Name: _____

WORKSHEET

Unit vectors

1 Which of the following are unit vectors? (circle)

$(0, 1)$ $\begin{pmatrix} 1 \\ 1 \end{pmatrix}$ $(1.1, 45°)$ $\left(\frac{8}{17}, \frac{-15}{17}\right)$ $(1\ ,1)$ $(1,1°)$ $\begin{pmatrix} 1 \\ 0 \end{pmatrix}$ $\left(\frac{1}{\sqrt{2}}, \frac{1}{\sqrt{2}}\right)$ $(1, 0°)$ $\left(\frac{-12}{13}, \frac{5}{13}\right)$

2 Find the unit vector with the same direction as the following:

a $\mathbf{a} = (3, 4)$

b $\mathbf{p} = (-5, 12)$

c $\mathbf{t} = (-2, 7)$

d $\mathbf{q} = (-5, -1)$

e $\mathbf{d} = (4, -6)$

f $\mathbf{j} = (0, 9)$

g $\mathbf{I} = (0.2, 0)$

h $\mathbf{w} = \begin{pmatrix} 0.05 \\ 0.4 \end{pmatrix}$

i $\mathbf{u} = \begin{pmatrix} -2.4 \\ 0.65 \end{pmatrix}$

j $\mathbf{v} = \begin{pmatrix} \mathbf{c} \\ 3\mathbf{c} \end{pmatrix}$

3 Find the polar form of the unit vector in the opposite direction to the following:

a $(5, 20°)$

b $(8, 95°)$

c $(0.6, 158°)$

d $(2, 273°)$

e $(14, 300°)$

f $(4.8, 359°)$

g $(11, 11°)$

h $(6, 207°)$

i $(4, 180°)$

j $(2, 238°)$

4 Find the unit vectors that are parallel to the following:

a $(-4, 3)$

b $(15, -8)$

c $(-5, -12)$

d $(2, 7)$

e $(-3, 5)$

f $(9, -1)$

g $(-4, -2)$

h $(5.5, 7)$

5 Find the unit vectors that are perpendicular to the vectors in question **4**.

a

b

c

d

e

f

g

h

Answers

1 $(0, 1)$ $\left(\frac{8}{17}, \frac{-15}{17}\right)$ $(1, 1°)$ $\begin{pmatrix} 1 \\ 0 \end{pmatrix}$ $\left(\frac{1}{\sqrt{2}}, \frac{1}{\sqrt{2}}\right)$ $(1, 0°)$ $\left(\frac{-12}{13}, \frac{5}{13}\right)$

2 **a** $\left(\frac{3}{5}, \frac{4}{5}\right)$

b $\left(\frac{-5}{13}, \frac{12}{13}\right)$

c $\left(\frac{-2}{\sqrt{53}}, \frac{7}{\sqrt{53}}\right)$

d $\left(\frac{-5}{\sqrt{26}}, \frac{-1}{\sqrt{26}}\right)$

e $\left(\frac{4}{\sqrt{52}}, \frac{-6}{\sqrt{52}}\right)$

f $(0, 1)$

g $(1, 0)$

h $\left(\frac{0.05}{\sqrt{0.1625}}, \frac{0.4}{\sqrt{0.1625}}\right)$

i $\left(\frac{-2.4}{\sqrt{6.1825}}, \frac{0.65}{\sqrt{6.1825}}\right)$

j $\left(\frac{1}{\sqrt{10}}, \frac{3}{\sqrt{10}}\right)$

3 **a** $(1, 200°)$

b $(1, 275°)$

c $(1, 338°)$

d $(1, 93°)$

e $(1, 120°)$

f $(1, 179°)$

g $(1, 191°)$

h $(1, 27°)$

i $(1, 0°)$

j $(1, 58°)$

4 **a** $\left(\frac{-4}{5}, \frac{3}{5}\right)$ $\left(\frac{4}{5}, \frac{-3}{5}\right)$

b $\left(\frac{15}{17}, \frac{-8}{17}\right)$ $\left(\frac{-15}{17}, \frac{8}{17}\right)$

c $\left(\frac{-5}{13}, \frac{-12}{13}\right)$ $\left(\frac{5}{13}, \frac{12}{13}\right)$

d $\left(\frac{2}{\sqrt{53}}, \frac{7}{\sqrt{53}}\right)$ $\left(\frac{-2}{\sqrt{53}}, \frac{-7}{\sqrt{53}}\right)$

e $\left(\frac{-3}{\sqrt{34}}, \frac{5}{\sqrt{34}}\right)$ $\left(\frac{3}{\sqrt{34}}, \frac{-5}{\sqrt{34}}\right)$

f $\left(\frac{9}{\sqrt{82}}, \frac{-1}{\sqrt{82}}\right)$ $\left(\frac{-9}{\sqrt{82}}, \frac{1}{\sqrt{82}}\right)$

g $\left(\frac{-4}{\sqrt{20}}, \frac{-2}{\sqrt{20}}\right)$ $\left(\frac{4}{\sqrt{20}}, \frac{2}{\sqrt{20}}\right)$

h $\left(\frac{5.5}{\sqrt{79.25}}, \frac{7}{\sqrt{79.25}}\right)$ $\left(\frac{-5.5}{\sqrt{79.25}}, \frac{-7}{\sqrt{79.25}}\right)$

5 **a** $\left(\frac{3}{5}, \frac{4}{5}\right)$ $\left(\frac{-3}{5}, \frac{-4}{5}\right)$

b $\left(\frac{8}{17}, \frac{15}{17}\right)$ $\left(\frac{-8}{17}, \frac{-15}{17}\right)$

c $\left(\frac{-12}{13}, \frac{5}{13}\right)$ $\left(\frac{12}{13}, \frac{-5}{13}\right)$

d $\left(\frac{-7}{\sqrt{53}}, \frac{2}{\sqrt{53}}\right)$ $\left(\frac{7}{\sqrt{53}}, \frac{-2}{\sqrt{53}}\right)$

e $\left(\frac{5}{\sqrt{34}}, \frac{3}{\sqrt{34}}\right)$ $\left(\frac{-5}{\sqrt{34}}, \frac{-3}{\sqrt{34}}\right)$

f $\left(\frac{1}{\sqrt{82}}, \frac{9}{\sqrt{82}}\right)$ $\left(\frac{-1}{\sqrt{82}}, \frac{-9}{\sqrt{82}}\right)$

g $\left(\frac{-2}{\sqrt{20}}, \frac{4}{\sqrt{20}}\right)$ $\left(\frac{2}{\sqrt{20}}, \frac{-4}{\sqrt{20}}\right)$

h $\left(\frac{-7}{\sqrt{79.25}}, \frac{5.5}{\sqrt{79.25}}\right)$ $\left(\frac{7}{\sqrt{79.25}}, \frac{-5.5}{\sqrt{79.25}}\right)$