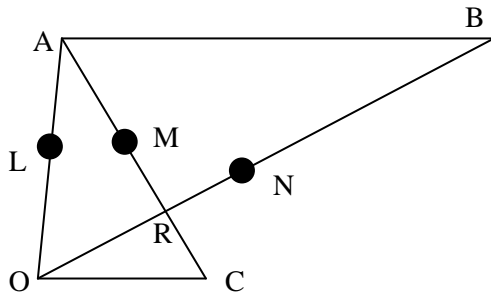


TRIGONOMETRY AND VECTORS S. 4

1. Vectors $OA = \begin{pmatrix} 3 \\ 5 \end{pmatrix}$ and $OB = \begin{pmatrix} 5 \\ -2 \end{pmatrix}$, find the magnitude of vector AB (4 marks)
2. Given that $\sin A = 3/5$, $\cos B$ and $B = 65^\circ$ calculate the possible values of angle A between 0 and 360°
- 3.



In the figure above $OB = 2b$, $OA = 2c$, $3OR = 2NO$ and $3CR = 2CM$. Given that L, M and N are the midpoints of OA, CA and OB respectively find in terms of c and b:

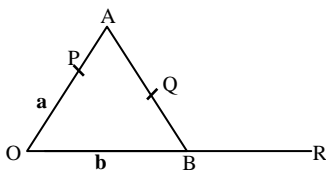
- (i) OA
 - (ii) LM
 - (iii) LN
- (b) Show that OCNL is a parallelogram.

4. Given that $\mathbf{a} = \begin{pmatrix} 3 \\ 1 \end{pmatrix}$, $\mathbf{b} = \begin{pmatrix} -2 \\ 3 \end{pmatrix}$ and $\mathbf{c} = \begin{pmatrix} 1 \\ 4 \end{pmatrix}$. Find scalars p and q such that $p\mathbf{a} + q\mathbf{b} = \mathbf{c}$

5. Given that $AB = \begin{pmatrix} 3 \\ 3 \end{pmatrix}$, $BC = \begin{pmatrix} -4 \\ 3 \end{pmatrix}$, find:

- (i) AC
- (ii) The magnitude of AC

6.



In the figure above $OA = a$, $OB = b$,
 $2OA = 3OP$, $5AB = 9AQ$ and
 $3BR = 2OB$

- a) find in terms of a and b
 - i) PA
 - ii) AQ
 - iii) QB
 - iv) BR
- (b) Show that P, Q, R are in a straight line

7. . Given that $\mathbf{a} = \begin{pmatrix} 3 \\ -2 \end{pmatrix}$, $\mathbf{b} = \begin{pmatrix} -5 \\ 4 \end{pmatrix}$, and $\mathbf{c} = \begin{pmatrix} -1 \\ -5 \end{pmatrix}$. Find the length of $\mathbf{a} + \mathbf{b} + \mathbf{c}$.

8. . Given that $\cos \theta = \frac{-5}{13}$ and that θ lies between 0° and 180° . Find without using table the values of

- (i) $\sin \theta$,
- (ii) $\tan \theta$.

9. The position vectors of the vertices of a triangle ABC are $OA = \begin{pmatrix} 2 \\ 0 \end{pmatrix}$, $OB = \begin{pmatrix} 5 \\ 0 \end{pmatrix}$ and $OC = \begin{pmatrix} 2 \\ 4 \end{pmatrix}$. Find the area of the triangle.

10. . Given tat $\tan \theta = \frac{5}{2}$, calculate without using tables or calculator, the value of $\cos \theta - \sin \theta$

11. A spider made the following four moves $OA = \begin{pmatrix} 2 \\ 3 \end{pmatrix}$, $AB = \begin{pmatrix} -3 \\ 1 \end{pmatrix}$, $BC = \begin{pmatrix} 4 \\ 0 \end{pmatrix}$ and $CD = \begin{pmatrix} 2 \\ -8 \end{pmatrix}$. What single vector is equivalent to these four movements?

12. Three points P, Q and R in a plane have position vectors $p = \begin{pmatrix} 4 \\ 6 \end{pmatrix}$, $q = \begin{pmatrix} 1 \\ 2 \end{pmatrix}$ and $r = \begin{pmatrix} 12 \\ 0 \end{pmatrix}$ respectively.

- (a) Find:
 - (i) The length of PQ, QR and PR
 - (ii) The size of the angle QPR
 - (iii) The area of triangle PQR

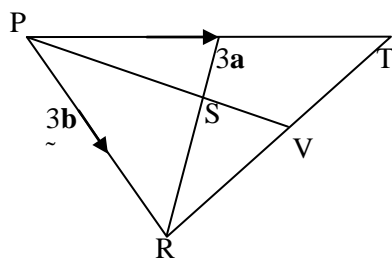
13. It is given that $OP = \begin{pmatrix} 5 \\ 3 \end{pmatrix}$ and $OQ = \begin{pmatrix} -2 \\ 5 \end{pmatrix}$. Find the magnitude of QP.

14. . Given that $\cos \theta = 0.599$ and $0^\circ < \theta < 90^\circ$, find in degrees, the value of θ .

15.. If the position vector of point A is $\begin{pmatrix} -3 \\ 2 \end{pmatrix}$ and $BA = \begin{pmatrix} 5 \\ 2 \end{pmatrix}$, find the position vector of B

16. Given that $\tan x = \frac{-3}{4}$ and $0^\circ \leq x \leq 360^\circ$. Without using tables or calculator, find the possible values of $\cos x + \sin x$

17.

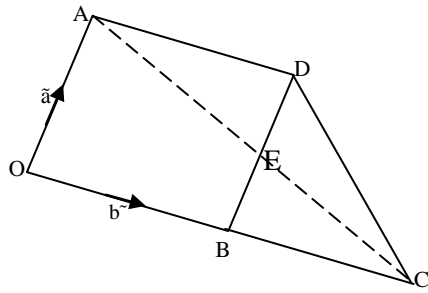


In diagram above $PQ = 4PT$; $2PS = PV$, $3RS = 2RT$, $PT = 3a$ and $PR = 3b$

- (a) Express in terms of a and b.
 - (i) RS,
 - (ii) PV,
 - (iii) RQ,
- (b) Find the ratio of RV to RQ.

18. Draw the graph of the curve $y = \cos 3x$ for $0^\circ \leq x \leq 150^\circ$. Using your graph determine the values of x ($0^\circ \leq x \leq 150^\circ$) for which $4\cos 3x + 3 = 0$

19.



In the diagram above AD is parallel to OC and OA parallel to BD. $3OC = 5OB$. E is the point where \overline{AC} meets \overline{BD} . $AE:EC = 3:2$.

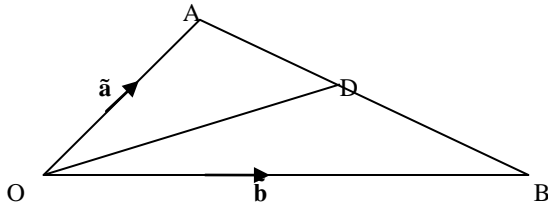
Find i) in terms of the vectors a and b the vectors AC, DC, ED, AE and OE.

ii) the ratio BE: ED

20. . If vector $a = \begin{pmatrix} 3 \\ -2 \end{pmatrix}$, $b = \begin{pmatrix} 1.5 \\ 3 \end{pmatrix}$,

find the length of $\frac{1}{2}a + 3b$.

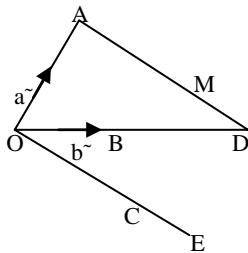
21.



In the figure above $OA = a$; $OB = b$, $3AD = AB$

Find OD in terms of a and b.

22.



In the figure above $\underline{OA} = a$ and $\underline{OB} = b$,

$3OB = 2BD$, M is a point on AD such that $MD:AM = 1:2$ $OC = 3CE = 3AM$.

(i) Express the vector AD, BM, DC terms of vector a and b

(ii) Show that $AD:OE = 3:8$

23. a) The length of the side of an equilateral triangle ABC is x units.

i) Show with the help of the triangle that

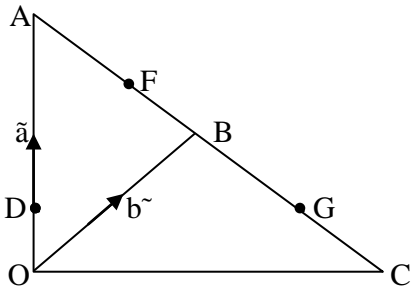
$$\sin 60^\circ = \frac{\sqrt{3}}{2}$$

ii) Without using tables or calculator, find the value of $\left(\frac{\sin 60^\circ}{\sin 30^\circ} + \tan 60^\circ \right)^2$

b) Draw the graph of

$$y = \cos 3x \text{ for } 0 \leq x \leq 150^\circ$$

24.



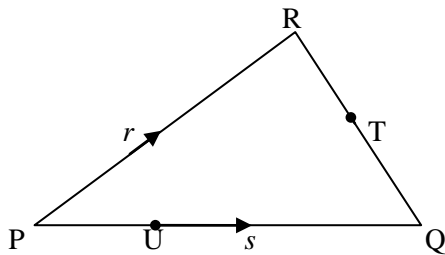
In the figure above $OA = b$; F and G are points on \overline{AC} such that $AF: AB = 3:4$ and $AG: AC = 2:3$, respectively, D is a point on OA such that $OD: DA = FB: BG = 1:2$

- i) Express AG and AC in terms of AB hence find in terms of vectors a and b the vector AB, AC, DG of
- ii) Determine the ratio DG: OC

25. Given that $\tan \theta = \frac{-12}{5}$ and lies between 0° and 180° . Find without using tables or calculator the values of $\sin \theta$ and $\cos \theta$

26. . Given that $\sin \theta = 0.500$, find the two possible values of θ . What would be the two values of θ if $\sin \theta = -0.500$.

27. $2\overline{QT} = \overline{TR}$ and $\overline{PU}:\overline{UQ}=2:3$



a) Find in terms of vector r and s vectors

(i) QR (ii) QT (iii) PT

(b) Show that UT is parallel to PR

28. Given that $OA = \begin{pmatrix} 3 \\ 3 \end{pmatrix}$, $OB = \begin{pmatrix} 2 \\ 0 \end{pmatrix}$ where \overline{OA} and \overline{OB} are position vectors of A and B respectively, find the area of triangle OAB.

29. Given that $\tan \theta = \frac{5}{12}$, without using tables or calculator, find the value of $\cos \theta - \sin \theta$.

30. Without using tables or calculator, find the value of:

(i) $\cos 780^\circ$

(ii) $\sin 390^\circ$

END