جريدة الدستور

Revision

And

Rules

First secondary

Mathematics

Prepare by

Mr / Mortagy

Rules sec 1 math

The unit matrix

It is a diagonal matrix in which each element on the main diagonal is the number 1 and it is denoted by I

For example: $I = \begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix}$ is a unit matrix of order 2 × 2

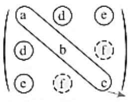
$I = \begin{pmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{pmatrix}$ is a unit matrix of order 3 × 3

Symmetric and skew symmetric matrices

If A is a square matrix, then:

- A is called a symmetric matrix if and only if $A = A^t$
- A is called a skew symmetric matrix if and only if $A = -A^t$

- If A is a symmetric matrix, we notice that its elements are symmetric about the main diagonal, then $a_{ij} = a_{ji}$ as in the opposite figure, where $a_{21} = a_{12} = d$, $a_{31} = a_{13} = e$, $a_{32} = a_{23} = f$



- The elements of the main diagonal in the skew symmetric matrix have the numeral zero, and its elements satisfy the relation $a_{ij} = -a_{ji}$

- $(A + B)^t = A^t + B^t$
- $(AB)^t = B^t A^t$
- $(A^t)^t = A$

$$|A| = \begin{vmatrix} a & b \\ c & d \end{vmatrix} = ad - cb$$

$$\begin{vmatrix} + & - & + \\ - & + & - \\ + & - & + \end{vmatrix}$$

$$|A| = \begin{vmatrix} a_{11} & a_{12} & a_{13} \\ a_{21} & a_{22} & a_{23} \\ a_{31} & a_{32} & a_{33} \end{vmatrix} = a_{11}\begin{vmatrix} a_{22} & a_{23} \\ a_{32} & a_{33} \end{vmatrix} - a_{12}\begin{vmatrix} a_{21} & a_{23} \\ a_{31} & a_{33} \end{vmatrix} + a_{13}\begin{vmatrix} a_{21} & a_{22} \\ a_{31} & a_{32} \end{vmatrix}$$

If XYZ is a triangle where X (a, b), Y (c, d), Z (e, f), then the area of Δ XYZ is |A|

Where $A = \frac{1}{2}\begin{vmatrix} a & b & 1 \\ c & d & 1 \\ e & f & 1 \end{vmatrix}$

To prove that the three points X (a, b), Y (c, d), Z (e, f) are collinear by using determinants, then we prove that: $\begin{vmatrix} a & b & 1 \\ c & d & 1 \\ e & f & 1 \end{vmatrix} = 0$

If $A = \begin{pmatrix} a & b \\ c & d \end{pmatrix}$, the multiplicative inverse of the matrix A which is denoted by the symbol A^{-1} is defined (existed) when the determinant of $A = \Delta \neq 0$, then

$$A^{-1} = \frac{1}{\Delta}\begin{pmatrix} d & -b \\ -c & a \end{pmatrix}$$

where $AA^{-1} = A^{-1}A = I$

$a_1 x + b_1 y = c_1$, $a_2 x + b_2 y = c_2$ by using:

① By using determinants (Cramer's rule)

We find the values of the determinants:

$\Delta = \begin{vmatrix} a_1 & b_1 \\ a_2 & b_2 \end{vmatrix}$, $\Delta_x = \begin{vmatrix} c_1 & b_1 \\ c_2 & b_2 \end{vmatrix}$, $\Delta_y = \begin{vmatrix} a_1 & c_1 \\ a_2 & c_2 \end{vmatrix}$, then $x = \frac{\Delta_x}{\Delta}$, $y = \frac{\Delta_y}{\Delta}$

② By using the multiplicative inverse of the matrix

We write the two equations in the form of the matrix equation: $\begin{pmatrix} a_1 & b_1 \\ a_2 & b_2 \end{pmatrix}\begin{pmatrix} x \\ y \end{pmatrix} = \begin{pmatrix} c_1 \\ c_2 \end{pmatrix}$

i.e. In the form AX = C where $A = \begin{pmatrix} a_1 & b_1 \\ a_2 & b_2 \end{pmatrix}$, $X = \begin{pmatrix} x \\ y \end{pmatrix}$ and $C = \begin{pmatrix} c_1 \\ c_2 \end{pmatrix}$

, then $X = A^{-1}C$ and from that we deduce the values of x and y

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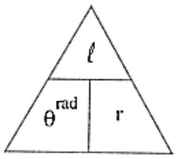
$\theta^{rad} = \frac{\ell}{r}$, then $\begin{cases} \ell = \theta^{rad}\, r \\ r = \frac{\ell}{\theta^{rad}} \end{cases}$



$x^\circ = \theta^{rad} \times \frac{180^\circ}{\pi}$

(to convert from the radian measure to the degree measure)

$\theta^{rad} = x^\circ \times \frac{\pi}{180^\circ}$

(to convert from the degree measure to the radian measure)

If the terminal side of the directed angle of measure θ in the standard position intersects the unit circle at the point (x, y), then:

$\sin\theta = y$, $\cos\theta = x$, $\tan\theta = \frac{y}{x}$

Reciprocals of the trigonometric functions

$\sec\theta = \frac{1}{\cos\theta}$, $\csc\theta = \frac{1}{\sin\theta}$

$\cot\theta = \frac{1}{\tan\theta}$, $\cos\theta = \frac{1}{\sec\theta}$

$\sin\theta = \frac{1}{\csc\theta}$, $\tan\theta = \frac{1}{\cot\theta}$

The relation between θ and −θ

$\sin(-\theta) = -\sin\theta$, $\cos(-\theta) = \cos\theta$

$\tan(-\theta) = -\tan\theta$, $\csc(-\theta) = -\csc\theta$

$\sec(-\theta) = \sec\theta$, $\cot(-\theta) = -\cot\theta$

The relation between θ and (90° − θ)

- $\sin(90° - \theta) = \cos\theta$
- $\csc(90° - \theta) = \sec\theta$
- $\cos(90° - \theta) = \sin\theta$
- $\sec(90° - \theta) = \csc\theta$
- $\tan(90° - \theta) = \cot\theta$
- $\cot(90° - \theta) = \tan\theta$

$\sin^2\theta + \cos^2\theta = 1$, we get: $\sin^2\theta = 1 - \cos^2\theta$ and $\cos^2\theta = 1 - \sin^2\theta$

$1 + \tan^2\theta = \sec^2\theta$, we get: $\tan^2\theta = \sec^2\theta - 1$ and $\sec^2\theta - \tan^2\theta = 1$

$\cot^2\theta + 1 = \csc^2\theta$, we get: $\cot^2\theta = \csc^2\theta - 1$ and $\csc^2\theta - \cot^2\theta = 1$

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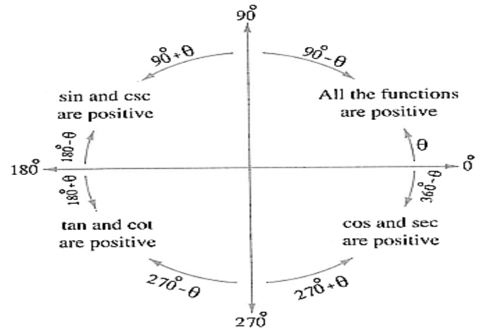


The general solution of the trigonometric equation

The general solution of the equation : $\cos\theta = a$ is $\theta = \pm\beta + 2\pi n$

The general solution of the equation : $\sin\theta = a$ is $\theta = \beta + 2\pi n$, $\theta = (\pi - \beta) + 2\pi n$

The general solution of the equation : $\tan\theta = a$ is $\theta = \beta + \pi n$

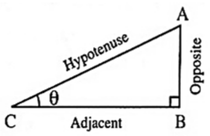
The general solution of the trigonometric equations of the quadrantal angles

$\sin\theta = 0$	its general solution is : $\theta = \pi n$
$\sin\theta = 1$	its general solution is : $\theta = \frac{\pi}{2} + 2\pi n$
$\sin\theta = -1$	its general solution is : $\theta = \frac{3\pi}{2} + 2\pi n$
$\cos\theta = 0$	its general solution is : $\theta = \frac{\pi}{2} + \pi n$
$\cos\theta = 1$	its general solution is : $\theta = 2\pi n$
$\cos\theta = -1$	its general solution is : $\theta = \pi + 2\pi n$

$\sin\theta = \frac{\text{Opposite}}{\text{Hypotenuse}} = \frac{AB}{AC}$

$\cos\theta = \frac{\text{Adjacent}}{\text{Hypotenuse}} = \frac{BC}{AC}$

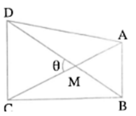
$\tan\theta = \frac{\text{Opposite}}{\text{Adjacent}} = \frac{AB}{BC}$



$(AC)^2 = (AB)^2 + (BC)^2$

- The area of the triangle = $\frac{1}{2}$ length of the base × height
- The area of the triangle = $\frac{1}{2}$ the product of the lengths of two sides × sine of the included angle between them
- The area of the triangle = $\sqrt{S(S-AB)(S-BC)(S-AC)}$

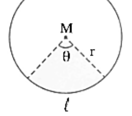
where S equals half of the perimeter of the triangle ABC



- The area of the quadrilateral = $\frac{1}{2}$ product of the lengths of its diagonals × sine of the included angle between them $= \frac{1}{2} AC \times BD \times \sin\theta$

- The area of the regular polygon in which the number of its sides is n sides and the length of its side is $x = \frac{1}{4} n x^2 \cot\frac{\pi}{n}$

The circular sector



The area of the circular sector $= \frac{1}{2}\ell r$

$= \frac{1}{2}\theta^{rad} r^2 = \frac{x^\circ}{360^\circ} \times \pi r^2$

Notice that :

- x° and θ^{rad} are the degree measure and the radian measure of the angle of the sector.
- The perimeter of the sector $= 2r + \ell$

The area of the circular segment $= \frac{1}{2} r^2 (\theta^{rad} - \sin\theta)$

★ If $\overrightarrow{OA}$ is the position vector of the point A (x , y) , then

- $\|\overrightarrow{A}\|$ = the length of $\overrightarrow{OA} = \sqrt{x^2 + y^2}$
- If $\|\overrightarrow{A}\| = 1$ (the unit) , then $\overrightarrow{A}$ is called the unit vector.

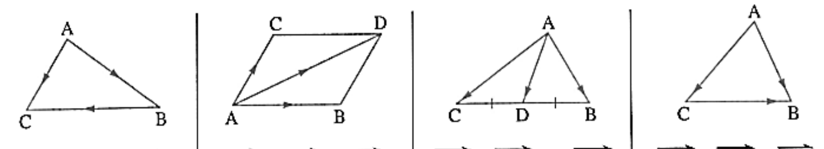
① Cartesian form	② Polar form	③ In terms of $\vec{i}$ and $\vec{j}$
$\overrightarrow{A} = (x , y)$	$\overrightarrow{A} = (\|\overrightarrow{A}\| , \theta)$	$\overrightarrow{A} = x\vec{i} + y\vec{j}$

If the position vector of the point A (x , y) is in the polar form $\overrightarrow{OA} = (\|\overrightarrow{OA}\| , \theta)$, then

$x = \|\overrightarrow{OA}\| \cos\theta$

, $y = \|\overrightarrow{OA}\| \sin\theta$ where $\tan\theta = \frac{y}{x}$

$$\|\overrightarrow{A}\| = \sqrt{x^2 + y^2}$$



$\overrightarrow{AB} + \overrightarrow{BC} = \overrightarrow{AC}$ | $\overrightarrow{AB} + \overrightarrow{AC} = \overrightarrow{AD}$ | $\overrightarrow{AB} + \overrightarrow{AC} = 2\overrightarrow{AD}$ | $\overrightarrow{AB} - \overrightarrow{AC} = \overrightarrow{CB}$

$$\overrightarrow{AB} = \overrightarrow{B} - \overrightarrow{A}$$

If $\overrightarrow{A} // \overrightarrow{B}$ ∴ $x_1 y_2 - x_2 y_1 = 0$

If $\overrightarrow{A} \perp \overrightarrow{B}$ ∴ $x_1 x_2 + y_1 y_2 = 0$

Division of a line segment

$$\vec{r} = \frac{m_1 \vec{r_1} + m_2 \vec{r_2}}{m_1 + m_2}$$

$$(x , y) = \left(\frac{m_1 x_1 + m_2 x_2}{m_1 + m_2} , \frac{m_1 y_1 + m_2 y_2}{m_1 + m_2} \right)$$

The straight line L which passes through the point $A = (x_1 , y_1)$ and the vector $\vec{u} = (a , b)$ is a direction vector to it then.

- **The vector equation is** $\vec{r} = \overrightarrow{A} + k\vec{u}$
- **The two parametric equations are** $x = x_1 + ka$, $y = y_1 + kb$
- **The cartesian equation of the straight line is** $\frac{y - y_1}{x - x_1} = m$

If the straight line L passes through the two points (x_1 , y_1) and (x_2 , y_2) , then its slope (m) $= \frac{y_2 - y_1}{x_2 - x_1}$

If θ is the measure of the positive angle which the straight line L makes with the positive direction of x-axis , then its slope (m) = $\tan\theta$

If $\vec{u} = (a , b)$ is a direction vector of the straight line L , then its slope (m) $= \frac{b}{a}$

If the equation of the straight line L is in the form : $a x + b y + c = 0$, then its slope (m) $= \frac{-a}{b}$

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1. The slope of X-axis and the slope of any horizontal straight line (parallel to X-axis) are equal to zero.
2. The slope of y-axis and the slope of any vertical straight line (parallel to y-axis) are undefined.
3. If L_1 and L_2 are two straight lines of slopes m_1 and m_2 respectively , then :
   - $L_1 // L_2 \Leftrightarrow m_1 = m_2$

   i.e. The two parallel straight lines have equal slopes and vice versa.
   - $L_1 \perp L_2 \Leftrightarrow m_1 \times m_2 = -1$

   (unless one of them is parallel to one of the two coordinate axes)
4. If the slope of $\overleftrightarrow{AB}$ = the slope of $\overleftrightarrow{BC}$, then the points A , B and C are collinear.

$$\| k \vec{A} \| = |k| \, \| \vec{A} \|$$

1. The straight line whose slope $m = \frac{a}{b}$, then its direction vector $\vec{u} = (b , a)$

2. The straight line which passes through the two points $C(X_1 , y_1)$ and $D(X_2 , y_2)$, then its direction vector $\vec{u} = \overrightarrow{CD} = \vec{D} - \vec{C} = (X_2 - X_1 , y_2 - y_1)$

If the direction vector of the straight line L is $\vec{u} = (a , b)$, then the direction vector of the perpendicular straight line to the straight line L is $\vec{N} = (-b , a)$ or $(b , -a)$

If the two straight lines $L_1 : a_1 X + b_1 y + c_1 = 0$ and $L_2 : a_2 X + b_2 y + c_2 = 0$ intersect at a point , then the general equation of any straight line passing through the point of intersection of L_1 and L_2 other than L_1 and L_2

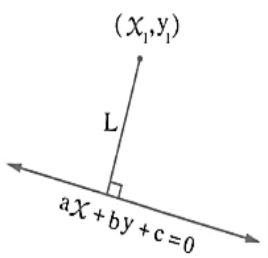
is $a_1 X + b_1 y + c_1 + k(a_2 X + b_2 y + c_2) = 0$

Where $k \neq 0$

If θ is the measure of the included angle between the two straight lines L_1 and L_2 whose slopes are m_1 and m_2 , then $\tan \theta = \left| \frac{m_1 - m_2}{1 + m_1 m_2} \right|$ where $\theta \in [0 , \frac{\pi}{2}]$

1. If the tangent is positive , then we obtain an acute angle.
2. If the tangent is zero , then the measure of the included angle = zero , then $m_1 = m_2$ and the two straight lines are parallel or coincident.
3. If the tangent is undefined , then the measure of the included angle is 90° , then $m_1 m_2 = -1$ and the two straight lines are orthogonal (perpendicular).
4. The measure of the obtuse angle = the measure of the supplementary angle of the acute angle.

- The length of the perpendicular (L) drawn from the point (X_1 , y_1) to the straight line whose equation is : $aX + by + c = 0$ is determined by the relation :



$$\text{The length of the perpendicular (L)} = \frac{|a X_1 + b y_1 + c|}{\sqrt{a^2 + b^2}}$$

The length of the perpendicular drawn from the point (X_1 , y_1) to X-axis = $|y_1|$

The length of the perpendicular drawn from the point (X_1 , y_1) to y-axis = $|X_1|$

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Answer the following :

1 If the slope of a straight line = $\frac{-2}{3}$, then its direction vector is ....

(a) $(3 , -2)$ (b) $(-3 , 2)$

(c) $(6 , -4)$ (d) All the previous answers are correct.

---

2 If ℓ and m are the two roots of the equation : $x^2 - 3x + 1 = 0$

, then value of $\begin{vmatrix} \ell^2 m & -\ell^2 \\ m^2 & m \end{vmatrix}$ = ...

(a) zero (b) 1 (c) 2 (d) 3

---

3 In the opposite figure :

If the equation of the straight line $\overleftrightarrow{AB}$ is $\frac{x}{6} + \frac{y}{8} = 1$

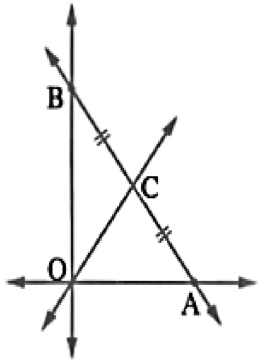
, then parametric equation of the straight line $\overleftrightarrow{OC}$ is ....

(a) $x = 3 + 4k$, $y = 4 + 3k$

(b) $x = 4 + 3k$, $y = 4 + 4k$

(c) $x = 3 + 3k$, $y = 4 + 4k$

(d) $x = 4 + 4k$, $y = 3 + 3k$



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4 If the measure of the elevation angle of the parachute from a point at 60 m. height above a lake level is 30° and measure of the depression angle of the reflexed image of the parachute in the lake from the same point is 60° , then height of the parachute from the lake level = ... m.

(a) 120 (b) 60 (c) 90 (d) 150

---

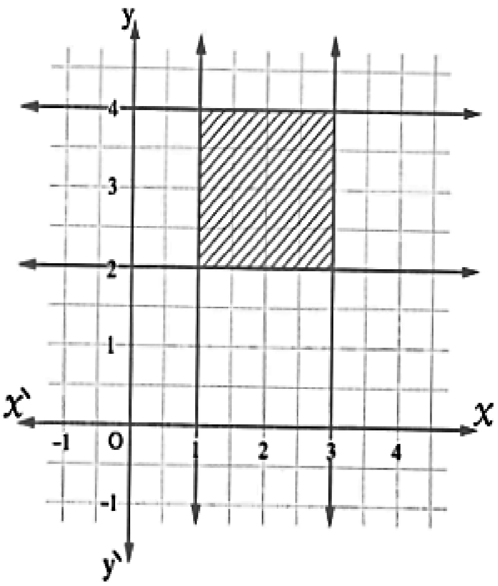
5 The shaded region in the opposite graph represents the S.S. of the inequalities ....

(a) $x > 1$, $y > 2$

(b) $1 < x < 3$, $2 < y < 4$

(c) $1 \le x \le 3$, $2 \le y \le 4$

(d) $x + y \ge 3$, $x - y \le 7$



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6 $(\sin^2 5° + \sin^2 10° + \sin^2 15° + \cdots + \sin^2 90°) = \cdots\cdots$

(a) $7\frac{1}{2}$ (b) $8\frac{1}{2}$ (c) $9\frac{1}{2}$ (d) $10\frac{1}{2}$

---

7 If $\overrightarrow{A} = \overrightarrow{i} + 3\overrightarrow{j}$, $\overrightarrow{B} = -10\overrightarrow{i} + \ell\overrightarrow{j}$ are two parallel vectors , then $\ell = \cdots\cdots$

(a) -30 (b) 6 (c) -6 (d) 3

---

8 Length of the drawn perpendicular from the point $(1 , 1)$ to the straight line : $x + y = 0$ equals $\cdots\cdots$ length unit.

(a) $\frac{\sqrt{2}}{2}$ (b) $\sqrt{2}$ (c) $2\sqrt{2}$ (d) 2

---

9 Measure of the acute angle between the straight line $\overrightarrow{r} = (2 , 2) + k(1 , 1)$ and the straight line $x = 0$ is $\cdots\cdots$

(a) $45°$ (b) $30°$ (c) $135°$ (d) $60°$

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10 If $\overrightarrow{A} = 20\overrightarrow{i} - 15\overrightarrow{j}$, $\overrightarrow{B} = 7\overrightarrow{i} + 24\overrightarrow{j}$ and $\overrightarrow{M} = \overrightarrow{A} + \overrightarrow{B}$, $\overrightarrow{N} = \overrightarrow{A} - \overrightarrow{B}$, then $\cdots\cdots$

(a) $\overrightarrow{M} \parallel \overrightarrow{N}$ (b) $\overrightarrow{M} \perp \overrightarrow{N}$ (c) $\overrightarrow{M} = \overrightarrow{N}$ (d) $\|\overrightarrow{M}\| = \|\overrightarrow{N}\|$

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11 General solution of the equation : $3 \cot\left(\frac{\pi}{2} - \theta\right) = \sqrt{3}$ is $\cdots\cdots$

(a) $\frac{\pi}{6} + 2\pi n$ (b) $\frac{\pi}{6} + \pi n$ (c) $\frac{7\pi}{6} + 2\pi n$ (d) $\frac{\pi}{3} + \pi n$

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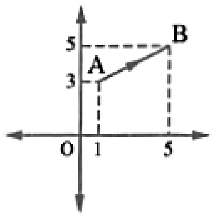
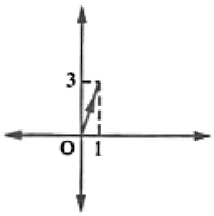
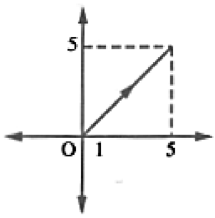
12 In the opposite graph :
$A = (1 , 3)$, $B = (5 , 5)$
, then which of the
following represent $\overrightarrow{AB}$

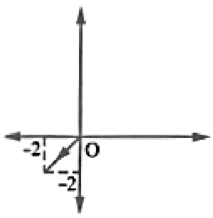




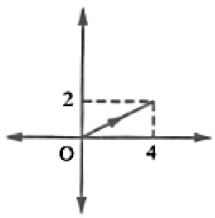
(a)



(b)



(c)



(d)

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13 If A is a symmetric matrix , then which of the following can be a rule to deduce the element of matrix A ?

(a) $a_{ij} = 2i - j$ (b) $a_{ij} = i + j$ (c) $a_{ij} = i^j$ (d) $a_{ij} = 3i + 2j$

14 If a zero matrix O its order 3×3 , then number of elements of the matrix = ...

(a) zero (b) $\varnothing$ (c) 3 (d) 9

---

15 Find the maximum value of the objective function $P = 3x + 2y$ under conditions :

$x \geq 0$, $y \geq 0$, $2x \leq 3y$, $2y + x \leq 7$

---

16 If $A = \begin{vmatrix} \sin 5\theta & -\cos 5\theta \\ \cos 5\theta & \sin 5\theta \end{vmatrix} =$ ....

(a) 1 (b) -1 (c) 5 (d) -5

---

17 The area of a circular sector is 45 cm^2 and the length of the diameter of its circle is 20 cm. , then perimeter of this circular sector equals .... cm.

(a) 29 (b) 19 (c) 39 (d) 49

---

18 The area of the regular hexagon in which the length of its edge is 8 cm. equals .... cm^2

(a) $12\sqrt{3}$ (b) $24\sqrt{3}$ (c) $96\sqrt{3}$ (d) $144\sqrt{3}$

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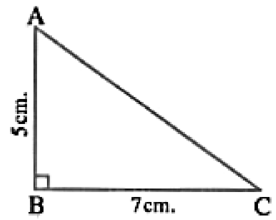
19 In the opposite figure :



m ($\angle$ C) = ... to the nearest degree.

(a) 30 (b) 35

(c) 36 (d) 45

---

20 All of the following are unit vectors except ....

(a) (1 , 0) (b) (0 , − 1) (c) (1 , 1) (d) (0.6 , 0.8)

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21 In ΔABC : $\overrightarrow{AB} - \overrightarrow{CB} + \overrightarrow{AC} =$ ....

(a) $\overrightarrow{AC}$ (b) $\overrightarrow{CA}$ (c) $2\overrightarrow{AC}$ (d) $2\overrightarrow{AB}$

---

22 The direction vector of the straight line whose parametric equations are $x + 3 = 2k$, $y = 5$ is ....

(a) (2 , 0) (b) (2 , − 3) (c) (2 , 3) (d) (2 , 5)

---

23 If $C \in \overline{AB}$, $3\overrightarrow{AB} = 5\overrightarrow{CB}$, then C divides $\overline{BA}$ by the ratio .... internally.

(a) 2 : 3 (b) 3 : 2 (c) 3 : 5 (d) 5 : 3

24 The measure of the angle between the two straight lines $3x = 5$, $y = 3$ is ....

(a) 30° (b) 45° (c) 60° (d) 90°

---

25 If $\overrightarrow{AB} = 2\vec{i} + \vec{j}$, B (3 , – 1) , then the point of A is ....

(a) (1 , – 2) (b) (– 2 , 1) (c) (2 , 1) (d) (1 , 2)

---

26 If $\begin{vmatrix} x & 12 \\ 3 & x \end{vmatrix} = \begin{vmatrix} 2 & 1 \\ 10 & 5 \end{vmatrix}$, then $x =$ ....

(a) 2 (b) 5 (c) 6 (d) ± 6

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27 If $A \times \begin{pmatrix} 3 & -1 \\ 2 & -1 \end{pmatrix} = I$, then A = ...

(a) $\begin{pmatrix} -1 & 3 \\ -1 & 2 \end{pmatrix}$ (b) $\begin{pmatrix} 2 & -1 \\ 3 & -1 \end{pmatrix}$ (c) $\begin{pmatrix} -1 & 1 \\ -2 & 3 \end{pmatrix}$ (d) $\begin{pmatrix} 1 & -1 \\ 2 & -3 \end{pmatrix}$

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28 If $\vec{A} = -2\vec{i} - 2\vec{j}$, then the polar form of $\vec{A}$ is ....

(a) $\left(2\sqrt{2} , \frac{\pi}{4}\right)$ (b) $\left(2\sqrt{2} , \frac{3\pi}{4}\right)$ (c) $\left(2\sqrt{2} , \frac{5\pi}{4}\right)$ (d) $\left(2\sqrt{2} , \frac{7\pi}{4}\right)$

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29 If $\vec{A} = 3\vec{i} - 4\vec{j}$, $\vec{B} = \vec{j}$, $\vec{C} = \left(5 , \frac{\pi}{18}\right)$, find the value of : $\|\vec{A}\| + \|\vec{B}\| + \|\vec{C}\|$

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30 Find the area of circular segment whose chord length is 18 cm. and the radius length of its circle is 18 cm. to the nearest cm^2

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31 The solution set of the inequality : $x + 5 \leq 3x + 1 < 2x + 2$ in $\mathbb{R}$ is ....

(a) $\mathbb{R} - [1 , 2[$ (b) $]1 , 2]$ (c) $\varnothing$ (d) $\{1 , 2\}$

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32 Find the different forms of the equation of the straight line which passes through the point (1 , 3) and is perpendicular to the straight line : $\vec{r} = (2 , 5) + k(-2 , 1)$

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33 Find the area of the triangle whose vertices are A (2 , 4) , B (– 2 , 4) , C (0 , – 2)

Answer

1 (d) 2 (c) 3 (c) 4 (a)

5 (c) 6 (c) 7 (a) 8 (b)

9 (a) 10 (b) 11 (b) 12 (d)

13 (b) 14 (d)

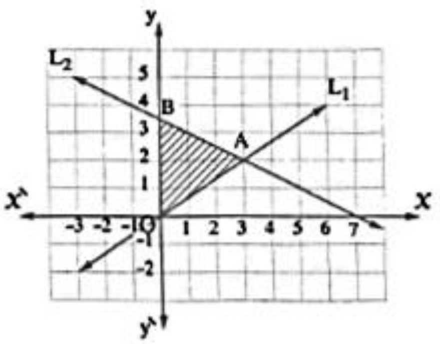
15

$\because x \geq 0$, $y \geq 0$ represented by $\overrightarrow{Ox} \cup \overrightarrow{Oy} \cup$ the first quadrant

$L_1 : 2x = 3y$ passes through (0 , 0) and (3 , 2)

, $L_2 : 2y + x = 7$ passes through (0 , 3.5) and (7 , 0)

$\therefore$ The solution set is the shaded region AOB



$\therefore [P]_O = 3(0) + 2(0) = 0$

, $[P]_A = 3(3) + 2(2) = 13$

, $[P]_B = 3(0) + 2(3.5) = 7$

$\therefore$ The maximum value of the objective function = 13 at the point (3 , 2)

16 (a) 17 (a) 18 (c) 19 (c)

20 (c) 21 (c) 22 (a) 23 (b)

24 (d) 25 (a) 26 (d) 27 (d)

28 (c)

29

$\because \hat{A} = 3\hat{i} - 4\hat{j}$ $\qquad \therefore \|\hat{A}\| = \sqrt{(3)^2 + (4)^2} = 5$

, $\because \hat{B} = \hat{j}$ $\qquad \therefore \|\hat{B}\| = \sqrt{(0)^2 + (1)^2} = 1$

, $\because \hat{C} = \left(5 , \frac{\pi}{18}\right)$ $\qquad \therefore \|\hat{C}\| = 5$

$\therefore \|\hat{A}\| + \|\hat{B}\| + \|\hat{C}\| = 11$

30

In Δ ABM :

$\therefore m(\angle AMB) = 60°$

$\therefore \theta^{rad} = \frac{\pi}{3}$

$\therefore$ The area of the circular segment

$= \frac{1}{2} r^2 (\theta^{rad} - \sin\theta) = \frac{1}{2} \times (18)^2 \left(\frac{\pi}{3} - \sin 60°\right)$

$\simeq 29 \text{ cm}^2$

31 (c)

32

$\because$ The direction vector of the given line is (– 2 , 1)

$\therefore$ The direction vector of the required line is (1 , 2)

$\therefore$ The vector equation : $\vec{r} = (1 , 3) + k(1 , 2)$

i.e. $(x , y) = (1 , 3) + k(1 , 2)$

The parametric equations are $x = 1 + k$, $y = 3 + 2k$

The cartesian equation $\frac{y - 3}{x - 1} = \frac{2}{1}$

$\therefore 2x - 2 = y - 3$

$\therefore$ The general form : $2x - y + 1 = 0$

33

$$\because A = \frac{1}{2} \begin{vmatrix} 2 & 4 & 1 \\ -2 & 4 & 1 \\ 0 & -2 & 1 \end{vmatrix} = 12$$

$\therefore$ The area of Δ ABC = | 12 | = 12 square units.

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