

868



TUTORS

Preparation for

High School Mathematics Vectors

Math



Instructions and Tips:

- ✓ **You have 90 minutes to complete this worksheet**
- ✓ **This worksheet consists of 12 questions**
- ✓ **Write answers in the spaces provided**
- ✓ **Show all Vector Algebra**
- ✓ **Give your answers in the simplest form**



Student Name: _____

Student ID: _____

Date: __ / __ / ____

Total Score:

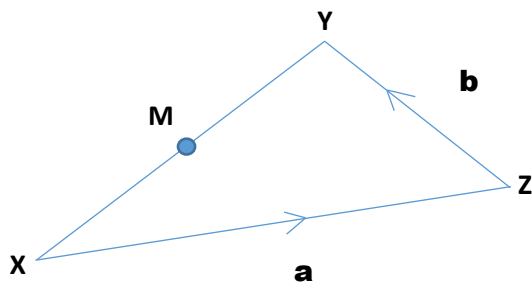
Highest Score:

Tutor's Comments:

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Question 1

Consider the triangle XYZ.



(Diagram not drawn to scale)

M is the midpoint of XY.

$$\vec{XZ} = \mathbf{a}$$

$$\vec{ZY} = \mathbf{b}$$

(a) Express \vec{YX} in terms of \mathbf{a} and \mathbf{b} .



(2 marks)

(b) Express \vec{YM} in terms of \mathbf{a} and \mathbf{b} .

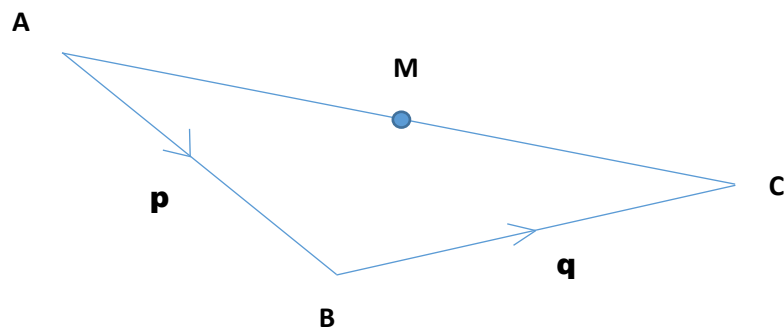
(1 mark)

(c) Express \vec{ZM} in terms of \mathbf{a} and \mathbf{b} .

(2 marks)

Question 2

Consider the triangle ABC.



(Diagram not drawn to scale)

M is the midpoint of AC.

$$\overrightarrow{AB} = \mathbf{p}$$

$$\overrightarrow{BC} = \mathbf{q}$$

(a) Express \overrightarrow{AC} in terms of p and q.



(2 marks)

(b) Express \overrightarrow{AM} in terms of p and q.

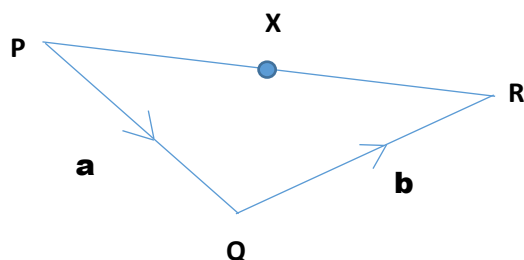
(1 mark)

(c) Express \overrightarrow{BM} in terms of p and q.

(2 marks)

Question 3

Consider the triangle PQR.



(Diagram not drawn to scale)

X is the midpoint of PR.

$$\overrightarrow{PQ} = \mathbf{a}$$

$$\overrightarrow{QR} = \mathbf{b}$$

(a) Express \overrightarrow{PR} in terms of \mathbf{a} and \mathbf{b} .



(2 marks)

(b) Express \overrightarrow{PX} in terms of \mathbf{a} and \mathbf{b} .

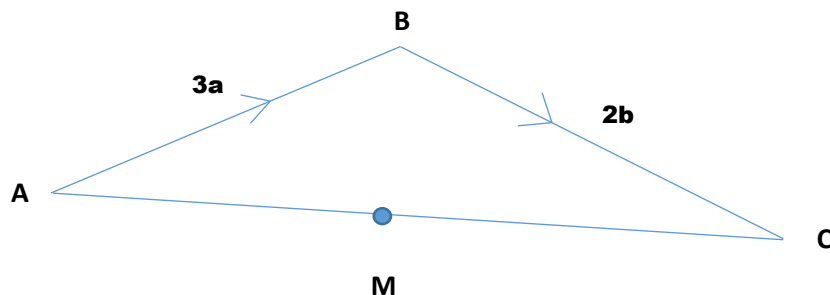
(1 mark)

(c) Express \overrightarrow{QX} in terms of \mathbf{a} and \mathbf{b} .

(2 marks)

Question 4

Consider the triangle ABC.



(Diagram not drawn to scale)

M is the midpoint of AC.

$$\overrightarrow{AB} = 3\mathbf{a}$$

$$\overrightarrow{BC} = 2\mathbf{b}$$

(a) Express \overrightarrow{AC} in terms of \mathbf{a} and \mathbf{b} .



(2 marks)

(b) Express \overrightarrow{AM} in terms of \mathbf{a} and \mathbf{b} .

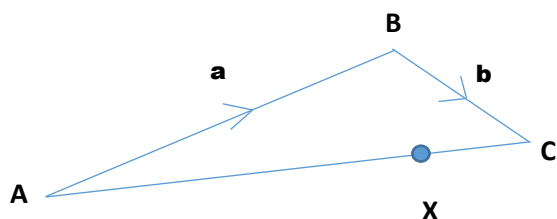
(1 mark)

(c) Express \overrightarrow{BM} in terms of \mathbf{a} and \mathbf{b} .

(2 marks)

Question 5

Consider the triangle ABC.



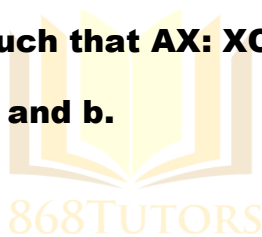
(Diagram not drawn to scale)

$$\overrightarrow{AB} = \mathbf{a}$$

$$\overrightarrow{BC} = \mathbf{b}$$

X is a point on the line AC such that AX: XC = 2:1

(a) Express \overrightarrow{AC} in terms of a and b.



(2 marks)

(b) Express \overrightarrow{AX} in terms of a and b.

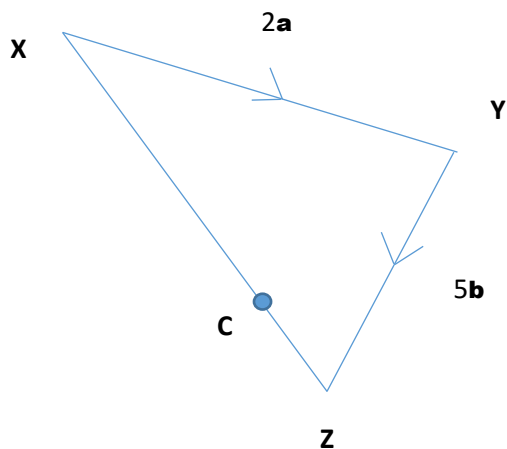
(1 mark)

(c) Express \overrightarrow{BX} in terms of a and b.

(2 marks)

Question 6

Consider the triangle XYZ.



(Diagram not drawn to scale)

$$\overrightarrow{XY} = 2\mathbf{a} \quad \overrightarrow{YZ} = 5\mathbf{b}$$

C is a point on the line XZ such that XC: CZ = 3:1.

(a) Express \overrightarrow{XZ} in terms of a and b.

(2 marks)

(b) Express \overrightarrow{XC} in terms of a and b.

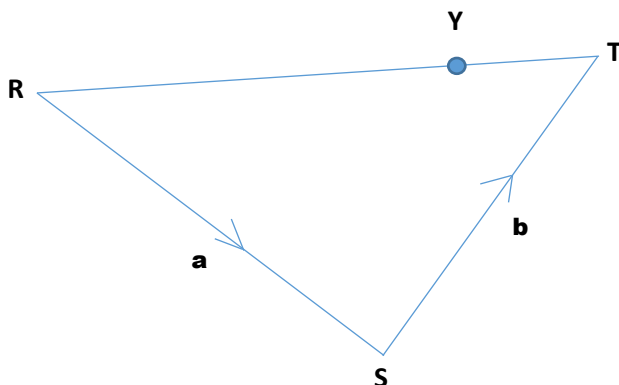
(2 marks)

(c) Show that \overrightarrow{XC} is parallel to the vector $2\mathbf{a} + 5\mathbf{b}$.

(2 marks)

Question 7

Consider the triangle RST



(Diagram not drawn to scale)

$$\overrightarrow{RS} = \mathbf{a}$$

$$\overrightarrow{ST} = \mathbf{b}$$

Y is a point on the line RT such that $RY:YT = 5:1$.

(a) Express \overrightarrow{RT} in terms of \mathbf{a} and \mathbf{b} .

(2 marks)

(b) Express \overrightarrow{RY} in terms of \mathbf{a} and \mathbf{b} .

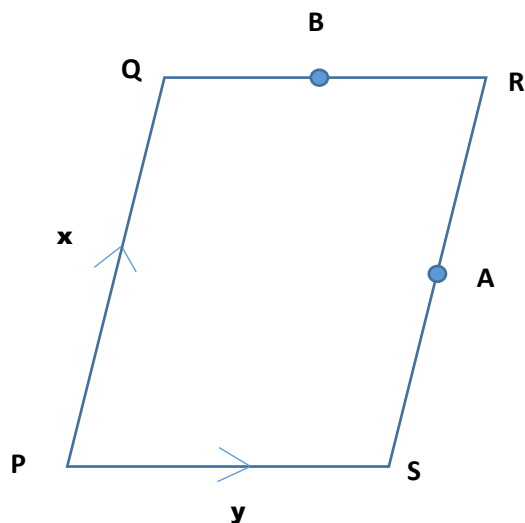
(2 marks)

(c) Express \overrightarrow{SY} in terms of \mathbf{a} and \mathbf{b} .

(2 marks)

Question 8

Consider the parallelogram PQRS.



(Diagram not drawn to scale)

$$\overrightarrow{PQ} = \mathbf{x} \quad \overrightarrow{PS} = \mathbf{y}$$

A is the midpoint of the line SR. B is the midpoint of the line QR.

(a) Express \overrightarrow{SA} in terms of \mathbf{x} .

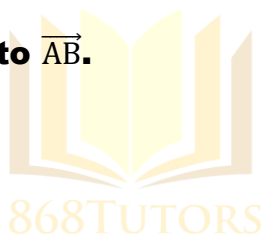
(b) Express \overrightarrow{QB} in terms of \mathbf{y} .

(c) Express \overrightarrow{SQ} in terms of \mathbf{x} and \mathbf{y} .

(4 marks)

(d) Express \overrightarrow{AB} in terms of x and y .

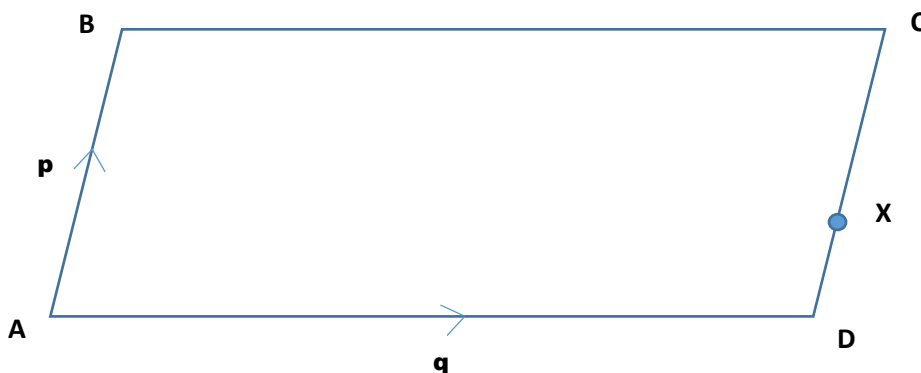
(e) Show that \overrightarrow{SQ} is parallel to \overrightarrow{AB} .



(4 marks)

Question 9

Consider the parallelogram ABCD.



(Diagram not drawn to scale)

$$\overrightarrow{AB} = \mathbf{p}$$

$$\overrightarrow{AD} = \mathbf{q}$$

X is a point on DC such that $DX:XC = 1:5$.

(a) Express \overrightarrow{DX} in terms of \mathbf{p} .

(1 mark)

(b) Express \overrightarrow{XC} in terms of \mathbf{p} .

(2 marks)

(c) Express \overrightarrow{CB} in terms of q .

(1 mark)

(d) Express \overrightarrow{XB} in terms of p and q .



(2 marks)

Question 10

The points X, Y and Z have coordinates as follows: X (1, 4) Y (-6,-5) and Z (1,-7).

Express each of the following in the form: $\begin{pmatrix} x \\ y \end{pmatrix}$

(3 marks)

Determine the value of the following:

$$|\overrightarrow{OX}| =$$

$$|\overrightarrow{OY}| =$$

$$|\overrightarrow{OZ}| =$$

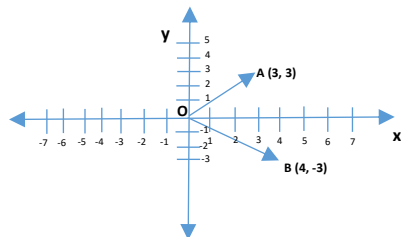
(3 marks)

(a) Draw a diagram to illustrate the vectors \overrightarrow{OX} \overrightarrow{OY} and \overrightarrow{OZ} .

(4 marks)

Question 11

Consider the diagram below:



The coordinates of A and B are given as A (3, 3) and B (4,-3).

Express each of the following in the form $\begin{pmatrix} x \\ y \end{pmatrix}$

(a) $\overrightarrow{OA} =$

(b) $\overrightarrow{OB} =$

(c) $\overrightarrow{AB} =$



(3 marks)

(d) Given that $\overrightarrow{OA} = \overrightarrow{CB}$, determine the coordinates of the point C.

(4 marks)

Question 12

The points A, B and C have coordinates as follows: A (5, 2) B (-1, 5) and C (-4,-3).

Express each of the following in the form : $\begin{pmatrix} x \\ y \end{pmatrix}$

(a) $\overrightarrow{OA} =$

(b) $\overrightarrow{OB} =$

(c) $\overrightarrow{OC} =$

(d) $\overrightarrow{AB} =$

(e) $\overrightarrow{AC} =$

(f) $\overrightarrow{BC} =$



(5 marks)

(g) Draw a diagram to illustrate the vectors \overrightarrow{OA} , \overrightarrow{OB} and \overrightarrow{OC} .

(4 marks)

(h) Determine the values of the following:

$$|\overrightarrow{OA}| =$$

$$|\overrightarrow{OB}| =$$

$$|\overrightarrow{OC}| =$$



(3 marks)



END OF WORKSHEET

