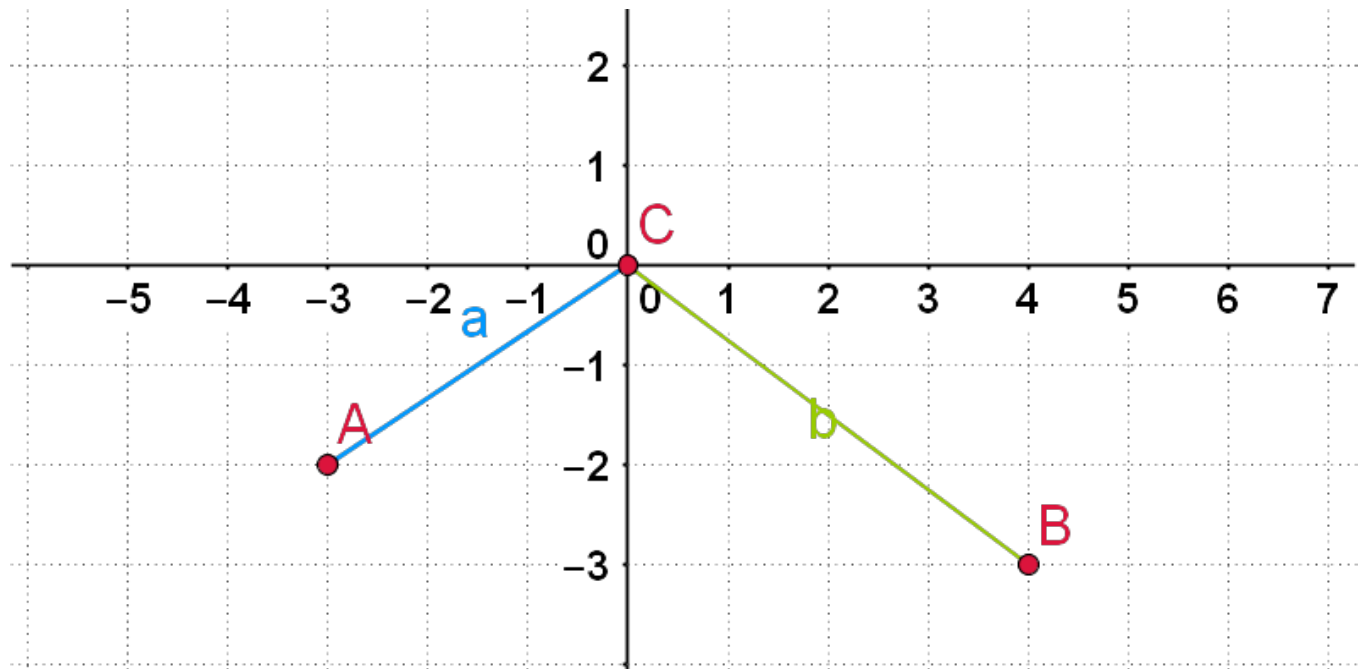




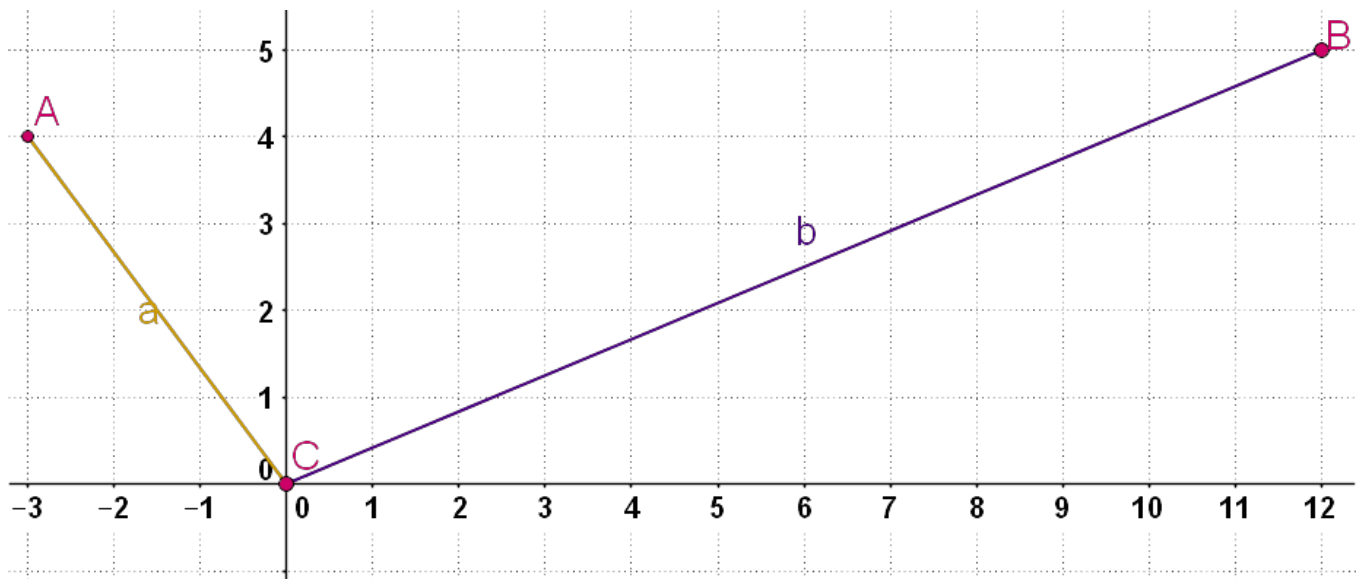
## Twelfth Grade - Vector Algebra

1) What is the value of  $a \times b$ ?



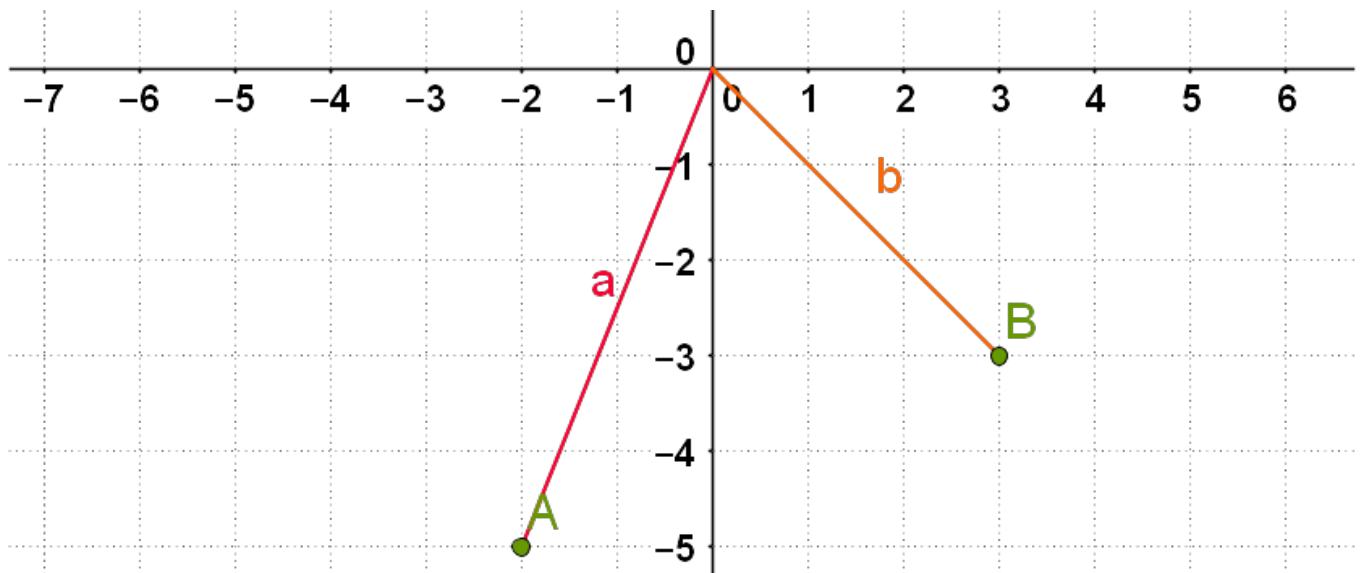
- -6
- -3
- -9
- 6

2) What is the value of  $a \cdot b$  and hence find the value of ??



- $104.3^\circ$
- $102.4^\circ$
- $100.3^\circ$
- $101.1^\circ$

3) Use the dot product to find the size of angle ??



- $106.8^\circ$
- $16.4^\circ$
- $66.8^\circ$
- $59.8^\circ$



4) If  $k$  is any positive number, what is the size of the angle between the vectors  $a = (k, k)$  and  $b = (-3, 4)$ ?

- $101.1^\circ$
- $56.5^\circ$
- $91.9^\circ$
- $81.9^\circ$

5) Which one of the following is not a unit vector?

a.  $(0,1,0)$  b.  $(0,0,1)$  c.  $(\frac{1}{\sqrt{3}}, \frac{1}{\sqrt{3}}, \frac{1}{\sqrt{3}})$  d.  $(1,1,1)$

- b
- c
- d
- a

6) What is the size of the angle between the vectors  $a = (2, 5, -1)$  and  $b = (-3, 2, 6)$ ?

- 98.0
- 99.0
- 96.0
- 93.0

7) Vector  $a$  has magnitude 3, vector  $b$  has magnitude 4, the angle between  $a$  and  $b$  is  $30^\circ$  and  $n$  is the unit vector at right angles to both  $a$  and  $b$ . What is  $a \times b$ ?

- $2n$
- $6n$
- $5n$
- $4n$

8) Vector  $a$  has magnitude  $3\sqrt{2}$ , vector  $b$  has magnitude 5. The angle between  $a$  and  $b$  is  $135^\circ$  and  $n$  is the unit vector at right angles to both  $a$  and  $b$ . What is the value of  $a \times b$ ?



- $16n$
- $13n$
- $12n$
- $15n$

9) Vector  $a$  has magnitude  $1/\sqrt{3}$ , vector  $b$  has magnitude 4, the angle between  $a$  and  $b$  is  $60^\circ$  and  $n$  is the unit vector at right angles to both  $a$  and  $b$ . What is the value of  $a \times b$ ?

- $3n$
- $6n$
- $2n$
- $4n$

10) What is the cross product of  $a = (1, 2, 3)$  and  $b = (4, 5, 6)$ ?

- $(-3, -6, 3)$
- $(-3, 6, -3)$
- $(8, 6, 7)$
- $(3, 9, 3)$

11) What is the cross product of  $a = (-2, 3, 5)$  and  $b = (-4, 1, -6)$ ?

- $(-23, -32, 10)$
- $(-53, -72, 10)$
- $(-29, -72, 30)$
- $(-33, -32, 40)$

12) What is the cross product of  $a = (2, -5, 1)$  and  $b = (3, -2, -4)$ ?

- $(25, 16, 11)$
- $(25, 13, 14)$
- $(22, 11, 11)$
- $(28, 12, 11)$



13) If  $a = (-2, 1, 1)$ ,  $b = (2, 1, 1)$  and  $c = a \times b$ , what is the magnitude of  $c$ ?

- 9?2
- 4?2
- 7?2
- 5?3

14) If  $a = (2, 0, 1)$ ,  $b = (0, 1, 1/2)$  and  $c = a \times b$ , what is the magnitude of  $c$ ?

- ?6
- ?8
- ?5
- ?3

15) If  $a = (2, -4, 4)$ ,  $b = (4, 0, 3)$  and  $c = a \times b$ , what is the magnitude of  $c$ ?

- 10?5
- 9?5
- 12?5
- 18?5

16)  $a$ ,  $b$  and  $c$  are three vectors such that  $c$  is perpendicular to both  $a$  and  $b$ . What is the value of  $a \times b \times c$ ?

- $(0, 0, 0)$
- $(1, 0, 0)$
- $(0, 0, 1)$
- $(0, 1, 0)$

17) What should be added in vector to get its resultant a unit vector  $i$ , if  $a = 3i + 4j - 2k$



- $-i - j + k$
- $-2i - 4j + 2k$
- $-2i - 4j + 5k$
- $-2i + 4j + 2k$

18) The magnitudes of mutually perpendicular forces  $a$ ,  $b$  and  $c$  are 2, 10 and 11 respectively. Then the magnitude of its resultant is

- 13
- 10
- 15
- 12

19) The position vectors of two points  $A$  and  $B$  are  $i + j - k$  and  $2i - j + k$  respectively. Then  $|AB| = ?$

- 8
- 0
- 6
- 4

20) If  $a$  and  $b$  are two non-zero and non-collinear vectors, then  $a + b$  and  $a - b$  are?

- Linearly dependent
- Linearly independent
- None of these
- Linearly spanning

21) Find the angle between two vectors  $a$  and  $b$  having the same length  $\sqrt{2}$ , and their scalar product is  $-1$

- $\pi/3$
- $2\pi/3$
- $\pi$
- $2\pi$



22) Let  $\vec{a}$  and  $\vec{b}$  be two vectors of the same magnitude, such that the angle between them is  $60^\circ$  and  $\vec{a} \times \vec{b} = 8\vec{k}$ . Find

$$|\vec{a}| \text{ and } |\vec{b}|$$

- 1
- 4
- 5
- 2

23) If vector  $\vec{a} = 5\vec{i} - \vec{j} - 3\vec{k}$  and vector  $\vec{b} = \vec{i} + 3\vec{j} - 5\vec{k}$ , then the vectors  $(\vec{a} + \vec{b}) \times (\vec{a} - \vec{b})$  is

- Collinear
- Non parallel
- Parallel
- Perpendicular

24) Find

$$\vec{a} \times \vec{b}, \text{ if } \vec{a} = 2\vec{i} + \vec{k} \text{ and } \vec{b} = \vec{i} + \vec{j} + \vec{k}$$

- $-\vec{i} - \vec{j} + 2\vec{k}$
- $\vec{i} + \vec{j} + 2\vec{k}$
- $-2\vec{i} - 3\vec{j} - 2\vec{k}$
- $-\vec{i} - \vec{j} - 2\vec{k}$

25) Find the magnitude of

$$|\vec{a}| \text{ if } \vec{a} = (\vec{i} + 3\vec{j} - 2\vec{k}) \times (-\vec{i} + 3\vec{k})$$

- 19
- 91



- ?19
- ?91

26) If  $\vec{a}$  and  $\vec{b}$  are two vectors such that

$$|\vec{a}| = 3 \quad |\vec{b}| = 2 \quad \vec{a} \cdot \vec{b} = 6, \text{ Find } |\vec{a} + \vec{b}|$$

- 7
- 4
- 3
- 5

27) Find the values of  $x$  for which vectors  $\vec{a} = 2x\vec{i} + 4x\vec{j} + \vec{k}$  and  $7\vec{i} - 2\vec{j} + x\vec{k}$  is obtuse.

- $0 > x > 1/2$
- 0
- 0
- 0

28) Find the projection of vector  $7\vec{i} + \vec{j} - 4\vec{k}$  on vector  $2\vec{i} + 6\vec{j} + 3\vec{k}$

- $8/7$
- $9/7$
- $7/8$
- $16/7$

29) Here which of the following represents the linear combination of vectors?

1.  $\vec{r} = x\vec{a} + y\vec{b} + z\vec{c}$    2.  $\vec{r} = x\vec{a} - y\vec{b}$    3.  $\vec{r} = x\vec{a}$    4. None of these

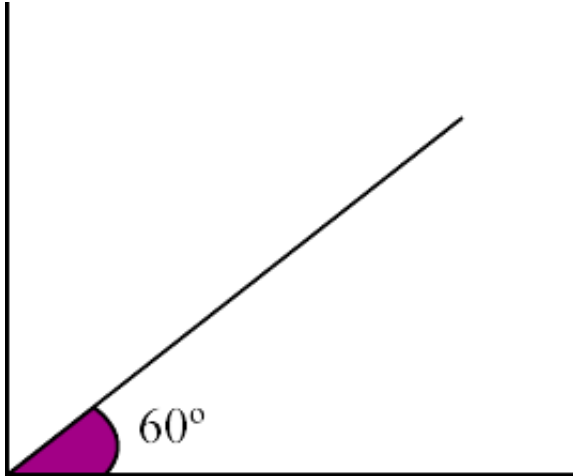
- None of these
- Both 1 and 3
- Both 1 and 2





- Only 1

30) The magnitude of a vector  $F$  is 10 units and the direction of the vector is  $60^\circ$  with the horizontal. Find the components of the vector?



- (5,  $5\sqrt{3}$ )
- (6,  $6\sqrt{3}$ )
- (9,  $9\sqrt{2}$ )
- (4,  $4\sqrt{2}$ )