# MATHS

# BOOKS - CENGAGE MATHS (HINGLISH)

# VECTORS; DEFINITION, GEOMETRY RELATED TO VECTORS

## Dpp 1 1

**1.** A line makes an angle $\theta$ both with x-axis and y-axis. A possible range of $\theta$ 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 $\Delta ABC$ 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 $\Delta ABC$ such that $\overline{OA} + 2\overline{OB} + 3\overline{OC} = 0$. Then the ratio of a $\Delta ABC$ to area of $\Delta AOC$ 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, $P, Q, andR$ 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 $\lambda$ is scalar, such that $\overrightarrow{AD}+\frac{2}{3}\overrightarrow{BE}+\frac{1}{3}\overrightarrow{CF}=\lambda\overrightarrow{AC}$, then $\lambda$ 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 $\vec{A}B+\vec{A}C+\vec{A}D+\vec{A}E+\vec{A}F$ in terms of the vector $\vec{A}D$

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

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 $\overrightarrow{OA}=\overrightarrow{a}, \overrightarrow{OB}=\overrightarrow{b}, \overrightarrow{OC}=\overrightarrow{c}$, then $\overrightarrow{AB}+2\overrightarrow{BC}+3\overrightarrow{CA}=$

A. $3\overrightarrow{c}$

B. $3\overrightarrow{a}$

C. $\overrightarrow{0}$

D. $3\overrightarrow{b}$

**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 byi $\vec{a} = 8\vec{b} nd \vec{c} = -7\vec{b}$. Then the angle between $\vec{a}$ and $\vec{c}$ is (A) $\pi$ (B) 0 (C) $\frac{\pi}{4}$ (D) $\frac{\pi}{2}$

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

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

C. $\pi$

D. 0

**Answer: C**

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

A. $\dfrac{\overrightarrow{i}+\overrightarrow{j}+\overrightarrow{k}}{\sqrt{3}}$

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

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

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

**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 $\overrightarrow{a}$ and $\overrightarrow{b}$ 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. $2014\overrightarrow{a} - 2015\overrightarrow{b}$

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

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

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

**Answer: D**

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**21.** Let $\overrightarrow{a} = (1, 1, -1), \overrightarrow{b} = (5, -3, -3)$ and $\overrightarrow{c} = (3, -1, 2)$. If $\overrightarrow{r}$ is collinear with $\overrightarrow{c}$ and has length $\frac{\left|\overrightarrow{a} + \overrightarrow{b}\right|}{2}$, then $\overrightarrow{r}$ equals

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

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

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**

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