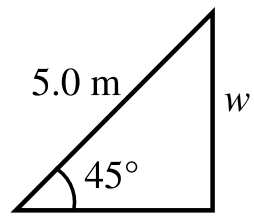
Components of a Vector 1

GCSE P P P A Level P P P

Essential Pre-Uni Physics B1.1



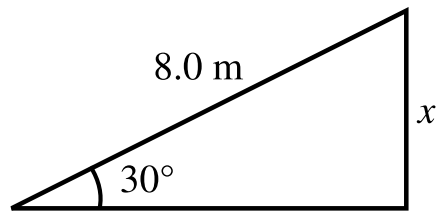
What is the length marked w to 2 significant figures?

Components of a Vector 2

GCSE P P P

A Level P P P

Essential Pre-Uni Physics B1.2



What is the length marked x to 2 significant figures?

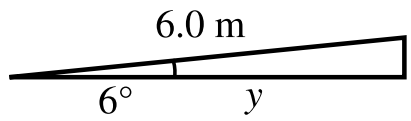
Gameboard:

STEM SMART Physics Week 5 - Vectors

Components of a Vector 3

GCSE P P P A Level P P P

Essential Pre-Uni Physics B1.3



What is the length marked y to 2 significant figures?

Gameboard:

STEM SMART Physics Week 5 - Vectors

Components of a Vector 5

GCSE P P P A Level P P P

Essential Pre-Uni Physics B1.5

Where bearings are given, they are in degrees East of North (so North is $000°$, East is $090°$, South is $180°$ and West is $270°$). For the purposes of this exercise, assume that the Earth is flat.

Eric the Explorer walks $35\,\mathrm{km}$ on a bearing of $075\,°$. How far East is he compared to his original position? Give your answer to 2 significant figures.

Gameboard:

STEM SMART Physics Week 5 - Vectors

Components of a Vector 6

GCSE C C C

A Level C C C

Essential Pre-Uni Physics B1.6

A trolley has a weight of $11\,\mathrm{N}$ and sits on a ramp inclined at 33° to the horizontal. How big is the component of the weight which is trying to pull the trolley along the ramp? Give your answer to 2 significant figures.

Gameboard:

STEM SMART Physics Week 5 - Vectors

Components of a Vector 8

GCSE C C C

A Level P P P

Essential Pre-Uni Physics B1.8

When you walk up Amersham Hill, you walk at an angle of about 6.0° to the horizontal. How far do you travel vertically when you walk $500\,\mathrm{m}$ along the road? Give your answer to 2 significant figures.

Gameboard:

STEM SMART Physics Week 5 - Vectors

Adding Vectors 2

GCSE C C C A Level P P P

Essential Pre-Uni Physics B2.2

Where bearings are given, they are in degrees East of North (so North is $000°$, East is $090°$, South is $180°$ and West $270°$). For the purposes of this exercise, assume the Earth is flat.

Part A Rowing speed

Work out how fast I am going (relative to a ground-based observer) if I row at $9.0\,\mathrm{m\,s^{-1}}$ South (relative to the water) in a river where the water is flowing $1.0\,\mathrm{m\,s^{-1}}$ South.

Part B Swimming speed

Work out how fast I am going (relative to a ground-based observer) if I swim at $1.0\,\mathrm{m\,s^{-1}}$ North (relative to the water) in a river where the water is flowing $0.30\,\mathrm{m\,s^{-1}}$ East.

Part C Swimming direction

In what direction would a ground-based observer think I was swimming in part (b)? Give your answer as a number of degrees East of North (a bearing). Give your answer to 2 significant figures.

Part D Flying speed

Work out how fast I am going (relative to a ground-based observer) if I fly at $100\,\mathrm{km\,h^{-1}}$ North-West (relative to the air) when the wind is blowing from the North-East at a speed of $20\,\mathrm{km\,h^{-1}}$. Give your answers to 2 significant figures.

Gameboard:
STEM SMART Physics Week 5 - Vectors

Adding Vectors 3

GCSE C C C

A Level C C C

Essential Pre-Uni Physics B2.3

Where bearings are given, they are in degrees East of North (so North is $000°$, East is $090°$, South is $180°$ and West $270°$). For the purposes of this exercise, assume the Earth is flat.

Part A Swimming in a river

In which direction would I have to travel in order to travel North (relative to a stationary observer) if I am swimming in a river with a current running $0.40\,\mathrm{m\,s^{-1}}$ to the East, and I can swim at $1.5\,\mathrm{m\,s^{-1}}$ relative to the water? Give your answer as a bearing (degrees clockwise from North) to 3 significant figures.

Part B Flying in the wind

In which direction would I have to travel in order to travel North (relative to a stationary observer) if I am flying in a $15\,\mathrm{km\,h^{-1}}$ wind coming from the West and can fly at $90\,\mathrm{km\,h^{-1}}$ relative to the air? Give your answer as a bearing (degrees clockwise from North) to 3 significant figures.

Part C Speed Northwards

How fast do I move Northwards over the ground in part B?

Gameboard:

STEM SMART Physics Week 5 - Vectors

Components of a Vector 10

GCSE C C C

A Level C C C

Essential Pre-Uni Physics B1.10

Where bearings are given, they are in degrees East of North (so North is $000°$, East is $090°$, South is $180°$ and West is $270°$). For the purposes of this exercise, assume that the Earth is flat.

A fly in a room is flying on a bearing of $204°$ at a speed of $0.36\,\mathrm{m\,s^{-1}}$. Sunlight streams horizontally westward across a room, forming a shadow of the fly on the west wall. How fast does the shadow move? Give your answer to 2 significant figures.

Gameboard:

STEM SMART Physics Week 5 - Vectors

Swimming to a Boat

A Level

C C C

A boat is travelling on a bearing of $\alpha = 60\,^\circ$ at a constant speed $u = 3.0\,\mathrm{m\,s^{-1}}$. A man is swimming at a constant speed v in order to reach the boat from a point a distance $l = 100\,\mathrm{m}$ due east of the boat.

Part A Direction of swimmer

Find, as a bearing, the direction in which the swimmer should head in order to reach the boat with the minimum speed.

Part B Speed of swimmer

What then is the minimum value of v which will enable the swimmer to reach the boat.

Part C Time taken

What is the time taken for the swimmer to reach the boat with this speed?

Adapted with permission from UCLES, A Level Further Maths, Syllabus C, June 1986, Paper II, Question 4