

# Area of a Traingle

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## 12<sup>th</sup> Maths - Chapter 10

1. Find  $\left| \vec{a} \times \vec{b} \right|$ , if  $\vec{a} = \hat{i} - 7\hat{j} + 7\hat{k}$  and  $\vec{b} = 3\hat{i} - 2\hat{j} + 2\hat{k}$ .
2. Find a unit vector perpendicular to each of the vector  $\vec{a} + \vec{b}$  and  $\vec{a} - \vec{b}$ , where  $\vec{a} = 3\hat{i} + 2\hat{j} + 2\hat{k}$  and  $\vec{b} = \hat{i} + 2\hat{j} - 2\hat{k}$ .
3. If a unit vector  $\vec{a}$  makes angles  $\frac{\pi}{3}$  with  $\hat{i}$ ,  $\frac{\pi}{4}$  with  $\hat{j}$  and an acute angle  $\theta$  with  $\hat{k}$ , then find  $\theta$  and hence, the components of  $\vec{a}$ .
4. Show that
$$(\vec{a} - \vec{b}) \times (\vec{a} + \vec{b}) = 2(\vec{a} \times \vec{b})$$
5. Find  $\lambda$  and  $\mu$  if  $(2\hat{i} + 6\hat{j} + 27\hat{k}) \times (\hat{i} + \lambda\hat{j} + \mu\hat{k}) = \vec{0}$ .
6. Given that  $\vec{a} \cdot \vec{b} = 0$  and  $\vec{a} \times \vec{b} = \vec{0}$ . What can you conclude about the vectors  $\vec{a}$  and  $\vec{b}$ ?
7. Let the vectors be given as  $\vec{a}, \vec{b}, \vec{c}$  be given as  $a_1\hat{i} + a_2\hat{j} + a_3\hat{k}, b_1\hat{i} + b_2\hat{j} + b_3\hat{k}, c_1\hat{i} + c_2\hat{j} + c_3\hat{k}$ . Then show that  $\vec{a} \times (\vec{b} + \vec{c}) = \vec{a} \times \vec{b} + \vec{a} \times \vec{c}$ .
8. If either  $\vec{a} = \vec{0}$  or  $\vec{b} = \vec{0}$ , then  $\vec{a} \times \vec{b} = \vec{0}$ . Is the converse true? Justify your answer with an example.

9. Find the area of the triangle with vertices  $A(1, 1, 2)$ ,  $B(2, 3, 5)$ , and  $C(1, 5, 5)$
10. Find the area of the parallelogram whose adjacent sides are determined by the vectors  $\vec{a} = \hat{i} - \hat{j} + 3\hat{k}$  and  $\vec{b} = 2\hat{i} - 7\hat{j} + \hat{k}$ .
11. Let the vectors  $\vec{a}$  and  $\vec{b}$  be such that  $|\vec{a}| = 3$  and  $|\vec{b}| = \frac{\sqrt{2}}{3}$ , then  $\vec{a} \times \vec{b}$  is a unit vector, if the angle between  $\vec{a}$  and  $\vec{b}$  is
- $\frac{\pi}{6}$
  - $\frac{\pi}{4}$
  - $\frac{\pi}{3}$
  - $\frac{\pi}{2}$
12. Area of a rectangle having vertices A, B, C and D with position vectors  $-\hat{i} + \frac{1}{2}\hat{j} + 4\hat{k}$ ,  $\hat{i} + \frac{1}{2}\hat{j} + 4\hat{k}$ ,  $\hat{i} - \frac{1}{2}\hat{j} + 4\hat{k}$  and  $-\hat{i} - \frac{1}{2}\hat{j} + 4\hat{k}$ , respectively is
- $\frac{1}{2}$
  - 1
  - 2
  - 4