MATHS

BOOKS - CENGAGE

VECTORS; DEFINITION, GEOMETRY RELATED TO VECTORS

Dpp 1 1

1. A line in the 3 dimensiional space makes an angle $\theta \left(0 \leq \theta \leq \frac{\pi}{2}\right)$ 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 ΔABC and if $\left|\vec{a}-\vec{b}\right|=4, \left|\vec{b}-\vec{c}\right|=2, \left|\vec{c}-\vec{a}\right|=3$, 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 $\overrightarrow{OA} + 2\overrightarrow{OB} + 3\overrightarrow{OC} = \vec{o}$. Then find the ratio of the area of $\triangle ABC$ to the area of $\triangle BRC$ is 1 unit.

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, $P, Q, andR$ are images of a point $A(a, b, c)$ in the $x - y, y - zandz - x$ 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 plance with vertices in the anticlockwise direction. If $\overrightarrow{A}B = 2\hat{i}$, then $\overrightarrow{C}D$ 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 represents 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 $\overrightarrow{AD} + \frac{2}{3}\overrightarrow{BE} + \frac{1}{3}\overrightarrow{CF} = \lambda\overrightarrow{AC}$, then λ is equal to

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

B. 1

C. $3/2$

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

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

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

D. none of these

Answer: A

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11. ABCDEF is a regular hexagon. Find the vector $\overrightarrow{A}B+\overrightarrow{A}C+\overrightarrow{A}D+\overrightarrow{A}E+\overrightarrow{A}F$ in terms of the vector $\overrightarrow{A}D$

A. 1

B. 2

C. 3

D. none of these

Answer: C

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12. If $\vec{a} + \vec{b} + \vec{c} = 0, \left|\vec{a}\right| = 3, \left|\vec{b}\right| = 5, \left|\vec{c}\right| = 7$ then the angle between $\vec{a}$ and $\vec{b}$ is :

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

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 $\overrightarrow{OA} = \vec{a}, \overrightarrow{OB} = \vec{b}, \overrightarrow{OC} = \vec{c}$, 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 i + 3j - 7k and 5i - 2j + 4k then the cosine of the angle between PQ and y - 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 byi $\vec{a} = 8\vec{b}\, nd\, \vec{c} = -7\vec{b}$. 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. $\dfrac{\vec{i}+\vec{j}+\vec{k}}{\sqrt{3}}$

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

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

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

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 $\overrightarrow{AB}$ produced such that $\overrightarrow{AC}$ =2015 $\overrightarrow{AB}$ 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 $\frac{\left|\vec{a} + \vec{b}\right|}{2}$, then $\vec{r}$ equals

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

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

C. $\pm \overrightarrow{c}$

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

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

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

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

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

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. $\overrightarrow{AC} = 2\overrightarrow{AB}$

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

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

D. None of these

Answer: C

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

Answer the following questions?

Which of the following is true?

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

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

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

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