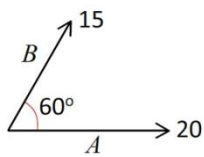


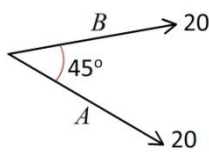
Work, Energy and Power

Objective : Calculations involving dot product of vectors

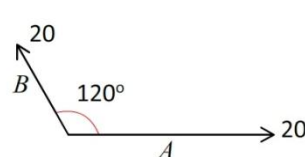
1. Two vectors of magnitude 10 units and 12 units are inclined at an angle of 60° w.r.t. each other. Find their dot product.
2. Vector A of magnitude $6\sqrt{3}$ units makes an angle of 30° with a vector B of magnitude 5 units. Find their dot product.
3. Vector A of magnitude 8 units makes an angle of 120° with a vector B of magnitude 2 units. Find their dot product.
4. Consider the vectors given in the figure below.



(a)



(b)



(c)

In each case, find

- (i) product of magnitude of A and component of B in the direction of A
- (ii) product of magnitude of B and component of B in the direction of B

5. Find the dot product of two vectors given by $\mathbf{A} = 5\hat{i} - 2\hat{j}$ and $\mathbf{B} = 2\hat{i} - 1\hat{j}$.
6. Find the scalar product of two vectors given by $\mathbf{A} = 2\hat{i} - 4\hat{j} + 3\hat{k}$ and $\mathbf{B} = \hat{i} + \hat{j} - 2\hat{k}$.
7. Find the value of 'a' if the vectors $\mathbf{P} = 4\hat{i} - 1\hat{j} + a\hat{k}$ and $\mathbf{Q} = 3\hat{i} + 2\hat{j} + \hat{k}$ are perpendicular to each other.
8. Find the angle between the vectors $\mathbf{A} = 2\hat{i} - 2\hat{j} + 4\hat{k}$ and $\mathbf{B} = 2\hat{i} + 4\hat{j} + \hat{k}$.
9. Find the angle between the vectors $\mathbf{u} = \hat{i} - \hat{j} + \hat{k}$ and $\mathbf{B} = -2\hat{i} + 2\hat{j} - 2\hat{k}$.
10. Find the angle between $\mathbf{u} = \sqrt{3}\hat{i} + \hat{j}$ and the x-axis.
11. Find the angle between $\mathbf{v} = \hat{i} + 2\hat{j}$ and the y-axis.
12. State true / false (and think of an example / reason) for the following
 - (a) Dot product of two vectors should be positive
 - (b) Dot product of two non-zero vectors can be zero
 - (c) Dot product of two vectors cannot be more than the product of their magnitudes.
 - (d) Dot product of two vectors cannot be less than the product of their magnitudes.
 - (e) Dot product of two vectors should be less than the magnitude of each vector.
 - (f) Dot product of two vectors may be equal to the magnitude of one of the vectors.

Answers

1. 60
2. 45
3. -8
4. (a) 150 (for both cases i and ii)
(b) $200\sqrt{2}$ (for both cases i and ii)
(c) -200 (for both cases i and ii)
5. 12
6. -8
7. -10
8. 90°
9. 180°
10. 30°
11. $\cos^{-1}(2/\sqrt{5})$
12. (a) F
(b) T
(c) T
(d) F
(e) F
(f) T

For detailed solutions mail your request to sigmaaprc@gmail.com (mention the class / chapter / assignment number in the mail)