Maths

Prove that Two Vectors are Colinear

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Please note this downloadable resource contains some colored font

Which of pair of statements are true.

a) Collinear vectors are always parallel.
Parallel vectors are always collinear.

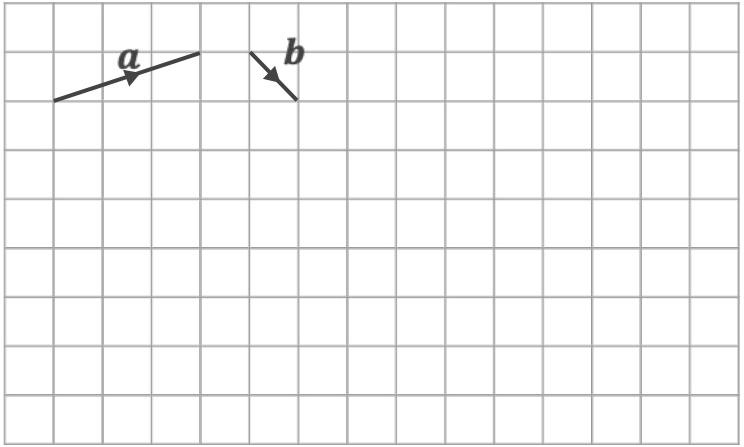
b) Collinear vectors are sometimes parallel.
Parallel vectors are always collinear.

c) Collinear vectors are sometimes parallel.
Parallel vectors are sometimes collinear.

d) Collinear vectors are always parallel.
Parallel vectors are sometimes collinear.

Prove that two vectors are colinear

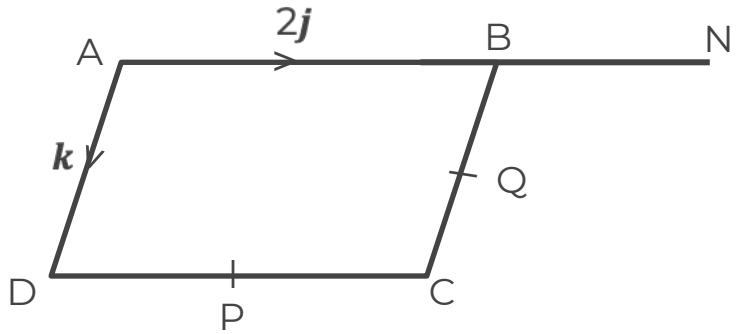
1. Here are two vectors, $\boldsymbol{a}$ and $\boldsymbol{b}$.



$\overrightarrow{XY} = \boldsymbol{a} + 2\boldsymbol{b}$ $\overrightarrow{XZ} = 2\boldsymbol{a} + 4\boldsymbol{b}$

Show that $\overrightarrow{XY}$ and $\overrightarrow{XZ}$ are colinear.

2. ABCD is a parallelogram. P and Q are the midpoints of CD and BC respectively. N is the point such that AB : BN is 2 : 1



Show that P, Q and N are colinear.

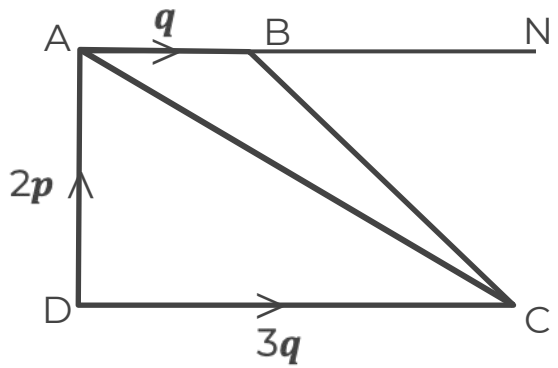
Prove that two vectors are colinear

3. ABCD is a trapezium.

E is the midpoint of AC.

AN : AB = 3 : 1

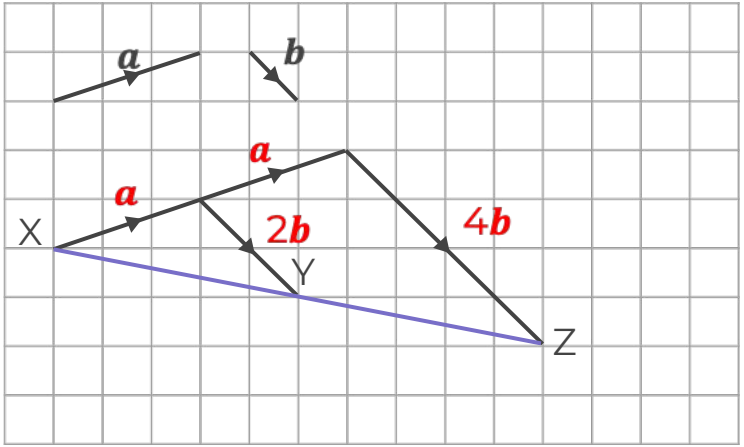
Show that D, F and N are collinear.



Answers

Prove that two vectors are colinear

1. Here are two vectors, $\boldsymbol{a}$ and $\boldsymbol{b}$.

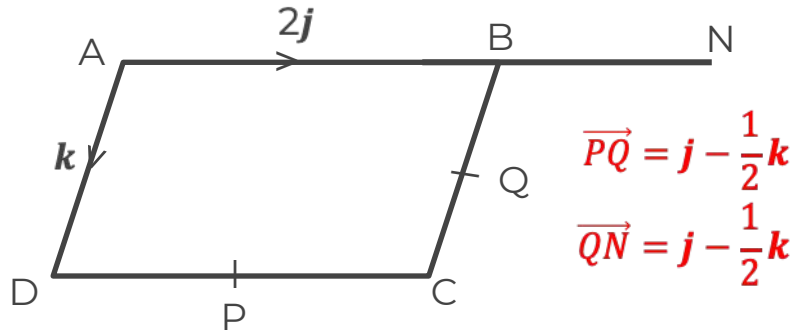


$\overrightarrow{XY} = \boldsymbol{a} + 2\boldsymbol{b}$ $\overrightarrow{XZ} = 2\boldsymbol{a} + 4\boldsymbol{b}$

Show that $\overrightarrow{XY}$ and $\overrightarrow{XZ}$ are colinear.

X, Y and Z lie on the same straight line so the vectors are colinear.

2. ABCD is a parallelogram. P and Q are the midpoints of CD and BC respectively. N is the point such that AB : BN is 2 : 1



Show that P, Q and N are colinear.

PQ and QN are parallel through a common point so P, Q and N are colinear.

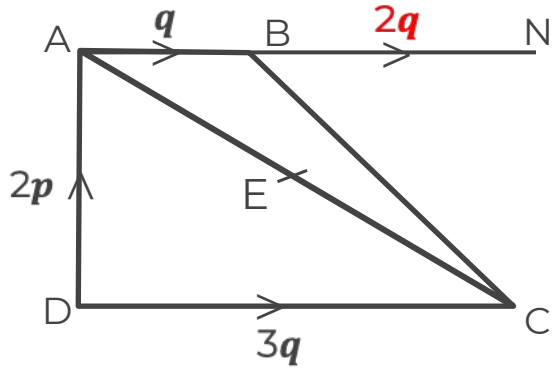
Prove that two vectors are colinear

3. ABCD is a trapezium.

E is the midpoint of AC.

AN : AB = 3 : 1

Show that D, F and N are colinear.



$\overrightarrow{DE} = 2\boldsymbol{p} + \frac{1}{2}\overrightarrow{AC} = 2\boldsymbol{p} + \frac{1}{2}(3\boldsymbol{q} - 2\boldsymbol{p}) = \boldsymbol{p} + \frac{3}{2}\boldsymbol{q}$

$\overrightarrow{DN} = 2\boldsymbol{p} + 3\boldsymbol{q}$

$\overrightarrow{DN} = 2 \times \overrightarrow{DE}$ therefore $\overrightarrow{DN}$ and $\overrightarrow{DE}$ are parallel.

$\overrightarrow{DE}$ and $\overrightarrow{DN}$ are parallel through a common point therefore they are colinear.