

2.3 Answers

A-Level Pure Mathematics Vectors II : Year 1 and Year 2

2.3.1 Solutions (2.2 Exercise)

Answer 1

$$\vec{AB} = \begin{pmatrix} 6 \\ 2 \end{pmatrix}$$

Answer 2

$$\vec{CD} = \begin{pmatrix} 5 \\ -1 \end{pmatrix}$$

Answer 3

$$\vec{PQ} = \begin{pmatrix} -6 \\ -1 \end{pmatrix}$$

Answer 4

$$\vec{AB} = \begin{pmatrix} 6 \\ 5 \end{pmatrix}$$

Answer 5

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

Answer 6

$$\vec{BA} = \begin{pmatrix} 2 \\ -2 \end{pmatrix}$$

Answer 7

$$\vec{QP} = \begin{pmatrix} -2 \\ -2 \end{pmatrix}$$

Answer 8

$$\vec{BA} = \begin{pmatrix} -4 \\ -5 \end{pmatrix}$$

Answer 9

$$\vec{PQ} = \begin{pmatrix} -9 \\ -2 \end{pmatrix}$$

P to Q

Answer 10

$$\vec{MN} = \begin{pmatrix} 4 \\ 12 \end{pmatrix}$$

N relative to M

Answer 11

$$\vec{DC} = \begin{pmatrix} -15 \\ 15 \end{pmatrix}$$

Answer 12.

$$\vec{AB} = \begin{pmatrix} -1 \\ -1.1 \end{pmatrix}$$

Distance is 1.49 km

Answer 13

- (i) Dragon : $\sqrt{65} = 8.06 \text{ kmh}^{-1}$
Runner : $\sqrt{50} = 7.07 \text{ kmh}^{-1}$

$\therefore$ Dragon is faster by about 1 km/h

(ii)

$$\vec{RD} = \begin{pmatrix} -1 \\ 2 \end{pmatrix}$$

- (iii) Speed of separation is $\sqrt{5}$

$$\text{Time} = \frac{\text{Distance}}{\text{Speed}} = \sqrt{5} \text{ hours, which is 2 hours 14 minutes}$$

Answer 14

$$u = 7, \quad v = -4$$

Answer 15

(i) Speed = 13 ms^{-1}

(ii) $\vec{AB} = \begin{pmatrix} -8 \\ 15 \end{pmatrix}$

(iii) 118°

Answer 16

$$\mathbf{r} = 15 \mathbf{i} + 21 \mathbf{j}$$

Answer 17

(i)

$$d = \sqrt{(2t - 9)^2 + (t - 2)^2}$$

$$d = \sqrt{4t^2 - 36t + 81 + t^2 - 4t + 4}$$

$$d = \sqrt{5t^2 - 40t + 85}$$

(ii)

$$d^2 = 5t^2 - 40t + 85$$

$$\frac{1}{5}d^2 = t^2 - 8t + 17$$

$$\frac{1}{5}d^2 = (t^2 - 8t + 16) + 1$$

$$\frac{1}{5}d^2 = (t - 4)^2 + 1$$

(iii) $t = 4$ seconds

(iv) $\sqrt{5}$ or 2.24