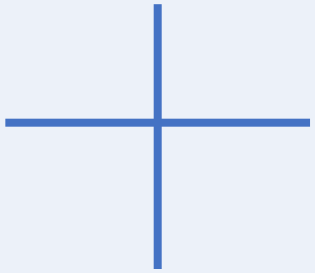
Resultant Vectors

Answer the following questions:

1. State the definition of a scalar quantity.
   A quantity that has size/magnitude only.
2. State the definition of a vector quantity.
   A quantity that has size/magnitude and direction.
3. Classify force as a scalar or a vector quantity.
   Vector
4. State the definition of resultant force.
   The net force or the overall effect of all the forces acting on an object.
5. Sketch two lines that are perpendicular to each other.



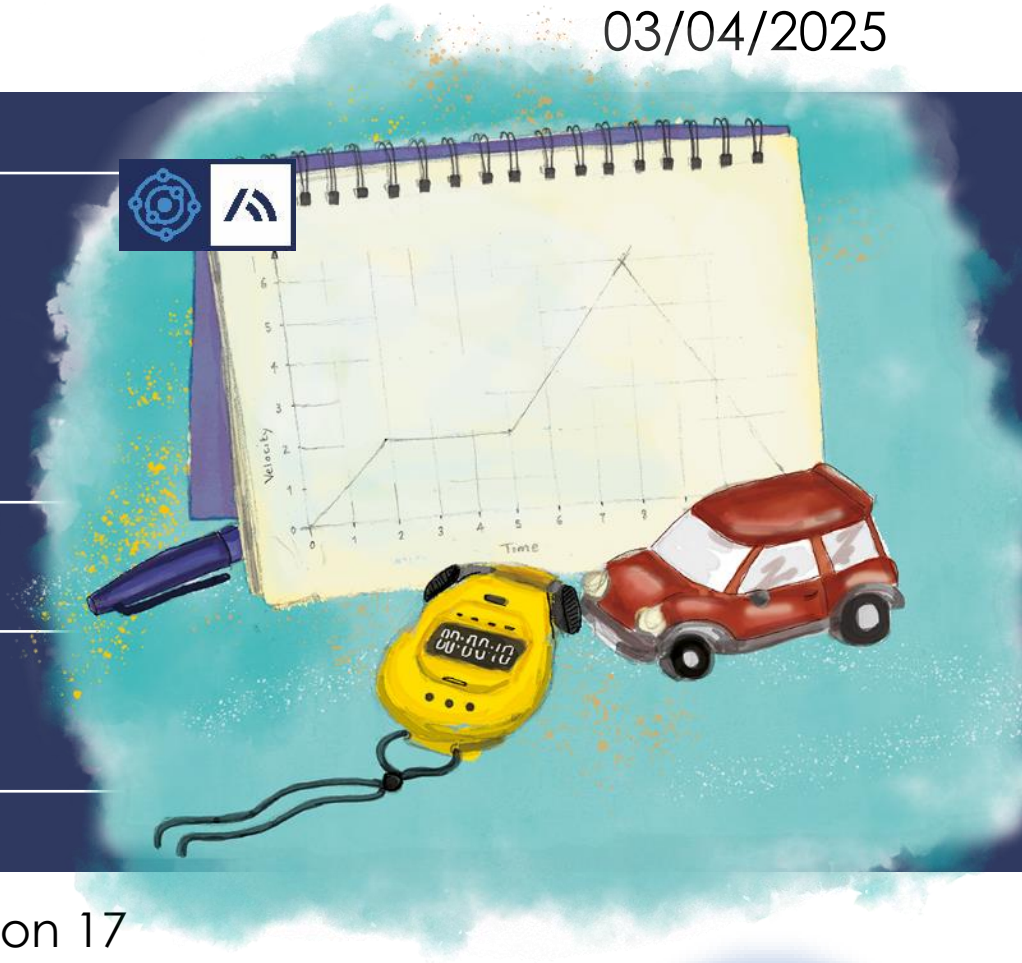
Do Now

03/04/2025

Resultant Vectors

P3.1.3

Science Mastery



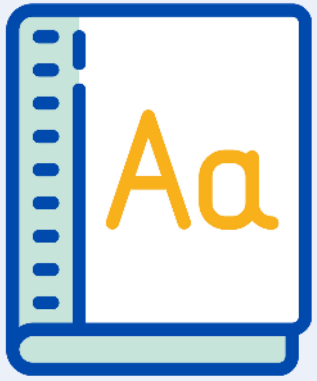
P3.1.1 Prior Knowledge Review
P3.1.2 Scalars and Vectors
➢ **P3.1.3 Resultant Vectors**
P3.1.4 Resolving Vectors
P3.1.5 Newton's Third Law
P3.1.6 Newton's First Law
P3.1.7 Acceleration
P3.1.8 Acceleration Investigation

Maths in Science Lesson 17
P3.1.9 Velocity-Time Graphs
P3.1.10 Velocity-Time Graphs 2
P3.1.11 Acceleration Problems

Following this lesson, students will be able to:

- Define resultant vectors.
- Use scale drawings to determine resultant vectors.

Key Words:



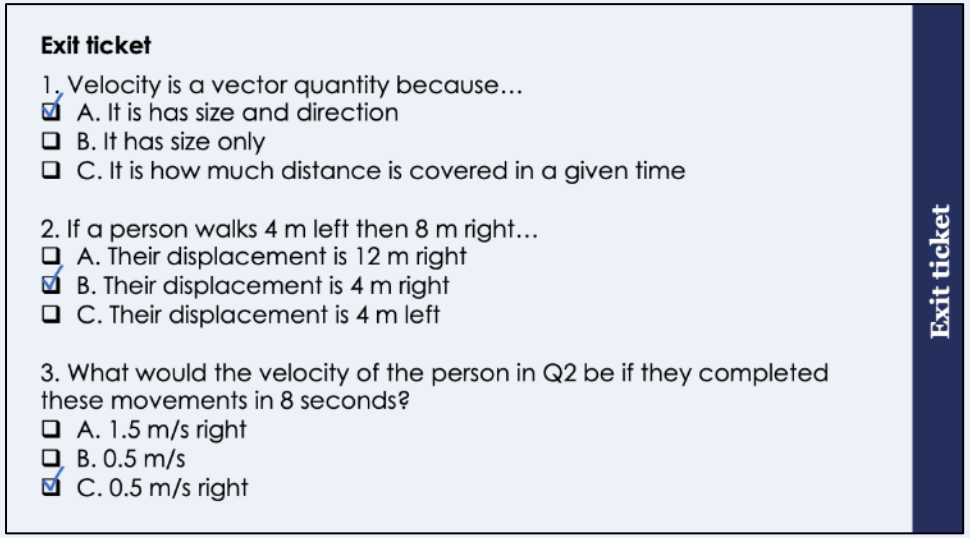
resultant	**vector**	**scale**
horizontal	**vertical**	

Lesson Objectives

This is the fix-it portion of the lesson

The **fix-it** is an opportunity to respond to gaps in knowledge, especially those identified by the previous lesson's exit ticket.

- The teacher should customise this slide as needed, to facilitate
  - **reteach**, **explanation, demonstration** or **modelling** of ideas and concepts that students have not yet grasped or have misunderstood.
  - **practise** answering specific questions or of key skills.
  - **redrafting** or **improving** previous work.



Think outside the box!

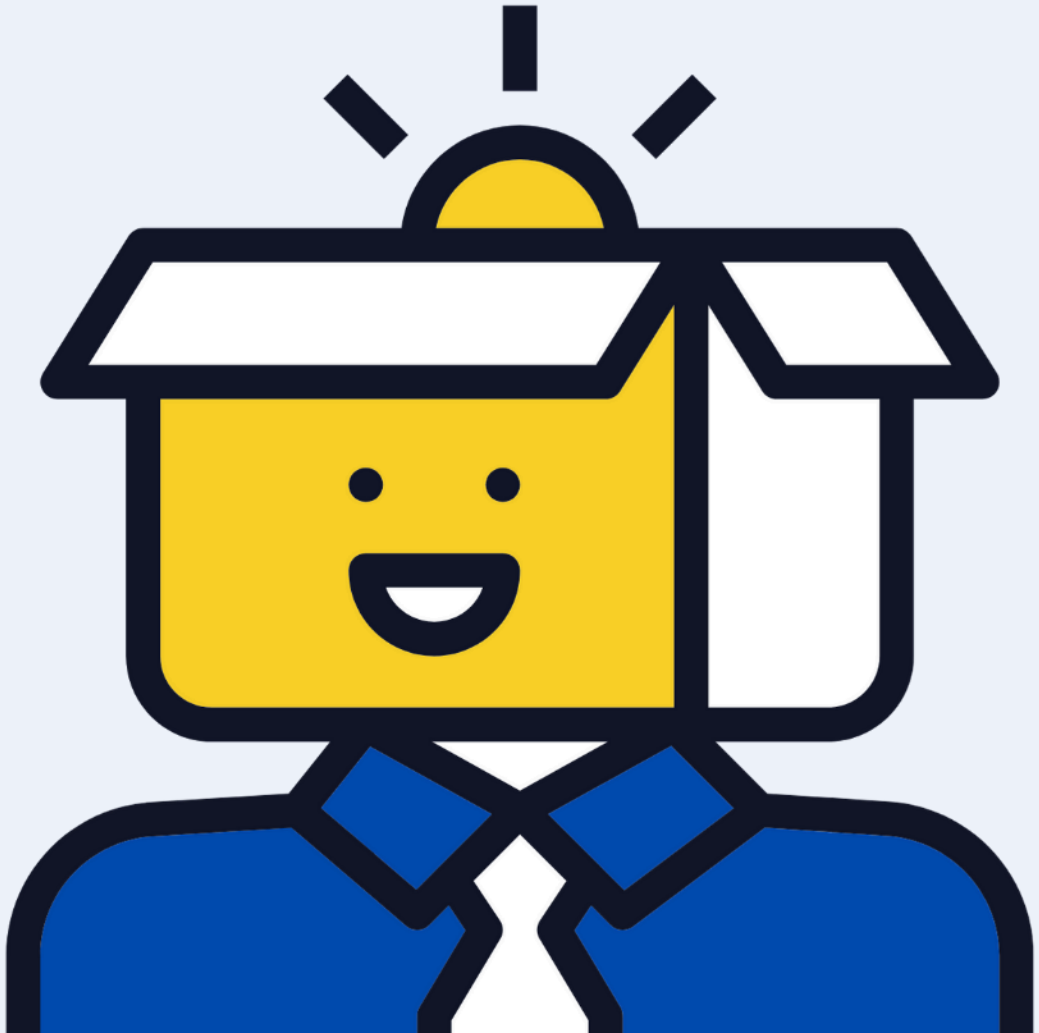
What would happen if a force of 20 N pulled an object to the left and a force of 5 N pushed an object to the right?

How could these forces be represented?

What would the overall effect of these forces be on the motion of the object?

Are these forces balanced or unbalanced?

How could these forces be balanced?



Talk Task

Resultant Vectors

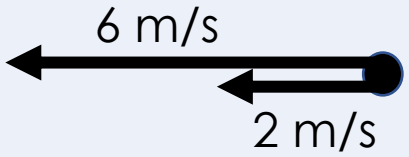
A **resultant vector** is the combination of two (or more) single vectors.

Resultant force is an example of a resultant vector.

Other vectors can combined to make a resultant, including **displacement** and **velocity**.

Resultant force = 15 N left

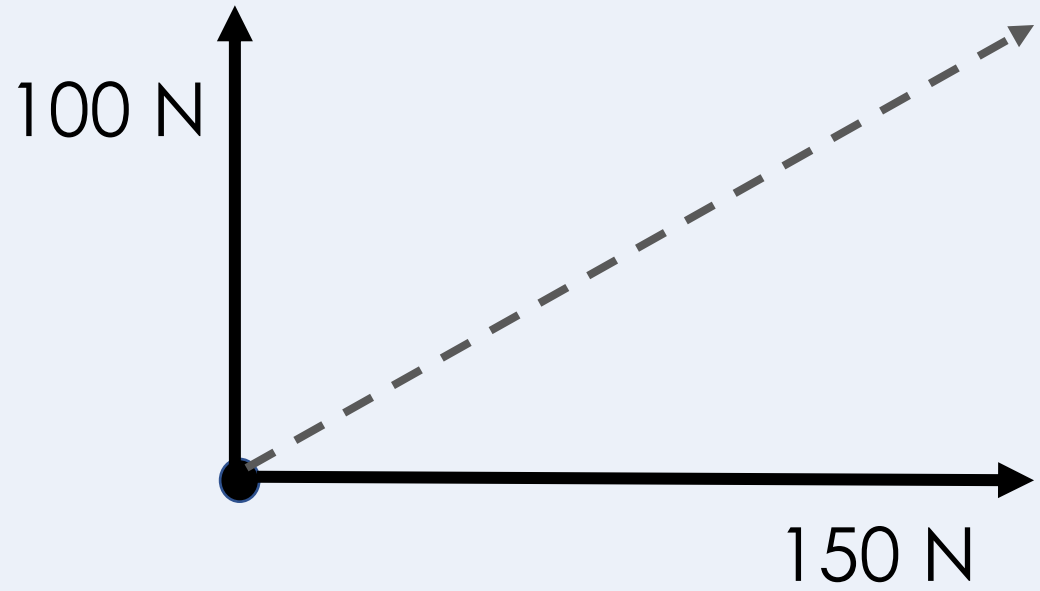
Resultant displacement = 150 m right



Resultant velocity = 8 m/s left

What happens when vectors are not acting in a straight line?

What would happen if a force of 150 N pulled an object to the right and a force of 100 N pulled an object upwards?



Which direction would the resultant force be acting in?

How big would the resultant force be?

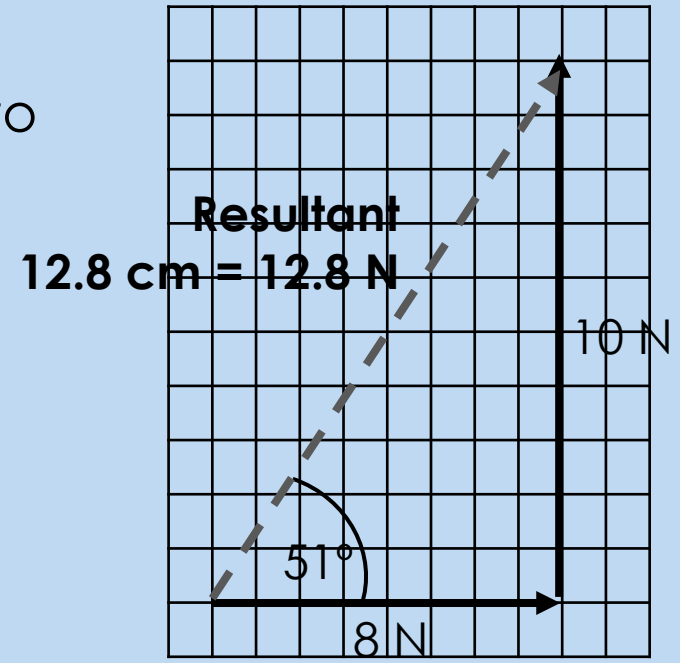
Talk Task

Higher Tier only

Vector Diagrams

The resultant of two (or more) vectors acting perpendicular to each other can be determined using a **scale drawing.**

Example: What is the resultant force when a force of 8N right and 10N upwards.



1. Choose a **suitable scale** to use for the scale drawing (e.g. 1 N = 1 cm)
2. Draw the first vector using your scale and a ruler
3. At the end of your first vector, draw the second vector using the same scale
4. Draw line from the point of origin to the end of the 2nd vector - this is the resultant vector
5. Measure the length of the resultant and use your scale to determine its real magnitude
6. Draw on the angle between the first vector and the resultant vector. Measure the angle using a protractor and label it on the diagram.

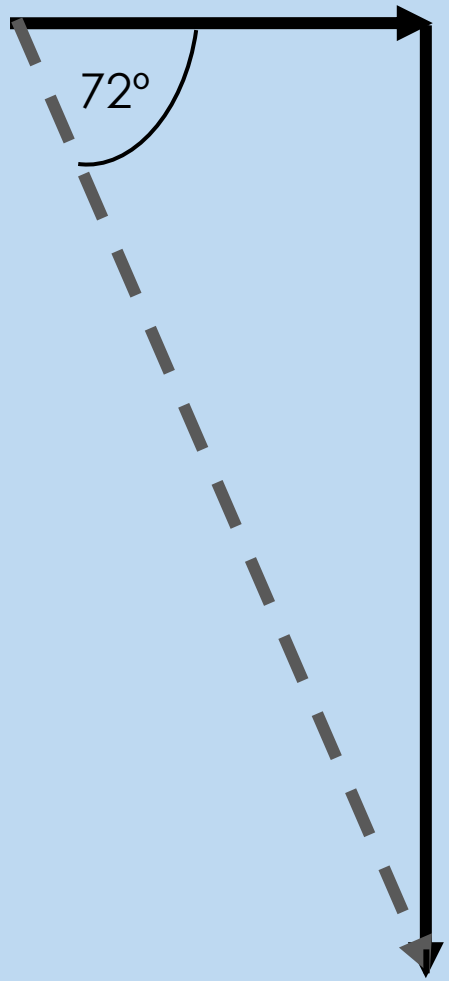
Higher Tier only

Resultant Vectors

Use a scale drawing to determine the resultant vector.

A person walks 5 km East then 15 km South.

1 km = 1 cm

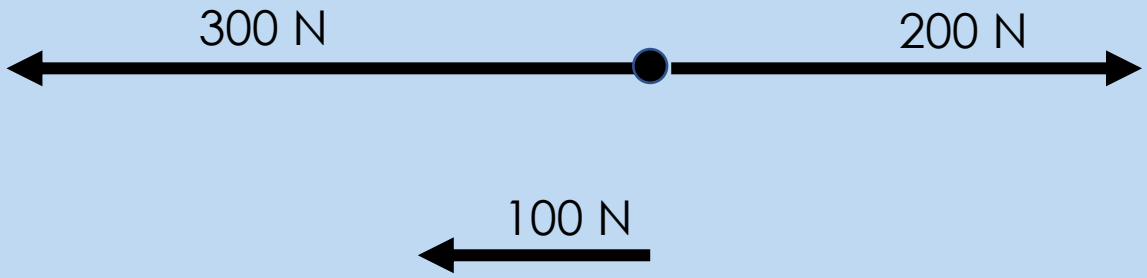


Higher Tier only

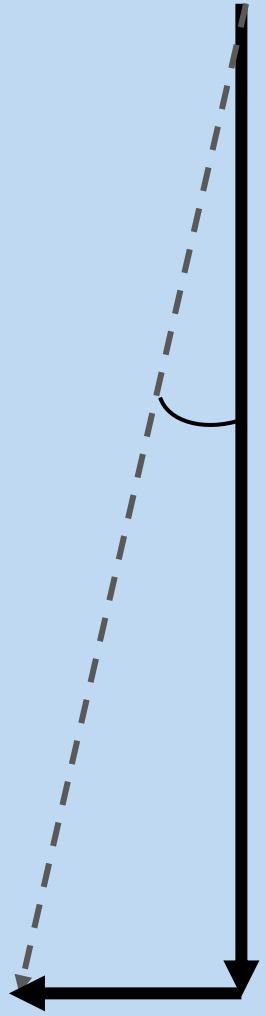
Resultant Vectors

Use a scale drawing to determine the resultant vector.

An object has a weight of 500 N, and is pulled to the left with a force of 300 N and to the right with a force of 200 N.



50 N = 1 cm



Determine if the following statements are true or false:

1. Resultant force is a scalar quantity. **False**

2. The resultant of two forces acting in the same direction can be calculated by subtracting them. **False**

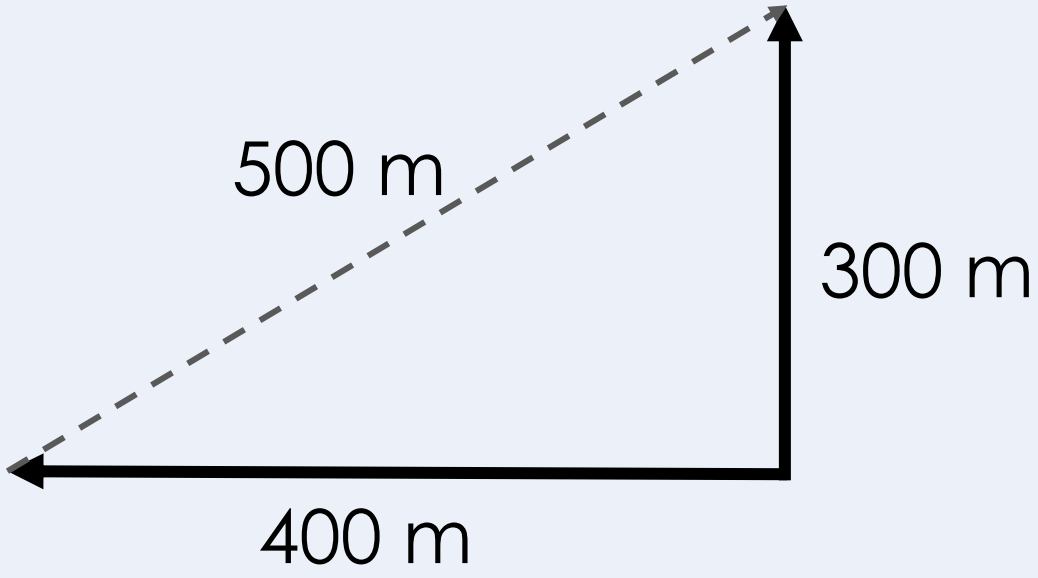
3. Only two vectors can be combined to give a resultant vector. **False**

4. The resultant of two forces acting in opposite direction can be calculated by adding them together. **False**

Check for understanding

What mistake has this student made?

Draw the resultant vector for an object that moves 300m upwards and 400m left.



The resultant displacement is 500 metres.

Talk Task

Drill

1. What is a resultant vector?
2. When drawing vector diagrams, you must always choose an...
3. When drawing a vector diagram always use a pencil and...
4. What 2 measurements must you take when you have drawn a dotted line from the point of origin to the opposite corner?
5. When you have measured your resultant vector length with a ruler how do you convert it to the real magnitude?
6. Where must you measure the angle of your resultant vector?

Check for understanding

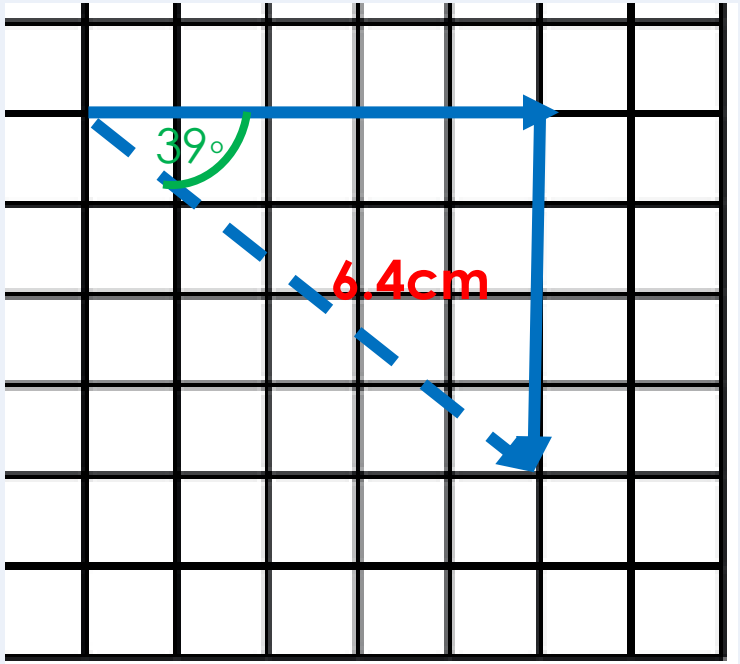
Drill answers

1. A resultant vector is the combination of two or more single vectors.
2. When drawing vector diagrams, you must always choose an appropriate scale.
3. When drawing a vector diagram or with user pencil and ruler.
4. You must measure the length on the angle of this resultant vector.
5. To convert your length to the real magnitude, look at the scale and multiply it by your length. (Scale x length)
6. You always measure the angle from your first vector.

Check for understanding

I: Worked example

Find the resultant vector of an object that travels 100 N right and 80 N down.



Suitable scale: 1cm = 20N

6.4 cm = 20 x6.4 = 128N

Angle from the first vector = 39°

Apply

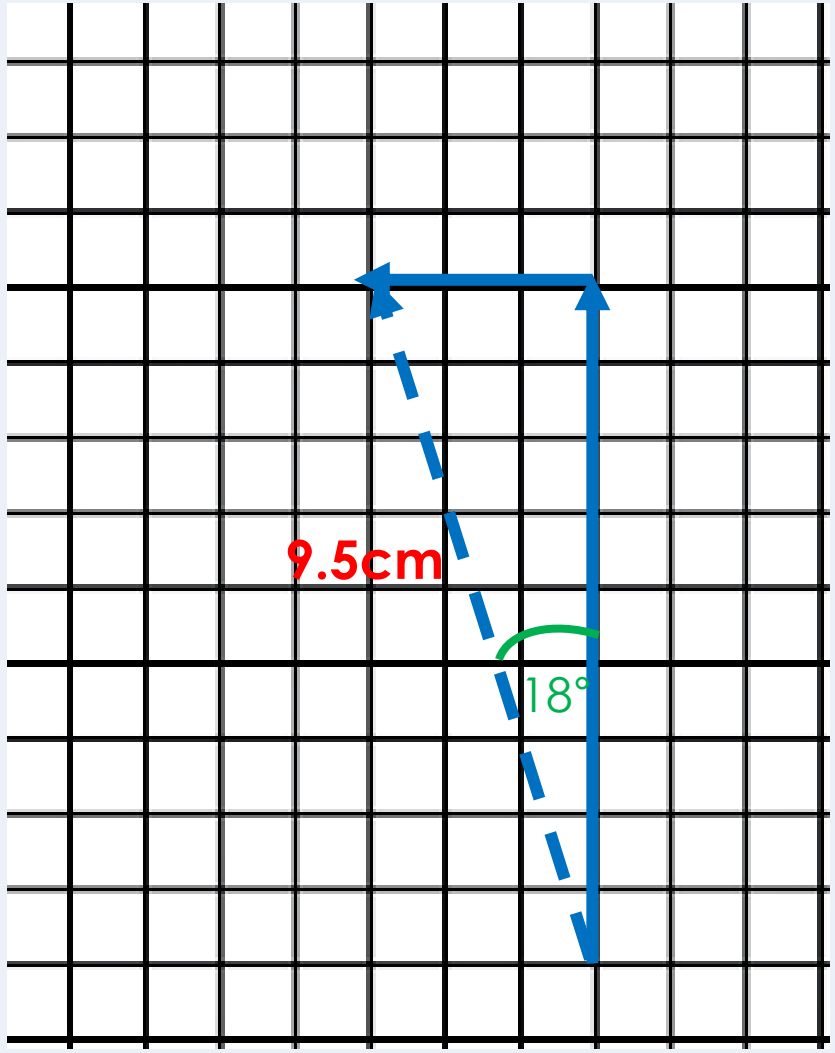
We: Worked example

Find the resultant vector of an object that travels 9N up and 3N left.

Suitable scale: 1cm = 1N

9.5 cm = 1 x9.5 = 9.5N

Angle from the first vector = 18°



Apply

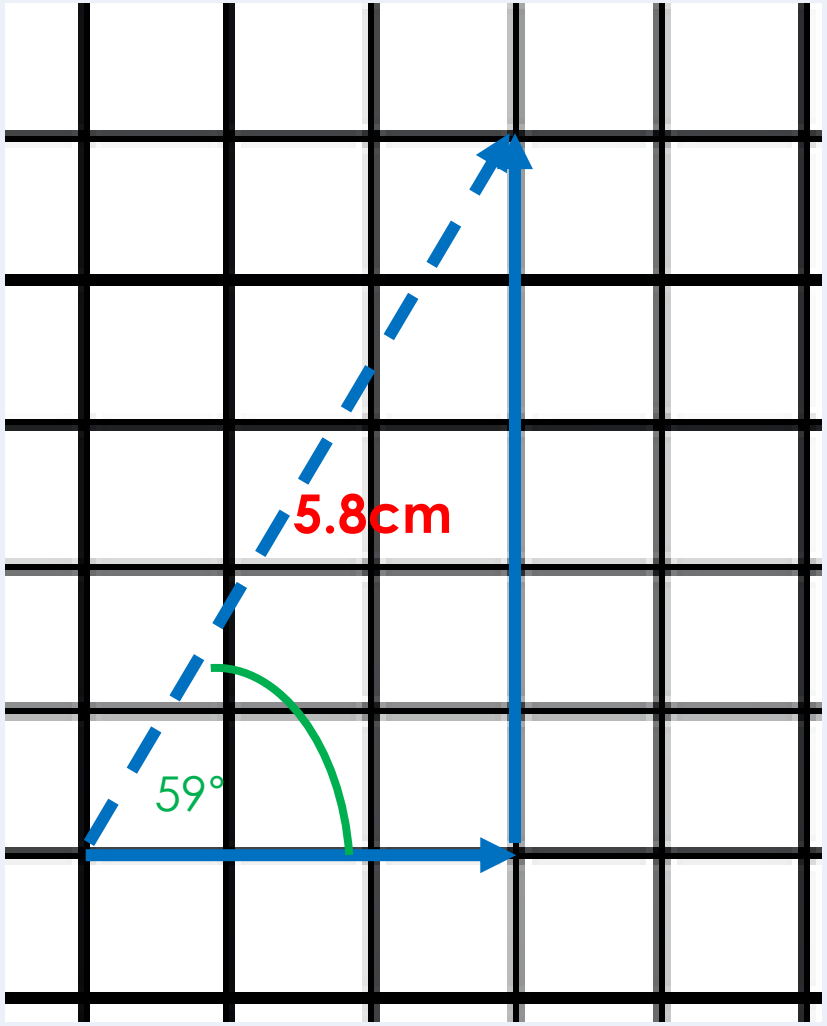
You: Worked example

Find the resultant vector of an object that travels 15 m East and 25 m North.

Suitable scale: 1cm = 5m

5.8 cm = 1 x5.8 = 29m

Angle from the first vector = 59°



Apply

Answer the questions below.

1. Which is the best definition of resultant vector?

- [x] A. A vector that has the same effect as two or more single vectors
- [ ] B. The net force acting on an object
- [ ] C. A quantity that has both size and direction

2. A diagonal resultant vector of magnitude 12 N could be made up of…

- [ ] A. Two horizontal 6 N components
- [ ] B. A horizontal 18 N and a horizontal 6 N component
- [x] C. Two 8.5 N components

3. Which is an essential aspect to include in a scale drawing?

- [ ] A. Lines drawn in pen
- [x] B. A scale
- [ ] C. A bearing

Exit ticket

Feedback

Lesson P3.1.3	
What was good about this lesson?	What can we do to improve this lesson?

Send us your feedback by clicking this link
or by emailing sciencemastery@arkonline.org
Thank you!