Lycée Des Arts | Mathematics | 9^{th}-Grade

Name: . . . . | "Equation of Straight Lines" | W.S-8

1) Answer by True or False, and correct false statements:

a. All straight lines have a definite director coefficient.

b. There is only one vector parallel to $\vec{V}(2,1)$.

c. To find distance between a point and a line, is to determine the distance between this point and any point on that line.

d. The slant of a straight line is the ratio of horizontal change to the vertical change.

2) Write each of the following equations in slope intercept form (***reduced form***):

a. $(d_1): 3x-2(y-1)=3(2y-x)+7.$

b. $(d_2): \dfrac{3(y+3)}{7-y}=\dfrac{1-3x}{2+x}$

3) Choose with the appropriate ***justification*** the correct answer.

No.	Statements	Proposed answers		
		A	B	C
1.	The lines $x=1$ & $x=-1$. are	Parallel	Perpendicular	Parallel to $x'ox$.
2.	The lines $x=1$ & $y=-3$. are	Parallel	Perpendicular	Parallel to $x'ox$.
3.	$y=-3x.$	Has a slope -1	Passes through origin	Intercepts $y-axis$ at -3.
4.	The line $y=-3$ passes through	$(0;-3)$	$(-3;0)$	$(0;0)$
5.	If $\left\{\begin{array}{l} A(1;-3)\ satisfy\ (d) \\ and\ (d)\parallel x'Ox \end{array}\right\}$, then equation of (d) is:	$(d): x=1.$	$(d): y=-3.$	$(d): y=x-3.$
6.	The lines $y=-3$ and $x=2$ intersect at the point	$(-3;2)$	$(-2;3)$	$(2;-3)$
7.	Equation of a straight line	$y=2x.$	$y=(x-1)^2.$	$y=-\dfrac{3}{x}.$
8.	The line $y=-1$ intercept the y-axis at:	1	-1	Does not have

4) Trace the following straight lines in an orthonormal system of axes ($x'Ox$ & $y'Oy$):

$(d_1): 4x-2y+6=0.$ $\qquad$ $(d_2): 2x-4=0.$ $\qquad$ $(d_3): y+1=0.$

5) Consider the points $A(2;-1)$ & $B(4;1)$ and the straight line $(L): y=2x-4.$

a. Plot the points and draw the straight line in the plane $(x'Ox\ and\ y'Oy)$.

b. Assemble the equation of the straight line (AB).

c. Find the coordinates of M, the intersection point of the straight lines (L) & (AB).

d. Line (L) intersects the axes $(x'x)$ and $(y'y)$ at E and F respectively. Calculate $[EF]$.

e. Find equation of straight line (P) the perpendicular bisector of $[EF]$.

f. Determine the coordinates of J the centroid of triangle OEF.

6) Consider in an orthonormal system $x'Ox, y'Oy$ the equations:

$(D_1): y = 2x + 3$ *and* $(D_2): y = (m-3)x - 1.$

a. Find the numerical value of *m*, such that (D_1) is perpendicular to (D_2).

b. Trace the given lines.

c. Find the coordinates of point *M*, the point of intersection of (D_1) and (D_2).

d. Verify that the point $N(-3;-3)$ belongs to the line of y-intercept $(0;3)$.

e. Determine the coordinates of point $R(2n;n+1)$ that verifies the equation of line (D_2).

7) Consider the following cartesian systems:

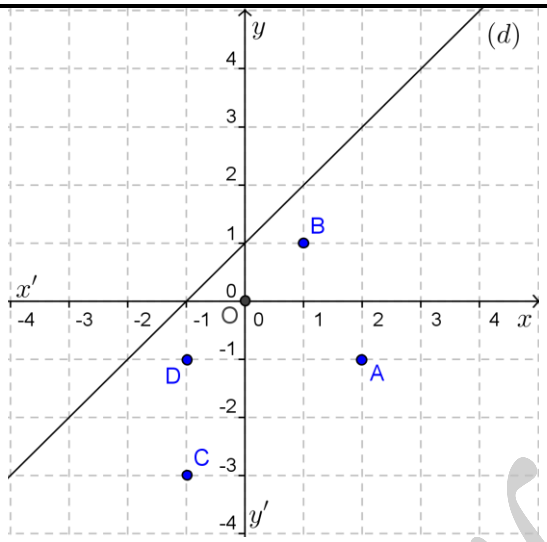

Fig-1.

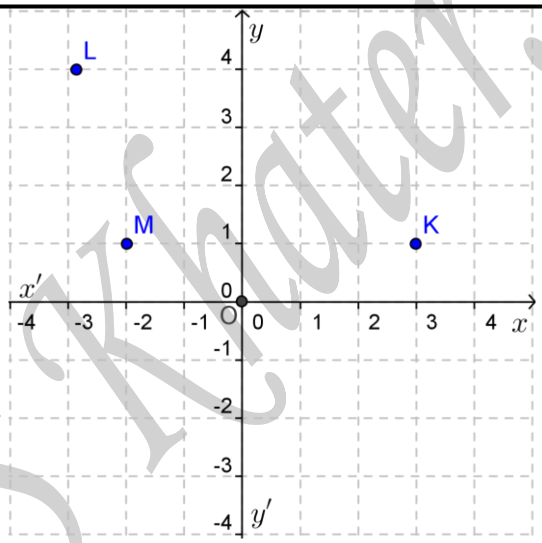

Fig-2.

***Find & locate the coordinates of the points*:**	***Find & locate the coordinates of the points*:**
a- ***R*** the symmetric of ***A*** *w. r. t* origin.	***i- S*** the orthogonal projection of ***K*** on *x*-axis.
b- ***N*** the symmetric of ***A*** *w. r. t* ***B***.	***ii- T*** the orthogonal projection of ***L*** on y-axis.
c- ***E*** the symmetric of ***C*** *w. r. t* *x*-axis.	***iii- P*** the orthogonal projection of M on the straight line joining points ***K*** & ***L***.
d- ***Q*** the symmetric of ***C*** *w. r. t* *y*-axis.	

8) Consider the lines: $(\Delta_1): 2y = mx + 2n$. $(\Delta_2): y = -x - 2$ and the point $N(0;1)$.

a. Determine the values of *m* & *n* so that (Δ_1) & (Δ_2) are perpendicular & N belongs to (Δ_1).

b. If $P(a;a-1)$ is any point. Find *a* so that triangle *NOP* is isosceles with vertex *O*.

9) Given in the plane $(x'Ox \text{ and } y'Oy)$ the points *R*(0;-3), *N*(5;2) *K*(2;-1) and the straight line, $(d): y = -2x + 3$.

a. Locate the points *R* and *N* and trace line (*d*) on the same orthonormal system of axes.

b. Find the equation of line (*RN*) and verify that it intersects (*d*) at *K*.

c. Let *F*(*f*;0) be a point in same plane of (*d*).

i. Calculate the length of *RF* and *NF* interms of *f*.

ii. Find the value of *f* such that triangle *RNF* is right at *R*.

iii. Calculate *f* where triangle *RNF* is isosceles of vertex *F*.

10) Consider the points: $R(0;-1), P(4;-1)$ *and* $N(2;5)$.

i. Prove that triangle *RPN* is isosceles of vertex *N*.

ii. Deduce the coordinates of *H*, the orthogonal projection of *N* on (*RP*).

iii. Determine coordinates of *J* the circumcenter of triangle *RHN*.

11) In a reference frame given the points $A(1;1), B(2;2)$ and $M(x;y)$.
Determine a relation between x and y such that triangle ABM is isosceles of vertex M.

12) Consider in ***cartesian*** system $x'Ox, y'Oy$ the equations:
$(D): y = 2mx + 1$ & $(D'): y = (4m-2)x - 4$.
1- What is the value of m, so that (D) is parallel to (D')?
2- Construct (D) & (D') in the given system.
3- Find the value of a, if the point $N(3;a)$ belong to (D').
4- Determine the coordinates of point B the symmetric of N with respect to $M(2;0)$.

13) Consider in the coordinate system $x'Ox, y'Oy$ the points:
$A(-1;0), B(1;-4)$ and $C(-9;-4)$.
a. Plot the given points.
b. Determine the nature of the triangle formed by the three given points.
c. Compute the area of triangle ABC.
d. Determine the coordinates of point I the center of gravity of the formed triangle.
e. Find the center and the radius of the circle circumscribed about triangle ABC.
f. Find the coordinates of point D the fourth vertex of the parm $ABCD$.

14) Consider the line $(d): mx + (m-2)y + m - 4 = 0$, where m is a real number and the points $A(-1;2), B(3;-1)$ & $M(1;-2)$.
a. Determine the value of m in each of the following cases:
i. (d) passes through the origin.
ii. (d) parallel to abscissa axis.
iii. (d) parallel to ordinate axis.
iv. (d) passes through the point A.
v. (d) parallel to the line $(d'): y = -2x + 4$.
b. Verify that the points A, O & M are collinear.
c. Find the coordinates of the point D the fourth vertex of parallelogram $ABMD$.

15) Let $R(1;3)$ be the symmetric of $N(3;1)$ with respect to a line (Δ) of the form: $y = ax + b$.
a. Determine the equation of (Δ).
b. What is the nature of triangle ORN? Justify.
c. Find coordinates of point D such that $\overrightarrow{RN} = 2\overrightarrow{ND} - \overrightarrow{RD}$

16) Consider the plane of orthonormal system of axes $(x'Ox, y'Oy)$ the points $A(3;0) B(-1;8)$, and the line $(\Delta): 2y - x = 7$.
a. Trace the line and place the given points.
b. Construct the equation of the straight line (AB).
c. Find coordinates of I the point of intersection of lines (AB) and (Δ).
d. Show that I is the midpoint of $[AB]$. Deduce the relative positions of $[AB]$ and (Δ).

17) In a reference frame consider the points $A(2x+1;3), B(2y-2;5), C(x+y;2x)$ and $D(5x-3y;6-2y)$.
a. Find the numerical values of x & y so that quadrilateral $ABCD$ is a parallelogram.
b. Deduce coordinates of the vertices of parallelogram $ABCD$.

18) In an orthonormal reference of axes $(x'Ox, y'Oy)$ consider the points:
$A(5;-3), B(11;0), C(2;3)$ and the line $(d): y = -2x + 7$.

a. Plot points A, B, C and draw (d).
b. Determine the slope of line (AB). Write its equation.
c. Show that (d) is perpendicular to line (AB) and passes through the points A and C.
d. Calculate the measure of the sides AB & AC . Deduce the nature of triangle ABC.
e. Locate and find coordinates of point D the image of C by the translation $\overrightarrow{AB}$.
f. Deduce the nature of quadrilateral $ABDC$.
g. Let R be the orthogonal projection of C on the x-axis.
  i. Prove that the points D, B, R & C belong to the same circle (***c***).
  ii. Find the radius and the coordinates of J the center of circle (***c***).

19) Consider the point $R(m+1, 2n-4)$
Find the values of m & n in each of the following cases:

a. R coincides with the origin O.
b. R is the y-intercept of the straight line $(\Delta): 2x - 3y = 1$.
c. R is the x-intercept of the straight line $(d): x - 2y + 1 = 0$.
d. R belongs to the first quadrant.
e. R belongs to the second quadrant.

20) In a system of axes $x'Ox, y'Oy$, consider the point $A(-3;3)$ .Let (C) be a circle of center A and tangent to (xx').

a. What is the relative position of $(y'y)$ with respect to (C)?
b. Construct the circle (C'), the translate of (C) by the translation of vector $\overrightarrow{AO}$ and determine the tangents through A to (C').

21) 1. Plot the points $A(1;3), B(5;5)$ & $N(5;3)$ in a system of orthogonal axes.
2. Compute the coordinates of I the midpoint of $[AB]$.
3. What is the nature of triangle ABN?
4. Deduce that points A, B & N belong to a circle (***C***), whose center is to be determined.
5. Let (d) be a line of equation: $y = -2x + 15$.
  i. Prove that B belongs to (d).
  ii. Show that the straight line (d) is tangent to the (***C***) at point B.

22) Use the following graph to construct the equations of the traced lines: