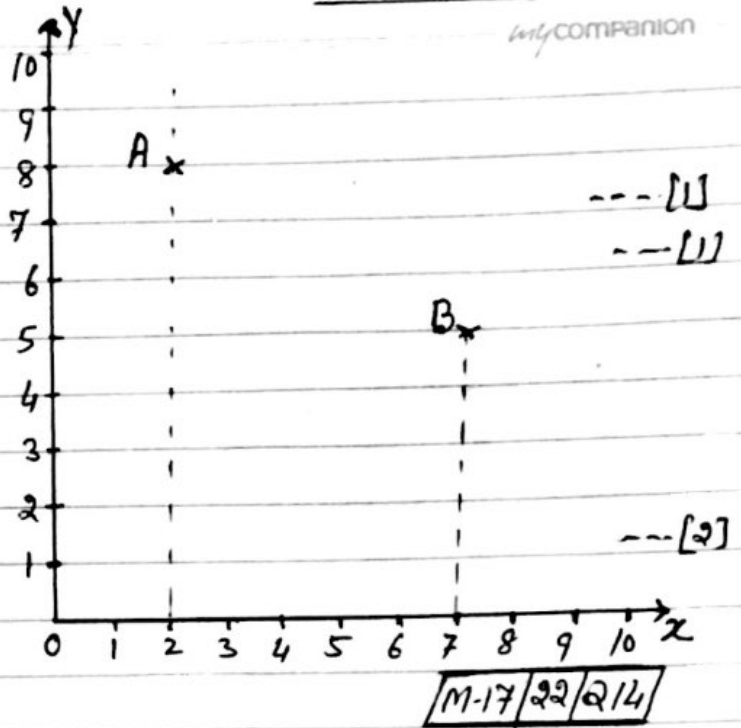
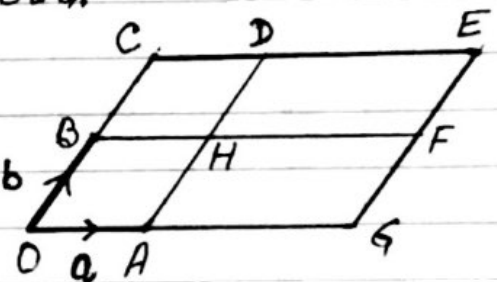


- Q1 Points A and B are marked on the grid. $\vec{BC} = \begin{pmatrix} -4 \\ 0 \end{pmatrix}$
- On the grid, plot the point C.
 - Write \vec{AC} as a column vector.
 - \vec{DE} is a vector that is perpendicular to \vec{BC} . The magnitude of \vec{DE} is equal to the magnitude of \vec{BC} . Write down a possible column vector for \vec{DE} .



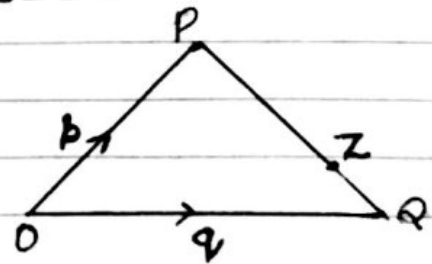
- Q2 The diagram shows a parallelogram OCEG. O is the origin, $\vec{OA} = \mathbf{a}$ and $\vec{OB} = \mathbf{b}$. BH and AF are straight lines parallel to the sides of the parallelogram. $\vec{OG} = 3\vec{OA}$ and $\vec{OC} = 2\vec{OB}$



- Write the vector \vec{HE} in terms of \mathbf{a} and \mathbf{b} . --- [1]
- Complete this statement.
 $\mathbf{a} + 2\mathbf{b}$ is the position vector of the point --- [1]
- Write down two vectors that can be written as $3\mathbf{a} - \mathbf{b}$. --- [2]

- Q3 (a) $\vec{GH} = \begin{pmatrix} 6 \\ -4 \end{pmatrix}$ Find (i) $5\vec{GH}$ --- [1]
(ii) \vec{HG} --- [1]
- (b) $\begin{pmatrix} 6 \\ 7 \end{pmatrix} + \begin{pmatrix} 2 \\ y \end{pmatrix} = \begin{pmatrix} 8 \\ 3 \end{pmatrix}$ Find the value of y . --- [1]

- Q4 O is the origin, $\vec{OP} = \mathbf{p}$ and $\vec{OQ} = \mathbf{q}$. Z is a point on PQ such that $PZ : ZQ = 5 : 2$.



Work out, in terms of \mathbf{p} and \mathbf{q} , the position vector of Z. Give your answer in its simplest form. --- [3]

S-17/23/17

Q5 (a) D is a point (2, -5) and $\vec{DE} = \begin{pmatrix} 7 \\ 1 \end{pmatrix}$

Find the co-ordinates of the point E. ---[1]

(b) $v = \begin{pmatrix} t \\ 12 \end{pmatrix}$ and $|v| = 13$

Work out the value of t, where t is negative. ---[2]

W-17/21/Q14

Q6 O is the origin and K is the point on AB

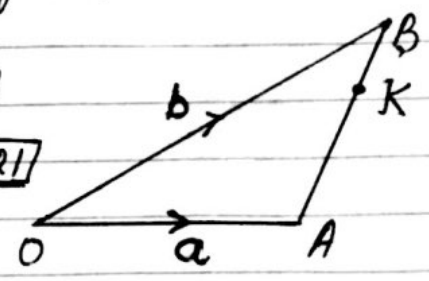
so that $AK:KB = 2:1$

$\vec{OA} = a$ and $\vec{OB} = b$.

Find the position vector of K.

Give your answer in terms of a and b in its simplest form. ---[3]

W-17/22/Q21



Q7

In the diagram, O is the origin,

$\vec{OA} = a$, $\vec{OC} = c$ and $\vec{AB} = b$.

P is on the line AB so that,

$AP:PB = 2:1$.

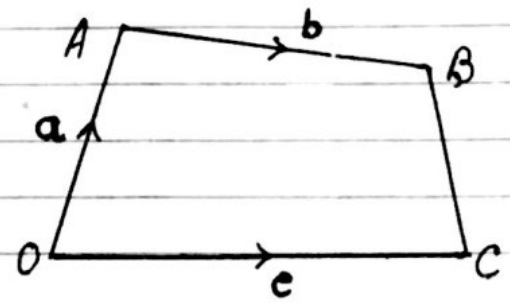
Q is the mid point of BC.

Find, in the terms of a, b and c, in its simplest form,

(a) \vec{CB} ---[1]

(b) the position vector of Q, ---[2]

(c) \vec{PQ} ---[2]



S-16/22/Q24

Q8 GHJK is a quadrilateral.

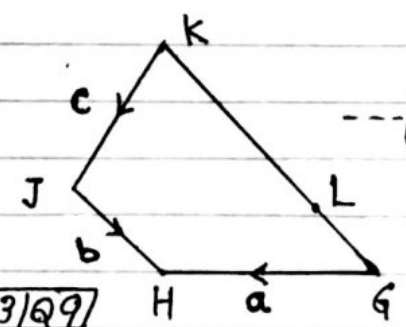
$\vec{GH} = a$, $\vec{JH} = b$ and $\vec{KJ} = c$

L lies on GK so that $LK = 3GL$

Find an expression, in terms of

a, b and c for \vec{GL} .

S-16/23/Q9

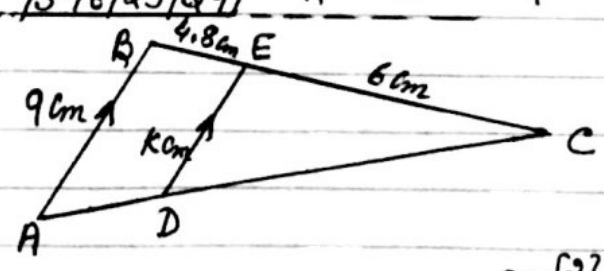


Q9 (a) Triangles CBA and CED are similar. AB is parallel to DE.

$AB = 9\text{cm}$, $BE = 4.8\text{cm}$, $EC = 6\text{cm}$ and $ED = k\text{cm}$.

Work out the value of k.

(continued →)



S-16/23/Q21(a)

(Continued →)

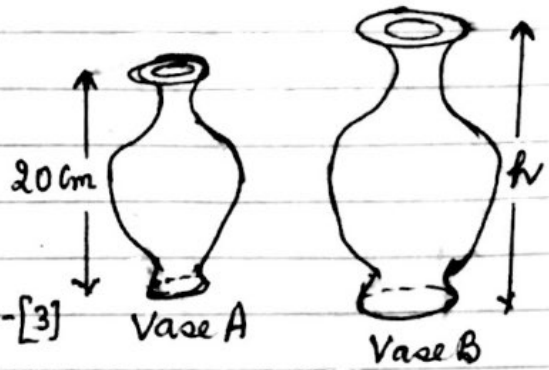
Q 9(b) The diagram shows two mathematically similar vases.

Vase A has height 20 cm and

Volume 1500 cm^3 .

Vase B has volume 2592 cm^3 .

Calculate h , the height of vase B.



[S-16/23/Q1(b)] [3]

Q10 $\vec{BC} = \begin{pmatrix} 2 \\ 3 \end{pmatrix}$

$\vec{BA} = \begin{pmatrix} -5 \\ 6 \end{pmatrix}$

(a) Find \vec{CA}

[W-16/22/Q16] [2]

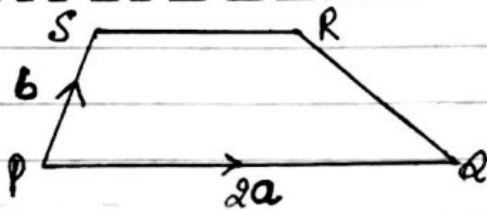
(b) Work out $|\vec{BA}|$

[2]

Q11(a) PQRS is a trapezium with $PQ = 2SR$.

$\vec{PQ} = 2a$ and $\vec{PS} = b$

Find \vec{QR} in terms of a and b in its simplest form.



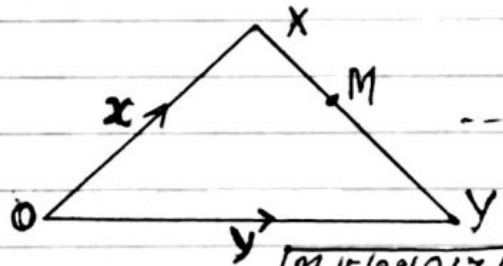
[2]

(b) $\vec{OX} = x$ and $\vec{OY} = y$

M is a point on XY such that,

$XM : MY = 3 : 5$

Find \vec{OM} in terms of x and y in its simplest form.



[2]

[M-15/22/Q17]

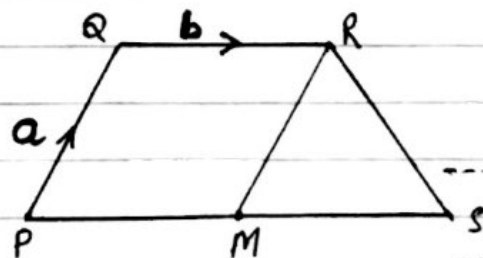
Q12 PQRS is a quadrilateral and M is the midpoint of PS.

$\vec{PQ} = a$, $\vec{QR} = b$ and $\vec{SQ} = a - 2b$

(a) Show that $\vec{PS} = 2b$

(b) Write down the mathematical name for

the quadrilateral PQRM, giving reasons for your answer.



[11]

[2]

[S-15/21/Q14]

Q13 OAPB is a parallelogram. O is the origin.

$\vec{OA} = a$ and $\vec{OB} = b$. M is the midpoint of BP.

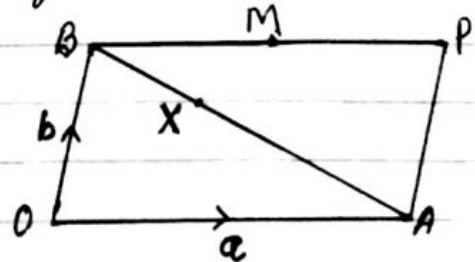
(a) Find in terms of a and b , in simplest form,

(i) \vec{BA} [1]

(ii) the position vector of M. [1]

(b) X is on BA so that $BX : XA = 1 : 2$

Show that X lies on OM.



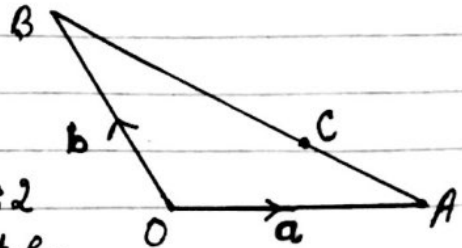
[S-15/23/Q19]

[4]

Q14 $\vec{AB} = \begin{pmatrix} -3 \\ 5 \end{pmatrix}$, Find $|\vec{AB}|$

W-15/22/Q4 --- [2]

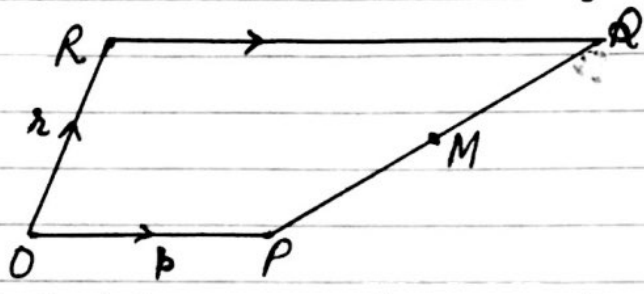
Q15 In the diagram, O is the origin,
 $\vec{OA} = a$ and $\vec{OB} = b$.
 C is on the line AB so that $AC:CB = 1:2$
 Find, in terms of a and b, in its simplest form.



- (a) \vec{AC} --- [2]
- (b) the position vector of C. --- [2]

W-15/23/Q23

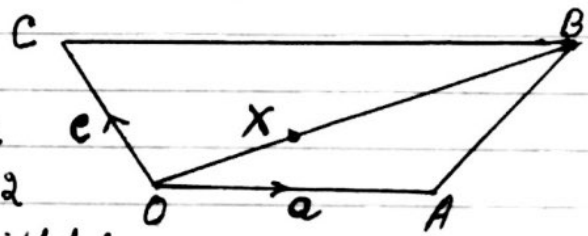
Q16 OPQR is trapezium with
 RQ is parallel to OP and
 $RQ = 2OP$. O is the origin,
 $\vec{OP} = p$ and $\vec{OR} = r$



- M is the mid point of PQ, Find in terms of p and r, in its simplest form.
- (a) \vec{PQ} --- [1]
- (b) \vec{OM} the position vector of M, --- [2]

S-14/22/Q14

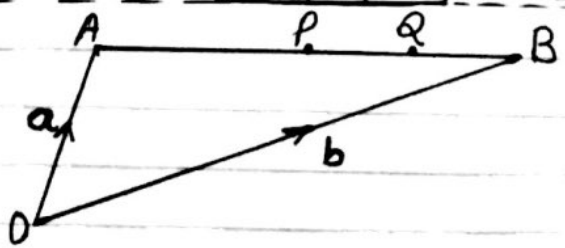
Q17 The diagram shows a quadrilateral
 OABC, $\vec{OA} = a$, $\vec{OC} = c$ and $\vec{CB} = 2a$
 X is a point on OB, such that $OX:XB = 1:2$



- (a) Find in terms of a and c, in its simplest form.
- (i) \vec{AC} --- [1]
- (ii) \vec{AX} --- [3]
- (b) Explain why the vectors \vec{AC} and \vec{AX} show that C, X and A lie on a straight line.

W-14/22/Q19

Q18 The diagram shows two points,
 P and Q, on a straight line AB.
 P is the mid point of AB and Q
 is the mid point of PB.



- O is the origin, $\vec{OA} = a$ and $\vec{OB} = b$
- write down in terms of a and b, in its simplest form:
- (a) \vec{AP} --- [2]
- (b) the position vector of Q. --- [2]

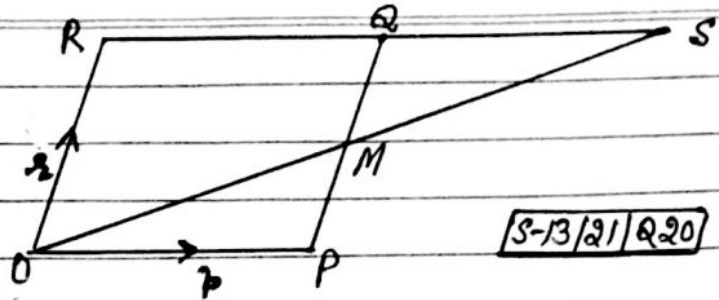
W-14/23/Q14

Q19

OPQR is a parallelogram, with O the origin.

M is the mid point of PR.

OM and RQ are extended to meet at S. $\vec{OP} = p$ and $\vec{OR} = r$.



S-13/21/Q20

(a) Find, in terms of p and r , in its simplest form,

(i) \vec{OM} --- [1]

(ii) the position vector of S. --- [1]

(b) When $\vec{PT} = -\frac{1}{2}p + r$, what can you write down about the position of T. --- [1]

Q20

OABCDE is a regular polygon.

(a) Write down the geometrical name for this polygon. --- [1]

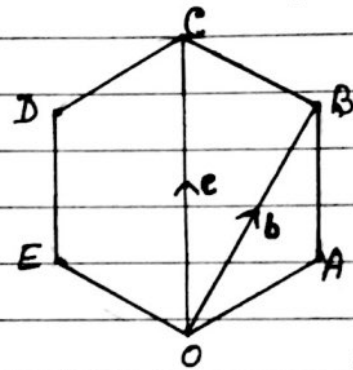
(b) O is the origin, $\vec{OB} = b$ and $\vec{OC} = c$

Find, in terms of b and c , in their simplest form,

(i) \vec{BC} --- [1]

(ii) \vec{OA} --- [2]

(iii) the position vector of E --- [1]



S-13/23/Q19

Q21

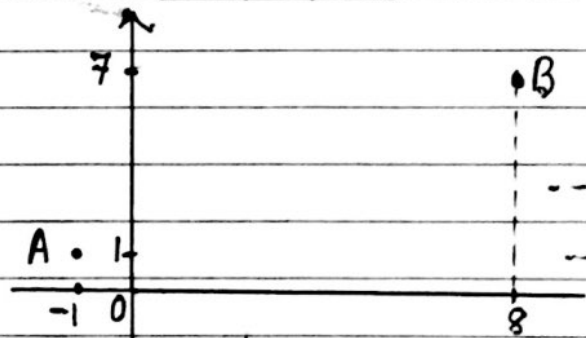
A is the point (-1, 1) and B is the point (8, 7).

(a) Write \vec{AB} as a column vector. --- [1]

(b) Find $|\vec{AB}|$ --- [2]

(c) $\vec{AC} = 2\vec{AB}$

Write down the co-ordinates of C. --- [1]



W-13/21/Q16

Q22

O is the origin.

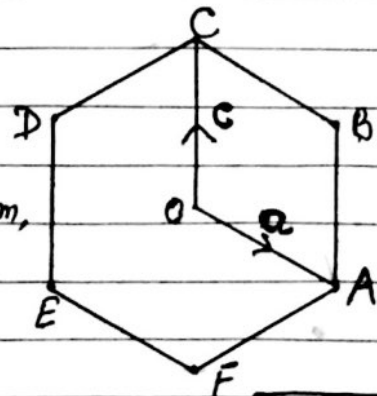
ABCDEF is a regular hexagon and O is the mid point of AD. $\vec{OA} = a$ and $\vec{OC} = c$

Find, in terms of a and c , in their simplest form,

(a) \vec{BE} --- [2]

(b) \vec{DB} --- [2]

(c) the position vector of E. --- [2]



W-13/22/Q19

Answers

Q1 (a) Point at (3, 5)

(b) $\begin{pmatrix} 1 \\ -3 \end{pmatrix}$

(c) $\begin{pmatrix} 0 \\ 4 \end{pmatrix}$ or $\begin{pmatrix} 0 \\ -4 \end{pmatrix}$

Q2 (a) $2a + b$

(b)

(c) \vec{CF} and \vec{BG}

Q3 (a) (i) $\begin{pmatrix} 30 \\ -24 \end{pmatrix}$

(ii) $\begin{pmatrix} -6 \\ 4 \end{pmatrix}$

(b) -4

Q4 $\frac{2}{7}b + \frac{5}{7}a$

Q5 (a) (9, -4)

(b) -5

Q6 $\frac{1}{3}a + \frac{2}{3}b$

Q7 (a) $a + b - c$

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

(c) $\frac{1}{2}c - \frac{1}{2}a - \frac{1}{6}b$

Q8 $\frac{1}{4}a - \frac{1}{4}b - \frac{1}{4}c$

Q9 (a) 5 (b) 24

Q10 (a) $\begin{pmatrix} -7 \\ 3 \end{pmatrix}$ (b) 7.81

Q11 (a) $b - a$ (b) $\frac{5}{8}x + \frac{3}{8}y$

Q12 (a) $a + 2b - a$ or $a - (a - 2b)$

(b) Parallelogram since PM is parallel and equal to QR.

Q13 (a) (i) $-b + a$ (ii) $b + \frac{1}{2}a$

(b) Show $\vec{OX} = \frac{2}{3}\vec{OM}$

Q14 5.83

Q15 (a) $\frac{1}{3}(-a + b)$

(b) $\frac{2}{3}a + \frac{1}{3}b$

Q16 (a) $b + \lambda$ (b) $\frac{3}{2}b + \frac{1}{2}\lambda$

Q17 (a) (i) $c - a$

(ii) $-\frac{1}{3}a + \frac{1}{3}c$

(b) Show $\vec{AC} = k\vec{AX}$ and have a common point A.

Q18 (a) $\frac{1}{2}b - \frac{1}{2}a$ (b) $\frac{1}{4}a + \frac{3}{4}b$

Q19 (a) (i) $b + \frac{1}{2}\lambda$ (ii) $2b + \lambda$

(b) Mid point of RQ.

Q20 (a) hexagon

(b) (i) $-b + c$ (ii) $b - \frac{1}{2}c$

(iii) $-b + c$

Q21 (a) $\begin{pmatrix} 9 \\ 6 \end{pmatrix}$ (b) 10.8

(c) (17, 13)

Q22 (a) $-2a - 2c$ (b) $2a + c$

(c) $-a - c$

← X — X →