 + c^2$

C. $\frac{2}{3}(a^2 + b^2 + c^2)$

D. none of these

Answer: A



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6. ABCDEF is a regular hexagon in the x-y plane with vertices in the anticlockwise direction. If $\vec{AB} = 2\hat{i}$, then \vec{CD} is

A. $\hat{i} + \sqrt{3}\hat{j}$

B. $\hat{i} - \sqrt{3}\hat{j}$

C. $-\hat{i} + \sqrt{3}\hat{j}$

D. $\sqrt{3}\hat{i} - \hat{j}$

Answer: C



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7. Let position vectors of point A, B and C of triangle ABC be $\hat{i} + \hat{j} + 2\hat{k}$, $\hat{i} + 2\hat{j} + \hat{k}$ and $2\hat{i} + \hat{j} + \hat{k}$. Let $l_1 + l_2$ and l_3 be the length of perpendicular

drawn from the orthocenter 'O' on the sides AB, BC and CA, then $(l_1 + l_2 + l_3)$ equals

A. $\frac{2}{\sqrt{6}}$

B. $\frac{3}{\sqrt{6}}$

C. $\frac{\sqrt{6}}{2}$

D. $\frac{\sqrt{6}}{3}$

Answer: C



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8. If D, E and F are the mid-points of the sides BC, CA and AB respectively of a triangle ABC

and λ is scalar, such that

$$\vec{AD} + \frac{2}{3}\vec{BE} + \frac{1}{3}\vec{CF} = \lambda\vec{AC},$$

then λ is equal to

A. $\frac{1}{2}$

B. 1

C. $\frac{3}{2}$

D. 2

Answer: A



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9. If points $(1,2,3)$, $(0,-4,3)$, $(2,3,5)$ and $(1,-5,-3)$ are vertices of tetrahedron, then the point where lines joining the mid-points of opposite edges of concurrent is

A. $(1, -1, 2)$

B. $(-1, 1, 2)$

C. $(1,1,-2)$

D. $(-1, 1, -2)$

Answer: A



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10. The unit vector parallel to the resultant of the vectors $2\hat{i} + 3\hat{j} - \hat{k}$ and $4\hat{i} - 3\hat{j} + 2\hat{k}$ is

A. $\frac{1}{\sqrt{37}} (6\hat{i} + \hat{k})$

B. $\frac{1}{\sqrt{37}} (6\hat{i} + \hat{j})$

C. $\frac{1}{\sqrt{37}} (6\hat{i} + \hat{k})$

D. none of these

Answer: A



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11. ABCDEF is a regular hexagon. Find the vector $\vec{AB} + \vec{AC} + \vec{AD} + \vec{AE} + \vec{AF}$ in terms of the vector \vec{AD}

A. 1

B. 2

C. 3

D. none of these

Answer: C



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12.

if

$$\vec{a} + \vec{b} + \vec{c} = 0, \quad |\vec{a}| = 3, \quad |\vec{b}| = 5, \quad |\vec{c}| = 7$$

, then find the angle between \vec{a} and \vec{b} .

A. $\frac{\pi}{2}$

B. $\frac{\pi}{3}$

C. $\frac{\pi}{4}$

D. $\frac{\pi}{6}$

Answer: B



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13. If sum of two unit vectors is a unit vector; prove that the magnitude of their difference is

$$\sqrt{3}$$

A. $\sqrt{2}$

B. $\sqrt{3}$

C. 1

D. none of these

Answer: B



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14. The position vectors of the points A, B, and C are $\hat{i} + 2\hat{j} - \hat{k}$, $\hat{i} + \hat{j} + \hat{k}$, and $2\hat{i} + 3\hat{j} + 2\hat{k}$ respectively. If A is chosen as the origin, then the position vectors B and C are

A. $\vec{i} + 2\hat{k}$, $\hat{i} + \hat{j} + 3\hat{k}$

B. $\hat{j} + 2\hat{k}$, $\hat{i} + \hat{j} + 3\hat{k}$

C. $-\hat{j} + 2\hat{k}$, $\hat{i} - \hat{j} + 3\hat{k}$

$$D. -\hat{j} + 2\hat{k}, \hat{i} + \hat{j} + 3\hat{k}$$

Answer: D



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15. Orthocenter of an equilateral triangle ABC

is the origin O. If

$$\overrightarrow{OA} = \vec{a}, \overrightarrow{OB} = \vec{b}, \overrightarrow{OC} = \vec{c}, \quad \text{then}$$

$$\overrightarrow{AB} + 2\overrightarrow{BC} + 3\overrightarrow{CA} =$$

A. $3\vec{c}$

B. $3\vec{a}$

C. $\vec{0}$

D. $3\vec{b}$

Answer: B



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16. If the position vectors of P and Q are $\hat{i} + 2\hat{j} - 7\hat{k}$ and $5\hat{i} - 3\hat{j} + 4\hat{k}$ respectively, the cosine of the angle between \overrightarrow{PQ} and z-axis is

A. $\frac{4}{\sqrt{162}}$

B. $\frac{11}{\sqrt{162}}$

C. $\frac{5}{\sqrt{162}}$

D. $-\frac{5}{\sqrt{162}}$

Answer: B



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17. The non zero vectors \vec{a} , \vec{b} , and \vec{c} are related by $\vec{a} = 8\vec{b}$ and $\vec{c} = -7\vec{b}$. Then

the angle between \vec{a} and \vec{c} is (A) π (B) 0 (C)

$\frac{\pi}{4}$ (D) $\frac{\pi}{2}$

A. $\frac{\pi}{4}$

B. $\frac{\pi}{2}$

C. π

D. 0

Answer: C



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18. The unit vector bisecting \overrightarrow{OY} and \overrightarrow{OZ} is

A. $\frac{\vec{i} + \vec{j} + \vec{k}}{\sqrt{3}}$

B. $\frac{\vec{i} - \vec{k}}{\sqrt{2}}$

C. $\frac{\vec{j} + \vec{k}}{\sqrt{2}}$

D. $\frac{-\vec{j} + \vec{k}}{\sqrt{2}}$

Answer: C



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19. A unit tangent vector at $t=2$ on the curve

$x = t^2 + 2$, $y = 4t - 5$ and $z = 2t^2 - 6t$ is

A. $\frac{1}{\sqrt{3}} \left(\vec{i} + \vec{j} + \vec{k} \right)$

B. $\frac{1}{3} \left(2\vec{i} + 2\vec{j} + \vec{k} \right)$

C. $\frac{1}{\sqrt{6}} \left(2\vec{i} + \vec{j} + \vec{k} \right)$

D. $\frac{1}{3} \left(\vec{i} + \vec{j} + \vec{k} \right)$

Answer: B



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20. If \vec{a} and \vec{b} are position vectors of A and B respectively, then the position vector of a point C in \vec{AB} produced such that $\vec{AC} = 2015 \vec{AB}$ is

A. $2014\vec{a} - 2015\vec{b}$

B. $2014\vec{b} + 2015\vec{a}$

C. $2015\vec{b} + 2014\vec{a}$

D. $2015\vec{b} - 2014\vec{a}$

Answer: D



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21. Let $\vec{a} = (1, 1, -1)$, $\vec{b} = (5, -3, -3)$ and $\vec{c} = (3, -1, 2)$. If \vec{r} is collinear with \vec{c}

and has length $\frac{|\vec{a} + \vec{b}|}{2}$, then \vec{r} equals

A. $\pm 3\vec{c}$

B. $\pm \frac{3}{2}\vec{c}$

C. $\pm \vec{c}$

D. $\pm \frac{2}{3}\vec{c}$

Answer: C



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22. A line passes through the points whose position vectors are $\hat{i} + \hat{j} - 2\hat{k}$ and $\hat{i} - 3\hat{j} + \hat{k}$. The position vector of a point on it at unit distance from the first point is

A. $\frac{1}{5}(5\hat{i}\hat{j} - 7\hat{k})$

B. $\frac{1}{5}(4\hat{i} + 9\hat{j} - 15\hat{k})$

C. $(\hat{i} - 4\hat{j} + 3\hat{k})$

D. $\frac{1}{5}(\hat{i} - 4\hat{j} + 3\hat{k})$

Answer: A



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23. Three points A, B, and C have position vectors $-2\vec{a} + 3\vec{b} + 5\vec{c}$, $\vec{a} + 2\vec{b} + 3\vec{c}$ and $7\vec{a} - \vec{c}$ with reference to an origin O.

Answer the following questions?

Which of the following is true?

A. $\vec{AC} = 2\vec{AB}$

B. $\vec{AC} = -3\vec{AB}$

C. $\vec{AC} = 3\vec{AB}$

D. None of these

Answer: C



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24. Three points A, B, and C have position vectors $-2\vec{a} + 3\vec{b} + 5\vec{c}$, $\vec{a} + 2\vec{b} + 3\vec{c}$ and $7\vec{a} - \vec{c}$ with reference to an origin O.

Answer the following questions?

Which of the following is true?

A. $2\vec{OA} - 3\vec{OB} + \vec{OC} = \vec{0}$

B. $2\vec{OA} + 7\vec{OB} + 9\vec{OC} = \vec{0}$

C. $\vec{OA} + \vec{OB} + \vec{OC} = \vec{0}$

D. None of these

Answer: A



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25. Three points A, B, and C have position vectors $-2\vec{a} + 3\vec{b} + 5\vec{c}$, $\vec{a} + 2\vec{b} + 3\vec{c}$ and $7\vec{a} - \vec{c}$ with reference to an origin O.

Answer the following questions?

B divided AC in ratio

A. 2:1

B. 2:3

C. 2: - 3

D. 1:2

Answer: B



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