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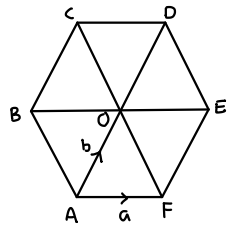
11.1 Vectors

1.



a) $\overrightarrow{AD} = \overrightarrow{AO} + \overrightarrow{OD}$
$= 2b$

b) $\overrightarrow{EB} = \overrightarrow{EO} + \overrightarrow{OB}$
$= -2a$

c) $\overrightarrow{CB} /\!/ \overrightarrow{OA}$
$= -b$

d) $\overrightarrow{AE} = \overrightarrow{AF} + \overrightarrow{FE}$
$= a + b$

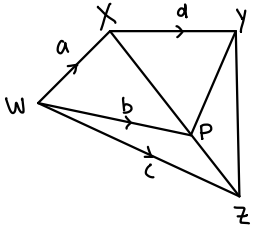
e) $\overrightarrow{OF} = \overrightarrow{OE} + \overrightarrow{EF}$
$= a - b$

f) $\overrightarrow{FC} = \overrightarrow{FA} + \overrightarrow{AO} + \overrightarrow{OD} + \overrightarrow{CD}$
$= -2a + 2b$

g) $\overrightarrow{CE} = \overrightarrow{CB} + \overrightarrow{BO} + \overrightarrow{OE}$
$= 2a - b$

h) $\overrightarrow{BF} = \overrightarrow{BO} + \overrightarrow{OE} + \overrightarrow{EF}$
$= 2a - b$

2.



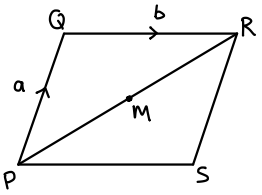
a) $\overrightarrow{XP} = \overrightarrow{XW} + \overrightarrow{WP}$
$= -a + b$

b) $\overrightarrow{PY} = \overrightarrow{PW} + \overrightarrow{WX} + \overrightarrow{XY}$
$= a - b + d$

c) $\overrightarrow{PZ} = \overrightarrow{PW} + \overrightarrow{WZ}$
$= -b + c$

d) $\overrightarrow{ZY} = \overrightarrow{ZW} + \overrightarrow{WX} + \overrightarrow{XY}$
$= a - c + d$

3.



a) $\overrightarrow{PR} = \overrightarrow{PQ} + \overrightarrow{QR}$

$= a + b$

b) $\overrightarrow{PM} = \frac{1}{2}\overrightarrow{PR}$

$= \frac{1}{2}\overrightarrow{PQ} + \frac{1}{2}\overrightarrow{QR}$

$= \frac{1}{2}a + \frac{1}{2}b$

c) $\overrightarrow{SM} = \overrightarrow{SP} + \overrightarrow{PM}$

$= \overrightarrow{SP} + \frac{1}{2}\overrightarrow{PR}$

$= \overrightarrow{SP} + \frac{1}{2}\overrightarrow{PQ} + \frac{1}{2}\overrightarrow{QR}$

$= -b + \frac{1}{2}a + \frac{1}{2}b$

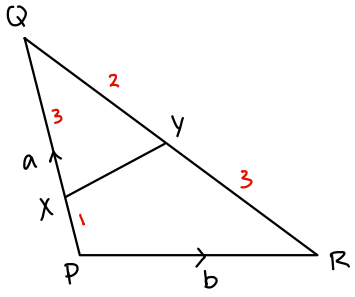
$= \frac{1}{2}a - \frac{1}{2}b$

4. $8a - 10b \;//\; pa + qb$

$\frac{8a}{-10b} = \frac{p}{q}$

$\frac{p}{q} = -\frac{4}{5}$

5.



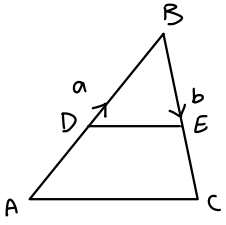
$$\overrightarrow{YX} = \frac{2}{5}\overrightarrow{RQ} + \frac{3}{4}\overrightarrow{QP}$$

$$= \frac{2}{5}(a-b) + \frac{3}{4}(-a)$$

$$= \frac{2}{5}a - \frac{2}{5}b - \frac{3}{4}a$$

$$= -\frac{7}{20}a - \frac{2}{5}b$$

6.



$$\overrightarrow{AC} = \overrightarrow{AB} + \overrightarrow{BC}$$
$$= a + b$$

$$\overrightarrow{DE} = \frac{1}{2}\overrightarrow{AB} + \frac{1}{2}\overrightarrow{BC}$$

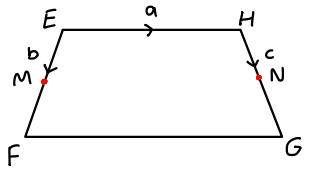
$$= \frac{1}{2}a + \frac{1}{2}b$$

$$\frac{1}{2}a + \frac{1}{2}b = \frac{1}{2}(a+b)$$

$\therefore \overrightarrow{AC}$ is a multiple of $\overrightarrow{DE}$

$\therefore \overrightarrow{AC}$ is parallel to $\overrightarrow{DE}$

7.



$\overrightarrow{FG} = k\overrightarrow{EH}$

a) $\overrightarrow{MN} = \frac{1}{2}\overrightarrow{EF} + k\overrightarrow{EH} + \frac{1}{2}\overrightarrow{GH}$

$= \frac{1}{2}b + ka - \frac{1}{2}c$

$\overrightarrow{MN} = \frac{1}{2}\overrightarrow{FE} + \overrightarrow{EH} + \frac{1}{2}\overrightarrow{HG}$

$= -\frac{1}{2}b + a + \frac{1}{2}c$

$2\overrightarrow{MN} = \frac{1}{2}b + ka - \frac{1}{2}c - \frac{1}{2}b + a + \frac{1}{2}c$

$= ka + a$

$\therefore \overrightarrow{MN} = \frac{ka + a}{2}$

$= \left(\frac{1 + k}{2}\right)a$

b) $\overrightarrow{EH} = a$

$\overrightarrow{FG} = ka$

$\overrightarrow{MN} = \left(\frac{1+k}{2}\right)a$

All are scalar multiples of a

$\therefore$ all are parallel to each other