Final Revision

GEOMETRY

3rd. Prep First Term

منتدى توجيه الرياضيات أ/ عادل إدوار

Geometry – Final Revision – Rules

First Trigonometry

Remember — The main trigonometrical ratios of the acute angle and the important relations between them

The trigonometrical ratios of the angle A

- $\sin A = \dfrac{\text{Opposite}}{\text{Hypotenuse}} = \dfrac{BC}{AC}$
- $\cos A = \dfrac{\text{Adjacent}}{\text{Hypotenuse}} = \dfrac{AB}{AC}$
- $\tan A = \dfrac{\text{Opposite}}{\text{Adjacent}} = \dfrac{BC}{AB}$

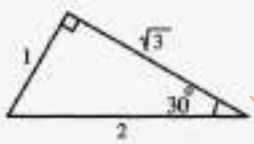
The trigonometrical ratios of the angle C

- $\sin C = \dfrac{\text{Opposite}}{\text{Hypotenuse}} = \dfrac{AB}{AC}$
- $\cos C = \dfrac{\text{Adjacent}}{\text{Hypotenuse}} = \dfrac{BC}{AC}$
- $\tan C = \dfrac{\text{Opposite}}{\text{Adjacent}} = \dfrac{AB}{BC}$

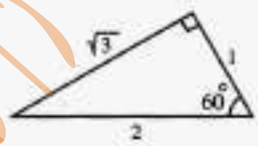
Some important relations

- $\tan A = \dfrac{\sin A}{\cos A}$
- If $m(\angle A) + m(\angle C) = 90°$, then $\sin A = \cos C$, $\cos A = \sin C$
- If $\sin A = \cos C$ or $\cos A = \sin C$, then $m(\angle A) + m(\angle C) = 90°$

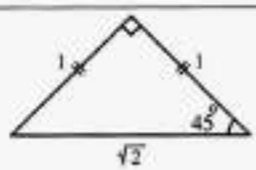
Remember — The trigonometrical ratios of some angles



- $\sin 30° = \dfrac{1}{2}$
- $\cos 30° = \dfrac{\sqrt{3}}{2}$
- $\tan 30° = \dfrac{1}{\sqrt{3}}$



- $\sin 60° = \dfrac{\sqrt{3}}{2}$
- $\cos 60° = \dfrac{1}{2}$
- $\tan 60° = \sqrt{3}$



- $\sin 45° = \dfrac{1}{\sqrt{2}}$
- $\cos 45° = \dfrac{1}{\sqrt{2}}$
- $\tan 45° = 1$

Notice that

If $\cos \theta = 0.7152$, then we use the calculator to find θ by using the keys as the following sequence from left : shift cos . 7 1 5 2 = °'''

Then $\theta \simeq 44° \, 20' \, 25''$

Second Analytical geometry

Remember — The important laws

If $A(x_1, y_1)$, $B(x_2, y_2)$

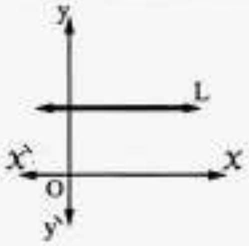
- The law of the distance between the two point A , B (the length of $\overline{AB}$) :
  $AB = \sqrt{(\text{difference between } x\text{-coordinates})^2 + (\text{difference between } y\text{-coordinates})^2}$
- The law of finding the coordinates of the midpoint of $\overline{AB}$:
  The midpoint of $\overline{AB} = \left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2}\right)$
- The law of finding the slope of the straight line $\overleftrightarrow{AB}$:
  $m = \frac{y_2 - y_1}{x_2 - x_1}$

Remember — How to find the slope of the straight line

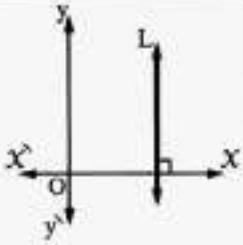
❶	Given two points on the line as : $A(x_1, y_1)$, $B(x_2, y_2)$	$m = \frac{y_2 - y_1}{x_2 - x_1}$
❷	Given the measure of the positive angle which the straight line makes with the positive direction of x-axis , say θ	$m = \tan\theta$
❸	Given the equation of the straight line in the form : $y = bx + c$	$m = b$ where b is the coefficient of x
❹	Given the equation of the straight line in the form : $ax + by + c = 0$	$m = \frac{-\text{coefficient of } x}{\text{coefficient of } y} = \frac{-a}{b}$
❺	Given the slope of the parallel straight line to it , say m_1	$m = m_1$ because the two slopes are equal.
❻	Given the slope of the perpendicular straight line to it , say m_2	$m = \frac{-1}{m_2}$ because : $m \times m_2 = -1$

Important remarks on the slope of the straight line

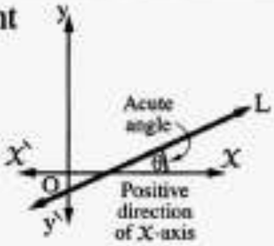
- The slope of X-axis = 0
- The slope of the straight line parallel to X-axis equals 0



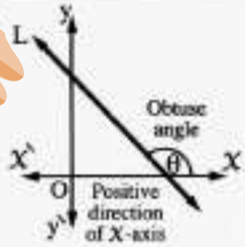
- The slope of y-axis is undefined.
- The slope of the straight line parallel to y-axis is undefined.



- The slope of the straight line which makes an acue angle with the positive direction of X-axis is positive.



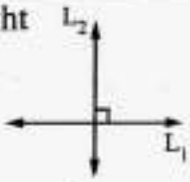
- The slope of the straight line which makes an obtuse angle with the positive direction of X-axis is negative.



- The two parallel straight lines their slopes are equal.

i.e. If $L_1 // L_2$, then $m_1 = m_2$

- The two perpendicular straight lines the product of their slopes equals – 1

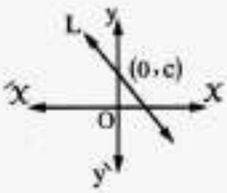


i.e. If $L_1 \perp L_2$, then $m_1 \times m_2 = -1$

Remember — The equation of the straight line

- The equation of the straight line whose slope = m and cuts y-axis at the point (0 , c) is :

$y = m X + c$



For example :

- The equation of the straight line whose

Slope is – 2 and cuts from the positive part of y-axis 7 units is : $y = -2X + 7$

- To find the equation of the striaght line whose slope is 3 and passes through the point (1 , – 2) :

$\because$ The slope = 3 $\qquad$ $\therefore$ The equation of the straight line is : $y = 3X + c$

, then substitute by the point (1 , – 2) to find the value of c as the following :

$-2 = 3 \times 1 + c$ $\qquad$, then : $c = -5$

$\therefore$ The equation of the straight line is : $y = 3X - 5$

Important remarks on the equation of the straight line

1. The equation of the straight line which passes through the origin point O (0 , 0) is : $y = m\,x$ where m is the slope.
2. The equation of x-axis is : $y = 0$ and the equation of y-axis is : $x = 0$
3. The equation of the straight line parallel to x-axis and cuts y-axis at the point (0 , c) is : $y = c$
4. The equation of the straight line parallel to y-axis and cuts x-axis at the point (a , 0) is : $x = a$

Remember — Some rules and remarks which help you to solve the exercises

1. To prove that the points A , B and C are collinear

We will prove that :

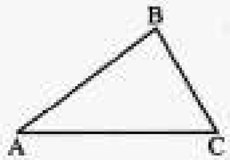
- The slope of $\overleftrightarrow{AB}$ = the slope of $\overleftrightarrow{BC}$ **or** • AB + BC = AC (where AC is the greatest length)

2. To prove that the points A , B and C are vertices of a triangle

We prove that :

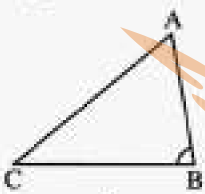
- The slope of $\overleftrightarrow{AB} \neq$ the slope of $\overleftrightarrow{BC}$

or • AB + BC > AC (where AC is the greatest length)



3. To determine the type of the triangle ABC according to its angle measures

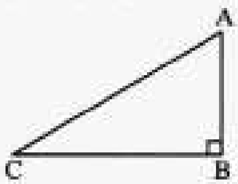
We compare between : $(AC)^2$, $(AB)^2 + (BC)^2$ where $\overline{AC}$ is the longest side , if :



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

, then :

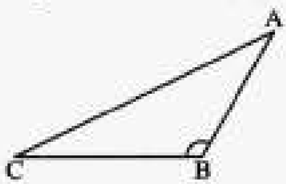
Δ ABC is acute-angled.



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

, then :

Δ ABC is right-angled at B



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

, then :

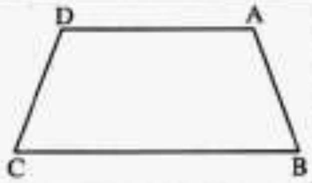
Δ ABC is obtuse-angled at B

❹ To prove that : the quadrilateral ABCD is a trapezium

We prove that :

The slope of $\overleftrightarrow{AD}$ = the slope of $\overleftrightarrow{BC}$, then $\overline{AD} \parallel \overline{BC}$

, the slope of $\overleftrightarrow{AB} \neq$ the slope of $\overleftrightarrow{DC}$, then $\overline{AB}$ is not parallel to $\overline{DC}$



❺ To prove that : the quadrilateral ABCD is a parallelogram

- **By using the slope , we prove that :**

  The slope of $\overleftrightarrow{AD}$ = the slope of $\overleftrightarrow{BC}$, then $\overline{AD} \parallel \overline{BC}$

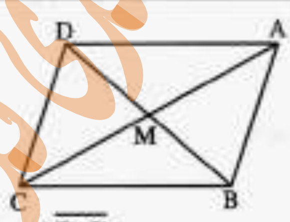
  , the slope of $\overleftrightarrow{AB}$ = the slope of $\overleftrightarrow{DC}$, then $\overline{AB} \parallel \overline{DC}$

- **By using the distance between two points , we prove that :**

  The length of $\overline{AD}$ = the length of $\overline{BC}$, the length of $\overline{AB}$ = the length of $\overline{DC}$

- **By using the coordinates of the midpoint of a line segment , we prove that :**

  The coordinates of the midpoint of $\overline{AC}$ is the coordinates of the midpoint of $\overline{BD}$, then : $\overline{AC}$, $\overline{BD}$ bisect each other.



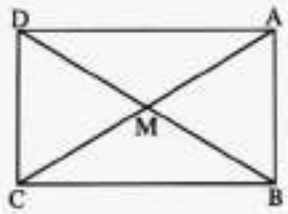
❻ To prove that : the quadrilateral ABCD is a rectangle

First we prove that : the quadrilateral ABCD is a parallogram by one of the previous methods , then

prove that :

- AC = BD (By using the distance between two points)

or • The slope of $\overleftrightarrow{AB}$ × the slope of $\overleftrightarrow{BC} = -1$, then : $\overline{AB} \perp \overline{BC}$



❼ To prove that : the quadrilateral ABCD is a rhombus

* First we prove that : the quadrilateral ABCD is a parallelogram , then

Prove that :

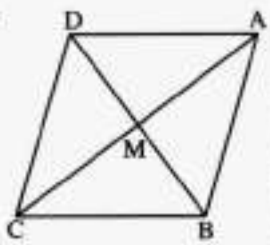
- AB = BC (By using the distance between two points)

or • The slope of $\overleftrightarrow{AC}$ × the slope of $\overleftrightarrow{BD} = -1$, then $\overline{AC} \perp \overline{BD}$

* We can prove that the quadrialateral ABCD is a rhombus directly by using the distance between two points

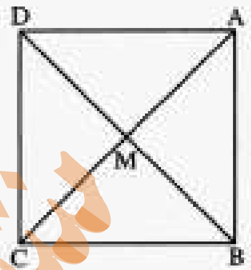
we prove that :

AB = BC = CD = DA



8 To prove that : the quadrilateral ABCD is a square

* First we prove that : the quadrilateral ABCD is a parallelogram , then



prove that :

• AB = BC (By using the distance between two points)

and the slope of $\overleftrightarrow{AB}$ × the slope of $\overleftrightarrow{BC} = -1$, then $\overline{AB} \perp \overline{BC}$

or • AC = BD (By using the distance between two points)

and the slope of $\overleftrightarrow{AC}$ × the slope of $\overleftrightarrow{BD} = -1$ then : $\overline{AC} \perp \overline{BD}$

* We can prove that the quadrilateral ABCD is a square by using the distance between two points

we prove that :

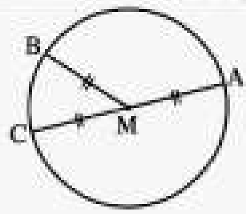
AB = BC = CD = DA , then the quadrilateral is a rhombus , then

prove that : AC = BD

9 To prove that : the points A , B , C lie on one circle of centre M

By using the distance between two points

we prove that : MA = MB = MC



Rules And laws

Area of rectangle: Area / Width | Length

Perimeter of rectangle: P / (L+W) | 2

Area of square: Area / L | L

Perimeter of square: P / L | 4

Circumference of circle: C / D | π

Circumference of circle: C / 2 π | r

Volume of Cuboid: V / L | W | H

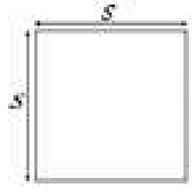
Volume of Cuboid: V / B.A | H

Area of triangle: P / 0.5 | B | H

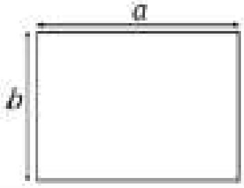
Lateral area of Cylinder	Volume of Cylinder	Volume of sphere
L.A	V	V
2 π | r | H	π | r² | H	4/3 | π | r³

GEOMETRY SHAPES AND SOLIDS

SQUARE
$P = 4s$
$A = s^2$

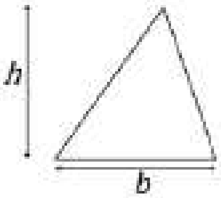


RECTANGLE
$P = 2a + 2b$
$A = ab$

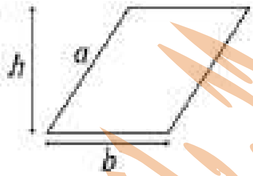


CIRCLE
$P = 2\pi r$
$A = \pi r^2$

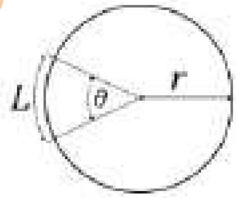
TRIANGLE
$P = a + b + c$
$A = \frac{1}{2}bh$



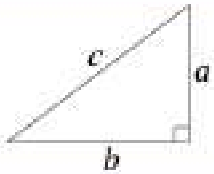
PARALLELOGRAM
$P = 2a + 2b$
$A = bh$



CIRCULAR SECTOR
$L = \pi r \frac{\theta}{180°}$
$A = \pi r^2 \frac{\theta}{360°}$

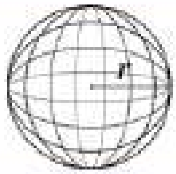


PYTHAGOREAN THEOREM
$a^2 + b^2 = c^2$
$c = \sqrt{a^2 + b^2}$

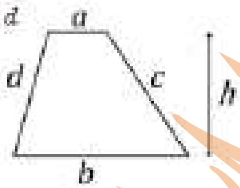


CIRCULAR RING
$A = \pi(R^2 - r^2)$

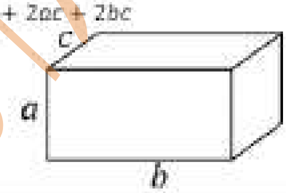
SPHERE
$S = 4\pi r^2$
$V = \frac{4\pi r^3}{3}$



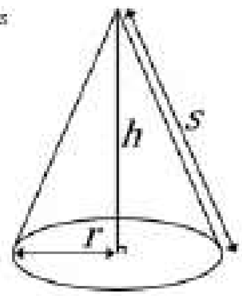
TRAPEZOID
$P = a + b + c + d$
$A = h\frac{a + b}{2}$



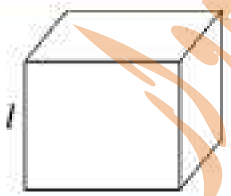
RECTANGULAR BOX
$A = 2ab + 2ac + 2bc$
$V = abc$



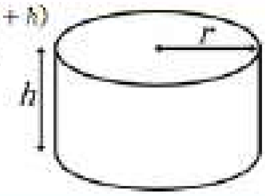
RIGHT CIRCULAR CONE
$A = \pi r^2 + \pi rs$
$s = \sqrt{r^2 + h^2}$
$V = \frac{1}{3}\pi r^2 h$



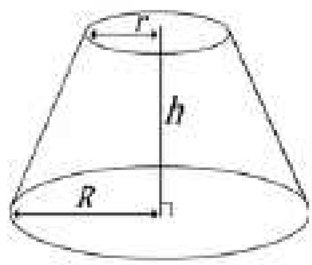
CUBE
$A = 6l^2$
$V = l^3$



CYLINDER
$A = 2\pi r(r + h)$
$V = \pi r^2 h$



FRUSTUM OF A CONE
$V = \frac{1}{3}\pi h(r^2 + rR + R^2)$



[A] Choose the correct Answer :

1	$\tan 45° =$ …………… (a) $\sqrt{3}$ (b) 1 (c) $\frac{1}{\sqrt{3}}$ (d) $\frac{1}{2}$	
2	$\tan^2 45° =$ …………… (a) $\sqrt{3}$ (b) $\frac{1}{\sqrt{3}}$ (c) 1 (d) $\frac{1}{2}$	
3	$\sqrt{2} \sin 30° =$ …………… (a) $\sin 45°$ (b) $\sin 60°$ (c) $\cos 30°$ (d) $\cos 60°$	
4	$\tan 45° \sin 30° =$ …………… (a) $\frac{1}{2}$ (b) 1 (c) $\frac{2}{3}$ (d) $\frac{\sqrt{3}}{2}$	
5	$2 \sin 30° \cos 30° =$ …………… (a) $\sin 60°$ (b) $\cos 60°$ (c) $\tan 60°$ (d) $\tan 30°$	
6	$4 \cos 30° \tan 60° =$ …………… (a) 3 (b) $2\sqrt{3}$ (c) 6 (d) 12	
7	$\sin 30° + \cos 60° + \tan 45° =$ …………… (a) -2 (b) 1 (c) 1.5 (d) 2	
8	$2 \tan 45° - \frac{1}{\cos 60°} =$ …………… (a) zero (b) $\frac{1}{2}$ (c) $\frac{\sqrt{3}}{2}$ (d) 1	
9	If $\sin X = \frac{1}{2}$ where X is a measure of an acute angle , then $X =$ …………… ° (a) 90 (b) 60 (c) 45 (d) 30	
10	If $\sin X = \frac{1}{2}$, where X is an acute angle. $\therefore \sin 2X =$ …………… (a) 1 (b) 2 (c) $\frac{1}{2}$ (d) $\frac{\sqrt{3}}{2}$	
11	If $\cos X = \frac{1}{2}$ where X is an acute angle , then $X =$ …………… (a) 30° (b) 60° (c) 90° (d) 45°	

12	If $\sin X = 1$ where X is an angle , then $m(\angle X) =$ ....$^\circ$ (a) 30 (b) 60 (c) 45 (d) 90
13	If $\cos 2X = \frac{1}{2}$, X is the measure of an acute angle , then $m(\angle X) =$ .... $^\circ$ (a) 15 (b) 30 (c) 45 (d) 60
14	If $\tan \frac{3X}{2} = 1$ where X is an acute angle , then $m(\angle X) =$ .... (a) 10° (b) 30° (c) 45° (d) 60°
15	If $\tan 3X = 1$, where X is an acute angle , then $3X =$ .... (a) 15° (b) 20° (c) 45° (d) 60°
16	If $\tan 3X = \sqrt{3}$ where $3X$ is an acute angle , then $m(\angle X) =$ ....$^\circ$ (a) 10 (b) 20 (c) 30 (d) 60
17	If $\tan(X + 15°) = \sqrt{3}$ where X is an acute angle , then $m(\angle X) =$ .... (a) 15° (b) 30° (c) 45° (d) 60°
18	If $\sin 30° = \cos\theta$ where θ is an acute angle , then $m(\angle \theta) =$ .... (a) 45° (b) 10° (c) 60° (d) 30°
19	If $\sin X = \cos 30°$ where X is an acute angle , then $m(\angle X) =$ ....$^\circ$ (a) 10 (b) 30 (c) 45 (d) 60
20	In ΔABC , if $m(\angle A) = 85°$, $\sin B = \cos B$, then $m(\angle C) =$ ....$^\circ$ (a) 30 (b) 45 (c) 50 (d) 60
21	In ΔABC , if $m(\angle B) = 90°$, then $\sin A + \cos C =$ .... (a) 2 sin A (b) 2 sin C (c) 2 sin B (d) 2 cos A
22	In ΔABC if $m(\angle B) = 90°$, $\sin A = \frac{4}{5}$, then $\sin C =$ .... (a) $\frac{4}{5}$ (b) $\frac{5}{4}$ (c) $\frac{3}{5}$ (d) $\frac{5}{3}$
23	If ABC is a right-angled triangle at B , then $\frac{BC}{AC} =$ .... (a) cos C (b) cos A (c) tan C (d) tan A

24 In ΔABC , if $m(\angle B) = 90^\circ$, AB = 3 cm. , BC = 4 cm. , then sin A cos C = ...

(a) 1 (b) $\frac{9}{25}$ (c) $\frac{12}{25}$ (d) $\frac{16}{25}$

25 The length of the line segment which is drawn between the two points (0 , 0) , (5 , 12) equals ....

(a) 5 (b) 7 (c) 12 (d) 13

26 The distance between the two points (5 , 0) , (0 , 12) equals .... length unit.

(a) 5 (b) 13 (c) 17 (d) 7

27 The distance between the two points (5 , 0) , (0 , – 12) equals .... length unit.

(a) 12 (b) 13 (c) 17 (d) 5

28 The distance between the point A = (2 , – 5) and the point B = (5 , – 1) equals .... unit length.

(a) 5 (b) 2 (c) – 5 (d) – 3

29 If A = (0 , 0) , B = (3 , 4) , then the length of $\overline{AB}$ = ... length unit.

(a) 3 (b) 4 (c) 5 (d) 6

30 The distance between the point (4 , 3) and the origin point equals .... units.

(a) 3 (b) 5 (c) 4 (d) 7

31 The distance between the point (– 3 , 4) and the point of origin equals ....

(a) – 3 (b) 4 (c) 5 (d) – 5

32 The distance between the point (3 , – 4) and the origin point equals .... unit length.

(a) 3 (b) 4 (c) 5 (d) 7

33 The distance between the point (3 , – 4) and X-axis = ... length unit.

(a) 3 (b) 5 (c) 4 (d) – 4

34 The distance between the point (4 , – 3) and the X-axis equals .... length unit.

(a) – 3 (b) 3 (c) 4 (d) 5

35 The distance between the point $(2 , -2)$ and the y-axis = ... length unit.

(a) -2 (b) 2 (c) $2\sqrt{2}$ (d) 4

36 If the origin point is a centre of a circle of diameter length 6 length unit , then the point which belongs to the circle is ....

(a) $(6 , 0)$ (b) $(0 , -6)$ (c) $\left(\sqrt{8} , 1\right)$ (d) $\left(1 , \sqrt{5}\right)$

37 If the distance between the point $(a , 0)$ and the point $(0 , 1)$ equals one length unit , then a = ...

(a) -1 (b) 0 (c) 1 (d) 2

38 The points $(-3 , 0)$, $(0 , 3)$, $(3 , 0)$ are the vertices of ....

(a) a scalene triangle. (b) an equilateral triangle.

(c) an obtuse-angled triangle. (d) a right-angled triangle and isosceles.

39 If A $(1 , 2)$ and B $(3 , 4)$, then the coordinates of the midpoint of $\overline{AB}$ is ....

(a) $(1 , 3)$ (b) $(3 , 3)$ (c) $(2 , 3)$ (d) $(3 , 2)$

40 The coordinates of the midpoint of the line segment joining the two points $(3 , -8)$, $(-3 , 4)$ is ....

(a) $(0 , -4)$ (b) $(0 , -2)$ (c) $(0 , 4)$ (d) $(0 , 2)$

41 If A = $(-1 , 2)$, B = $(5 , -2)$, then the midpoint of $\overline{AB}$ = ...

(a) $(2 , 2)$ (b) $(2 , 0)$ (c) $(3 , 2)$ (d) $(4 , 0)$

42 If $\overline{AB}$ is a diameter in a circle where A $(3 , -5)$ and B $(5 , 1)$, then the centre of the circle is ....

(a) $(4 , -2)$ (b) $(4 , 2)$ (c) $(2 , 2)$ (d) $(8 , 2)$

43 $\overline{AB}$ is a diameter in a circle where A $(3 , 6)$, B $(5 , -2)$, then the coordinates of the centre of the circle are ....

(a) $(4 , 2)$ (b) $(4 , 6)$ (c) $(8 , 4)$ (d) $(2 , 8)$

44 If the point $(0 , 4)$ is the midpoint of the two points $(-1 , -1)$, (X , y) , then the poin (X , y) is ....

(a) $(1 , 9)$ (b) $(-1 , 9)$ (c) $\left(\frac{-1}{2} , \frac{3}{2}\right)$ (d) $(-1 , 3)$

45 If $(4 , -3)$ is the midpoint of $\overline{AB}$ where $A(3 , -4)$, then the coordinates of B is ....

(a) $(5 , -2)$ (b) $(2 , 5)$ (c) $(5 , 2)$ (d) $(3.5 , -3.5)$

46 The slope of the straight line which is parallel to the X-axis is ....

(a) -1 (b) zero. (c) 1 (d) undefined.

47 The slope of the straight line which is parallel to the y-axis is ....

(a) -1 (b) zero (c) 1 (d) undefined.

48 Slope of the line which makes with the positive direction of the X-axis angle of measure θ equals .... (where θ is the positive measure)

(a) $\sin\theta$ (b) $\sin^2\theta$ (c) $\tan\theta$ (d) $\cos\theta$

49 The product of the two slopes of two perpendicular lines equal to ....

(a) $\frac{-1}{2}$ (b) $\frac{1}{2}$ (c) 1 (d) -1

50 If $\overleftrightarrow{AB} // \overleftrightarrow{CD}$ and the slope of $\overleftrightarrow{CD}$ equals $\frac{1}{2}$, then the slope of $\overleftrightarrow{AB}$ equals ....

(a) -2 (b) $-\frac{1}{2}$ (c) $\frac{1}{2}$ (d) 2

51 If $\overleftrightarrow{AB} // \overleftrightarrow{CD}$ and the slope of $\overleftrightarrow{AB} = \frac{2}{3}$, then the slope of $\overleftrightarrow{CD}$ equals ....

(a) $\frac{-3}{2}$ (b) $\frac{-2}{3}$ (c) $\frac{2}{3}$ (d) $\frac{3}{2}$

52 If $\overleftrightarrow{AB} \perp \overleftrightarrow{CD}$ and the slope of $\overleftrightarrow{AB} = \frac{3}{5}$, then the slope $\overleftrightarrow{CD}$ = ...

(a) $-\frac{5}{3}$ (b) $\frac{5}{3}$ (c) $\frac{3}{5}$ (d) $\frac{9}{25}$

53 If $\overleftrightarrow{AB} \perp \overleftrightarrow{CD}$, and then slope of $\overleftrightarrow{AB} = \frac{1}{2}$, then the slope of $\overleftrightarrow{DC}$ = ...

(a) -2 (b) 2 (c) $\frac{1}{2}$ (d) $\frac{-1}{2}$

54 If $\overleftrightarrow{LM} \perp \overleftrightarrow{EO}$, $E(-1 , 2)$, $O(0 , 0)$, then the slope of $\overleftrightarrow{LM}$ equals ....

(a) -2 (b) $\frac{-1}{2}$ (c) $\frac{1}{2}$ (d) 2

55 If $\frac{-2}{3}$, $\frac{k}{2}$ are the slopes of two parallel straight lines , then k = ...

(a) $\frac{-4}{3}$ (b) $\frac{-3}{4}$ (c) $\frac{1}{3}$ (d) 3

56	If $\frac{2}{3}$, $\frac{k}{3}$ are the slopes of two parallel straight lines , then k = ... (a) $\frac{2}{9}$ (b) $\frac{9}{2}$ (c) 2 (d) – 2	
57	If the two straight lines L_1 , L_2 are parallel and the slope of $L_1 = \frac{3}{4}$, then the slope of L_2 = ... (a) $\frac{3}{4}$ (b) $\frac{-3}{4}$ (c) $\frac{4}{3}$ (d) $\frac{-4}{3}$	
58	The slope of the straight line whose equation : $2\,x - 3\,y + 5 = 0$ equals .... (a) $\frac{-3}{2}$ (b) $\frac{-2}{3}$ (c) $\frac{2}{3}$ (d) $\frac{3}{2}$	
59	The slope of the straight line whose equation is : $3\,y = 5 - 2\,x$ equals .... (a) $\frac{-3}{2}$ (b) $\frac{2}{3}$ (c) $\frac{-2}{3}$ (d) $\frac{3}{2}$	
60	The straight line passing through two points (– 1 , – 1) , (4 , 4) makes positive angle with the positive direction to the x-axis an angle measure = ...° (a) 30 (b) 45 (c) 60 (d) 135	
61	If the equation of the straight line is : $a\,x - by + c =$ zero , $b \neq 0$, then its slope m = ... (a) $\frac{b}{a}$ (b) $\frac{-a}{b}$ (c) $\frac{-b}{a}$ (d) $\frac{a}{b}$	
62	The straight line whose equation is : $x - 3\,y - 6 = 0$ intercepts from the y-axis a part of length .... (a) – 6 (b) – 2 (c) $\frac{1}{3}$ (d) 2	
63	The straight line whose equation is : $2\,x - 3\,y + 6 = 0$ intercepts from the y-axis a part of length .... (a) 6 (b) 4 (c) 2 (d) – 6	
64	The line whose equation : $3\,x + 4\,y - 5 = 0$ intersects a part of y-axis its length = ... units. (a) 5 (b) – 5 (c) $\frac{5}{4}$ (d) $\frac{-4}{3}$	

65	The straight line whose equation is : $2y - 4x = 6$ intercepts from the y-axis a part of length = ... units. (a) 2 (b) 3 (c) 4 (d) 6
66	) The straight line whose equation is : $3y = 2x + 6$ cuts a part from the y-axis with length equals .... unit of length. (a) 6 (b) 3 (c) 2 (d) $\frac{2}{3}$
67	) The line : $2y = 3x + 12$ cuts from the y-axis part of length .... units. (a) 12 (b) 3 (c) 2 (d) 6
68	The equation of the straight line whose slope 1 and passing through the origin point is .... (a) $x = -1$ (b) $y = -1$ (c) $y = -x$ (d) $y = x$
69	The equation of the straight line whose its slope = 2 and passes through the origin point is .... (a) $x = 2$ (b) $y = 2$ (c) $y = 2x$ (d) $y = -2x$
70	The equation of the straight line which passes through the origin point and its slope = 3 is .... (a) $y = 3x$ (b) $x = 3$ (c) $y = 3$ (d) $y = \frac{1}{3}$
71	The equation of the straight line which passes through the point $(2 , -3)$, parallel to x-axis is .... (a) $x = -2$ (b) $y = -3$ (c) $x = 2$ (d) $y = 3$
72	If the two straight lines : $3x - 4y - 3 = 0$, $ky + 3x - 8 = 0$ are parallel , then k = ... (a) -4 (b) -3 (c) 3 (d) 4
73	The two straight lines : $x + y = 5$, $kx + 2y = 0$ are parallel when k = ... (a) 2 (b) -1 (c) 1 (d) -2

74 If the two straight lines : $x + y = 5$ and $k\,x + 2\,y = 0$ are perpendicular , then k = ...

(a) 2 (b) 1 (c) – 1 (d) – 2

75 If the straight line whose equation : $x + 3\,y - 6 = 0$ is perpendicular to the straight line whose equation : $a\,x - 3\,y + 7 = 0$, then a = ...

(a) 2 (b) 9 (c) 4 (d) 1

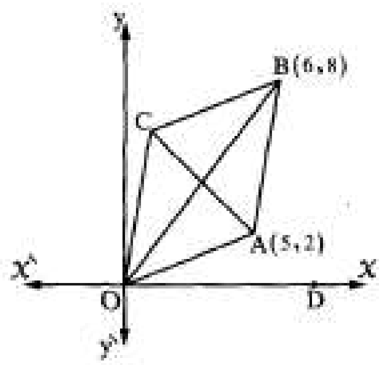
76 If the two straight lines : $3\,x - 4\,y - 5 = 0$ and $k\,x - 3\,y + 8 = 0$ are perpendicular , then k = ...

(a) – 4 (b) – 3 (c) 3 (d) 4

77 The area of the triangle in square units which is bounded by the straight lines $3\,x - 4\,y = 12$, $x = 0$, $y = 0$ equals ....

(a) 6 (b) – 6 (c) 12 (d) – 12

78 OABC is a parallelogram where A (5 , 2) B (6 , 8) , O is the origin point.



(1) The coordinates of the point C = ...

(a) (2 , 5) (b) (1 , 5)

(c) (1 , 6) (d) (2 , 6)

(2) OB = ... length unit.

(a) 5 (b) 6 (c) 8 (d) 10

(3) tan m (∠ AOD) = ...

(a) 0.3 (b) 0.4 (c) 0.6 (d) 0.8

(4) The equation of $\overleftrightarrow{OC}$ is ....

(a) $y = 6\,x$ (b) $y = -6\,x$ (c) $y = x$ (d) $y = -x$

(5) The equation of the straight line passing through the origin point and perpendicular to $\overleftrightarrow{OB}$ ....

(a) $y = \frac{4}{3}\,x$ (b) $y = \frac{3}{4}\,x$ (c) $y = -\frac{4}{3}\,x$ (d) $y = -\frac{3}{4}\,x$

(6) cos m (∠ BOD) = ...

(a) 0.8 (b) 0.7 (c) 0.6 (d) 0.4

Choose the correct Answers

Sn.	Answer	Sn.	Answer	Sn.	Answer	Sn.	Answer
1	B	21	A	41	B	61	D
2	C	22	C	42	A	62	D
3	A	23	A	43	A	63	C
4	A	24	D	44	A	64	C
5	A	25	D	45	A	65	B
6	C	26	B	46	B	66	C
7	D	27	B	47	D	67	D
8	A	28	A	48	C	68	D
9	D	29	C	49	D	69	C
10	D	30	B	50	C	70	A
11	B	31	C	51	C	71	B
12	D	32	C	52	A	72	A
13	B	33	C	53	A	73	A
14	B	34	B	54	C	74	D
15	C	35	B	55	A	75	B
16	B	36	C	56	C	76	A
17	C	37	B	57	A	77	A
18	C	38	D	58	C	78	1)C – 2) D 3)B – 4)A 5)D – 6)C
19	D	39	C	59	C		
20	C	40	B	60	B		

[B] Essay Problems : -

1	ABC is a right-angled triangle at B where : AB = 3 cm. , AC = 5 cm. **Find the value of each of the following :** (1) $\tan A \times \tan C$ (2) $\sin^2 A + \sin^2 C$ 2016 Exam (10) Question (3) (a)
2	**Without using calculator , find the numerical value of the expression :** $\cos 60° \sin 30° - \sin 60° \cos 30°$ 2016 Exam (11) Question (2) (a)
3	Without using the calculator , find the numerical value of the following expression : $2 \sin 45° \cos 45° + 4 \sin 30° \cos 60°$ 2016 Exam (1) Question (2) (a)
4	Find the value of : $\sin 45° \cos 45° + \sin 30° \cos 60° - \cos^2 30°$ 2016 Exam (13) Question (3) (a)
5	**Without using calculator find the value of :** $\tan^2 45° - 4 \cos^2 60°$ 2016 Exam (12) Question (2) (a)
6	**Without using calculator , find the value of :** $\dfrac{\cos^2 60° + \cos^2 30° + \tan^2 45°}{\sin 60° \tan 60° - \sin 30°}$ 2016 Exam (7) Question (2) (a)
7	**Without using calculator , prove that :** $\cos 60° = \cos^2 30° - \sin^2 30°$ 2016 Exam (2) Question (2) (a)
8	**Prove that :** $\tan^2 60° - \tan^2 45° = 4 \sin 30°$ (without using a calculator) 2016 Exam (4) Question (3) (a)
9	**Find the value of X (where X is a measure of acute angle) if :** $2 \sin X = \tan^2 60° - 2 \tan 45°$ 2016 Exam (12) Question (4) (a)
10	**Prove that :** $\sin^3 30° = 9 \cos^3 60° - \tan^2 45°$ 2016 Exam (15) Question (2) (a)
11	**Without using calculator prove that :** $\tan 60° = 2 \tan 30° \div (1 - \tan^2 30°)$ 2016 Exam (10) Question (2) (a)

12	**Prove that :** $\sin 45° \cos 45° + \sin 30° \cos 60° = \cos^2 30°$ 2016 Exam (12) Question (3) (a)
13	**Prove that without calculator :** $\tan 60° = \frac{2 \tan 30°}{1 - \tan^2 30°}$ 2016 Exam (15) Question (4) (a)
14	**Without using the calculator prove that :** $2 \cos^2 30° - 1 = 1 - 2 \sin^2 30°$ 2016 Exam (5) Question (2) (a)
15	ABC is a triangle in which , AB = AC = 10 cm. , BC = 12 cm. , $\overline{AD} \perp \overline{CB}$ to cut it at D **Prove that :** (1) $\sin B + \cos C = 1.4$ (2) $\sin^2 C + \cos^2 C = 1$ 2016 Exam (4) Question (2) (b)
16	**Without using calculator prove that :** $2 \sin 30° \cos 30° = \sin 60°$ 2016 Exam (14) Question (2) (b)
17	If $\sin \theta = \sin 45° \cos 30° + \cos 45° \sin 30°$ find m ($\angle$ θ) where θ is an acute angle. 2016 Exam (10) Question (4) (a)
18	If $\sin X = \tan 30° \sin 60°$ where X is an acute angle find X in degrees. **, then find the value of :** $4 \cos X \tan 2X$ without using the calculator. 2016 Exam (6) Question (4) (a)
19	**Find m ($\angle$ θ) where θ is an acute angle :** $2 \sin \theta = \tan^2 60° - 2 \tan 45°$ 2016 Exam (15) Question (3) (a)
20	If $\sin X = 2 \sin 60° \cos 30° - \tan 45°$ Find the value of X in degrees **such that :** $X \in [0° , 90°]$ 2016 Exam (9) Question (4) (b)
21	**Find the value of X where :** $X \sin 30° \cos^2 45° = \sin^2 60°$ 2016 Exam (3) Question (2) (a)
22	If $\sin^2 45° = \cos E \tan 30°$ find m ($\angle$ E) where E is an acute angle. 2016 Exam (11) Question (3) (a)

23

If $2\cos(X + 15°) = \sqrt{2}$ where X is measure an acute angle , find $(\tan 2X - \sin 2X)$

2016 Exam (5) Question (3) (b)

24

Find θ where $0° < \theta < 90°$, if $\sin\theta \sin 45° \cos 45° \tan 60° = \tan^2 45° - \cos^2 60°$

2016 Exam (4) Question (5) (b)

25

ABC is a right-angled triangle at B , if $2\,AB = \sqrt{3}\,AC$

Find the main trigonometrical of the angle C

2016 Exam (3) Question (3) (a)

26

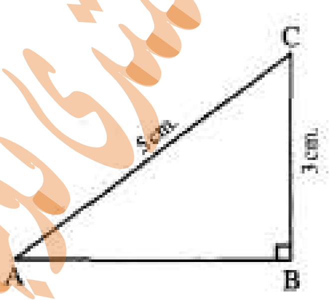
In the opposite figure :

ABC is a right-angled triangle at B

, AC = 5 cm. , BC = 3 cm.

(1) Find the length of $\overline{AB}$

(2) Find the value : $\cos A \sin C - \sin A \cos C$



2016 Exam (13) Question (2) (a)

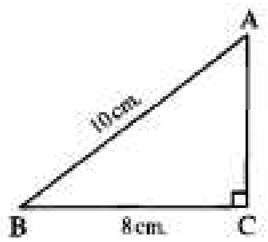
27

In the opposite figure :

ABC is a right-angled triangle at C , in which :

AB = 10 cm. and BC = 8 cm. **Find the value of :**

(1) $\tan B \times \tan A$ (2) $m(\angle B)$



2016 Exam (1) Question (4) (a)

28

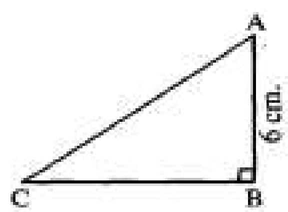
In the opposite figure :

ABC is a right-angled triangle at B

where AB = 6 cm. , $\tan C = \frac{3}{4}$

Find : (1) The length of each of $\overline{BC}$, $\overline{AC}$

(2) $\sin A + \cos A$



2016 Exam (6) Question (3) (b)

29

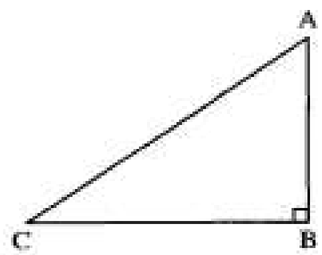
In the opposite figure :

ABC is a right-angled triangle at B

and $m(\angle C) = 2\,m(\angle A)$, **find :**

(1) The measure of each $\angle A$ and $\angle C$

(2) The value of $\sin A + \cos C$



2016 Exam (9) Question (3) (b)

30

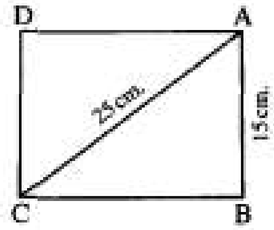
In the opposite figure :

ABCD is a rectangle where : AB = 15 cm.

, AC = 25 cm.

Find : (1) m ($\angle$ ACB)

(2) The surface area of the rectangle ABCD



2016 Exam (4) Question (5) (a)

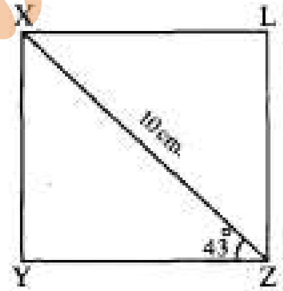
31

In the opposite figure :

XYZL is a rectangle , XZ = 10 cm.

, m ($\angle$ XZY) = 43°

Calculate the perimeter of triangle XYZ



2016 Exam (8) Question (2) (b)

32

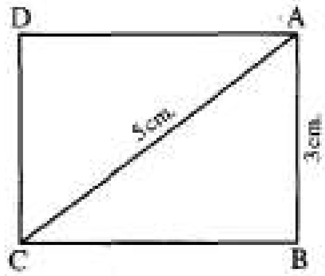
In the opposite figure :

ABCD is a rectangle in which :

AB = 3 cm. , AC = 5 cm.

(1) Find area of the rectangle ABCD

(2) m ($\angle$ ACB)



2016 Exam (9) Question (2) (b)

33

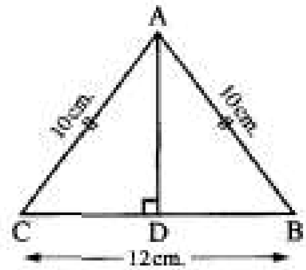
In the opposite figure :

ABC is a triangle in which : AB = AC = 10 cm.

, BC = 12 cm. , $\overline{AD} \perp \overline{CB}$

Prove that : (1) $\sin^2 C + \cos^2 C = 1$

(2) $\sin B + \cos C > 1$



2016 Exam (7) Question (3) (a)

34

Find the length of $\overline{MN}$ when M (7 , – 3) , N (0 , 4)

2016 Exam (13) Question (4) (a)

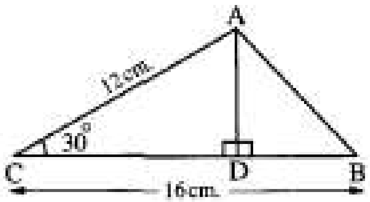
35

Prove that : the triangle whose vertices A (3 , 2) , B (– 4 , 1) , C (2 , – 1) is a right-angled triangle at C , then find its surface area.

2016 Exam (2) Question (2) (b)

36

In the opposite figure :



ABC is a triangle , $\overline{AD} \perp \overline{BC}$, AC = 12 cm.

, BC = 16 cm. and m (∠ C) = 30°

Complete the following :

* $\sin 30° = \frac{AD}{\cdots\cdots}$

* AD = ... × sin 30° = ... cm.

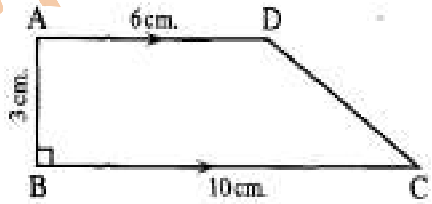
* The area of Δ ABC = ... × AD × BC

* The area of Δ ABC = ... × .... × .... = ... cm^2.

2016 Exam (13) Question (5) (b)

37

In the opposite figure :



ABCD is a trapezium in which : $\overline{AD}$ // $\overline{BC}$

, m (∠ B) = 90° , if AB = 3 cm. , AD = 6 cm.

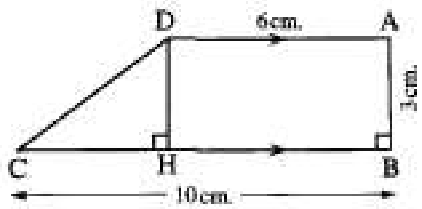
, BC = 10 cm.

Prove that : cos (∠ DCB) – tan (∠ ACB) = $\frac{1}{2}$

2016 Exam (3) Question (4) (a)

38

In the opposite figure :



ABCD is a trapezium in which :

$\overline{AD}$ // $\overline{BC}$, $\overline{DH} \perp \overline{BC}$, m (∠ B) = 90°

, AD = 6 cm. , AB = 3 cm. , BC = 10 cm.

Prove that : cos (∠ DCB) – tan (∠ ACB) = $\frac{1}{2}$

2016 Exam (7) Question (4) (a)

39

Prove that : the triangle ABC whose vertices A (1 , 4) , B (– 1 , – 2) , C (2 , – 3) is a right-angled triangle at B , then find its area.

2016 Exam (10) Question (3) (b)

40

Prove that : the triangle whose vertices A (1 , – 2) , B (– 4 , 2) , C (1 , 6) is an isosceles triangle.

2016 Exam (15) Question (3) (b)

41	Determine the type of the triangle whose vertices are A (– 2 , 3) , B (1 , – 1) and C (1 , 7) with respect to the lengths of its sides , then find its perimeter. 2016 Exam (1) Question (3) (b)
42	Identify the type of the triangle whose vertices are A (– 2 , 4) , B (3 , – 1) , C (4 , 5) due to its sides lengths. 2016 Exam (11) Question (2) (b)
43	**Prove that the points :** A (3 , – 1) , B (– 4 , 6) and C (2 , – 2) lie on a circle whose centre is M (– 1 , 2) , then find the circumference of the circle. ($\pi \approx 3.14$) 2016 Exam (1) Question (5) (b)
44	**Find the value of :** a if the distance between the points (a , 7) , (2 a , – 5) equals 13 2016 Exam (7) Question (3) (b)
45	If the distance of the point (X , 5) from the point (6 , 1) equals $2\sqrt{5}$, then find the value of X 2016 Exam (10) Question (5) (a)
46	If the distance between the point (X , 7) and the point (– 2 , 3) equal 5 unit length Find the value of X 2016 Exam (14) Question (3) (a)
47	If A (X , 3) , B (3 , 2) and C (5 , 1) Given that : AB = BC **Find the values of** X 2016 Exam (8) Question (5) (b)
48	Calculate the coordinates of the point C which is the midpoint of $\overline{AB}$ where : A (3 , – 7) and B (– 5 , – 3) 2016 Exam (13) Question (2) (b)
49	If the two points A = (2 , – 1) , B = (5 , 3) **Find :** (1) The length of $\overline{AB}$ (2) The coordinates of the point C which is the midpoint of $\overline{AB}$ 2016 Exam (9) Question (5) (a)

50	If C is the midpoint of $\overline{AB}$ where C (– 3 , k) , A (h , – 6) , B (9 , – 11) **Find :** k and h 2016 Exam (3) Question (4) (b)
51	If C is the midpoint of $\overline{AB}$, then find the values of each of X , y If A (X , 3) , B (6 , y) and C (4 , 6) 2016 Exam (12) Question (3) (b)
52	$\overline{AB}$ is a diameter of circle M if B (8 , 11) , M (5 , 7) , then find the coordinates of A 2016 Exam (11) Question (3) (b)
53	In Δ ABC , A (0 , 8) , B (3 , 2) , C (– 3 , 6) , $\overline{AD}$ is a median , M is a midpoint of $\overline{AD}$ Find the coordinates of the two points D , M 2016 Exam (14) Question (4) (a)
54	**Prove that :** the point A (– 3 , 0) , B (3 , 4) and C (1 , – 6) are the vertices of an isosceles triangle its vertex A , then find the length of the line segment which is drawn from A and perpendicular to $\overline{BC}$ 2016 Exam (12) Question (4) (b)
55	ABCD is a parallelogram where A (3 , 2) , B (4 , – 5) , C (0 , – 3) find the coordinates of the point of intersection of its diagonals , then find the coordinates of D 2016 Exam (2) Question (5) (b)
56	If the points A (3 , 2) , B (4 , – 3) , C (– 1 , – 2) , D (– 2 , 3) are vertices of a rhombus **Find :** (1) The coordinates of the point of intersection of the two diagonals. (2) The area of the rhombus ABCD (3) m (∠ ABC) 2016 Exam (5) Question (4) (a)
57	**Prove that :** the straight line which passes through the two points $(4 , 2\sqrt{3})$, $(5 , 3\sqrt{3})$ is parallel to the straight line which makes with positive direction of X-axis an angle of measure 60° 2016 Exam (2) Question (4) (b)
58	**Prove that :** the straight line which passes through the two points (3 , 5) and (2 , 6) is perpendicular to the straight line which makes with the positive direction of the X-axis an angle of measure 45° 2016 Exam (1) Question (4) (b)

59	**Prove that :** the straight line which passes through the two points $(-3, 2)$, $(4, -5)$ is perpendicular to the straight line which make an angle of measure $45°$ with the positive direction of X-axis. **2016 Exam (14) Question (2) (a)**
60	**Prove that :** the points $A(5, 1)$, $B(1, -3)$, $C(-5, 3)$, $D(-1, 7)$ are the vertices of the rectangle. **2016 Exam (6) Question (2) (b)**
61	If $\overleftrightarrow{AB}$ // the X-axes where $A(5, -4)$, $B(-2, y)$ Find the value of y **2016 Exam (6) Question (5) (a)**
62	If the point $A(0, k)$, $B(1, 3)$, $C(2, 5)$ are collinear, find the value of : k **2016 Exam (14) Question (4) (b)**
63	If the straight line whose equation : $aX - 2y + 5 = 0$ is parallel to the straight line which makes angle of measure $45°$ with the positive direction of the X-axis, find the value of a **2016 Exam (9) Question (3) (a)**
64	If the straight line L_1 passing through the two points $(-3, 1)$, $(2, k)$ and the straight line L_2 makes with the positive direction to the X-axis an angle its measure is $45°$, then find the value of k if $L_1 \perp L_2$ **2016 Exam (7) Question (4) (b)**
65	Find the equation of the straight line which its slope is $\frac{1}{2}$ and intercepts from the positive part of y-axis 2 units. **2016 Exam (2) Question (5) (a)**
66	Find the equation of the straight line whose slope equals $\frac{1}{2}$ and passes through the point $(4, 7)$ **2016 Exam (1) Question (2) (b)**
67	Find the equation of the straight line which passes through the point $(3, -5)$ and whose slope $\frac{3}{4}$ **2016 Exam (9) Question (4) (a)**
68	Find the equation of the straight line passing through the two points $(2, -3)$ and $(5, -1)$ **2016 Exam (4) Question (4) (a)**

69	Find the equation of the axis of symmetry of $\overline{AB}$ where A (1 , 3) and B (3 , 5) 2016 Exam (5) Question (2) (b)
70	Find the equation of the straight line passing through the two points A (1 , 2) , B (– 1 , 6) 2016 Exam (5) Question (3) (a)
71	Write the equation of the straight line that passes through the two points (2 , 3) and (– 3 , 2) 2016 Exam (12) Question (2) (b)
72	ABC is a right-angled triangle at B such that A (1 , 4) , B (– 1 , – 2) find the equation of $\overleftrightarrow{BC}$ 2016 Exam (9) Question (5) (b)
73	Find the equation of the straight line passing through the point (3 , – 5) and parallel to the straight line : $x + 2y - 7 = 0$ 2016 Exam (3) Question (2) (b)
74	Find the equation of the straight line passing through the point (2 , 3) and parallel to the straight line : $2x - y + 5 = 0$ 2016 Exam (10) Question (4) (b)
75	Find the equation of the straight line which passes through the point (3 , – 5) and perpendicular to the straight line : $x + 2y - 7 = 0$ 2016 Exam (2) Question (3) (b)
76	Find the equation of the straight line which passes through the point (3 , 4) and perpendicular to the straight line : $5x - 2y + 7 = 0$ 2016 Exam (7) Question (2) (b)
77	Find the equation of the straight line passing through the point (1 , 5) and perpendicular on the straight line passing through the two points A (3 , – 1) , B (– 7 , 4) 2016 Exam (13) Question (3) (b)
78	Find the equation of the straight line passing through the point (1 , 2) and perpendicular on the straight line passing through the two points A (2 , – 3) , B (5 , – 4) 2016 Exam (15) Question (2) (b)

79	Find the equation of the straight line which passes through the point (1 , 6) and the midpoint of $\overline{AB}$, where A (1 , – 2) , B (3 , – 4) 2016 Exam (4) Question (2) (a)
80	A straight line , its slope is $\frac{1}{2}$ and intercepts from the positive part of y-axis two units. **Find :** (1) The equation of this straight line. (2) Its intersection point with the X-axis. 2016 Exam (10) Question (5) (b)
81	ABCD is a square where A (5 , 4) , C (– 1 , 6) Find the equation $\overleftrightarrow{BD}$ 2016 Exam (6) Question (3) (a)
82	$\overline{AB}$ is a diameter of the circle M if B (8 , 11) , M (5 , 7) , **then find :** (1) The coordinates of A (2) The equation of the perpendicular straight line to $\overline{AB}$ from the point B 2016 Exam (7) Question (5) (b)
83	Find the equation of the straight line which intercepts from the coordinate axes (X-axis , y-axis) two positive parts of lengths 3 and 6 respectively. Then find the area of the bounded triangle by the straight line and the X-axis and y-axis. 2016 Exam (6) Question (5) (b)
84	ABC is a triangle where A (1 , 2) , B (5 , – 2) , C (3 , 4) , D is the midpont of $\overline{AB}$ drawn $\overrightarrow{DE}$ // $\overleftrightarrow{BC}$ and intersects $\overline{AC}$ in E , find the equation of the straight line $\overleftrightarrow{DE}$ 2016 Exam (3) Question (5) (a)
85	If the two straight lines : $X + y = 2$ and $3y + kX = 0$ are parallel , find the value of k 2016 Exam (12) Question (5) (a)
86	Find the slope of the straight line $3X + 4y - 5 = 0$ and then find the length of the intercepted part from y-axis. 2016 Exam (13) Question (5) (a)
87	If the ratio between the measures of two supplementary angles is 3 : 5 Find the measure of each angle by the degree measure. 2016 Exam (14) Question (3) (b)

88

Calculate the slope and the intercepted part of y-axis by the straight line whose equation :

$\frac{x}{2} + 3y = 6$

2016 Exam (8) Question (2) (a)

89

Find the slope and the intercepted part of the y-axis of the straight line :

$\frac{x}{3} + \frac{y}{2} = 1$

2016 Exam (12) Question (5) (b)

90

The opposite table represents linear relation :

x	1	2	3
$y = f(x)$	1	3	a

(1) Find the equation of the straight line.

(2) Find the length of the intersected part from the y-axis.

(3) Find the value of a

2016 Exam (3) Question (5) (b)

91

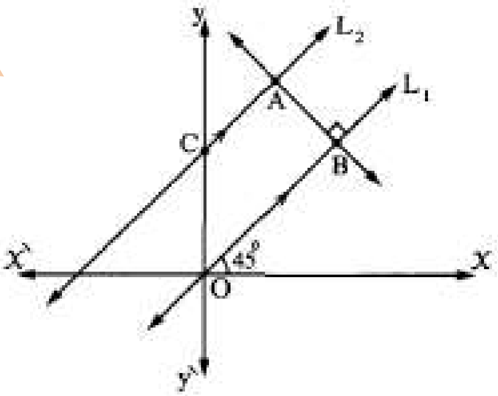
In the opposite figure :

L_1 and L_2 are two parallel straight lines , L_1 make with the positive direction of the x-axis angle of measure 45° and passes of origin point O , $A \in L_2$ where A (1 , 5) , $\overleftrightarrow{AB} \perp L_1$, L_2 cuts y-axis at the point C

Find : (1) The equation of L_1

(2) The equation of L_2

(3) The length of $\overline{AB}$



2016 Exam (5) Question (5) (a)

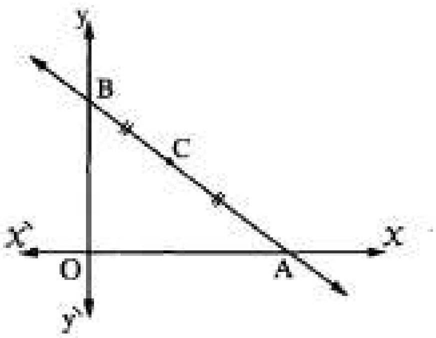
92

In the opposite figure :

C is the midpoint of $\overline{AB}$, where C (4 , 3)

(1) Find coordinates of each of the two points A , B

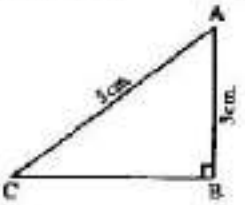
(2) The equation of the straight line $\overleftrightarrow{AB}$



2016 Exam (8) Question (4) (a)

Essay Problems Answers

Problem number [1]



$\because m(\angle B) = 90^\circ$

$\therefore (BC)^2 = (5)^2 - (3)^2 = 16$

$\therefore BC = 4$ cm.

(1) $\tan A \times \tan C = \frac{4}{3} \times \frac{3}{4} = 1$

(2) $\sin^2 A + \sin^2 C = \left(\frac{4}{5}\right)^2 + \left(\frac{3}{5}\right)^2 = \frac{16}{25} + \frac{9}{25} = 1$

Problem number [2]

$\cos 60^\circ \sin 30^\circ - \sin 60^\circ \cos 30^\circ$

$= \frac{1}{2} \times \frac{1}{2} - \frac{\sqrt{3}}{2} \times \frac{\sqrt{3}}{2} = \frac{1}{4} - \frac{3}{4} = -\frac{1}{2}$

Problem number [3]

$2 \sin 45^\circ \cos 45^\circ + 4 \sin 30^\circ \cos 60^\circ$

$= 2 \times \frac{1}{\sqrt{2}} \times \frac{1}{\sqrt{2}} + 4 \times \frac{1}{2} \times \frac{1}{2} = 2$

Problem number [4]

$\sin 45^\circ \cos 45^\circ + \sin 30^\circ \cos 60^\circ - \cos^2 30^\circ$

$= \frac{1}{\sqrt{2}} \times \frac{1}{\sqrt{2}} + \frac{1}{2} \times \frac{1}{2} - \left(\frac{\sqrt{3}}{2}\right)^2 = \frac{1}{2} + \frac{1}{4} - \frac{3}{4} = 0$

Problem number [5]

$\tan^2 45^\circ - 4 \cos^2 60^\circ = (1)^2 - 4 \times \left(\frac{1}{2}\right)^2$

$= 1 - 4 \times \frac{1}{4} = 0$

Problem number [6]

$$\frac{\cos^2 60^\circ + \cos^2 30^\circ + \tan^2 45^\circ}{\sin 60^\circ \tan 60^\circ - \sin 30^\circ}$$

$$= \frac{\left(\frac{1}{2}\right)^2 + \left(\frac{\sqrt{3}}{2}\right)^2 + (1)^2}{\frac{\sqrt{3}}{2} \times \sqrt{3} - \frac{1}{2}} = \frac{\frac{1}{4} + \frac{3}{4} + 1}{\frac{3}{2} - \frac{1}{2}} = 2$$

Problem number [7]

$\because \cos 60^\circ = \frac{1}{2}$ (1)

, $\cos^2 30^\circ - \sin^2 30^\circ = \left(\frac{\sqrt{3}}{2}\right)^2 - \left(\frac{1}{2}\right)^2 = \frac{3}{4} - \frac{1}{4}$

$= \frac{1}{2}$ (2)

From (1) and (2) : $\therefore \cos 60^\circ = \cos^2 30^\circ - \sin^2 30^\circ$

Problem number [8]

$\because \tan^2 60^\circ - \tan^2 45^\circ = \left(\sqrt{3}\right)^2 - (1)^2$

$= 3 - 1 = 2$ (1)

, $4 \sin 30^\circ = 4 \times \frac{1}{2} = 2$ (2)

From (1) and (2) : $\therefore \tan^2 60^\circ - \tan^2 45^\circ = 4 \sin 30^\circ$

Problem number [9]

$\because 2 \sin X = \tan^2 60^\circ - 2 \tan 45^\circ$

$\therefore 2 \sin X = \left(\sqrt{3}\right)^2 - 2 \times 1$

$\therefore \sin X = \frac{3-2}{2} = \frac{1}{2}$ $\qquad \therefore X = 30^\circ$

Problem number [10]

$\because \sin^3 30^\circ = \left(\frac{1}{2}\right)^3 = \frac{1}{8}$ (1)

, $9 \cos^3 60^\circ - \tan^2 45^\circ = 9 \times \left(\frac{1}{2}\right)^3 - (1)^2$

$= \frac{9}{8} - 1 = \frac{1}{8}$ (2)

From (1) and (2) :

$\therefore \sin^3 30^\circ = 9 \cos^3 60^\circ - \tan^2 45^\circ$

Problem number [11]

$\because \tan 60^\circ = \sqrt{3}$ (1)

, $2 \tan 30^\circ \div (1 - \tan^2 30^\circ)$

$$= \frac{2 \times \frac{1}{\sqrt{3}}}{1 - \left(\frac{1}{\sqrt{3}}\right)^2} = \frac{\frac{2}{\sqrt{3}}}{1 - \frac{1}{3}} = \frac{\frac{2}{\sqrt{3}}}{\frac{2}{3}} = \sqrt{3} \qquad (2)$$

Problem number [12]

$\because \sin 45^\circ \cos 45^\circ + \sin 30^\circ \cos 60^\circ$

$= \frac{1}{\sqrt{2}} \times \frac{1}{\sqrt{2}} + \frac{1}{2} \times \frac{1}{2} = \frac{1}{2} + \frac{1}{4} = \frac{3}{4}$ (1)

, $\cos^2 30^\circ = \left(\frac{\sqrt{3}}{2}\right)^2 = \frac{3}{4}$ (2)

From (1) and (2) :

$\therefore \sin 45^\circ \cos 45^\circ + \sin 30^\circ \cos 60^\circ = \cos^2 30^\circ$

Problem number [13]

$\because \tan 60^\circ = \sqrt{3}$ (1)

$, \dfrac{2\tan 30^\circ}{1-\tan^2 30^\circ} = \dfrac{2\times\frac{1}{\sqrt{3}}}{1-\left(\frac{1}{\sqrt{3}}\right)^2} = \dfrac{\frac{2}{\sqrt{3}}}{1-\frac{1}{3}} = \dfrac{\frac{2}{\sqrt{3}}}{\frac{2}{3}} = \sqrt{3}$ (2)

From (1) and (2) : $\therefore \tan 60^\circ = \dfrac{2\tan 30^\circ}{1-\tan^2 30^\circ}$

Problem number [14]

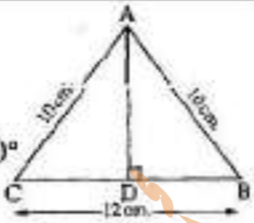
$\because 2\cos^2 30^\circ - 1 = 2\times\left(\frac{\sqrt{3}}{2}\right)^2 - 1$

$= \frac{3}{2} - 1 = \frac{1}{2}$ (1)

$, 1 - 2\sin^2 30^\circ = 1 - 2\times\left(\frac{1}{2}\right)^2 = 1 - \frac{1}{2} = \frac{1}{2}$ (2)

From (1) and (2) : $\therefore 2\cos^2 30^\circ - 1 = 1 - 2\sin^2 30^\circ$

Problem number [15]



$\because \overline{AD} \perp \overline{BC}$, $AB = AC$

$\therefore BD = CD = 6$ cm.

In $\triangle ABD$: $\because m(\angle ADB) = 90^\circ$

$\therefore (AD)^2 = (10)^2 - (6)^2 = 64$

$\therefore AD = 8$ cm.

(1) L.H.S $= \sin B + \cos C = \frac{8}{10} + \frac{6}{10} = 1.4 =$ R.H.S

(2) L.H.S $= \sin^2 C + \cos^2 C$

$= \left(\frac{8}{10}\right)^2 + \left(\frac{6}{10}\right)^2 = \frac{64}{100} + \frac{36}{100} = 1 =$ R.H.S

Problem number [16]

$\because 2\sin 30^\circ \cos 30^\circ = 2\times\frac{1}{2}\times\frac{\sqrt{3}}{2} = \frac{\sqrt{3}}{2}$ (1)

$, \sin 60^\circ = \frac{\sqrt{3}}{2}$ (2)

From (1) and (2) : $\therefore 2\sin 30^\circ \cos 30^\circ = \sin 60^\circ$

Problem number [17]

$\because \sin\theta = \sin 45^\circ \cos 30^\circ + \cos 45^\circ \sin 30^\circ$

$\therefore \sin\theta = \frac{1}{\sqrt{2}}\times\frac{\sqrt{3}}{2} + \frac{1}{\sqrt{2}}\times\frac{1}{2} = \frac{\sqrt{3}+1}{2\sqrt{2}}$

$\therefore \theta = 75^\circ$

Problem number [18]

$\because \sin X = \tan 30^\circ \sin 60^\circ$

$\therefore \sin X = \frac{1}{\sqrt{3}}\times\frac{\sqrt{3}}{2} = \frac{1}{2}$ $\quad \therefore X = 30^\circ$

$\therefore 4\cos X \tan 2X = 4\cos 30^\circ \tan 60^\circ$

$= 4\times\frac{\sqrt{3}}{2}\times\sqrt{3} = 6$

Problem number [19]

$\because 2\sin\theta = \tan^2 60^\circ - 2\tan 45^\circ$

$\therefore 2\sin\theta = \left(\sqrt{3}\right)^2 - 2\times 1 = 1$

$\therefore \sin\theta = \frac{1}{2}$ $\quad \therefore \theta = 30^\circ$

Problem number [20]

$\because \sin X = 2\sin 60^\circ \cos 30^\circ - \tan 45^\circ$

$\therefore \sin X = 2\times\frac{\sqrt{3}}{2}\times\frac{\sqrt{3}}{2} - 1 = \frac{1}{2}$ $\quad \therefore X = 30^\circ$

Problem number [21]

$\because X \sin 30^\circ \cos^2 45^\circ = \sin^2 60^\circ$

$\therefore X\times\frac{1}{2}\times\left(\frac{1}{\sqrt{2}}\right)^2 = \left(\frac{\sqrt{3}}{2}\right)^2$ $\quad \therefore X = \dfrac{\frac{3}{4}}{\frac{1}{2}\times\frac{1}{2}} = 3$

Problem number [22]

$\because \sin^2 45^\circ = \cos E \tan 30^\circ$

$\therefore \left(\frac{1}{\sqrt{2}}\right)^2 = \cos E\times\frac{1}{\sqrt{3}}$

$\therefore \cos E = \frac{\sqrt{3}}{2}$ $\quad \therefore E = 30^\circ$

Problem number [23]

$\because 2\cos(X + 15^\circ) = \sqrt{2}$ $\quad \therefore \cos(X + 15^\circ) = \frac{\sqrt{2}}{2}$

$\therefore X + 15^\circ = 45^\circ$ $\quad \therefore X = 30^\circ$

$\therefore \tan 2X - \sin 2X = \tan 60^\circ - \sin 60^\circ$

$= \sqrt{3} - \frac{\sqrt{3}}{2} = \frac{\sqrt{3}}{2}$

Problem number [24]

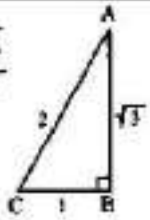
$\because \sin\theta \sin 45^\circ \cos 45^\circ \tan 60^\circ = \tan^2 45^\circ - \cos^2 60^\circ$

$\therefore \sin\theta\times\frac{1}{\sqrt{2}}\times\frac{1}{\sqrt{2}}\times\sqrt{3} = (1)^2 - \left(\frac{1}{2}\right)^2$

$\therefore \sin\theta = \dfrac{1-\frac{1}{4}}{\frac{\sqrt{3}}{2}} = \frac{\sqrt{3}}{2}$ $\quad \therefore \theta = 60^\circ$

Problem number [25]

$\because 2\,AB = \sqrt{3}\,AC \qquad \therefore \frac{AB}{AC} = \frac{\sqrt{3}}{2}$



let $AB = \sqrt{3}$ length unit

, $AC = 2$ length unit

$\therefore BC = 1$ length unit

$\therefore \sin C = \frac{\sqrt{3}}{2}$, $\cos C = \frac{1}{2}$, $\tan C = \sqrt{3}$

Problem number [26]

$\because m(\angle B) = 90^\circ$

(1) $\therefore (AB)^2 = (5)^2 - (3)^2 = 16 \qquad \therefore AB = 4$ cm.

(2) $\cos A \sin C - \sin A \cos C = \frac{4}{5} \times \frac{4}{5} - \frac{3}{5} \times \frac{3}{5}$

$= \frac{16}{25} - \frac{9}{25} = \frac{7}{25}$

Problem number [27]

$\because m(\angle C) = 90^\circ \qquad \therefore (AC)^2 = (10)^2 - (8)^2 = 36$

$\therefore AC = 6$ cm.

(1) $\tan B \times \tan A = \frac{6}{8} \times \frac{8}{6} = 1$

(2) $\because \cos B = \frac{8}{10}$

$\therefore m(\angle B) \simeq 36^\circ\ 52'\ 12''$

Problem number [28]

(1) $\because \tan C = \frac{AB}{BC} \qquad \therefore \frac{3}{4} = \frac{6}{BC}$

$\therefore BC = \frac{4 \times 6}{3} = 8$ cm.

, $\because m(\angle B) = 90^\circ$

$\therefore (AC)^2 = (8)^2 + (6)^2 = 100 \qquad \therefore AC = 10$ cm.

(2) $\sin A + \cos A = \frac{8}{10} + \frac{6}{10} = \frac{14}{10} = 1.4$

Problem number [29]

(1) In ΔABC : $\because m(\angle B) = 90^\circ$

, $\because m(\angle C) = 2\,m(\angle A)$

$\therefore m(\angle A) + 2\,m(\angle A) = 90^\circ$

$\therefore 3\,m(\angle A) = 90^\circ \qquad \therefore m(\angle A) = 30^\circ$

$\therefore m(\angle C) = 60^\circ$

(2) $\sin A + \cos C = \sin 30^\circ + \cos 60^\circ = \frac{1}{2} + \frac{1}{2} = 1$

Problem number [30]

In ΔABC :

$\because m(\angle B) = 90^\circ$ (properties of rectangle)

$\therefore (BC)^2 = (25)^2 - (15)^2 = 400 \qquad \therefore BC = 20$ cm.

(1) $\because \sin(\angle ACB) = \frac{15}{25} = \frac{3}{5}$

$\therefore m(\angle ACB) \simeq 36^\circ\ 52'\ 12''$

(2) The area of the rectangle $ABCD = 15 \times 20$

$= 300\ cm^2$

Problem number [31]

In ΔXYZ :

$\because m(\angle Y) = 90^\circ$ (properties of rectangle)

$\therefore \sin 43^\circ = \frac{XZ}{XZ} = \frac{XY}{10}$

$\therefore XY = 10 \sin 43^\circ \simeq 6.8$ cm.

, $\cos 43^\circ = \frac{XZ}{XZ} = \frac{YZ}{10}$

$\therefore YZ = 10 \cos 43^\circ \simeq 7.3$ cm.

$\therefore$ The perimeter of $\Delta XYZ = 10 + 6.8 + 7.3$

$= 24.1$ cm.

Problem number [32]

In ΔABC : $\because m(\angle B) = 90^\circ$ (properties of rectangle)

$\therefore (BC)^2 = (5)^2 - (3)^2 = 16 \qquad \therefore BC = 4$ cm.

(1) The area of the rectangle $ABCD = 4 \times 3 = 12\ cm^2$.

(2) $\because \sin(\angle ACB) = \frac{AB}{AC} = \frac{3}{5}$

$\therefore m(\angle ACB) \simeq 36^\circ\ 52'\ 12''$

Problem number [33]

In ΔABC :

$\because AB = AC$, $\overline{AD} \perp \overline{BC}$

$\therefore D$ is the midpoint of $\overline{BC} \qquad \therefore BD = CD = 6$ cm.

In ΔADC : $\because m(\angle ADC) = 90^\circ$

$\therefore AD = \sqrt{(10)^2 - (6)^2} = 8$ cm.

(1) $\sin^2 C + \cos^2 C = \left(\frac{8}{10}\right)^2 + \left(\frac{6}{10}\right)^2$

$= \frac{64}{100} + \frac{36}{100} = 1$

(2) $\sin B + \cos C = \frac{8}{10} + \frac{6}{10} = \frac{14}{10} > 1$

Problem number [34]

$MN = \sqrt{(0-7)^2 + (4+3)^2}$

$= \sqrt{49+49} = \sqrt{98} = 7\sqrt{2}$ length unit

Problem number [35]

$\because AB = \sqrt{(-4-3)^2 + (1-2)^2}$

$= \sqrt{49+1} = \sqrt{50} = 5\sqrt{2}$ length unit

, $BC = \sqrt{(2+4)^2 + (-1-1)^2}$

$= \sqrt{36+4} = \sqrt{40} = 2\sqrt{10}$ length unit

, $AC = \sqrt{(2-3)^2 + (-1-2)^2}$

$= \sqrt{1+9} = \sqrt{10}$ length unit

, $\because (AB)^2 = (BC)^2 + (AC)^2$

$\therefore \Delta ABC$ is a right-angled triangle at C

, its area $= \frac{1}{2} \times 2\sqrt{10} \times \sqrt{10} = 10$ square unit

Problem number [36]

$\sin 30^\circ = \frac{AD}{12}$

$AD = 12 \times \sin 30^\circ = 6$ cm.

The area of $(\Delta ABC) = \frac{1}{2} \times AD \times BC$

The area of $(\Delta ABC) = \frac{1}{2} \times 6 \times 16 = 48\ cm^2$

Problem number [37]

Draw $\overline{DF} \perp \overline{BC}$

$\therefore \overline{AD} \parallel \overline{BC}$, $\overline{AB} \perp \overline{BC}$, $\overline{DF} \perp \overline{BC}$

$\therefore$ ABFD is a rectangle $\quad \therefore BF = AD = 6$ cm.

$\therefore FC = 4$ cm. ,

$DF = AB = 3$ cm.

From Δ DFC which is right-angled at F :

$(DC)^2 = 3^2 + 4^2 = 25 \quad \therefore DC = 5$ cm.

$\therefore \cos(\angle DCB) - \tan(\angle ACB) = \frac{4}{5} - \frac{3}{10} = \frac{1}{2}$

Problem number [38]

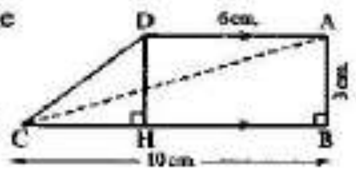
$\because \overline{AD} \parallel \overline{BH}$, $\overline{AB} \perp \overline{BH}$, $\overline{DH} \perp \overline{BH}$

$\therefore$ ABHD is a rectangle

$\therefore BH = AD = 6$ cm.

, $CH = 10 - 6 = 4$ cm.

, $DH = AB = 3$ cm.



In Δ DHC : $\because m(\angle CHD) = 90^\circ$

$\therefore (CD)^2 = (4)^2 + (3)^2 = 25 \qquad \therefore CD = 5$ cm.

$\therefore \cos(\angle DCB) - \tan(\angle ACB) = \frac{4}{5} - \frac{3}{10} = \frac{1}{2}$

Problem number [39]

$\because AB = \sqrt{(-1-1)^2 + (-2-4)^2}$

$= \sqrt{4+36} = \sqrt{40} = 2\sqrt{10}$ length unit

, $BC = \sqrt{(2+1)^2 + (-3+2)^2}$

$= \sqrt{9+1} = \sqrt{10}$ length unit

, $AC = \sqrt{(2-1)^2 + (-3-4)^2}$

$= \sqrt{1+49} = \sqrt{50} = 5\sqrt{2}$ length unit

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

$\therefore \Delta ABC$ is a right-angled triangle at B

, its area $= \frac{1}{2} \times 2\sqrt{10} \times \sqrt{10} = 10$ square units.

Problem number [40]

$\because AB = \sqrt{(-4-1)^2 + (2+2)^2}$

$= \sqrt{25+16} = \sqrt{41}$ length unit

, $BC = \sqrt{(1+4)^2 + (6-2)^2}$

$= \sqrt{25+16} = \sqrt{41}$ length unit

, $AC = \sqrt{(1-1)^2 + (6+2)^2} = \sqrt{64} = 8$ length unit

$\therefore AB = BC \qquad \therefore \Delta ABC$ is an isosceles triangle.

Problem number [41]

$\because AB = \sqrt{(1+2)^2 + (-1-3)^2}$

$= \sqrt{9+16} = \sqrt{25} = 5$ length unit

, $BC = \sqrt{(1-1)^2 + (7+1)^2} = \sqrt{64} = 8$ length unit

, $AC = \sqrt{(1+2)^2 + (7-3)^2}$

$= \sqrt{9+16} = \sqrt{25} = 5$ length unit

$\therefore AB = AC$

$\therefore \Delta ABC$ is an isosceles triangle

, the perimeter $= 5 + 8 + 5 = 18$ length unit

Problem number [42]

$\because AB = \sqrt{(3+2)^2 + (-1-4)^2}$

$= \sqrt{25+25} = \sqrt{50} = 5\sqrt{2}$ length unit

, $BC = \sqrt{(4-3)^2 + (5+1)^2}$

$= \sqrt{1+36} = \sqrt{37}$ length unit

$, AC = \sqrt{(4+2)^2+(5-4)^2}$

$= \sqrt{36+1} = \sqrt{37}$ length unit

$\therefore BC = AC$ $\quad \therefore \Delta ABC$ is an isosceles triangle

Problem number [43]

$\because MA = \sqrt{(-1-3)^2+(2+1)^2}$

$= \sqrt{16+9} = \sqrt{25} = 5$ length unit

$, MB = \sqrt{(-1+4)^2+(2-6)^2}$

$= \sqrt{9+16} = \sqrt{25} = 5$ length unit

$, MC = \sqrt{(-1-2)^2+(2+2)^2}$

$= \sqrt{9+16} = \sqrt{25} = 5$ length unit

$\therefore MA = MB = MC$

$\therefore$ A , B and C lie on the circle M which its radius length is 5 length units

$\therefore$ The circumference of the circle

$= 2\pi r = 2 \times 3.14 \times 5 = 31.4$ length unit

Problem number [44]

$\because \sqrt{(2a-a)^2+(-5-7)^2} = 13$

$\therefore \sqrt{a^2+144} = 13$ "squaring both sides"

$\therefore a^2 + 144 = 169$ $\quad \therefore a^2 = 169 - 144$

$\therefore a^2 = 25$ $\quad \therefore a = \pm\sqrt{25} = \pm 5$

Problem number [45]

$\because \sqrt{(x-6)^2+(5-1)^2} = 2\sqrt{5}$ "squaring the two sides"

$\therefore (x-6)^2 + (4)^2 = 20$

$\therefore x^2 - 12x + 36 + 16 - 20 = 0$

$\therefore x^2 - 12x + 32 = 0$ $\quad \therefore (x-4)(x-8) = 0$

$\therefore x = 4$ or $x = 8$

Problem number [46]

$\because \sqrt{(x+2)^2+(7-3)^2} = 5$ "squaring the two sides"

$\therefore (x+2)^2 + (4)^2 = 25$

$\therefore x^2 + 4x + 4 + 16 - 25 = 0$

$\therefore x^2 + 4x - 5 = 0$ $\quad \therefore (x+5)(x-1) = 0$

$\therefore x = -5$ or $x = 1$

Problem number [47]

$BC = \sqrt{(5-3)^2+(1-2)^2} = \sqrt{4+1} = \sqrt{5}$ length unit

$\therefore AB = \sqrt{5}$ length unit

$\therefore \sqrt{(x-3)^2+(3-2)^2} = \sqrt{5}$ "squaring the two sides"

$\therefore (x-3)^2 + (1)^2 = 5$ $\quad \therefore x^2 - 6x + 9 + 1 - 5 = 0$

$\therefore x^2 - 6x + 5 = 0$

$\therefore (x-5)(x-1) = 0$ $\quad \therefore x = 5$ or $x = 1$

Problem number [48]

The coordinates of $C = \left(\frac{3-5}{2}, \frac{-7-3}{2}\right) = (-1, -5)$

Problem number [49]

(1) $AB = \sqrt{(5-2)^2+(3+1)^2} = \sqrt{9+16} = \sqrt{25}$

$= 5$ length unit

(2) $c = \left(\frac{2+5}{2}, \frac{-1+3}{2}\right) = \left(3\frac{1}{2}, 1\right)$

Problem number [50]

$\because$ C is the midpoint of $\overline{AB}$

$\therefore (-3, k) = \left(\frac{h+9}{2}, \frac{-6-11}{2}\right)$

$\therefore k = \frac{-6-11}{2} = -8\frac{1}{2}$, $\frac{h+9}{2} = -3$

$\therefore h + 9 = -6$ $\quad \therefore h = -15$

Problem number [51]

$\because$ C is the midpoint of $\overline{AB}$

$\therefore (4, 6) = \left(\frac{x+6}{2}, \frac{3+y}{2}\right)$

$\therefore \frac{x+6}{2} = 4$ $\quad \therefore x + 6 = 8$ $\quad \therefore x = 2$

$, \frac{3+y}{2} = 6$ $\quad \therefore 3 + y = 12$ $\quad \therefore y = 9$

Problem number [52]

$\because \overline{AB}$ is a diameter in the circle M

$\therefore$ M is the midpoint of $\overline{AB}$

Let $A(x, y)$ $\therefore (5, 7) = \left(\frac{x+8}{2}, \frac{y+11}{2}\right)$

$\therefore \frac{x+8}{2} = 5$ $\quad \therefore x + 8 = 10$ $\quad \therefore x = 2$

$, \frac{y+11}{2} = 7$ $\quad \therefore y + 11 = 14$

$\therefore y = 3$ $\quad \therefore A(2, 3)$

Problem number [53]

$\because \overline{AD}$ is a median in ΔABC

$\therefore$ D is the midpoint of $\overline{BC}$

$\therefore D = \left(\frac{3-3}{2}, \frac{2+6}{2}\right) = (0, 4)$

, $\because$ M is the midpoint of $\overline{AD}$

$\therefore M = \left(\frac{0+0}{2}, \frac{8+4}{2}\right) = (0, 6)$

Problem number [54]

$\because AB = \sqrt{(3+3)^2 + (4-0)^2} = \sqrt{36+16} = \sqrt{52}$

$= 2\sqrt{13}$ length unit

, $BC = \sqrt{(1-3)^2 + (-6-4)^2} = \sqrt{4+100} = \sqrt{104}$

$= 2\sqrt{26}$ length unit

, $AC = \sqrt{(1+3)^2 + (-6-0)^2}$

$= \sqrt{16+36} = \sqrt{52} = 2\sqrt{13}$ length unit

$\therefore AB = AC$ $\quad\therefore \Delta ABC$ is an isosceles triangle.

Let $\overline{AD} \perp \overleftrightarrow{BC}$

, $\because AB = AC$ $\quad\therefore$ D is the midpoint of $\overline{BC}$

$\therefore D = \left(\frac{3+1}{2}, \frac{4-6}{2}\right) = (2, -1)$

$\therefore AD = \sqrt{(2+3)^2 + (-1-0)^2}$

$= \sqrt{25+1} = \sqrt{26}$ length unit

Problem number [55]

$\because$ In the parallelogram the two diagonals bisect each other.

$\therefore$ Let M be the point of intersection of the two diagonals.

$\therefore$ The coordinates of $M = \left(\frac{3+0}{2}, \frac{2-3}{2}\right)$

$= \left(1\frac{1}{2}, -\frac{1}{2}\right)$

Let D (x, y)

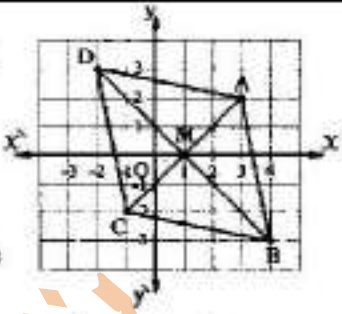
$\therefore \left(1\frac{1}{2}, -\frac{1}{2}\right) = \left(\frac{4+x}{2}, \frac{-5+y}{2}\right)$ $\quad\therefore \frac{4+x}{2} = 1\frac{1}{2}$

$\therefore 4 + x = 3$ $\quad\therefore x = -1$

, $\frac{-5+y}{2} = -\frac{1}{2}$ $\quad\therefore -5 + y = -1$ $\quad\therefore y = 4$

$\therefore D(-1, 4)$

Problem number [56]



$\because$ The two diagonals of the rhombus bisect each other

(1) Let M be the point of intersection of the two diagonals

$\therefore$ the coordinates of $M = \left(\frac{3-1}{2}, \frac{2-2}{2}\right) = (1, 0)$

(2) $\because AC = \sqrt{(-1-3)^2 + (-2-2)^2}$

$= \sqrt{16+16} = \sqrt{32} = 4\sqrt{2}$ length unit

, $BD = \sqrt{(-2-4)^2 + (3+3)^2}$

$= \sqrt{36+36} = \sqrt{72} = 6\sqrt{2}$ length unit

The area of the rhombus ABCD

$= \frac{1}{2} \times 4\sqrt{2} \times 6\sqrt{2} = 24$ square unit

(3) $\because$ The two diagonals of the rhombus are perpendicular

$\therefore$ In Δ AMB which is right at M

$\tan(\angle ABM) = \frac{AM}{BM} = \frac{2\sqrt{2}}{3\sqrt{2}} = \frac{2}{3}$

$\therefore m(\angle ABM) \simeq 33° 41' 24''$

$\because$ The diagonals of the rhombus bisect its angles.

$\therefore m(\angle ABC) = 2\, m(\angle ABM) = 2 \times 33° 41' 24''$

$= 67° 22' 48''$

Problem number [57]

$\because m_1 = \frac{3\sqrt{3} - 2\sqrt{3}}{5-4} = \sqrt{3}$, $m_2 = \tan 60° = \sqrt{3}$

$\therefore m_1 = m_2$

$\therefore$ The two straight lines are parallel.

Problem number [58]

$\because m_1 = \frac{6-5}{2-3} = -1$, $m_2 = \tan 45° = 1$

$\therefore m_1 \times m_2 = -1 \times 1 = -1$

$\therefore$ The two straight lines are perpendicular.

Problem number [59]

$\because m_1 = \frac{-5-2}{4+3} = -1$, $m_2 = \tan 45° = 1$

$\therefore m_1 \times m_2 = -1 \times 1 = -1$

$\therefore$ The two straight lines are perpendicular.

Problem number [60]

$\because AB = \sqrt{(1-5)^2 + (-3-1)^2}$

$= \sqrt{16+16} = \sqrt{32} = 4\sqrt{2}$ length unit

, $BC = \sqrt{(-5-1)^2 + (3+3)^2}$

$= \sqrt{36+36} = \sqrt{72} = 6\sqrt{2}$ length unit

, $CD = \sqrt{(-1+5)^2 + (7-3)^2}$

$= \sqrt{16+16} = \sqrt{32} = 4\sqrt{2}$ length unit

, $AD = \sqrt{(-1-5)^2 + (7-1)^2} = \sqrt{36+36}$

$= \sqrt{72} = 6\sqrt{2}$ length unit

$\therefore AB = CD$, $AD = BC$

$\therefore ABCD$ is a parallelogram

, $\because AC = \sqrt{(-5-5)^2 + (3-1)^2}$

$= \sqrt{100+4} = \sqrt{104} = 2\sqrt{26}$ length unit

, $BD = \sqrt{(-1-1)^2 + (7+3)^2}$

$= \sqrt{4+100} = \sqrt{104} = 2\sqrt{26}$ length unit

$\therefore AC = BD$ $\qquad \therefore ABCD$ is a rectangle

Problem number [61]

$\because \overleftrightarrow{AB}$ // the x-axis $\qquad \therefore$ The slope of $\overleftrightarrow{AB} = 0$

$\therefore \frac{y+4}{-2-5} = 0$ $\qquad \therefore y + 4 = 0$ $\qquad \therefore y = -4$

Problem number [62]

$\because m_1 = \frac{3-k}{1-0} = 3 - k$, $m_2 = \frac{5-3}{2-1} = 2$

$\because m_1 = m_2$ $\qquad \therefore 3 - k = 2$ $\qquad \therefore k = 1$

Problem number [63]

$\because L_1 // L_2$ $\qquad \because m_1 = m_2$

$\therefore \tan 45° = \frac{-a}{-2}$ $\qquad \therefore 1 = \frac{a}{2}$ $\qquad \therefore a = 2$

Problem number [64]

$m_1 = \frac{k-1}{2+3} = \frac{k-1}{5}$, $m_2 = \tan 45° = 1$

, $\because L_1 \perp L_2$ $\qquad \therefore m_1 \times m_2 = -1$

$\therefore \frac{k-1}{5} \times 1 = -1$ $\qquad \therefore k - 1 = -5$ $\qquad \therefore k = -4$

Problem number [65]

$y = \frac{1}{2}x + 2$

Problem number [66]

$\because$ The slope $= \frac{1}{2}$

$\therefore$ The equation of the straight line is : $y = \frac{1}{2}x + c$

, $\because (4 , 7)$ satisfies the equation

$\therefore 7 = \frac{1}{2} \times 4 + c$ $\qquad \therefore c = 5$

$\therefore$ The equation of the straight line is : $y = \frac{1}{2}x + 5$

Problem number [67]

$\because$ The slope $= \frac{3}{4}$

$\therefore$ The equation of the straight line is : $y = \frac{3}{4}x + c$

$\because (3 , -5)$ satisfies the equation

$\therefore -5 = \frac{3}{4} \times 3 + c$ $\qquad \therefore c = -7\frac{1}{4}$

$\therefore$ The equation of the straight line is : $y = \frac{3}{4}x - 7\frac{1}{4}$

Problem number [68]

$\because$ The slope of the straight line $= \frac{-1+3}{5-2} = \frac{2}{3}$

$\therefore$ The equation of the straight line is : $y = \frac{2}{3}x + c$

, $\because (2 , -3)$ satisfies the equation

$\therefore -3 = \frac{2}{3} \times 2 + c$ $\qquad \therefore c = -4\frac{1}{3}$

$\therefore$ The equation of the straight line is :

$y = \frac{2}{3}x - 4\frac{1}{3}$

Problem number [69]

$\because$ The slope of $\overleftrightarrow{AB} = \frac{5-3}{3-1} = 1$

$\therefore$ The slope of the axis of symmetry of $\overline{AB} = -1$

$\therefore$ The equation of the axis of symmetry of $\overleftrightarrow{AB}$ is :

$y = -x + c$

, $\because$ The midpoint of $\overline{AB} = \left(\frac{1+3}{2} , \frac{3+5}{2}\right)$

$= (2 , 4)$

$\therefore (2 , 4)$ satisfies the equation : $y = -x + C$

$\therefore 4 = -2 + c$ $\qquad \therefore c = 6$

$\therefore$ The equation of the axis of symmetry of $\overleftrightarrow{AB}$ is :

$y = -x + 6$

Problem number [70]

$\because$ The slope of the straight line $= \frac{6-2}{-1-1} = -2$

$\therefore$ The equation of the straight line is : $y = -2x + c$

, $\because$ The straight line passes through the point (1 , 2)

$\therefore 2 = -2 \times 1 + c$ $\qquad \therefore c = 4$

$\therefore$ The equation of the straight line is :

$y = -2x + 4$

Problem number [71]

$\because$ The slope of the straight line $= \frac{2-3}{-3-2} = \frac{1}{5}$

$\therefore$ The equation of the straight line is :

$y = \frac{1}{5}x + c$

, $\because$ (2 , 3) satisfies the equation

$\therefore 3 = \frac{1}{5} \times 2 + c$ $\qquad \therefore c = 2\frac{3}{5}$

$\therefore$ The equation of the straight line is :

$y = \frac{1}{5}x + 2\frac{3}{5}$

Problem number [72]

$\because$ The slope of $\overleftrightarrow{AB} = \frac{-2-4}{-1-1} = 3$

$\therefore$ The slope of $\overleftrightarrow{BC} = -\frac{1}{3}$

$\therefore$ The equation of $\overleftrightarrow{BC}$ is : $y = -\frac{1}{3}x + c$

, $\because$ B (−1 , −2) satisfies the equation of $\overleftrightarrow{BC}$

$\therefore -2 = -\frac{1}{3} \times -1 + c$ $\qquad \therefore c = -2\frac{1}{3}$

$\therefore$ The equation of $\overleftrightarrow{BC}$ is : $y = \frac{-1}{3}x - 2\frac{1}{3}$

Problem number [73]

$\because$ The slope of the given straight line $= \frac{-1}{2}$

$\therefore$ The slope of the required straight line $= -\frac{1}{2}$

$\therefore$ The equation of the required straight line is :

$y = -\frac{1}{2}x + c$

$\because$ The straight line passes through the point :

(3 , −5)

$\therefore -5 = \frac{-1}{2} \times 3 + c$ $\qquad \therefore c = -3\frac{1}{2}$

$\therefore$ The equation of the required straight line is :

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

Problem number [74]

$\because$ The slope of the given straight line $= \frac{-2}{-1} = 2$

$\therefore$ The slope of the required straight line = 2

$\therefore$ The equation of the required straight line is :

$y = 2x + c$

$\because$ (2 , 3) satisfies the equation

$\therefore 3 = 2 \times 2 + c$ $\qquad \therefore c = -1$

$\therefore$ The equation of the required straight line is :

$y = 2x - 1$

Problem number [75]

$\because$ The slope of the given straight line $= \frac{-1}{2}$

$\therefore$ The slope of the required straight line = 2

$\therefore$ The equation of the required straight line is :

$y = 2x + c$

$\because$ (3 , −5) satisfies the equation

$\therefore -5 = 2 \times 3 + c$ $\qquad \therefore c = -11$

$\therefore$ The equation of the required straight line is :

$y = 2x - 11$

Problem number [76]

$\because$ The slope of the given straight line $= \frac{-5}{-2} = \frac{5}{2}$

$\therefore$ The slope of the required straight line $= \frac{-2}{5}$

$\therefore$ The equation of the required straight line is :

$y = \frac{-2}{5}x + c$

, $\because$ (3 , 4) satisfies the equation

$\therefore 4 = -\frac{2}{5} \times 3 + c$ $\qquad \therefore c = 5\frac{1}{5}$

$\therefore$ The equation of the required straight line is :

$y = \frac{-2}{5}x + 5\frac{1}{5}$

Problem number [77]

$\therefore$ The slope of the required straight line = 2

$\therefore$ The equation of the required straight line is :

$y = 2x + c$

, $\because$ (1 , 5) satisfies the equation

$\therefore 5 = 2 \times 1 + c$ $\qquad \therefore c = 3$

$\therefore$ The equation of the required straight line is :

$y = 2x + 3$

Problem number [78]

$\because$ The slope of the given straight line $= \frac{-4+3}{5-2}$

$= -\frac{1}{3}$

$\therefore$ The slope of the required straight line $= 3$

$\therefore$ The equation of the required straight line is :

$y = 3x + c$

, $\because$ (1 , 2) satisfies the equation

$\therefore 2 = 3 \times 1 + c$ $\quad\therefore c = -1$

$\therefore$ The equation of the required straight line is :

$y = 3x - 1$

Problem number [79]

$\because$ The midpoint of $\overline{AB} = \left(\frac{1+3}{2}, \frac{-2-4}{2}\right) = (2, -3)$

$\therefore$ The slope of the straight line $= \frac{6+3}{1-2} = -9$

$\therefore$ The equation of the straight line is : $y = -9x + c$

, $\because$ (1 , 6) satisfies the equation

$\therefore 6 = -9 \times 1 + c$ $\quad\therefore c = 15$

$\therefore$ The equation of the straight line is :

$y = -9x + 15$

Problem number [80]

(1) $y = \frac{1}{2}x + 2$

(1) Put $y = 0$ $\quad\therefore 0 = \frac{1}{2}x + 2$

$\therefore \frac{1}{2}x = -2$ $\quad\therefore x = -4$

$\therefore$ The intersection point with the X-axis is (−4 , 0)

Problem number [81]

$\because$ The slope of $\overleftrightarrow{AC} = \frac{6-4}{-1-5} = -\frac{2}{6} = -\frac{1}{3}$

, $\because$ The two diagonals of the square are perpendicular.

$\therefore$ The slope of $\overleftrightarrow{BD} = 3$

$\therefore$ The equation of $\overleftrightarrow{BD}$ is : $y = 3x + c$

$\because$ The coordinates of the midpoint of $\overline{AC}$

$= \left(\frac{5-1}{2}, \frac{6+4}{2}\right) = (2, 5)$

$\therefore$ (2 , 5) satisfies the equation of $\overleftrightarrow{BD}$

$\therefore 5 = 2 \times 3 + c$ $\quad\therefore c = -1$

$\therefore$ The equation of $\overleftrightarrow{BD}$ is : $y = 3x - 1$

Problem number [82]

(1) $\because$ $\overline{AB}$ is a diameter of the circle

, M is the midpoint of $\overline{AB}$ let A (x, y)

$\therefore (5, 7) = \left(\frac{x+8}{2}, \frac{y+11}{2}\right)$ $\quad\therefore \frac{x+8}{2} = 5$

$\therefore x + 8 = 10$ $\quad\therefore x = 2$ $\quad, \frac{y+11}{2} = 7$

$\therefore y + 11 = 14$ $\quad\therefore y = 3$ $\quad\therefore$ A (2 , 3)

(2) $\because$ The slope of $\overleftrightarrow{AB} = \frac{11-3}{8-2} = \frac{4}{3}$

$\therefore$ The slope of the required straight line $= \frac{-3}{4}$

$\therefore$ The equation of the required straight line is :

$y = \frac{-3}{4}x + c$

$\because$ B (8 , 11) satisfies the equation

$\therefore 11 = \frac{-3}{4} \times 8 + c$ $\quad\therefore c = 17$

$\therefore$ The equation of the required straight line is :

$y = \frac{-3}{4}x + 17$

Problem number [83]

$\because$ In the parallelogram the two diagonals bisect each other.

$\therefore$ The coordinates of M $= \left(\frac{3+0}{2}, \frac{2-3}{2}\right)$

$= \left(1\frac{1}{2}, -\frac{1}{2}\right)$

Let D (x, y)

$\therefore \left(1\frac{1}{2}, -\frac{1}{2}\right) = \left(\frac{4+x}{2}, \frac{-5+y}{2}\right)$

$\therefore \frac{4+x}{2} = 1\frac{1}{2}$ $\quad\therefore 4 + x = 3$ $\quad\therefore x = -1$

$, \frac{-5+y}{2} = -\frac{1}{2}$ $\quad\therefore -5 + y = -1$ $\quad\therefore y = 4$

$\therefore$ D (−1 , 4)

Problem number [84]

$\because$ The slope of $\overleftrightarrow{BC} = \frac{4+2}{3-5} = -3$

$\therefore$ The slope of $\overleftrightarrow{DE} = -3$

$\therefore$ The equation of $\overleftrightarrow{DE}$ is : $y = -3x + c$

$\because$ D is the midpoint of $\overline{AB} = \left(\frac{1+5}{2}, \frac{2-2}{2}\right) = (3, 0)$

$\therefore$ (3 , 0) satisfies the equation of $\overleftrightarrow{DE}$

$\therefore 0 = -3 \times 3 + c$ $\quad\therefore c = 9$

$\therefore$ The equation of $\overleftrightarrow{DE}$ is : $y = -3x + 9$

Problem number [85]

$\because m_1 = \frac{-1}{1} = -1$, $m_2 = \frac{-k}{3}$,

$\because$ The two straight lines are parallel

$\therefore m_1 = m_2$ $\quad \therefore -1 = -\frac{k}{3}$ $\quad \therefore k = 3$

Problem number [86]

The slope $= \frac{-3}{4}$

, the length of the intercepted part of y-axis

$= \left|\frac{-5}{4}\right| = \frac{5}{4}$ length unit

Problem number [87]

$\because$ Let the measure of the two angles be : $3x$, $5x$

$\therefore 3x + 5x = 180°$ $\quad \therefore 8x = 180°$ $\quad \therefore x = 22° \, 30'$

$\therefore$ The measure of the two angles are :

$67° \, 30'$, $112° \, 30'$

Problem number [88]

$\because \frac{x}{2} + 3y = 6$ $\qquad \therefore 3y = -\frac{x}{2} + 6$

$\therefore y = -\frac{x}{6} + 2$ $\qquad \therefore$ The slope $= -\frac{1}{6}$

and the intercepted part is 2 units from the positive part of y-axis.

Problem number [89]

$\because \frac{x}{3} + \frac{y}{2} = 1$ "multiplying by 2"

$\therefore \frac{2x}{3} + y = 2$ $\qquad \therefore y = -\frac{2x}{3} + 2$

$\therefore$ The slope $= \frac{-2}{3}$

, the intercepted part = 2 units from the positive part of y-axis

Problem number [90]

(1) $\because$ The slope of the straight line $= \frac{3-1}{2-1} = 2$

$\therefore$ The equation of the straight line is : $y = 2x + c$

$\because$ The point $(1 , 1) \in$ the straight line

$\therefore 1 = 2 \times 1 + c$ $\qquad \therefore c = -1$

$\therefore$ The equation of the straight line is : $y = 2x - 1$

(2) One unit of the negative part of y-axis

(3) $\because$ The point $(3 , a)$ satisfies the equation

$\therefore a = 2 \times 3 - 1 = 5$

Problem number [91]

(1) $\because$ The slope of $L_1 = \tan 45° = 1$

, $\because L_1$ passes through the origin point :

$\therefore$ The equation of L_1 is : $y = x$

(2) $\because L_1 \,//\, L_2$ $\qquad \therefore$ The slope of $L_2 = 1$

$\therefore$ The equation of L_2 is : $y = x + c$

, $\because (1 , 5)$ satisfies the equation of L_2 :

$\therefore 5 = 1 + c$ $\qquad \therefore c = 4$

$\therefore$ The equation of L_2 is : $y = x + 4$

(3) Let $B (x , y)$

$\because B$ satisfies the equation of L_1 : $\therefore x = y$

, $\because \overline{AB} \perp L_1$ $\qquad \therefore$ The slope of $\overleftrightarrow{AB} = -1$

$\therefore \frac{y-5}{x-1} = -1$ $\qquad \therefore y - 5 = 1 - x$

, $\because x = y$ $\qquad \therefore x - 5 = 1 - x$

$\therefore 2x = 6$ $\qquad \therefore x = 3$

$\therefore y = 3$ $\qquad \therefore B (3 , 3)$

$\therefore AB = \sqrt{(3-1)^2 + (3-5)^2}$

$= \sqrt{4+4} = \sqrt{8} = 2\sqrt{2}$ length unit

Problem number [92]

(1) Let $A (x , 0)$, $B (0 , y)$

$\because C$ is the midpoint of $\overline{AB}$

$\therefore (4 , 3) = \left(\frac{x+0}{2} , \frac{0+y}{2}\right)$

$\therefore \frac{x}{2} = 4$ $\qquad \therefore x = 8$ $\qquad \therefore A (8 , 0)$

$\therefore \frac{y}{2} = 3$ $\qquad \therefore y = 6$ $\qquad \therefore B (0 , 6)$

(2) The slope of $\overleftrightarrow{AB} = \frac{0-6}{8-0} = -\frac{3}{4}$

$\therefore$ The equation of $\overleftrightarrow{AB}$ is : $y = -\frac{3}{4}x + c$

$\because (0 , 6)$ statisfies the equation of $\overleftrightarrow{AB}$

$\therefore 6 = -\frac{3}{4} \times 0 + c$ $\qquad \therefore c = 6$

$\therefore$ The equation of $\overleftrightarrow{AB}$ is : $y = -\frac{3}{4}x + 6$

كيف تستعد للإمتحانات ؟

إرشادات هامة لليلة الامتحان

.التأكد من جدول الامتحان ومواعيده وترتيب المواد - :
.إعداد الأدوات اللازمة كل ليلة والمناسبة لكل مادة -
أخذ قسطا كافيا من النوم والبعد عن السهر المتواصل -
.ليلة الامتحان حتى يمكنك التركيز أثناء الامتحان
.مراجعة أرقام الجلوس -
الحرص على الإفطار قبل الخروج من المنزل ولو إفطارا -
.خفيفا
لا تتحدث كثيرا مع زملائك حول المادة حتى لاتعانى من -
.(تشتت الانتباه) فى المعلومات التي تم مراجعتها
الاستعانة بالله والثقة فى النفس وترديد الآيات -
.المناسبة بليلة الامتحان والتي تفيد فى هذه المواقف

نصائح وإرشادات هامة داخل لجنة الامتحان

أقرا ورقة الأسئلة كلها جيدا بإمعان وهدوء ولا تتعجل -
.فى الإجابة
قسم زمن الإجابة بين الأسئلة، واترك بعض الوقت -
.بمراجعة ولا تغادر اللجنة قبل انتهاء الوقت بكثير
ضع فى اعتبارك انك فى لجنة ليس بها إلا طالب واحد -
.هو أنت ولا تعتمد على مجهود غيرك
اترك فراغا بعد الإجابة على كل سؤال فربما تحتاج -
.إضافة أو تعديل أو تغيير شيء بعد المراجعة
أبدا بالأسئلة السهلة مع التأكد من الأسئلة الإجبارية -
.والاختيارية واترك الأسئلة الصعبة للنهاية
خصص مسودة فى نهاية كراسة الإجابة، وإذا تذكرت -