DPP - Daily Practice Problems

Name : _____ Date : _____

Start Time : _____ End Time : _____

PHYSICS 05

SYLLABUS : Vectors

Max. Marks : 116 **Time : 60 min.**

GENERAL INSTRUCTIONS

- The Daily Practice Problem Sheet contains 29 MCQ's. For each question only one option is correct. Darken the correct circle/ bubble in the Response Grid provided on each page.
- You have to evaluate your Response Grids yourself with the help of solution booklet.
- Each correct answer will get you 4 marks and 1 mark shall be deduced for each incorrect answer. No mark will be given/ deducted if no bubble is filled. Keep a timer in front of you and stop immediately at the end of 60 min.
- The sheet follows a particular syllabus. Do not attempt the sheet before you have completed your preparation for that syllabus. Refer syllabus sheet in the starting of the book for the syllabus of all the DPP sheets.
- After completing the sheet check your answers with the solution booklet and complete the Result Grid. Finally spend time to analyse your performance and revise the areas which emerge out as weak in your evaluation.

DIRECTIONS (Q.1-Q.21) : There are 21 multiple choice questions. Each question has 4 choices (a), (b), (c) and (d), out of which **ONLY ONE** choice is correct.

Q.1 The length of second's hand in watch is 1 cm. The change in velocity of its tip in 15 seconds is

(a) zero (b) $\frac{\pi}{30\sqrt{2}}$ cm/sec

(c) $\frac{\pi}{30}$ cm/sec (d) $\frac{\pi\sqrt{2}}{30}$ cm/sec

Q.2 A particle moves towards east with velocity 5 m/s. After 10 seconds its direction changes towards north with same velocity. The average acceleration of the particle is

(a) zero (b) $\frac{1}{\sqrt{2}}$ m/s^2 N-W

(c) $\frac{1}{\sqrt{2}}$ m/s^2 N-E (d) $\frac{1}{\sqrt{2}}$ m/s^2 S-W

Q.3 A force $\vec{F} = -K(y\hat{i} + x\hat{j})$ (where K is a positive constant) acts on a particle moving in the x-y plane. Starting from the origin, the particle is taken along the positive x-axis to the point $(a, 0)$ and then parallel to the y-axis to the point (a, a). The total work done by the forces $\vec{F}$ on the particle is

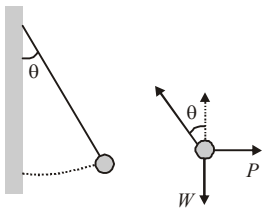
(a) $-2\,Ka^2$ (b) $2\,Ka^2$

(c) $-Ka^2$ (d) Ka^2

RESPONSE GRID	1. ⓐⓑⓒⓓ	2. ⓐⓑⓒⓓ	3. ⓐⓑⓒⓓ

Space for Rough Work

Q.4 A metal sphere is hung by a string fixed to a wall. The sphere is pushed away from the wall by a stick. The forces acting on the sphere are shown in the second diagram. Which of the following statements is wrong?



(a) $P = W\tan\theta$ (b) $\vec{T}+\vec{P}+\vec{W}=0$

(c) $T^2 = P^2 + W^2$ (d) $T = P + W$

Q.5 The speed of a boat is 5km/h in still water. It crosses a river of width 1 km along the shortest possible path in 15 minutes. The velocity of the river water is

(a) 1 km/h (b) 3 km/h

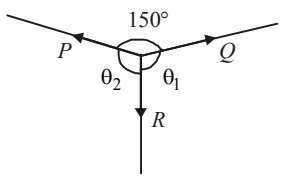
(c) 4 km/h (d) 5 km/h

Q.6 A man crosses a 320 m wide river perpendicular to the current in 4 minutes. If in still water he can swim with a speed 5/3 times that of the current, then the speed of the current in m/min is

(a) 30 (b) 40

(c) 50 (d) 60

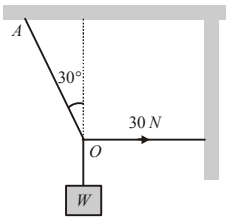
Q.7 P, Q and R are three coplanar forces acting at a point and are in equilibrium. Given $P = 1.9318$ kg wt, $\sin\theta_1 = 0.9659$, the value of R is (in kg wt)



(a) 0.9659 (b) 2

(c) 1 (d) $\frac{1}{2}$

Q.8 As shown in figure the tension in the horizontal cord is 30 N. The weight W and tension in the string OA in newton are



(a) $30\sqrt{3}, 30$ (b) $30\sqrt{3}, 60$

(c) $60\sqrt{3}, 30$ (d) None of these

Q.9 A boat is moving with a velocity $3\hat{i}+4\hat{j}$ with respect to ground. The water in the river is moving with a velocity $-3\hat{i}-4\hat{j}$ with respect to ground. The relative velocity of the boat with respect to water is

(a) $8\hat{j}$ (b) $-6\hat{i}-8\hat{j}$ (c) $6\hat{i}+8\hat{j}$ (d) $5\sqrt{2}\hat{i}$

Q.10 A person aiming to reach the exactly opposite point on the bank of a stream is swimming with a speed of 0.5 m/s at an angle of 120° with the direction of flow of water. The speed of water in the stream is

(a) 1 m/s (b) 0.5 m/s (c) 0.25 m/s (d) 0.433 m/s

Q.11 A man can swim with velocity v relative to water. He has to cross a river of width d flowing with a velocity u ($u > v$). The distance through which he is carried down stream by the river is x. Which of the following statements is correct?

(a) If he crosses the river in minimum time $x = \frac{du}{v}$

(b) x cannot be less than $\frac{du}{v}$

(c) For x to be minimum he has to swim in a direction making an angle of $\frac{\pi}{2} - \sin^{-1}\left(\frac{v}{u}\right)$ with the direction of the flow of water.

(d) x will be maximum if he swims in a direction making an angle of $\frac{\pi}{2} + \sin^{-1}\left(\frac{v}{u}\right)$ with direction of the flow of water.

RESPONSE GRID					
4. ⓐⓑⓒⓓ	5. ⓐⓑⓒⓓ	6. ⓐⓑⓒⓓ	7. ⓐⓑⓒⓓ	8. ⓐⓑⓒⓓ
9. ⓐⓑⓒⓓ	10. ⓐⓑⓒⓓ	11. ⓐⓑⓒⓓ		

Space for Rough Work

Q.12 A 120 m long train is moving towards west with a speed of 10 m/s. A bird flying towards east with a speed of 5 m/s crosses the train. The time taken by the bird to cross the train will be
(a) 16 sec (b) 12 sec (c) 10 sec (d) 8 sec

Q.13 What is the value of linear velocity, if $\vec{\omega} = 3\hat{i} - 4\hat{j} + \hat{k}$ and $\vec{r} = 5\hat{i} - 6\hat{j} + 6\hat{k}$
(a) $6\hat{i} - 2\hat{j} + 3\hat{k}$ (b) $6\hat{i} - 2\hat{j} + 8\hat{k}$
(c) $4\hat{i} - 13\hat{j} + 6\hat{k}$ (d) $-18\hat{i} - 13\hat{j} + 2\hat{k}$

Q.14 If $|\vec{A} \times \vec{B}| = \sqrt{3}\,\vec{A}.\vec{B}$, then the value of $|\vec{A} + \vec{B}|$ is
(a) $\left(A^2 + B^2 + \frac{AB}{\sqrt{3}}\right)^{1/2}$ (b) $A + B$
(c) $(A^2 + B^2 + \sqrt{3}AB)^{1/2}$ (d) $(A^2 + B^2 + AB)^{1/2}$

Q.15 Find the torque of a force $\vec{F} = -3\hat{i} + \hat{j} + 5\hat{k}$ acting at a point $\vec{r} = 7\hat{i} + 3\hat{j} + \hat{k}$
(a) $14\hat{i} - 38\hat{j} + 16\hat{k}$ (b) $4\hat{i} + 4\hat{j} + 6\hat{k}$
(c) $21\hat{i} + 4\hat{j} + 4\hat{k}$ (d) $-14\hat{i} + 34\hat{j} - 16\hat{k}$

Q.16 If $|\vec{A} \times \vec{B}| = |\vec{A}.\vec{B}|$, then angle between $\vec{A}$ and $\vec{B}$ will be
(a) 30° (b) 45° (c) 60° (d) 90°

Q.17 The vector $\vec{P} = a\hat{i} + a\hat{j} + 3\hat{k}$ and $\vec{Q} = a\hat{i} - 2\hat{j} - \hat{k}$ are perpendicular to each other. The positive value of a is
(a) 3 (b) 4
(c) 9 (d) 13

Q.18 A particle moves from position $3\hat{i} + 2\hat{j} - 6\hat{k}$ to $14\hat{i} + 13\hat{j} + 9\hat{k}$ due to a uniform force of $(4\hat{i} + \hat{j} + 3\hat{k})N$. If the displacement in metres then work done will be
(a) 100 J (b) 200 J (c) 300 J d) 250 J

Q.19 The three vectors $\vec{A} = 3\hat{i} - 2\hat{j} + \hat{k}$, $\vec{B} = \hat{i} - 3\hat{j} + 5\hat{k}$ and $\vec{C} = 2\hat{i} + \hat{j} - 4\hat{k}$ form
(a) an equilateral triangle (b) isosceles triangle
(c) a right angled triangle (d) no triangle

Q.20 Two forces $\vec{F}_1 = 5\hat{i} + 10\hat{j} - 20\hat{k}$ and $\vec{F}_2 = 10\hat{i} - 5\hat{j} - 15\hat{k}$ act on a single point. The angle between $\vec{F}_1$ and $\vec{F}_2$ is nearly
(a) 30° (b) 45°
(c) 60° (d) 90°

Q.21 With respect to a rectangular cartesian coordinate system, three vectors are expressed as
$\vec{a} = 4\hat{i} - \hat{j}$, $\vec{b} = -3\hat{i} + 2\hat{j}$, and $\vec{c} = -\hat{k}$
where $\hat{i}, \hat{j}, \hat{k}$ are unit vectors, along the X, Y and Z-axis respectively. The unit vectors $\hat{r}$ along the direction of sum of these vector is
(a) $\hat{r} = \frac{1}{\sqrt{3}}(\hat{i} + \hat{j} - \hat{k})$ (b) $\hat{r} = \frac{1}{\sqrt{2}}(\hat{i} + \hat{j} - \hat{k})$
(c) $\hat{r} = \frac{1}{3}(\hat{i} - \hat{j} + \hat{k})$ (d) $\hat{r} = \frac{1}{\sqrt{2}}(\hat{i} + \hat{j} + \hat{k})$

DIRECTIONS (Q.22-Q.24) : In the following questions, more than one of the answers given are correct. Select the correct answers and mark it according to the following codes:

Codes :
(a) 1, 2 and 3 are correct **(b)** 1 and 2 are correct
(c) 2 and 4 are correct **(d)** 1 and 3 are correct

Q.22 A boy walks uniformally along the sides of a rectangular park of size 400 m × 300 m, starting from one corner to the other corner diagonally opposite. Which of the following statements is correct?
(1) He has travelled a distance of 700 m
(2) His displacement is 500 m
(3) His velocity is not uniform throughout the walk
(4) His displacement is 700 m

Q.23 The three vectors $\vec{A} = 3\hat{i} - 2\hat{j} - \hat{k}$, $\vec{B} = \hat{i} - 3\hat{j} + 5\hat{k}$ and $\vec{C} = 2\hat{i} - \hat{j} - 4\hat{k}$ does not form
(1) an equilateral triangle (2) isosceles triangle
(3) a right angled triangle (4) no triangle

RESPONSE GRID					
	12. ⓐⓑⓒⓓ	**13.** ⓐⓑⓒⓓ	**14.** ⓐⓑⓒⓓ	**15.** ⓐⓑⓒⓓ	**16.** ⓐⓑⓒⓓ
	17. ⓐⓑⓒⓓ	**18.** ⓐⓑⓒⓓ	**19.** ⓐⓑⓒⓓ	**20.** ⓐⓑⓒⓓ	**21.** ⓐⓑⓒⓓ
	22. ⓐⓑⓒⓓ	**23.** ⓐⓑⓒⓓ			

Space for Rough Work

Q.24 If for two vectors $\vec{A}$ and $\vec{B}$, $\vec{A} \times \vec{B} = 0$, which of the following is not correct?

(1) They are perpendicular to each other
(2) They act at an angle of 60°
(3) They act at an angle of 30°
(4) They are parallel to each other

DIRECTIONS (Q.25-Q.27) : Read the passage given below and answer the questions that follows :

$\vec{A} = 2\hat{i} + \hat{j} + \hat{k}$ and $\vec{B} = \hat{i} + \hat{j} + \hat{k}$ are two vectors.

Q.25 The unit vector perpendicular to $\vec{A}$ is

(a) $\frac{-\hat{j}+\hat{k}}{\sqrt{2}}$ (b) $\frac{-\hat{j}-\hat{k}}{\sqrt{2}}$ (c) $\frac{\hat{i}+\hat{k}}{2}$ (d) $\frac{\hat{i}-\hat{k}}{2}$

Q.26 The unit vector parallel to $\vec{A}$ is

(a) $\frac{2\hat{i}-\hat{j}+3\hat{k}}{\sqrt{2}}$ (b) $\frac{2\hat{i}+\hat{j}+\hat{k}}{\sqrt{6}}$

(c) $\frac{2\hat{i}-\hat{j}-\hat{k}}{\sqrt{5}}$ (d) $\frac{2\hat{i}+\hat{j}-2\hat{k}}{\sqrt{6}}$

Q.27 The unit vector perpendicular to $\vec{B}$ is

(a) $\frac{-\hat{j}-\hat{k}}{\sqrt{3}}$ (b) $\frac{-\hat{j}+\hat{k}}{\sqrt{2}}$ (c) $\frac{\hat{i}-\hat{k}}{3}$ (d) $\frac{\hat{i}+\hat{k}}{2}$

DIRECTIONS (Q.28-Q.29) : Each of these questions contains two statements: Statement-1 (Assertion) and Statement-2 (Reason). Each of these questions has four alternative choices, only one of which is the correct answer. You have to select the correct choice.

(a) Statement-1 is True, Statement-2 is True; Statement-2 is a correct explanation for Statement-1.
(b) Statement-1 is True, Statement-2 is True; Statement-2 is NOT a correct explanation for Statement-1.
(c) Statement -1 is False, Statement-2 is True.
(d) Statement -1 is True, Statement-2 is False.

Q.28 Statement-1: If $|\vec{A}+\vec{B}| = |\vec{A}-\vec{B}|$, then angle between $\vec{A}$ and $\vec{B}$ is 90°

Statement-2 : $\vec{A}+\vec{B} = \vec{B}+\vec{A}$

Q.29 Statement-1 : The sum of two vectors can be zero.

Statement-2 : Two vectors cancel each other, when they are equal and opposite.

RESPONSE GRID	24. ⓐⓑⓒⓓ 25. ⓐⓑⓒⓓ 26. ⓐⓑⓒⓓ 27. ⓐⓑⓒⓓ 28. ⓐⓑⓒⓓ 29. ⓐⓑⓒⓓ

DAILY PRACTICE PROBLEM SHEET 5 - PHYSICS			
Total Questions	29	Total Marks	116
Attempted		Correct	
Incorrect		Net Score	
Cut-off Score	30	Qualifying Score	44
Success Gap = Net Score – Qualifying Score			
Net Score = (Correct × 4) – (Incorrect × 1)			

Space for Rough Work

DAILY PRACTICE PROBLEMS

PHYSICS SOLUTIONS

05

1. (d) $\Delta v = 2v\sin\left(\frac{90°}{2}\right)$

$= 2v\sin 45° = 2v\times\frac{1}{\sqrt{2}} = \sqrt{2}\,v$

$= \sqrt{2}\times r\omega = \sqrt{2}\times 1\times\frac{2\pi}{60} = \frac{\sqrt{2}\,\pi}{30}$ cm/s

2. (b) $\Delta v = 2v\sin\left(\frac{\theta}{2}\right) = 2\times 5\times\sin 45° = \frac{10}{\sqrt{2}}$

$\therefore\ a = \frac{\Delta v}{\Delta t} = \frac{10/\sqrt{2}}{10} = \frac{1}{\sqrt{2}}$ m/s^2

3. (c) For motion of the particle from (0, 0) to (a, 0)

$\vec{F} = -K(0\hat{i} + a\hat{j}) \Rightarrow \vec{F} = -Ka\hat{j}$

Displacement $\vec{r} = (a\hat{i} + 0\hat{j}) - (0\hat{i} + 0\hat{j}) = a\hat{i}$

So work done from (0, 0) to (a, 0) is given by

$W = \vec{F}.\vec{r} = -Ka\hat{j}.a\hat{i} = 0$

For motion (a, 0) to (a, a)

$\vec{F} = -K(a\hat{i} + a\hat{j})$ and displacement

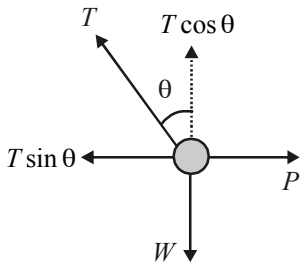
$\vec{r} = (a\hat{i} + a\hat{j}) - (a\hat{i} + 0\hat{j}) = a\hat{j}$

So work done from (a, 0) to (a, a)

$W = \vec{F}.\vec{r} = -K(a\hat{i} + a\hat{j}).a\hat{j} = -Ka^2$

So total work done = $-Ka^2$

4. (d)



As the metal sphere is in equilibrium under the effect of the three forces therefore

$\vec{T} + \vec{P} + \vec{W} = 0$

From the figure

$T\cos\theta = W$ ..... (i)

$T\sin\theta = P$ ..... (ii)

From equation (i) and (ii) we get

$P = W\tan\theta$ and $T^2 = P^2 + W^2$

5. (b) Time taken to cross the river along shortest possible path is given by

$t = \frac{d}{\sqrt{v^2 - u^2}}$

v = velocity of boat in still water

u = velocity of river water

d = width of river

$\therefore\ \frac{15}{60} = \frac{1}{\sqrt{5^2 - u^2}}$

$\Rightarrow$ u = 3 km/h

6. (d) Here d = 320 m = $\frac{320}{1000}$ km

t = 4 min

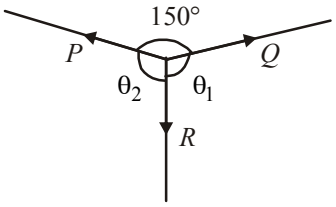
v = $\frac{5}{3}u$

Putting values in $t = \frac{d}{\sqrt{v^2 - u^2}}$, u = 60 m/min

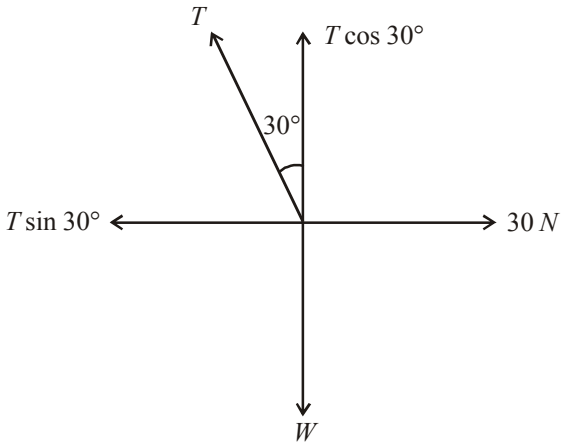
7. (c) $\frac{P}{\sin\theta_1} = \frac{Q}{\sin\theta_2} = \frac{R}{\sin 150°}$

$\Rightarrow\ \frac{1.93}{\sin\theta_1} = \frac{R}{\sin 150°}$

$\Rightarrow\ R = \frac{1.93\times\sin 150°}{\sin\theta_1} = \frac{1.93\times 0.5}{0.9659} = 1$



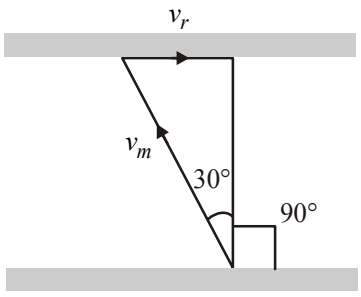
8. (b)



From the figure
$T\sin 30° = 30$ ...(i)
$T\cos 30° = W$ ...(ii)
By solving equation (i) and (ii) we get
$W = 30\sqrt{3}N$ and $T = 60\ N$

9. **(c)** Relative velocity $= (3\hat{i}+4\hat{j})-(-3\hat{i}-4\hat{j}) = 6\hat{i}+8\hat{j}$

10. **(c)**



$$\sin 30° = \frac{v_r}{v_m} = \frac{1}{2}$$

$$\Rightarrow\ v_r = \frac{v_m}{2} = \frac{0.5}{2} = 0.25\ \text{m/s}$$

11. **(a)** To cross the river in minimum time, the shift is given by $\frac{du}{v}$.

12. **(d)** Relative velocity = 10 + 5 = 15 m/s.

Time taken by the bird to cross the train $= \frac{120}{15} = 8$ sec

13. **(d)** $\vec{v} = \vec{\omega}\times\vec{r}$

$$= \begin{vmatrix} \hat{i} & \hat{j} & \hat{k} \\ 3 & -4 & 1 \\ 5 & -6 & 6 \end{vmatrix} = -18\hat{i}-13\hat{j}+2\hat{k}$$

14. **(d)** $|\vec{A}\times\vec{B}| = \sqrt{3}(\vec{A}.\vec{B})$

$AB\sin\theta = \sqrt{3}AB\cos\theta$

$\Rightarrow\ \tan\theta = \sqrt{3}$

$\Rightarrow\ \theta = 60°$

Now $|\vec{R}| = |\vec{A}+\vec{B}|$

$$= \sqrt{A^2+B^2+2AB\cos\theta}$$

$$= \sqrt{A^2+B^2+2AB\left(\frac{1}{2}\right)}$$

$$= (A^2+B^2+AB)^{1/2}$$

15. **(a)** $\vec{\tau} = \vec{r}\times\vec{F} = (7\hat{i}+3\hat{j}+\hat{k})(-3\hat{i}+\hat{j}+5\hat{k})$

$$\vec{\tau} = \begin{vmatrix} \hat{i} & \hat{j} & \hat{k} \\ 7 & 3 & 1 \\ -3 & 1 & 5 \end{vmatrix} = 14\hat{i}-38\hat{j}+16\hat{k}$$

16. **(b)** $|\vec{A}\times\vec{B}| = \vec{A}.\vec{B}$

$\Rightarrow\ AB\sin\theta = AB\cos\theta$

$\Rightarrow\ \tan\theta = 1$

$\therefore\ \theta = 45°$

17. **(a)** $\vec{P}.\vec{Q} = 0$

$\Rightarrow a^2 - 2a - 3 = 0$
$\Rightarrow a = 3$

18. **(a)** $\vec{S} = \vec{r_2}-\vec{r_1}$

$W = \vec{F}.\vec{S}$

$= (4\hat{i}+\hat{j}+3\hat{k}).(11\hat{i}+11\hat{j}+15\hat{k})$
$= (4\times 11 + 1\times 11 + 3\times 15) = 100$ J

19. **(c)** $\vec{A} = 3\hat{i}-2\hat{j}+\hat{k},\ \vec{B} = \hat{i}-3\hat{j}+5\hat{k},\ \vec{C} = 2\hat{i}+\hat{j}-4\hat{k}$

$$|\vec{A}| = \sqrt{3^2+(-2)^2+1^2} = \sqrt{9+4+1} = \sqrt{14}$$

$$|\vec{B}| = \sqrt{1^2+(-3)^2+5^2} = \sqrt{1+9+25} = \sqrt{35}$$

$$|\vec{C}| = \sqrt{2^2+1^2+(-4)^2} = \sqrt{4+1+16} = \sqrt{21}$$

As $B = \sqrt{A^2+C^2}$ therefore ABC will be right angled triangle.

20. **(b)** $\cos\theta = \frac{\vec{F}_1.\vec{F}_2}{|F_1||F_2|}$

$$= \frac{(5\hat{i}+10\hat{j}-20\hat{k}).(10\hat{i}-5\hat{j}-15\hat{k})}{\sqrt{25+100+400}.\sqrt{100+25+225}}$$

$$= \frac{50-50+300}{\sqrt{525}.\sqrt{350}}$$

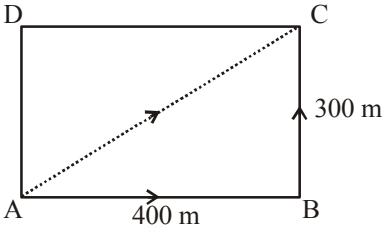
$$\Rightarrow\ \cos\theta = \frac{1}{\sqrt{2}}$$

$\therefore\ \theta = 45°$

21. **(a)** $\vec{r} = \vec{a}+\vec{b}+\vec{c} = 4\hat{i}-\hat{j}-3\hat{i}+2\hat{j}-\hat{k} = \hat{i}+\hat{j}-\hat{k}$

$$\hat{r} = \frac{\vec{r}}{|r|} = \frac{\hat{i}+\hat{j}-\hat{k}}{\sqrt{1^2+1^2+(-1)^2}} = \frac{\hat{i}+\hat{j}-\hat{k}}{\sqrt{3}}$$

22. **(a)**



Displacement $\overrightarrow{AC} = \overrightarrow{AB}+\overrightarrow{BC}$

$AC = \sqrt{(AB)^2 + (BC)^2} = \sqrt{(400)^2 + (300)^2} = 500\,m$

Distance = AB+BC =400+300=700 m

23. (a) $\vec{A} = 3\hat{i} - 2\hat{j} + \hat{k}, \vec{B} = \hat{i} - 3\hat{j} + 5\hat{k}, \vec{C} = 2\hat{i} - \hat{j} + 4\hat{k}$

$|\vec{A}| = \sqrt{3^2 + (-2)^2 + 1^2} = \sqrt{9+4+1} = \sqrt{14}$

$|\vec{B}| = \sqrt{1^2 + (-3)^2 + 5^2} = \sqrt{1+9+25} = \sqrt{35}$

$|\vec{C}| = \sqrt{2^2 + 1^2 + (-4)^2} = \sqrt{4+1+16} = \sqrt{21}$

As $B = \sqrt{A^2 + C^2}$ therefore ABC will be right angled triangle.

24. (a) $\vec{A} \times \vec{B} = 0 \therefore \sin\theta = 0 \therefore \theta = 0°$

Two vectors will be parallel to each other.

25. (a), 26 (b), 27. (b)

$$\vec{A} \times \vec{B} = \begin{vmatrix} \hat{i} & \hat{j} & \hat{k} \\ 2 & 1 & 1 \\ 1 & 1 & 1 \end{vmatrix} = \hat{i}(1-1) - \hat{j}(2-1) + \hat{k}(2-1)$$

$$= -\hat{j} + \hat{k}$$

Unit vector perpendicular to $\vec{A}$ and $\vec{B}$ is $\left(\frac{-\hat{j} + \hat{k}}{\sqrt{2}}\right)$.

Any vector whose magnitude is k (constant) times $(2\hat{i} + \hat{j} + \hat{k})$ is parallel to $\vec{A}$ so, unit vector $\frac{2\hat{i} + \hat{j} + \hat{k}}{\sqrt{6}}$ is parallel to $\vec{A}$.

28. (b) $|\vec{A} + \vec{B}| = |\vec{A} - \vec{B}|$

$\Rightarrow \quad A^2 + B^2 + 2AB\cos\theta = A^2 + B^2 + 2AB\cos\theta$

Hence $\cos\theta = 0$ which gives $\theta = 90°$

Also vector addition is commutative.

Hence $\vec{A} + \vec{B} = \vec{B} + \vec{A}$

29. (a) Let $\vec{P}$ and $\vec{Q}$ are two vectors in opposite direction, then their sum $\vec{P} + (-\vec{Q}) = \vec{P} - \vec{Q}$

If $\vec{P} = \vec{Q}$ then sum equal to zero.

30. (d) The resultant of two vectors of unequal magnitude given by $R = \sqrt{A^2 + B^2 + 2AB\cos\theta}$ cannot be zero for any value of θ.